Directorate of Distance Education

University of Jammu
Jammu

SELF LEARNING MATERIAL

B.A. SEMESTER IV

SUBJECT : HOME SCIENCE **UNIT : I - V**

COURSE NO.: HS (408) **LESSON : 1 - 22**

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COURSE CO-ORDINATOR

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CLOTHING AND TEXTILE

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B.A. Home Semester 4th

ClOTHING & TEXTILES

Duration of Examination=3 Hours | **M. Marks : 100**
Course Code : HS 408 (T) | **Internal Ass. : 20**
Credits : 4(4hrs. per week) | **External Ass. : 80**

Syllabus for the examination to be held in the year 2016, 2017 and 2018 onwards

Theory

Objectives:

The Course is designed to enable the students to:

1. Gain knowledge on the characteristics of fabrics and their use.
2. Understand the methods of maintaining different fabrics, their finishing and storage.
3. Learn the basic stitching skills and acquiring knowledge about embroidery.
4. Know the basics of Computers.

UNIT-1

- Introduction, Meaning and scope of clothing and textiles.
- Importance of clothing
- Classification of Natural and Man-made fibers
- Terms-Fabric, Yarn, Clothing, Textiles, Selvedge, Warp, Weft, Bias.

UNIT-II

- Manafacturing and properties of (physical and chemical) of cotton, silk, wool.
- Manafacturing of Nylon and Rayon, physical and chemical properties of synthetic and blended fibers
- Laundering and finishing of natural fabrics.

UNIT-III

Finishes: Sanfronising, Merceizing, Tantering, Calendering, Napping, Waterproof, Water repellant, Fine proof; Crease resistance, Moth proofing, Moiring Embossing, Crinkled or Crepe effect.

- Printing: Screen printing, Block printing, Printing by machine.
- Dyed and printed textiles of India.
  - Kalamkari (painted and block printed)
  - Patola, Tie-and-Dye of Gujrat and Rajyasthan.
  - Andra Pradesh Pochanpally, Telia rumals.
  - Tie and Dye of Tamil Naidu, Sungandi, Ikats of Orissa.
  - J&K - embroideries

UNIT-IV

- Soaps and Detergents:
- Properties of Good laundry soap, Material used in soap making, synthetic soaps of detergents.
- Starches Blues and Bleaches. (Types and their uses in laundry)
- Grease removers, Grease solvents and absorbents.

UNIT V COMPUTER Basics

- **MS-WORD**
  - Creating and Formatting a document.
  - Changing Fonts and point size
  - Page set-up, print preview, printing a document.
- **MS-POWER POINT**
  - Starting MS power point
  - Auto wizard, creating a presentation using Auto content wizard.
  - Using clip art, Word art Gallery.
  - Adding Transitions aid animation effects, sitting timings for slide show, preparing note pages, preparing audience handout, printing presentation documents.

NOTE FOR PAPER SETTING:

The question paper will consist of ten long answer questions (two from each unit, choice from within the unit). Each question carries a weightage of 16 marks. The candidate will have to attempt five questions (at least one from each unit). **(16x5=80 marks)**

Distribution of Internal Assessment (20 Marks)

20 marks for theory paper, in a subject reserved for internal assessment shall be distributed

as under:

(i) Class Test	: 10 marks
(ii) Two Written Assignments/ Project reports	: 10 marks (05 marks each)

REFERENCES :

1. Suheela Dhantyagi, (1983). fundamental of Textiles and their care, Orient Longman Ltd, Forth edition .
2. Durga Deulkar, (1944), Househoc.al and Laundary work, Atma Ram and sons, Kashmere Gate, New Delhi.
3. Gupta and Garg, (1988), Test Book of Home Science, Kalayani publishers, Ludhiana
4. Gupta, Garg, & Saini, (1989). Test Book of Clothing & Textile, Kalayani publishers, New Delhi.
5. Subramanian, S., Introduction to Computers.
6. Norton Pepter; Introduction to Computers.
7. Nagpal, P-P, Mastering Microsoft OFFICE-2000

PRACTICALS

B.A. Home Science Semester 4th

CLOTHING & TEXTILES

Duration of Examination=3 Hours	**M.Marks : 50**
Course Code : HS 408(P)	**Internal Ass. : 25**
Credits : 2(3hrs. per week	**External Ass. : 25**

Syllabus for the examination to be held in the year 2016, 2017 and 2018

1. Household Dyeing- Tie and Dye.
2. Drafting of Adult's Bodice Block.
3. Drafting of six panel petticoat.
4. Making of any article using different stitches.

Note for internal assessment (Total Marks : 25)

50% of the total marks for the practical paper in a subject reserved for internal assessment shall be distributed as under:

1) 40% for the class asessments and tests and
2) 10% for regularity of attendance

3) Chakrabory, S.K. 1976, Management by Objectives. An Integral Approach, Delhi; Macmillan
4) Chatterjee, S.S., 1960 An Introduction to Management ; Its Principles Techniques, World Press Private Ltd.
5) Dalela, S., 1983, Textbook of Work study, Standard Publishers distributors, New Delhi.
6) Deacon, Ruth E & Firebaugh, F.M., 1975, Home Management: contexts & concepts, Boston Houghton Mifflin Company.
7) Goel, S.L., 1987 Modern Management Techniques, New Delhi: Deep & Deep publishers.
8) Goldsmith, Elizabeth, B.,2000, Resource Management for Individuals & families, lied, Wadsworth.
9) Gross, I.H and Crandall, E.W., 1963, Management for Individuals & families, lied, Wadsworth.
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11) Jain, P.C and Monica, N. 2003 Consumer Behaviour in Indian context, S. Chand and Company, New Delhi.
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13) Narayan, B.ed, 1987, Leadership & Management effectiveness, New Delhi; Anmol publishers.
14) Newman, W.H., Warren, E.K. and Mc Gill, A.R., 1998. The process of management strategy, Action, Result, Prentice, Hall of Indian Pvt. Ltd.
15) Nickell and Dorsey J.M., 2002, Management in family living Wiley Ltd. New Delhi.
16) Rao, S, 2004, Sociology, Primary Principles. S. Chand and Company New, Delhi.
17) Sethi M, and Seetharam P. 1994 cosumerism: A growing concept phoenix publishing houses, New Delhi.
18) Singh B.P and Chhabra T.N., 1983, Business Organization and Management Kitab Mahal, Allahabad.
19) Steidl and Bratton, 1967, Work in the Home Johb Wiley and Sons. New York.
20) Swanson B., 1981, Introduction to Home Management, Mac Millan, New York.

TITLE OF CONTENTS

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Lesson-1

Unit I

MEANING AND SCOPE OF CLOTHING AND TEXTILES

1.1 INTRODUCTION

In this lesson, you will understand about the meaning and scope of clothing and textiles.

1.2 OBJECTIVES

This lesson aims to help you understand:

1. Meaning of Clothing and Textiles
2. Scope of Clothing and Textiles.

INTRODUCTION

Clothing came into existence from a very early age. The primitive people made their clothing from skins of animals and barks of trees. They also used a network of grass and strips of leaves to cover and decorate their bodies. Our knowledge of early development of textiles is very meagre because there are few written records. Textiles were first developed as a means for carrying foods, as mats in shelters and later used as clothing with the progress of the human race, the textile industry developed and linen, wool, silk and cotton came into use. China, India and Egypt were probably the first countries to start the manufacture of what we call textiles today. They invented and manufactured many tools for spinning and weaving and not only discovered and utilized the chief-textile fibres like cotton, wool, silk and linen but make remarkable progress in the techniques of textile manufacture.

At first fabrics were made entirely of one fibre. With the progress of the industry fabric manufacturers have evolved intricate and complex methods to produce a variety of quality and effects in textiles. Fabrics are made of various combinations of mixed fibres, of different kinds of yarns and different weavers. The designer and the artist too have made their contribution in bringing out new patterns. Long ago the cloth was coloured to look attractive by the use of natural dyes and pigments. The chemist with the help of scientific research has now produced new dyes and new shades of colours and new colour combinations. He has also succeeded in introducing synthetic fibres like rayons, nylon and vynion, while when spun, woven and finished look like natural fibres.

1.3 MEANING AND INTRODUCTION OF CLOTHING AND TEXTILES

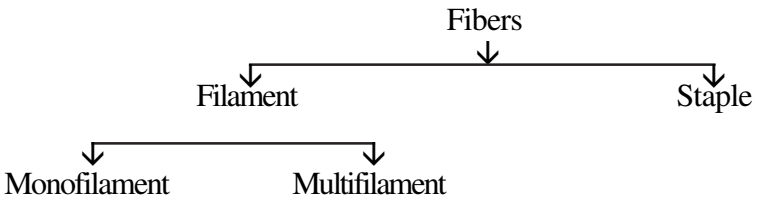
Clothing refers to the various articles of apparel used to cover the body.

Textiles refers to the raw as well as the finished materials made from fabrics.

Study of Clothing and Textiles is the study of yarns, construction of fabrics and finishes of the same. Fibres are the fundamental units used in fabrication of textile yarns and fabrics. Fibres are obtained from natural sources and also are man made. We get most of our clothing from the natural fibres. With the advancement of science, many more synthetic fibres were developed and are in routine use. These fibres resembles the natural fibers except for chemical composition.

According to the nature and physical composition various fibres can be classified as

Classification of Fibres



1.3.1 Filament Fibres

Filaments are natural or man-made fibres of continuous length, measurable in yards or meters. Naturally occuring filament fibres are cotton, silk and wool.

These filament fibres are of two types:

(i) Monofilament Fibres :- These are made up of a single, smooth,

solid strand.

(ii) Multifilament Fibres :- These are composed of a number of tiny filaments twisted together. The size and number of filaments can vary widely.

1.3.2. Staple Fibres

Staple fibres are short in length and measurable in inches. The length varies between three quarters of an inch to 18 inches or so. All the natural fibres except silk are stable fibres, however man-made fibres are cut into short lengths.

1.3.3 Natural fibres

Natural fibres can be of three types:

1. **Vegetable Fibres** :- The basic material of all plant life is Cellulose. Cellulose is formed of linear chains of glucose units bound to each other. All the cellulose fibres have many similar basic properties but do differ from each other with respect to others.

Some of the common properties of vegetable (cellulose) fibres -along with their significance are given below:

	Property	**Significance**
(i)	Low Resiliency	Fabric wrinkles unless any finish is given.
(ii)	High Density	Fabric feel heavier.
(iii)	High Water Absorbency	Comfortable for summer wears

		good for towels, handkerchief and diapers.
(iv)	Lacks loft	Yarns can be creped, high count fabrics feel can be made.
(v)	Good conductor of heat	Fabrics feel cool in summer.
(vi)	Resistant to Strong Alkalies	During washing, fabric can be boiled and can withstand hot Ironing.
(vii)	Susceptible to strong Mineral and organic acids	Stains that require acid treatments . should be rapidly removed.
(viii)	Resistant to Moth	Damp clothes should not be stored.
(ix)	Identification	Cellulose fibres ignite quickly burn freely with smoke have an after glow and form grey ash.

2. **Animal Fibres** :- Wool and Silk are obtained from animals, therefore termed as animal fibres. Common properties of animal fibres along with their significance are given below:

	Property	**Significance**
(i)	Medium density	Fabrics of same thickness feel lighter than cellulose fabrics.
(ii)	Weak strength, if wet	Wool when wet looses about 40% of its strength, silk looses 15%. So, careful handling is necessary during washing.
(iii)	High resiliency	Wrinkles go out upon wearing.
(iv)	Bad conductor of electricity	They build up static electricity in cold and dry weather.
(v)	Susceptible to strong alkalies	Use neutral or slightly alkaline detergents for washing.
(vi)	Resistant to dilute mineral acids	These can be dyed easily.
(vii)	Suspectable to oxidizing agents	Chlorine bleaches damages the fibres strength.

(viii)	Identification	Protein fibres burn with a peculiar odour similar to that of burning hair, pulses (dal) or

of moth.

3. Mineral Fibres :- Mineral fibres are inorganic materials shaped into fibres and are mainly used in the fire proof fabrics. Some of the common properties of mineral Fibres are as follows:

	Property	**Significance**
(i)	Fire Proof	Useful for making firemen's dress, fire proof curtains and screens etc.
(ii)	Resistant to acids	Cannot be easily dyed.
(iii)	High pliability	Except of asbestos, others like metal can be drawn into fibres. Asbestos in a natural fibre and non-pliable.
(iv)	Identification	Do not burn at all.

4. **Man-made or Artificial Fibres** :- These do not occur in fibre form, but are turned into it by man. The process involves breaking down their original form and then reassembling into different fibrous' forms. e.g. rayon, nylon, decron etc. Common properties and significance of man made fibres is as follows :-

	Property	**Significance**
(i)	High Strength	Resistant to pulling and rubbing during weaving washing and wearing.
.(ii)	High resiliency, elasticity and elongation	Less wrinkles after washing and wearing maintain spaces for warmth.
(iii)	Low moisture absorption	Easily washable, easy spot removing and quick drying.
(iv)	Low affinity for Dyes	Difficult to dyes and stain
(v)	Identification	Recently bums and melts giving a distinct plastic burning odour.

1.4 SCOPE OF CLOTHING AND TEXTILES

The scope of clothing and textiles is vast and ever expanding. We are all aware that the prime need of man are food, clothing, shelter and fuel. Textiles serves the individual (man, woman and child), the home and country. They add to our comfort, appearance and to our every happiness in several ways by their exceptional versatility. In the home, and in interior decoration textiles helps enhance their beauty. In a larger sphere, they help serve our country in the army, navy, aeronautics and in our manifold industries. In recent years, there has been an ever increasing demand for our textile and clothing, both at home and abroad.

Almost every state of India has its own exclusive textiles. Kashmir, popularly called 'The Touchstone of Beauty' is noted for its different exquisite embroidred fabrics. Kashmir carpets are famous all over the world for their elegance exquisite designs. workmanship with appropriate colour schemes and fine texture. They make our home living more graceful. Yet another of Kashmirri unsurpassed handmade textile treasures are the Pashmina shawls. As Charles Diskens said: If an article of dress could be immutable it would be the Kashmiri shawl designed for the unity in the unchanging East copied from patterns which are heirlooms of the orient. For untold ages Banaras has been the home of brocades and other selected fabric. We have the exquisite Patolas from Patan the silky muslin saris from Chanderi delicate fabrics from Bengal the Pulkaris from Punjab so on.

In order to gain a better understanding of scope of textiles we need to view the field in particular to India's total planning process and the objectives envisaged for the socio-economic development of our company. Each of our Five Year Plans present a picture of continuity and evolution in our basic economic social policies. Each plan has devoted careful attention to the political-social requisites of planning with fresh ways for strengthening institutions establishing methods and machinery and broadening the manpower base.

While the First Five Year Plan of 1951 marked the beginning of community development and national extension services in rural areas the second and third five year plans made the concept of planning and development more complete and dynamic with a clear comprehensive long term approach to the problem of industries and economic development. Industry was given a leading role in securing rapid economic advance. In order to overcome the diffculty of the lack of a trained personnel education with emphasis

on the technological and scientific side and research was given more importance. Personnel for the professions were to be prepared. The pattern of professional education differs from field to field as for instance the profession of textile technologies has developed its own pattern of project and education.

Admittedly, during the past few decades a new textile world has emerged. New fibres, new fabrics and the new finishes make new demands for understanding and evaluation. The progress of Rayons, the advent of new synthetic fibres and finishes seem to speak volume. Our ever increasing variety of fabrics in a wide range of colour is in almost all countries. Today light-weight, soil resistant, permanent-pressed fabrics durable pressed garments are becoming increasingly popular. Modem production methods overcome some of the old dificulties in making fibres into fabrics. We now make some fibres usable which formerly were unusable. We have now a whole range of beautiful fabrics which are crease-resistant, lustrous or dull as the desire may be. They do not fill and accumulate dust or dirt or 'static electricity'. Our manufacturing plants are constituting fabrics in weaving, knitting, felting and the like. Lightweight 'drip dry' garments have become household words. We have fabrics for furnishings, for industry, army, navy and aeronautics, which are becoming increasingly popular both at home and abroad.

The Handloom Export Promotion Council, set up by the Government of India, takes steps to promote the export of India's Handloom fabrics. In order to achieve this, the council organise trade missions and over seas market studies. This should open a communication channel that will continually feedback information about international market trends, consumer preferences and distribution facilities. Among its many responsibilities will the collaboration and publication of literature concerning the handloom industry for dissemination in foreign countries, and the staging of exhibitions abroad to educate the foreign public of the beauty and splendour of the handloom fabrics and the varieties of uses to which they could be put. The council looks after quality standards and takes prompt action to settle complaints. It helps the producer to get quality raw materials and also helps the exporters effectively in such matters as shipping opportunities, freight rates, credit problems, getting foreign exchange for visits abroad, matters, relating to drawback sales-tax etc.

The ever-increasing horizon of the textiles industry is largely the work of our professional personnel more goods and more services are being made available to mankind. These developments arise because intelligent and ingenious technologists invent and refine

new methods of serving, mankind's needs and because the public is willing and able to pay for the improved services and goods.

There is dire need for information labelling, quality, marking, indication of brands and standardisation to help the consumer get his mooney's worth. A pioneering effort in this direction is being made by the Indian Standards Institution which has a certification mark of ISI. All standard goods must have the ISI mark.

As aptly said by our well known philosopher and educationist, Swami Ranganadanada of the Ramakrishna Mission: 'We are passing through a renaissance. For the first time in our long history, India has resolved to translate her vision of human excellecne into reality by earnestly embarking the creation of a free and equalitarian society offering opportunities for self development to everyone of its citizens. Every citizen of modern India owes it to itself and to the nation at large to strive and to become strong and dynamic. Such strength is the product of faith in oneself and in one's country and heritage, reinforced by the assimilation of all available knowledge National and International. The growth of new and dynamic India effecting revolutionary changes within her body politic consistent with her vision of human excellence and exerting her distinctive influence on the rest of the world is the vision that should inspire all our life, education; politics and religion. The instruments of social change in our modern society are the educated folk of that society.

1.5 LESSON END EXERCISE

1. What do you mean by the team 'Clothing and Textiles' ?
2. Discuss the scope of 'Clothing and Textiles'.

1.6 GLOSSARY

Clothing: The term clothing refers to the various articles of apparel used to cover body.

Textiles: The term textiles refers to the raw as well as the finished materials made from fabrics.

Fibres: are the fundamental units used in fabrication of textile yarn and fabric.

Natural Fibres: All the fibers which are obtained from the natural resoruce like plants and animals of cotton, silk, wool.

Man-Made Fibres : Man made fibres do not occur in the fibre form but are

turned into it by man e.g. Rayon, Dacron, Nylon etc.

1.7 SUGGESTED FURTHER READINGS

1. *Duntyagi,* S. (1974) Fundamental Textiles and their care. Orient Longman, New Delhi.

2. *Gupta,* S. *Garg N. Sain R.* (1991) Text Book of Clothing and Textiles 4th Edition Jalandhar.

Lesson-2

Unit II

IMPORTANCE OF CLOTHING

2.1 INTRODUCTION

In this lesson, you will understand the importance of clothing.

2.2 OBJECTIVES

This lesson aims to help the students understand :-

- Importance of clothing in person's life
- Socio-psychological aspects of clothing.

2.3 IMPORTANCE OF CLOTHING : INTRODUCTION

Our desires in regard to wearing apparel may be divided into two classes primarily, the desire for warmth and for protection against the elements; secondly, the desire for satisfaction that we receive from wearing clothing that makes us appear to advantage. The former type is materialistic while the latter is mental or psychological.

There is much to be said for what the poet said, 'Clothes make the man'. Our sense of appreciation of beautiful things in wearing apparel and the knowledge of how to use them to the best advantage come to us through inherent qualities, education, training, environment and a background of habits and emotions. This background influences most of our wants in regard to clothing. Since these wants are expressed through the processes of the mind, it is necessary to know something of the way the mind works, and how our emotions will react to clothing. All these processes are closely related to one another.

The mind is the director of all organic functions. The gateway of our knowledge for wearing apparel and for developing our experiences in selecting and judging fabrics is our five senses-sight, smell, hearing, taste and touch.

SIGHT is the principal sense through which we receive most of our knowledge. By means of 'after images' produced in the eye it is possible to create style effects that are really optical illusions. By the proper use of lines, form, colour-effects, etc, it is possible to make a person appear taller or shorter even as much as by two inches or even heavier or lighter than his actual weight.

COLOR is one of the important factors in wearing apparel. According to Dr. C. V. Raman, the eminent Indian physicist, the human eye can distinguish some 250 different shades of colour between the red and violet ends of the spectrum. Thus a whole colour world is opened up for us. Like the ragas in music, colours in textiles influence our moods. It has much influence on people. While bright colours encourage a gay mood, soft pastel shades are soothing. This is often apparent of festive occasions like the Holi, Id, Diwali or Christmas, when we don beautiful clothes. The gay colours seem to add to the gladness of our hearts and the merriment of the occasion. Colour gives vitality to a new season, makes a fabric sing with life and freshness.

Not only the psyche but also the body reacts to colour, results of experiments

have shown that the physical equilibrium, the pulse rate, heart beat, respiration and even digestion to be effected by colour. It has been found that certain colours can be used as tranquilizers while others work as stimulants.. Colour has much use on modem psychotherapy.

SMELL evidence tends to show that women use their noses as well as their eyes when they go shopping. A garment no matter what its quality, generally will sell better if there is something about it to impress the purchaser without his knowing it. Unconsciously that sublimal or sub-conscious impression influences him to buy more. This psychological factor is being used more and more to advantage by textile businessmen today. They use faint scents on their newer rayons and fabrics in order to attract the consumer. Recent developments show hosiery being scented by chemicals that will repel moths and insects.

TOUCH While taste and hearing influence our choice of clothing less, touch contributes most to our emotion and knowledge concerning clothing. It is through the sense of touch that we experience the softness of a Benares or Conjeevaram silk sari, the feel of velvet, the warmth of wool or the coolness of lines or sheer cotton.

Most of our education is obtained by the exercise of our five senses either separately or in co-ordination, so to judging the quality of fabrics or to dressing ourselves.

ENVIRONMENT consists of both the physical and social contacts or surroundings and practices of the individual.

Down the ages -fundamentally we have placed an emphasis on the destiny of the human soul, and paid little heed to the gross physical body or its dress. Beautiful fabrics of the highest order were wrought no doubt in India, but little stress was placed in the sewing of a garment or its structural outline. This was partly due to the climate. The heat of the country demanded flowing costumes and loose clothes to let in air and lend coolness. Yet none can deny that Some of the saris have been very cleverly" draped to show the beautiful contours of the body-as in the wearing of a 'nine-yard sari in the 'Deccani way'. Local interests have brought about individual styles in the draping of the sari. Our environment has also modified our feelings and tastes in the matter of decoration. For instance we know that the brilliant rays of the sun have induced the Rajasthani to wear vivid coloured garments-hence Rajasthan is popularly known as the 'colour belt' of India. As we approach further north of India we see more subdued colours on garments.

Today, studies in child development indicate that children are often vitally influenced

by the clothing they are forced to wear. Behaviour problems are sometimes caused by ill fitting or poorly constructed or torn garments. This may even cause a feeling of shame and inferiority in children. In India, there is great disparity of wealth and the purchasing power of the consumer is very low. Hence the system of having uniforms in schools has greatly helped to avoid certain behaviour problems.

Research findings in the U.S.A. show that to the youth the appropriateness of a costume, the becomingness of colour, quality, style, neatness, and cleanliness in clothing help to build self-confidence and even a sense of security. To them clothes were important for the impression made on others, for getting a job more easily or for what they termed as 'social achievement or 'social contribution'. In short, the youth felt being well dressed was important because they could forget themselves and think of others more-because they are thus more pleasing to others. This survey-serves to throw much light on the attitude to the youth to clothing.

These are factors for thought and consideration. We are aware that the West has a realistic approach to life and a more practical way of living than we have much to learn from them.

Yet dress has its own place in the development of personality. One should not make a fetish of it, for beauty is not a thing of mere senses. Together with the patterns of external behaviour, which are of the surface mind, we have also to work out an integration of the physical self with the higher Inner Self. These alone can bring about a fuller development of our personality. The living soul is progressing in the process of evolution, rising from a lower to a higher state and fulfilling its mission at every step of manifestation. The destiny of the human soul is determined by our thoughts, desires and tendencies. Life after death is continuation of the present life, and we make our future according to our thoughts and deeds of the present life.

2.4 CLOTHING AND PERCEPTION OF PEOPLE

First impression play a very important part in the later social interaction between individuals. If a first impression is poor, it may create avoidance whereas if it is favourable and pleasant it helps building relationship. Clothes do have a definite influence on the impressions or characteristics a person attributes to those he meets. That is, clothing tells the observer something about the wearer. The way a friend is dressed may tell us the mood he is in, whether he is tired, or what he is planning to do next. We do perceive

people differently because of their clothing and grooming, but this may vary with the viewer, his acquaintance with the subject and the situation in which he is perceiving the individual.

2.5 CLOTHING AND BEHAVIOUR OF PERSON

In every culture men and women dress differently. Such as trousers verses skirts, pastel colours in contrast to darker, sari versus skirts, simple tailored versus fancy ruffles, and so on. In many cultures physical maturity is indicated by a change in clothing. The girls clothes indicate that they are of marriageable age or the boy's attire indicates whether he is to be considered a man or a boy. In India little girls are dressed in western manner, but when they reach maturity they are expected to wear the sari.

We even use clothing terms to describe the type of job for e.g., say **"White collar worker"** the labouring man will wear **"work clothes"**, his foreman may wear a sport shirt, those higher in range may wear shirt or a white shirts and tie while those still higher may wear a jacket.

2.6 CHOICE OF CLOTHING

Choice of clothing varies due to values, interests, attitudes and moods of the people. Psychologists and psychiatrists report that they use grooming and apparent interest in appearance as a clue in diagnosing of a psychiatric patient. When the patient tries to improve his grooming, the doctor considers the patient recuperating. When the patient is completely disinterested in his appearance then the doctor fears the patient is having a bad day. Costumes are designed to set the mood of the scene, or of the play or opera as a whole. There is a common belief that appearance does indicate something about the personality of the wearer.

2.7 MOTIVATION AND THE PURCHASE OF CLOTHING

It is believed that all dress is motivated by the environment i.e., both physical and social. Dress is a means through which man can express his sense of belonging to the group and his subjective sentiments. In consumer motivation and consumer satisfaction one tries to determine why a garment is liked or disliked. There are three types of explanation to this:

1. At the first stratum are the attributes of the garment itself -factors which are completely independent of the respondents, and can be measured objectively, such as colour, fibre, weave, price, style of collar and so on.

2. The second stratum of explanation is concerned with properties of the individual attributes of the components of satisfaction. For example, ease of care, durability, appearance, performance during use (wrinkling, holding shape, and so on), adaptability to various occasions or to other garments.

3. A third stratum of explanation of motivation in the selection of clothing is found in the relationship between the interests and values in clothing and the general interests and values of the individual. For example, the individual who is anxious to impress people and especially desirous of his groups approval may be interested in clothing mainly because of the impression it will make on others. Another person may be interested in practical considerations, in durability as related to price.

Consumer motivation is discussed while considering the purchase of a garment while consumer satisfaction is measured after the garment has been in the possession of the consumer.

2.8 SHOPPING BEHAVIOUR AND SATISFACTION

Research indicates that by the time the consumer is ready to purchase he has already done a certain amount of narrowing so that his choice is already limited. Initially in the beginning the consumer either plans to shop in his own town or neighbourhood.

The habits and values of the individual also determine the number of shops from which he will make his choice. Shopping is also done according to the status. The "higher" the social status, the more "specialized" is shopping.

The younger married women shopped with their husbands and older women did shopping with their daughters or daughter-in-laws. Price is another factor which limits choice.

One of the important problem is consumer behaviour is to determine the sources of information used by the consumer at each stage of the decision making process. Mass media plays an important role in creating awareness.

2.9 AGE DIFFERENCES IN THE PSYCHOLOGICAL ASPECTS OF CLOTHING.

Clothing is an extremely important part of the childs & adolescents world. The very young baby does not recognize objects or people. His awareness of life consists largely of consciousness of himself, particularly of his physical self. The sense of touch

functions almost perfectly from birth. The skin is very tender and easily chafed. Therefore, the clothes should be soft and pliable. Rough and unfinished seams or fastening irritate the skin. The more comfortable the clothing the less interfering and enhances active participation. Young children value clothes which will gain for them the approval of others.

Preschool children give importance to colour. Red is usually their first choice. They love soft texture clothes such as velvet, fur, toweling material. They love decorative details and also comfort is one of the most important aspect of clothing.

The adolescent's primary requirement for clothing is their clothing should meet the approval of the peer group. A number of studies have investigated the relative importance of appearance and other factors upon social acceptance or rejection of young adolescents. Studies of expenditure indicate that more money is spent on the teenagers' clothing than for any other group. Adolescents seldom shop alone. They go with mothers or with their friends. During adolescence there are many changes and necessary adjustments and the adolescent tends to feel insecure. This makes them highly sensitive towards clothing therefore need approval and acceptance.

The psychological needs to be met are fundamentally the same for the elderly as they are for the other age groups. They also need affection and opportunities for social contact. They desire the approval of others and recognition of their personal dignity. They do not want to be singled out and pitied. They go for clothes which are easy to wear, soft, sober, and comparatively spend less on their clothing. There would be specific preferences. The elderly shoppers greatest complaint is that they are unable to find stylish dresses.

Therefore, knowledge of the social psychological aspects of clothing is needed. According to Dorothy Dickens in the main, clothing serves a social purpose just as food serves in the main a health purpose.

2.10 SELECTION OF CLOTHING

1. Select the fabrics according to the need and purpose for which it is used i.e., daily wear, special wear etc.

2. Consider the quality of the fabric. .

3. While buying saris or dress materials consider the suitability of the fabric to the occasion, the age of the person, the personality and season. Both quality and attractiveness are essential features. For everyday wear especially if the fabric is

to be subjected to hard wear choose sturdy material with a firm weave. For special occasions consider the upkeep, quality and durability.

4. Fabric should be selected to suit the type of person and also the figure.

5. Soft drape into gentle folds and care ideal for the women who like to appear faminine and delicate.

6. Firm fabrics such as cotton, denim, tericotton, terrane, corduroy etc. flatter a heavy figure, giving a smooth line without adding bulk.

7. Shiny and lustrous fabrics reflect light and emphasize body contours. These should be worn only by the slim figure individuals. Dull textures absorb light and as a result do not enlarge the body size.

8. Colour is an important factor to be considered while choosing the fabric. They must be harmonious and be used in pleasing way. Dark/ bright colours are suitable for winter while in summer, light colours are more pleasing.

9. A short person should choose saris with narrow borders.

10. Avoid large-figured designs, wide borders or broad strips for a stout figure.

11. Consider the textile of the material.

12. Children's clothing should be patterned for growth, ease and freedom, well constructed to stand hard wear and be comfortable, simple, accompanied by becomingness of line and colour closely woven material which will remain fresh even after several washes.

13. Factors to be considered while choosing men's wear are quality, light weight, less laundry requirement, durability, appearance and comfort.

14. While choosing household textiles like towels, dinner clothes and napkins, bed sheets etc., look for the quality, wash ability, durability, absorbency, appearance and softness.

- For dress making -fabrics should be attractive in appearance, good draping, strong and flexible.
- For suiting -hard wearing, resilient.
- For underwear -Soft, washable, porous and flexible.

- For linings -smooth, slippery at one side.
- For bed linens -strong, smooth, washable.
- For toweling -soft, absorbent, washable.
- For sports wear, socks, hosiery items- comfort, good fit, shape retention, design flexibility, psychological appeal, wrinkle, resistance, appearance appeal, longer wear, reduced seam puckering e.g. strength items.
- Darker colours and shiny fabrics are for evening and night wear and lighter colours and dull textures are appropriate for day wear.

2.11 SUMMARY

Appropriate clothes help to make one happy. Clothes should be suitable for the occasion. If clothes are in good style, clean and neat, one unconsciously has a feeling of well-being which contributes to the happiness of an individual to a certain degree. It cannot be denied that good grooming helps to give a favourable impression and build self-confidence. But one must not forget that true beauty is something real not a mere physical fact, but an expression of personality; and this being so, beauty can find its way into the chambers of man's soul through different ways.

2.12 LESSON END EXERCISE

1. Write in detail about importance of clothing.
2. What are the points that you keep in mind while selecting clothes?
3. Write a note on socio-psychological aspects of clothing.

2.13 SUGGESTED FURTHER READINGS

Sushma Gupta, Neeru Garg, Renu Jain, (1991) Text Book of Clothing and Textiles.

Dantyagi, S (1974) Fundamentals of Textiles and their care. Orient Longman New Delhi.

CLASSIFICATION OF NATURAL FIBRES

3.1 INTRODUCTION

In the previous lessons you have studied meaning, scope and importance of Clothing and Textiles. In this lesson we understand the meaning and classification of Natural Fibres.

3.2 OBJECTIVES

This lesson aims to enable you understand:

- Meaning of Fibres
- Meaning of Natural Fibres
- Classification of Natural Fibres

3.3 MEANING OF FIBRES

Fibres are the basic visible units from which fabrics are made. Some fibres are short, others very long, some are kinky, scaly and rough, others are straight and smooth. They may have high or low tensile, strength or are transparent, opaque, coloured or colourless even or uneven in diameter.

Fibres may be from natural sources or man-made. Each of the natural fibres is produced in few varieties, which differ in quality e.g. Egyptian cotton and Mohar are examples of good quality varieties of cotton and wool respectively.

The fibrous raw materials are divided into two classes, based on their length.

(a) **Filament:**- Filaments are natural or man-made fibres of continuous length, measurable in yards or meters. Silk and all the man made fibres are filaments. Yarns made from filament fibres are of two types, mono-filaments and multifilament.

Mono-filaments yarns are made of a single solid, strong and smooth strand. Multi-filaments yarns are composed of a number of tiny filaments twisted together. Yarns of this type contribute towards smoothness, softness, lustrous, texture with good drapability.

(b) **Staple:-** Staple fibres are short in length and measurable in inches. The length varies between three quarters of an inch to 18 inches or so. All the natural fibres except silk are staple fibres, however, man made fibres are cut into short lengths. They are also known as staple fibres. All kinds of fibres cannot be used in the manufacture of fabrics only a few are suitable. The fibres that can be made into fabrics, intended for clothing or household uses, must necessarily have the following properties.

3.4 THE PRIMARY PROPERTIES OF FIBRES

There are five primary or essential properties which are as follows:

(i) **Staple:**- The word staple is associated with the dimension of the fibre, such as the length and diameter. It is an essential requirement because a fibre has to be long and fine enough for satisfactory use. Silk is a long fibre

but wool and cotton are short. This disadvantage in length is compensated by the good spinning quality of both of these fibres.

Various fibres have different lengths e.g., length of cotton varies between 0.3" to about 2" and wool between 1.5" to 12". All man made fibres are made into very long filaments and they are either used as filaments or cut into shorter lengths about the same size of the other fibres, which it wants to imitate *e.g.* certain staple rayon can look like cotton and the other like linen.

(ii) **Elasticity:**- Fibres must be pliable enough to wrap round each other to produce a yarn which in turn should be able to be woven into a fabric. The fabrics should resist crushing by bearing impacts and spring back to their original state. This property makes the fabrics diapable wrinkle resistant and helps to maintain their shape and size.

(iii) **Uniformity to Staple** :- Fibres of uniform dimensions spin better and make a smooth and uniform yarn.

(iv) **Spinning Quality** :- In order to have good spinning quality fibres must have cohesiveness as this prevents fibre slippage. Four main factors contribute to cohesiveness between fibre in a yarn,fineness of staple, nature of surface, pressure through twisting and length of the fibre.

The length of the fibre, other things being equal contributes to the strength of the yarn, hence it can be generalised this way, the longer the fibre the stronger the yarn. Similar generalisation can be done in the case of fineness of staple of textile fibres. Fine filaments like silk will produce fine, smooth and uniform fabrics with better draping qualities than the coarser fibres, which can only give coarse, rough, crude and low grade fabrics.

(v) **Strength:**- The fibre should also be strong enough to be spun into yarn and ultimately converted into durable fabrics. The strength of the textile fibres is very much influenced by the moisture in the atmosphere. In general natural vegetable fibres are stronger when they are wet, while other fibres like rayon and acetate are weaker in this state.

Besides these properties there are the other desirable properties such as

density or specific gravity: lustre, moisture regain, flammability, felting and resistance to heat, resistance to alkaline, acids and bleaches etc.

Fibres are of the following types:

(i) Natural Fibres

(ii) Man Made Fibre

3.5 MEANING OF NATURAL FIBRES

Natural fibres are those fibres which we obtain from the natural resources i.e. plants and animals. They are of two types.

3.6 TYPES OF NATURAL FIBRE

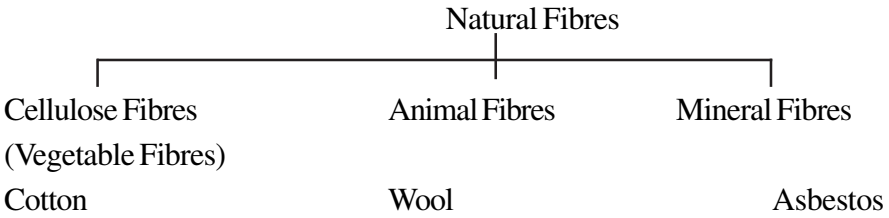
(i) **Cellulose Fibres** :- These fibres have as their origin cellulose which is the principal matter of the plant cell. Cellulose is a complex compound made up of carbon, hydrogen and oxygen with the molecular formula $(C_6H_{10}O_5)n$. Cotton contains about 91 % and hemp rame and fean flax contains similarly large amount of cellulose.

Cellulose is very sensitive to the action of mineral acids and oxidising agents. However, it is quite resistant to alkalies, including strong caustic alkalies at high temperature and pressure.

Cellulose fibres are low in resiliency. So the fabrics wrinkle easily. Because of the high absorbency of the fibres they are comfortable for summer wear.

(ii) **Animal Fibres** :- Wool and silk are obtained from animals and are therefore called animal fibres. They have protein as one of the chief constituents and are made up of carbon, hydrogen and nitrogen. Both are destroyed by concentrated mineral acids but the specification of the dilute acids is not very harmful in either.

3.7 CLASSIFICATION OF NATURAL FIBRES



Linen Silk
Jute
Hemp
Kapole
Ramie I
Sunn
Abaca or Manila
Sisal
Coir

3.7.1 Fibres: Different Types of Natural Vegetable Fibres

Following are some cellulose fibres:
Cotton
Linen
Jute
Hemp
Ramie
Sunn
Abaca or Manila
Sisal
Coir

(i) **Cotton:-** The Cotton fibre is composed chiefly of cellulose which constitute 88-90% water, 5-8% and other natural impurities. The fibre has a tube like structure containing sap. When the fibre ripens, the sap dries up, the tube collapses and the fibres becomes flat like a twisted ribbon. The fibre itself does not shrink but the fabrics made with it which have been stretched in the finishing processes. It is not affected by moisture content increases. Therefore, it lends itself to the washing process. Cotton does not hold moisture so well as wool or silk,' but absorbes it and so feels damp, much more quickly. It also rapidly spreads over throughout the material, it is the better conductor of heat. The quality of the cotton is based on the length and brightness of the, fibres. This depends upon the species, quality of the seed and soil, mode of cultivation, and climatic

conditions. Thus the length of the fibre varies according to the plants on which it grows. The best qualities are those capable of being spun into the finest yarns; and these are found to possess the greatest hair length, with a corresponding decrease in diameter and a greater number of convolutions per unit length than in the lower qualities. Kapok, Organide, muslin are some of the varieties of cotton.

(ii) **Linen:-** The linen fibre is composed chiefly of cellulose (66- 70%) and natural impurities (25-30%). It is cylindrical in shape, with a thick wall, and cross markings and intervals which are called nodes or joints. It resembles to a bamboo. It has a smooth surface and lustre. It is tenacious and can stand hard wear, hence, fabrics made with this fibre are used as bed and table linen and in hot climates for underwear. Fabrics made with this fibres does not shrink except when they have been stretched in the finishing process. It can hold more moisture than cotton, also it absorbs and spreads through the fabrics and gives up moisture much more rapidly than cotton. Therefore, it is a suitable fibre for use as towelling or handkerchiefs. It is a better conductor of heat. This, thread is used for stitching aircraft and railways, upholstery, carpets, suitcases, life-belts, tarpaulins, football and cricket.

(iii) **Jute** :- Jute is the second most widely used vegetable fibre exceeded only by cotton. The name of this plant is derived from the Indian word that which means "to be entangled", probably referring to the irregular fibres which readily mesh together.

The fibre has been used in India as handicraft material since very ancient times. The early Sanskrit writings speak of pat or jute as a useful household plant, serviceable both as a pot herb and as fibre. The fibre consists of bundles of cells with sharply defined polygonal outlines. The individual bast cells of the jute are very fine and much shorter than flax fibres. The best quality of jute fibres is a clear yellowish colour with a fine silky lustre. It is soft and smooth to the touch. It is highly hygroscopic. In a dry atmosphere it may have no more than 6 per cent of moisture, but in damp conditions the moisture may be as high as 23 per cent.

(iv) **Hemp:-** Hemp was very much in vogue among the ancient Asiatics long before the birth of Christ. It was used for carpets, tapestry, ropes, soles of shoes and even trying their letters which , were carved on wood, for

paper was not known then. The fibre is lustrous and has the microscopic nodes and joints of linen, but the central canal is wider, the cell are blunt ended. This is a bast fibre stronger than linen or jute, and is dark brown in colour excepting the Manila hemp, which is white. It is not used for weaving fine cloth but is used for making gauzes, ropes and webbing.

(v) **Ramie:-** Ramie is another vegetable fibre from nettles grown chiefly in India, China and our other neighbouring countries. The Chinese variety is often known as "China grass" or .Rhea. The finished fibre is' fine, silky and strong. This makes it suitable for weaving into fine table-linen, like tray-cloths, table cloths napkins, etc. Ramie has many properties similar to those of linen. Another quality of ramie that makes it unique among fibres is its behaviour when in contact with water. Ramie is more absorbent than cotton, holding water to the extent of 28% of its dry weight, whereas cotton holds water to the extent of 26% of its dry weight. Instead of losing strength when wet, as do many fibre, ramie is 30 to 60 per cent stronger when wet than when dry. It dries more rapidly than does flax or cotton. That has the additional advantages of being unshrinkable and of being highly resistant to mildew as well as to the attack of micro-organisms that cause rot.

(vi) **Sunn:**- This plant is a native of Southern Asia, chiefly India. There are two varieties. Bhadoi San and Rabi san. In order to secure the best grade of fibres, the plants are cut when they are in flower. They are exposed for 36 hours, and then retted in water for 3 to 4 days and fibres are immediately stripped off owning to their tendency to rot. They are then dried and sorted. Sunn is better in quality than jute, being lighter in colour and having greater textile strength. It contains 80 per cent cellulose as against 64 per cent cellulose in jute. Sunn is used for fishnets, twines, rug yarns, sacking fabrics and in paper making.

(vii) **Abaca or Manila :**- This plant is a native of the Philippine Island. It is planted clear of other trees and ten feet apart each way. It is perennial and grows to a height of 9 to 10 feet. A single plant yields about 1 lb. of fibre. The fibre is white and lustrous in appearance, light and hard and easily separable. It has good textile strength and great durability. The cellulose content is 64 to 65 per cent. It is used in the manufacture of rope and heavy cordage.

(viii) **Sisal :**- Sisal fibres contains 72 per cent cellulose and 14 to 15 per cent lignin. It rots readily in salt water. Its principal use is in the manufacture of commercial tying

twines, ropes and cords. It can be admixed with cotton to alter the quality and price of the rope.

(ix) **Coir:-** Coir is obtained from the shell of coconut. The fibres are about 10 inches long. Coir fibres has a natural affinity towards dyestuffs. Coir being a vegetable fibre shows more sensitiveness towards basic colours and good brilliant colours are obtained when the fibre is dyed with such dyestuff.

3.7.2 ANIMAL FIBRES

Animal fibres are as follows :-

Wool

Silk

(i) **Wool:-** Wool at first was meant to be the soft hair covering of sheep and camel. Now, its manufacture as a textile fibre includes hair of all kinds of animals provided the hair either in their natural state or after sort of treatment, lend themselves for being used for ,spinning or felting. The chief constituent of the fibre is a protein substance called 'Keratin'. This is the only fibre which contains sulphur. It has a rod like structure with rough surface of over-lapping horny scales. The rough surface or the scales of wool fibres become softened, gelatious and open out under the influence of heat and moisture and if pressure is applied, then get interlocked and mat together. Wool is considered the most hydroscopic of all the fibres. It absorbs moisture without feeling cold or clammy from the atmosphere and holds as much as 30 per cent of the weight without feeling wet to the touch. Wool fibre is a poor conductor of heat, and therefore the fabrics made of this are suitable for winter wear and cold climates. It is the ideal protective fibre. It protects with comfort, because it insulates. Millions of tiny cells of air are trapped by the wool fibres and form an insulating layer between wearer and weather. For this reason, wool is the best protection against both cold and heat.

(ii) **Silk:-** Silk is considered as the "Queen of Fabrics" even today. Its strength, lustre, softness and the graceful line in which it hangs makes it the most attractive of all the textiles. This fibre is known to have been used in China more than 2500 years ago. The silk fibre is in every respect one of the most perfect natural substances known for yarn-making. Silk is smooth and semi-transparent. It is the longest of all natural

fibres ranging from 800 to 1200 yards. Like wool silk is chiefly protein, but contains no sulphur. It consists of carbon, hydrogen, oxygen and nitrogen. Silk fibres has a double rod like structure, which is more or less flat in tussor silk. It is covered with lumps of gum. The fibre is not affected by moisture. It does not shrink or stretch when wet. Friction may spoil the smooth, soft texture of the fibre and therefore it is avoided in washing silk fibres. Silk is a bad conductor of heat and therefore is warmer than cotton, linen or rayon. The fibre has a great affinity to dyestuffs. Acid, basic and direct dyes are used for dyeing silk.. Strong alkalies have a harmful effect on silk but weak alkalies; such as borax or ammonia can be safely used, when necessary, in steeping or stain removal. Dilute acids do not damage silk but strong-acids will dissolve it.

3.7.3 MINERAL FIBRES

The mineral fibres are inorganic and used for fire proof fabrics. Asbestos is practically the only natural mineral fibre.

3.8 GLOSSARY

Fibres :- Basic visible units of which fabrics are made.

Filament :- Filaments are the natural or man-made continuous length, measurable in yards or meters.

Staple :- Staple fibres are short in length and measurable in inches.

3.9 LESSON END EXERCISE

1. What do you mean by Fibres?
2. What do you mean by Natural Fibres?
3. What are different type of Natural Fibre?
4. Give the classification of Natural Fibres.

3.10 SUGGESTED FURTHER READINGS

Dantyagi, S. (1974) : Fundamentals of Textiles and their care. Orient Longman, New Delhi.

Dewlkar Durga - Household and Laundry Work.

Sushma Gupta, Neeru Garg, Renu Jain, (1991) Text Book of Clothing and Textiles. Edition, Jalandhar.

Lesson-4

Unit I

CLASSIFICATION OF MAN-MADE FIBRES

4.1 INTRODUCTION

In the previous lesson i.e. Lesson No.3 we studied the meaning and classification of natural fibres. In this Lesson we will study the meaning and different types and characteristics of man-made fibre.

4.2 OBJECTIVES

This lesson aims to enable you to understand :-

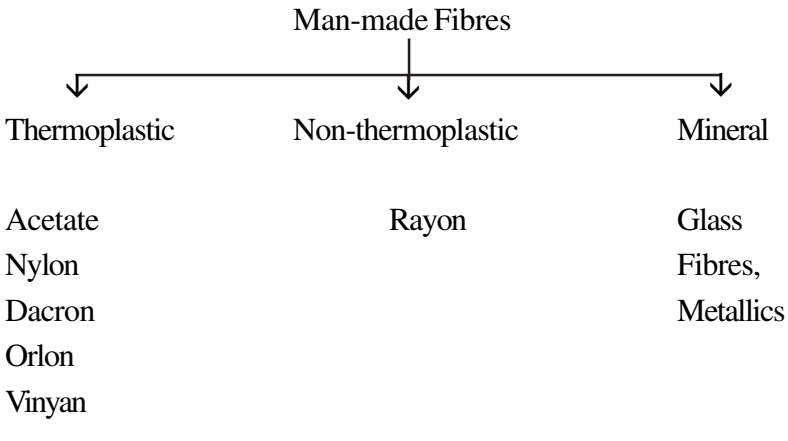
1. Meaning of man-made fibres
2. Types of man-made fibres.
3. Characteristics of man-made fibres.

4.3 MAN MADE FIBRES

Man-made fibre do not occur in fibre form but have been turned into it by man by breaking down from their original form and reassemble into different sort of structure *e.g.* Nylon, Rayon. These have high strength and are resistant to moths, mildew and insects. Man-made fibres are of the following types:

1. Thermoplastic
2. Non-thermoplastic
3. Mineral Fibres

These can be further classified as :



4.4 THERMOPLASTICS FIBRES

The thermoplastic fibres are those that soften and become pliable or plastic with heat. Their softening point vary from quite low to very high. They will also melt if they come in contact with too hot an- iron rod or other hot surface, or other sources which have temperatures above their melting points such as hot cigarette ashes. The hot, melted material can cause severe burns. Like other men made fibres' thermoplastic fibres must be stretched to orient the molecule in order to increase fibre strength, tenacity and sometime their drawing operations, the orientation of the molecules have occurred. At the same time the linear molecules are under considerable strain which if released during washing and steaming may result in considerable shrinkage and often puchering of the fabrics.

These thermoplastic fibres have a number of properties in common. Their hygroscopicity is low. Therefore they are uncomfortable in hot humid weather. They are washed easily and dry quickly. Water soluble stains are removed easily but not grease or oil. They are mostly wrinkle resistant.

A microscopic examination reveals that they have the same longitudinal appearance as other man-made fibres. But their cross-section varies and they can be identified with them.

The thermoplastic fibres are as follows:

(i) Acetate
(ii) Nylon
(iii) Dacron
(iv) Orlon
(v) Vinyon

4.4.1 Acetate

The acetates are one of the oldest and least expensive of all man made fibres. Acetate is the second of all the 'man made' fibres produced by Du Pont, which like rayon is dependent on cellulose for its basic material.

Acetate was originally classified with the rayons. Later, however, the Federal Trade Commission of U.S.A. classed acetate with the thermoplastic fibres, as it has properties that are so unlike the rayons and because it is a chemically different material.

(i) Manufacture

Acetate is an easter of cellulose produced by treating purified cellulose with acetic acid. It is then divided by acetone and forced out through a spinnerette into a column of warm air. As the acetone evaporates the fibre hardens and the acetone is reclaimed for later use.

(ii) Physical Appearence

The acetate fibre as seen under the microscope has length wise striations, but they are fewer in number than those in viscose. Cross-sections resembles 3 to 5 petalled flower.

(iii) Chemical Properties

Acetate is a cellulose ester compound of carbon, hydrogen and oxygen. It contains chemically reactive hydroxyl (OH) group and many acetyl groups. Oxidising agents seldom need to be used on acetate. If bleaching is necessary, a mild hydrogen peroxide or a weak chlorine bleach should be used. Acetate is resistant to moth, mildew and soil.

(iv) Effect on burning and heat

Acetate fibres and fabrics bums easily as cotton and viscose leaving back syrupy melted material at edge. Edges are hard and black. In napped or piled fabrics acetate does not bum with speed of others. When acetate is burned, it has a characteristic, vinegar like odour.

Like viscose, the acetate loses strength when wet, but its loss in strength is less than that of viscose and is completely regained on drying. Acetate rayon dries more rapidly than viscose, because it absorbs considerably less moisture.

(v) Dyeing

Acetate has little affinity for cotton or viscose dyes. Special direct acetate dyes have been developed. A common range of shades having good fastness has been available for many years, and new dyestuffs, generally if improved fastness are available today. Its uniformity in dyeing is unexcelled. It can be cross-dyed with rayon on cotton

to achieve an unlimited range of multi-coloured styling effects. In recent years a method of applying vat colours without impairing the material has been developed - these vat colours are fast to light and washing certain flourscent dye stuffs are also applied to acetate yarns and fabrics with full retention of brilliance. This was found useful during was for signal flags and identification panels.

(vi) Uses

Acetate produces fabrics with a luxurious "hand" or "feel". This makes it excellent for such fabrics as "strain" and 'taffeatas'. It dries very quickly. Acetate helps fabrics to keep their shape to resists wrinkles and shrinkage. It can be woven for warmth or coolness. Acetate fabrics are used for women's apparel, men's wear, children's garments, baby-blanket, curtains, upholstery and for industrial purposes.

Fabrics of acetate have excellent drapability. Because of its moisture resistance, acetate aids fabrics in keeping their fresh appearance in drying quickly.

(vii) Care of Acetate Fabrics

Acetate Fabrics should be ironed at the lowest temperature setting. They are either washable or dry. Cleanable, depending on the use for which they are made.

4.4.2 Nylon

Nylon was the fibre first to be synthesized from materials none of which had previously been fibrous in nature. The history of Nylon dates back to Dr. Stine, the Chemical Director of Du Pont Company, prevailed upon the company to start research work relating to new fibres. The research continued for some time and experiments were made on cellulose derivations, particularly, the esters and new types of esters, and also on certain nitrogen containing derivatives of cellulose. These experiments were not successful. Dr. Wallace whereby linear-polymers are produced; and their eventually led to plant for nylon production. This fibre was known as fibre 66. Later the name Nylon was given to it.

(i) Types of Nylon Textile Fibres

Multifilament Yarn: It is made up of a number of tiny almost endless strands twisted together into one yarn. The size and number of these minute strands can be varied as well as the amount of twist. Most of nylon fabrics are made from this versatile type of yarn. In lingeric, bathing suits and upholstery multifilament yarns give you pleasant surface texture, softness and luxurious drapes.

Monofilament: It is single, solid strand of great strength and smoothness. Very sheer hosiery is a glamorous example of its use. Monofilaments are also used to made sheer blouses, veils and gowns.

Staple consists of many short, wavy strands of nylon cut in lengths varying from one and one-half to five inches. The wave or "crimp" in there strands adds springiness to yarn spun from it, giving you light, soft fabrics that are pleasant to the touch. Its convenient washability and durability has made this form of nylon fibre especially popular in sweaters and socks.

(ii) Properties of Nylon

Nylon is a lustrous white transparent fibre and is both tough and pliable. Absorbency is low and this makes it a quick drying and easily washable fibre. Although it does not stain readily it tends to pick up colour, grease and soil if laundered with other garments. It is not affected by cold temperature but looses strength and yellows at sustained high temperatures. Pressing temperature of 24°F is considered safe for nylon.

It has good wrinkle resistance and crease recovery. It has very good abrasion resistance and is considered a very durable fibre. It is degraded by exposure to light. It is not-chemically reactive to soap, alkalies or alcohol, but reacts readily to acid. Bleaches do not affect it and so are ineffectual for whitening discoloured nylon.

They can be dyed and usually the colours are permanent. They are sometimes resin treated to stabilize, the weave, silicone treated to improve softness or water-repellency but because of their low absorbency they do not accept finishes readily.

4.4.3 Dacron

Dacron or Terylene was discovered during the second world war. The name dacron is a trade mark owned by E.I. Du Pont de Namours & Company for a particular synthetic polyster fibre. The basic work for the development of Dacron polyster fibre was done by Dr. W.H. Carothers in his experiments with giant molecular structures. The British studied the work of Dr. Carothels and continued the research of polyester. In 1946, they announced the production of a fibre, terylene made from ethylene glycol and dimethyl terephthalate. The same year the Du Pont Company bought the patent rights and began work on the development of the fibre which was later (1951) commercially known as Dacron.

Dacron is not chemically related to any other fibre. It is meltspun like nylon and is

much like it in physical appearance and in many of its properties. Dacron fabrics are very similar in appearance to nylon fabrics. There are two distinct types of dacron :-

(a) **The Filament Yarn :-** It is used in knit fabrics for men's shirts and women's dresses.

(b) **Staple Fibre :-** Used in upholstery fabrics and filling for pillow.

(i) Properties of Dacron.

1. It is warm to touch.
2. It has a low stretch in use in the filament yarn.
3. It is crease resistant and will keep its shape wet or dry.
4. Since dacron fabrics have a low absorbency, stains, on the surface. It is easily washed, dries quickly. Daron has excellent press or crease retention. Crease remain sharp even after washing.
5. It is very strong and has a high resistance for rubbing.
6. It is mothproof, mildew proof and immune from attack by other insects and bacteria.
7. It is resistant to weather and sunlight specially behind glass. It is not easily affected by perspiration. It has wicky property that makes it comfortable to wear in hot weather, even though it is not absorbent. Wicking is the ability of a fibre to pick up moisture and allow to travel along the fibre although it is not actually absorbed by the fibre. Thus the moisture is carried from the skin of a wearer outward, where it evaporates.

(ii) Dacron in Use

Dacron has been used for curtains, womens underwear and nightdresses, men's socks, women's dress material.

4.4.4 Orlon

Orlon first made its appearance in 1948. 'Orlon' is really the registered trade mark for the acrylic produced by E.I. du Pont de Nemoues. Other companies also manufacture acrylic fibres, but the mark 'orlon' applies only to Du Ponts acrylic fibre.

(i) Microscopic Appearance

The cross section of orlon shows a distinctive dog bone or dumb bell shape by moth or by carpet beetles.

(ii) Reaction to Alkalies and Acids

Orlon has fair to good resistance to weak alkalies. Orlon is exceedingly resistant to strong mineral acids as well as organic acids.

(iii) Properties of Orlon

'Orlon' is well known for its soft, luxurious hand. It is warm and pleasing to the touch. Staple fibre of 'orlon' adds a feeling and appearance of luxury to garments at a relatively low cost.

(iv) Effect of Burning

Orlon burns like cotton, rayon and acetate leaving a residue similar to that of acetate. It does not ignite easily, however some orlon fabrics sputers as they burn, the flame almost dies out momentarily then flares up and resumes burning with continuous alternate dying down and flaring up. The safe ironing temperature is 300°F.

(v) Effect of Light

Orlon has outstanding resistance to the effect of light. Its resistance to such degradation makes it especially useful for such outdoor purpose as awning, curtains draperies and uniforms.

(vi) Resistance to Mildew & Moth

Mildew may form on the surface, but it will have no effect on orlon fabric. It may be easily wiped off. Orlon is unaffected excellent resistance to such oxidising agents as sodium hypochlorite, hydrogen peroxide, even with severe treatment. It has a high resistance to all acids, even when concentrated and after a long exposure of 72 hours at a temperature of 176°F. It is resistant to hydrochloric, sulphuric, nitric acetic, formic and oxalic acids.

(vii) Uses

Orlon has taken over a large part of the sweater market and is being used alone or in blends in many types of knitted goods. Printing of sweater and jersey fabrics has been successful. It is used in dresses as blouses, suits and coats. Washable fleece coating material

has been made from Orlon because of its bulk warmth and light weight. Orlon is often used in making simulated fur coats. Permanently pleated washable skirts or Orlon and wool blends have proved to be very popular.

4.4.5 Vinyon

Vinyon is a manufactured fibre in which the fibre forming substance is any long chain synthetic polymer composed of at least 85% by weight of vinyl chloride units.

(i) Manufacture

Some of the raw material required for the manufacture of vinyon are petroleum, chloride acetic acid, acetone. The manufacturer of vinyon begins with a fluffy resin powder. After the vinyon is prepared, it is dispersed in a solvent deacrated aerated and spun by extrusion.

The fibres are heated under tension to 90° to 100°C and stretched to develop strength, eastility and resilience. The fibre may have a crimp developed by controlled heat setting or by a suitable bath.

Vinyon may be delustred by the usual procedures of incorporating pigment into the solution before it is spun or by a less destructive new process using water. Thus like rayon, it can be made into dull or bright yarn and can be dyed in various colours.

(ii) Properties of Vinyon

1. Vinyon is warm to the touch and feels like silk.
2. It is water resistant.
3. It is non flammable.
4. It is not attacked by bacteria, moulds or fungi.
5. It is satisfactorily resistant to sunlight.
6. It is non conductor of electricity and as water does not affect is an excellent insulator.
7. Unlike most man-made .fibres, vinyon has the same tensile strength in both dry and wet states.
8. It is thermoplastic and exceptionally resistant to numerical acids and alkali.

(iii) Uses of Vinyon

The short fibres of vinyon can be blended like rayon, with natural , fibres such as

cotton and wool. The short fibres are mixed with wool and , used for felt. They make excellent fabrics for pleated garments, as vinyon , serves as a binder and the garments do not shrink whilst the pleats are held well.

Because of its water and fire-resistant properties, vinyon is used for umbrellas, waterproof garments, bathing suit draperies, fish nets, awnings, industrial filter cloth etc.

It is also used as a binding fibre in certain kinds of paper. It is sometimes woven with other fibre in carpets to make embossed designs when woven or tuffed carpet is treated with heat the vinyon shrinks thus producing the design.

4.5 NON-THERMOPLASTIC FIBRES

The non-thermoplastic group of man-made fibres have several origins e.g. cellulose, alginates, minerals and protein base fibres. Except the mineral based fibres, their fibres can be cared as cotton, silk wool whichever they resemble most in their physical and chemical reactions. They scorch easily at high temperatures. They are soft, absorbent, comfortable to wear, do not discharge static electricity and are moth proof. Like all other man-made fibre under the microscope they appear as smooth roads with black specks as if they are delustered.

4.5.1 The Rayons

Rayon is an artificial synthetic fibre made from cellulose.

Characteristics of Rayons

(i) Effect of Moisture and Friction

Regenerated rayons look strength when wet but cellulose acetate is not as much affected in that respect by moisture or drying all of them regain their strength. Friction will weaker and spoil the lustre of the fibre, especially when wet.

(ii) Heat Conductivity

They are good conductors of heat.

(iii) Hygroscopic Moisture

Rayon fabrics absorb more moisture than cotton or linen but do not give out moisture as readily as those two fabrics.

(iv) Effect of Heat

Heat affects them. Cellulose acetate rayon melts and reduces by the application of heat. The viscose and uprammonium fibre are not greatly affected by heat, and the delustered effect given to their fabrics by heat can be diminished by the application of heat and moisture together as they will bring back the lustre.

(v) Action of Acids & Alkalies

All rayons are weakened even by dilute solution of acids. Cellulose acetate dissolves in acetate acid and formic and alkalies also have harmful effect on rayons.

(vi) Effect of Acetone

Cellulose acetate dissolves in acetone, but not the other rayon.

(vii) Affinity to Dyes

The viscose and cuprammonium fibre have great affinity for dyes used for cotton and linen. But the cellulose acetate Rayon does not react to the same dyes. Rayons generally take dye-stuffs easily.

(viii) Action of Bleaches

Reducing bleaches may be used in cold dilute solutions. Oxidizing bleaching will damage the fibre if they are not used with a great care. There are number of non-thermoplastic fibres. Some of them are avril, zentrel, qulin, Fortison, cornal titel -compared to regular rayons they have improved dimension, stability, better wet stability and they have lower power of elongation.

4.6 MINERAL FIBRES

The mineral fibres are inorganic Asbestos is practically the only natural metallics and man made.

4.6.1 Glass Fibres: Glass fibres are outstanding among textile fibres both natural and synthetic. Glass fibres were first prepared in 1893 by drawing the heated ends of glass rods. In 1900 a number of patents were issued in Germany & England, but till 1931 no success was achieved to have fine fibres which could be easily woven into fabrics. In 1936, fibres were prepared which were pliable enough to be woven into all glass fabrics which creased and folded. Owens-Corning Fibreglass Corporation started the manufacture

of glass fibre materials.

The primary ingredients for the various types of glass are silica, sand and limestone. In addition, other minerals are used according to the purpose for which the glass fibre are to be used. The fibres have no stretch and they are dimentionally stable. They are resistant to rust, rot and mildew. They are only affected by hydrofluoric and phosphoric and Fibreglass is the strongest of all textiles fibres and affected by perspiration.

They are used for curtain and drapery fabrics because of their attractive appearance, non-combustability and are resistant to light deterioration. Much of the glass fibres is used for insulation in buildings and for insulating electrical and other industrial equipment.

4.6.2 Metallics

"Metallics" is a manufactured fibre composed metal plastic coated metal, metal coated plastic or a core completely covered by metal. Metallic yarns have been known for hundreds of years. They were in fact, the first man- made fibres. Civilizations for thousands of years engaged in hand weaving with patterns of silver and gold threads. The use of less precious metals such as aluminium and copper are of relatively recent origin. Metallics are insect, most, mildew, and rot resistant and are completely non-tonic.

Metallics have been used in carpets and ruge, upholestery, drapery fabrics, slip covers, bed spreads, showel curtain and pillow cover.

4.7 GLOSSARY

Man Made Fibres :- Man made fibres are defined as those which do not occur in fibre form but have been turned into it by man, by breaking down from original form and reassembled into different sort of structure.

Thermoplastic Fibres :- These are those that soften with heat and become pliable, or if the heat is sufficiently high will melt.

Non- Thermoplastic Fibres :- These are those which neither soften or melt with the application of heat but will scorch or bum if the temperature is sufficiently high.

Mineral Fibres :- Mineral fibres are inorganic materials shaped into fibres and are mainly used as fire proof fabrics.

4.8 LESSON END EXERCISE

1. What do you mean by man-made fibres? Name the different types of man-made fibres.

2. Write a note on Thermoplastic Fibres?

3. What are different Thermoplastic Fibres?

4. Describe Non-thermoplastic Fibre?

5. Explain Mineral Fibres?

4.9 SUGGESTED FURTHER READINGS

1. Dewllear, Household and Laundry Work.

2. Dantyagi, S. (1974) Fundamentals of Textiles & their cover. Orient Longman, New Delhi.

3. Gupta, S. Garg, N. Sain, R. (1991) Text Book of Clothing & Textile 4th Edition, Jalandhar.

Unit I

TERMS-FABRIC, YARN, CLOTHING, TEXTILES, SELVEDGE, WARP, WEFT BIAS

5.1 INTRODUCTION

In this lesson you will study about different terms like Fabric, Yarn, Clothing,

Textiles, Selvedges, warp, weft, Bias used in Clothing and Textiles.

5.2 OBJECTIVES

This lesson aims to help you understand the following terms of clothing and textiles Fabric, yarn, clothing, textiles, selvedge, warp, weft and Bias.

5.3 FABRIC

Fabric is the term used for cloth produced by knitting, weaving or felting threads. The thread is made by twisting together a group of fine filaments or fibres. A fibre, therefore, is the finest continuous filament that is left after tearing out a thread. Leather is not a textile fabric because it is not made from fabrics and is not felted or knitted or woven. China glass and metal wear will not be included in textiles, but it is interesting to note that the modem textile industry has included metal, glass, soyabean etc. which by nature are not fibrous. These non-fibrous materials by the application of certain scientific process are converted into fine filaments, which are woven or knitted and these are then included under textile fibres.

5.4 YARN

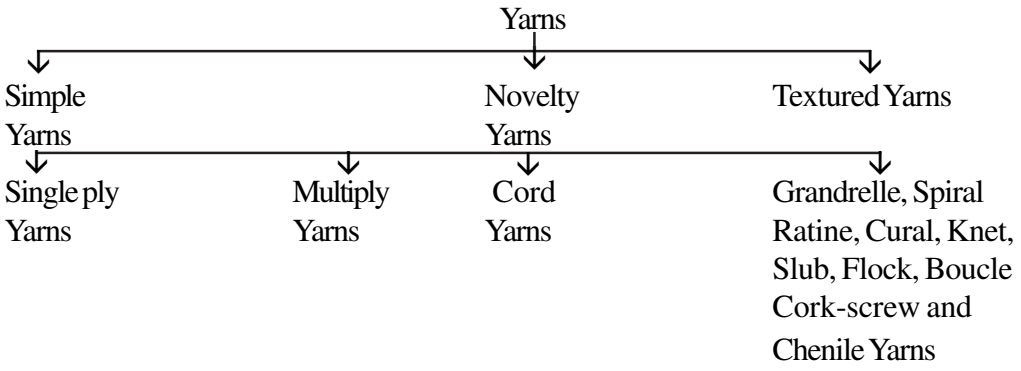
A yarn is a strand of fibres laid or twisted by a process called spinning. Yarns may be made from anyone or a mixture of many different natural or man made textiles fibres now available in the world. Each of these fibres have its own characteristic properties and is therefore best suited for particular use of woven cloth. Cotton is known for its absorbency, wool for its warmth and silk for the feel and appearance.

In the range of man-made fibres cellulosic rayon yarns are nearest to the natural fibres although they cannot fully replace them. They have a silky feel and appearance. Similarly that synthetic fibres have their own intrinsic properties such as strength, lusture, crease resistance handle and the draping properties. Mixture of there natural and man made fibres have enabled the spinner to produce a still wider variety of yarns and fabrics for domestic use and industrial uses of today.

When the weaver selects a yarn for a fabric, he looks for such characteristic properties as the thickness of the yarns, its evenness and cleanliness, its strength and elasticity, its twists etc. Each of these to be woven. So the first requirement for

the quality fabrics is the use of quality yarn.

Classification of Yarn



5.4.1 Types of Yarns

An important characteristic by which yarns are categorised is the number of strands used in yarns formation and the method of spinning :

Yarns are broadly classified into three classes:

1. Simple yarns or Ordinary yarns
2. Novelty yarns or complex yarns or fancy yarns
3. Textiled yarns

5.4.1.1 **Simple Yarns or Ordinary Yarns** :- These are spun from any of the natural or man made fibres but which are regular throughout their length and in their physical properties. No decorative elements are introduced into the yarns during spinning. According to the number of strands present in the yarns simple yarns have been further divided into three sub-classes.

(i) **Single Ply Yarns :-** A single ply yarn is the most basic assemblage of fibres either staple or filament suitable for the operation involved in the making of the fabrics. Single ply yarns that are used for making fabrics are stronger as these are highly twisted.

(ii) **Multi Ply Yarns :-** Multi ply yarns are made by spinning together two or more single yarns.

(iii) **Cord Yarn :-** Cord yarn consists of two or more ply yarns twisted together.

5.4.1.2. **Novelty Yarns or Fancy Yarns or Complex Yarns** :- While making these yarns decorative elements are added during the process of spinning which change the

appearance of the yarns, making them attractive and beautiful. Different counts, colours and different materials are combined in various ways in these fancy yarns. Fabrics made of novelty yarns cannot be as durable as fabrics made of uniform yarns that have been evenly spun. Novelty yarns are of following types:

(i) **Grandrelle yarns :**- are composed of two or more differently coloured threads, twisted together.

(ii) **Spinal yarn or Corkscrew yarns:-** consists of two or more single yarns of different size.

(iii) Boucle yarn are characterized by tight loops projecting from the body of the yarns at fairly regular interlude. Boucle fabrics can be constructed by either knitting or weaving. This yarn is also available for hand knitting.

(iv) **Loop or Curl Yarns** :- The loop yarn is of at least three ply construction. The base yarn is rather coarse and heavy. The effect yarn which forms loops or curls is made of either a single or a ply of two or more singles.

(v) **Slub Yarn** : A slub yarn may be either a single yarn or a two ply yarn.

5.4.1.3 **Textured Yarns** :- These may be made from either filament or staple fibres. The majority, however are made of specially processed filament fibres. These are of three types-stretch, modified and bulked.

5.5 CLOTHING

Clothing refers to the various articles of apparel used to cover the body. Clothing came into existence from a very early age. The primitive people made their clothing from skins of animals and barks of trees. They also used a network of grass and strips of leaves to cover and decorate their bodies with the progress of the human race, the textile industry developed and linen, wool, silk and cotton came into use. Changes have been so numerous and so rapid that the Kaleidoscopic appearance of a cloth merchant's shop is bewildering. Every few years there are new names for weaves, colours, finishes and the new synthetic fabrics. Clothing plays an important role in social interactions. In interacting to another person and forming an impression clothing plays a very significant role. Clothes affect the action of the wearer. First impression plays very important part in the later social interaction between individuals. If a first impression is poor, it may create avoidance whereas if it is favourable and pleasant it helps building relationship. Clothes do have a definite influence

on the impressions or characteristics a person attributes to those he meets. That is clothing tells the observer something about the weaver. Clothing term can be used to describe the type of job e.g. "white collar worker" etc. Choice of clothing varies due to values, interests, attitudes and moods of the people. There is a common belief that appearance does indicate something about the personality of the weaver.

Clothing is an extremely important part of the child's or adolescents world. Young children value clothes which will gain for them the approval of others. The adolescent's primary requirement for clothing is their clothing should meet the approval of the peer group. Aged people go for clothes which are easy to wear, soft, sober and comparatively spend less on their clothing.

So clothing serves a social purpose just as food serves in the main a health purpose and care is required while selecting clothes e.g. clothes should be selected according to the need and purpose for which it is used, age, occasion, personality and season should also be kept in mind.

5.6 TEXTILES

Textiles refers to the raw as well as the finished materials. Study of textiles is the study of yarns, construction of fabrics and finishes of the same. Our knowledge of early development of textiles is very meagre because there are few written records.. Textiles were first developed as a means for carrying foods, as mates in shelters and later used as clothing. Fibres are the fundamental units used in fabrication of textile yarns and fabrics. Fibres are obtained from natural sources and also are man made. According to the nature and physical composition various fibres can be classified as filament fibres and staple fibres. Filaments are natural or man-made fibres of continuous length, measurable in yards or meters. Naturally occurring filament fibres are cotton, silk and wool. These filament fibres are of two types: Monofilament Fibres and Multifilament Fibres.

Natural fibres are of three types: Vegetable Fibres, Animals Fibres and Mineral Fibres.

5.6.1. **Natural Fibres** have their origin as cellulose which is the principal matter of the plant cells. Cellulose is a complex compound made-up of carbon, hydrogen and oxygen which the molecular formula of $(C_6H_{10}O_5)n$. Cotton contains about 91 percent and hemp rame and flax contain similarly large amounts of cellulose. Cellulose is very sensitive to the

action of mineral acids and oxidising agents. Cellulose fibres are low in resiliency so the fabrics wrinkle easily. Because of the high absorbency of the fibre they are comfortable for summer wear.

5.6.2 **Animal Fibres.** Wool and silk are obtained from "animals and are therefore, called animal fibres. They have protein as one of the chief constituents and are made up of carbon, hydrogen and nitrogen. Animal fibres are very resilient and the wrinkles go out between wearings. However they are bad conductor of heat.

5.6.3 **Mineral Fibres** are inorganic materials shaped into fibres and are mainly used in the fire proof fabrics. Asbestos is practically the main natural mineral fibre. Some of the common properties of mineral fibres are that they are fire proof and useful for making firemen's dress, they are resistant to acids and cannot dyed easily. They have high pliability and they do not burn.

5.6.4 **Man Made or Artificial Fibres**

These do not occur in fibre form, but are turned into it by man. The process involves breaking down their original form and their reassembling into different fibrous forms e.g. rayon, nylon, decron etc.

5.7 Spinning -Yarn Construction

Spinning is the process of drawing out and twisting of a group or bundles of fibres into a continuous thread or yarn of sufficient strength to be woven or knitted into the fabrics. It is the raw material for the making of fabrics and garments. Yarn may be made from anyone or a mixture of many different natural and man-made textiles fibres. The variations in yarn may be classified into two main groups Simple and Novelty Yarns.

Construction of Textile Fabrics

Textile fabric is the term used for all kinds of cloth made from fibres or fine filaments by felting, knitting or weaving. The yarn or spun thread is the base for weaving a cloth.

(i) **Weaving**

Weaving is the most popular and largely used method for fabric construction. 'Warp' and the 'Weft' are the technical terms used in weaving to denote respectively that

yarn used lengthwise (warp) and across for filling (weft).

(ii) **Knitting**

Instead of making fabrics by interlacing warp and weft threads with the assistance of a loom, there is an alternative method of arranging for rows of stitches to be formed so that each row hangs on the row behind and row in front of it. It is in this way that simple knitted fabrics are made either by hand or by machine.

(iii) **Felting**

Felting is possible only with the fibres which can stick to one another firmly when pressure is applied and thus forms a cloth, e.g: felted wool.

Finishes and Finishing Materials

A finish is defined as anything that is done to fibre yarn or fabric to change the appearance. A yarn and fabric come from the spinner weaver or knitter are in rough condition. In many cases it is soiled and may have oil stains. If they becomes the task of the finishes to scour, bleach, dye, print and finish.

Preliminary Steps to Finishing

Scouring :- The principle underlying the scouring of all textile materials is simple. Methods and purifying substances are used under which the condition employed have a minimum harmful effect on the textile material, yet are able by destruction or solubalisation, to remove the impurities present.

Bleaching Treatments :- In most of the cases, after scouring the material will be whiter than before owing to removal of impurities. But this is not so in all cases. Cotton goods may become browner or yellower after scouring. Bleaching is the final treatment that removes the impurities and the natural colouring matters left in the material produce a good white colour. Silk and wool are bleached with hydrogen peroxide. All cellulose fibres and rayons can be bleached with hydrogen peroxide.

Dyeing :- Dyeing is employed to give solid shades all over the fibre yarn or fabric. When two different fibres with different dyeing properties are used, two different shades may be obtained. The art of dyeing involves considerable skill and this is especially in the case where shades of the highest degree of fastners are required.

Printing :- From plain dying it has become convenient now to turn to printing as

a means of producing more colourful effects on fabrics and also on yarns, although to a lesser extent. There are different methods of printing like, block, roller, discharge, resist, screen and pigment printing.

Finishing :- When yarns, fabrics and garments have been scoured, bleached, dyed and printed, they generally have to be finished to bring the material into a presentable attractive condition. It is often the finish which increases the sale value of textile fibres.

Finishings are of the following types:

Singeging, Tentering, Calendering, Sanforising, Mercerising Schreinerizing, Moireing, Weighing, Embossing, Water-proofing, Moth proofing, Mildew-proofing and Flame-Proofing.

5.8 WEFT AND WARP

Weaving is the most popular and largely used method for fabric construction. Warp and weft are the technical terms used in weaving to denote respectively the yarn used lengthwise (warp) and across for filling (weft). So the lengthwise yarns which runs from back to the front of the loom form the basic structure of the fabric are warp and the crosswise yarns are the filling referred as weft. The filling yarns undergo less strain when the weaving is done. 'Warp' and 'weft' are the terms found most often in the text-books and are used in relation to consumer products. The term (end) for warp and (picks) for filling are those used in textile industry. Knitting is the second most frequently used method of fabric construction. Today the usage of knitted fabrics range from hosiery, underwears, sweaters, slacks, suits and coats to rugs and other home furnishings. Knitted fibres are divided into two general types:

1. Those produced by weft knitting where one continuous yarn forms courses across the fabric.
2. Those produced by warp knitting where a series of yarns forms wales in the length wise direction of the fabric.

Weft Knitting

There are three fundamental stitches in weft knitting

1. Plain-Knit stitch
2. Purl Stitch
3. Rib Stitch

Novelty stitches are variations of these three stitches. The hand method of knitting is weft knitting.

Warp Knitting

Warp knitting differs from weft knitting basically in that each needle loops its own thread, whereas in weft knitting single yarn is used for all the loops. In this the needles make parallel loops which are joined to each other diagonally in a zig zag pattern by interlocking.

Conservers like warp knits because of their smoothness, possible sheerness, wrinkle and shrink resistance, strength and abrasion resistance. As compared with weft knit warp knits have certain other advantages. Warp knits have superior dimensional stability. Products ranging from hairnets to rugs may be produced by warp knitting. Various types of warp knitting are tricot, milanese knit and raschel knit.

5.9 SELVEDGES

In most of the materials, the edges, which are known as selvedges, are made with heavier and more closely placed warp yarns, so that they do not unravel easily. The width of the selvedges varies from 1/4 of an inch to 3/4 of an inch. The yarns are usually the same as those in the rest of the fabric except that they are made firmer and stronger by increasing the size or count of the way yarns in the selvedge. Fused selvedges or fabrics are made from the heat sensitive fibre. The applied heat melts and then seals the fibres together at the edges, e.g. ribbons are often made this way.

5.10 LESSON END EXERCISE

1. Define the terms Fabric and Yarn.
2. Write a note on Clothing and Textiles.
3. Define the terms Warp and Weft and Selvedges.

5.11 SUGGESTED FURTHER READINGS

1. Duntyagi, S. (1974) Fundamentals of Textiles and their care. Orient Longman, New Delhi.
2. Gupta, S. Garg N, Sain R. (1971). Text Book of Clothing and Textiles 4th Edition.

Lesson -6

Unit II

MANUFACTURING AND PROPERTIES OF COTTON

6.1 INTRODUCTION

In this lesson we will study about the manufacturing and properties of cotton in detail.

6.2 OBJECTIVES

This lesson aims you to understand :-

- Introduction of Cotton
- Manufacture of Cotton

- Physical and chemical properties of Cotton.

6.3 INTRODUCTION TO COTTON

India is the acknowledged birth-place of cotton and the original home of the best and finest cotton fabrics produced in the world for thousands of years right up to the 19th century A.D. The cultivation of cotton gradually spread throughout Asia to some parts of Africa and eventually, to the Southern States of U.S.A., which now grow more cotton than the rest of the world. The principal cotton producing regions are Egypt, Southern United States, India, Brazil the Western and the Southern Coast of Africa and East India. The U.S.A. produces more than 40 percent of the world's cotton. India ranks second to the U.S.A. as a producer and exporter of cotton. Cotton is the white, downy fibrous substance covering the seed of the cotton plants. The seeds with this covering are encased in pods which grow on the cotton plant and burst open when ripe, disclosing the white, downy covering of the seed now grown into cotton fibres. The cotton plant grown in the tropics needs a climate with six months of summer weather, to blossom and produce the pods.

The cotton fibre is the shortest of all the textile fibres. Its length varies from 8/10 of an inch to 2 inches. Cotton with short length fibres is technically known as 'short staple' and the one with long fibres is called 'long staple'. The latter fibre is valued more as it is used for making the fine qualities of cloth for which it is specially suitable, as it is easy to Spill and produces a strong, smooth yarn. It is also suitable for mercerisation.

6.4 MANUFACTURE OF HANDMADE COTTON IN INDIA

The tools and appliances used by cotton weavers consist of a spinning wheel (charka) and a spindle (takli). The cotton is first separated and carding follows. A bow-shaped beater known as a dhun is used for the purpose. The string of the bow is placed on the cotton and is made to be vibrate by means of a wooden hammer. These vibrations disentangle the fibres and cleanse there of all foreign matter such as seeds and leaves, and soft fine cotton is left behind. This fine cotton is next rolled on a stick in the form of a cylinder, about half a cubit long and half an inch in diameter. This is fastened to the spindle or takli. The wheel is twined again and again and the thread is gently and carefully drawn out, until the thread is about three hundred yards long. It is then taken out of the wheel and rolled on the charker. When a

quantity of thread has been spun and collected it is wound on a bamboo reel.

When this is done the threads about 1000-2400- according to the stuff required- are worked on the mill. The length of the warps are generally 50-1000 yards long. It is now set ready for weaving on the handloom. On finishing the weaving, the cloth is calendered with a blunt beater to give it a gloss and to soften it. It is finally passed to the hand folders to give the cloth the final fold. It is then stamped, ticketed and made ready for sale.

In recent years there has been a rapid development in the handloom sector to meet the demand for bringing about technical and asthetic betterment.

Realizing the socio-economic importance of the handloom sector a number of development programmes have been taken up recently. Some of the hightlights of the development programme include.

1. Modernisation of looms.
2. Training weavers in improved techniques.
3. Development of cooperatives for production and marketing.
4. Diversifying production and increasing use of multifibres.
5. Promoting consumer preference for handloom products, including fair and exhibitions and exports. Steps are being taken to bring operation new spindlage. So as to modernise equipment to meet the full demands of the handloom sector for yarn-both the home and export market.

6.5 MANUFACTURE OF COTTON BY MACHINERY PREPARATION

The fibres are first removed from seeds which are used for the production of seed oil, hydrogenated fats, soaps and cosmetics. The cotton mass if then compressed into bales for shipment to the spinning mills. Every bit of the fibre is used. The short ends linters left on the seed, after the longer 'fabric' fibres have been removed, go to make rayon, plastics, dynamite and many other by-products.

In the spinning mills the cotton is fed into machines which remove the dirt and form -the mass of the fibre into a soft roll or lap. Several laps may be combined into one.

- 6.5.1 Carding

The next process is known as carding, in which the fibres are smoothed and drawn together to form a loose rope silver.

- **Drawing**

The silver is then combed and smoothened and stretched. The silver may be drawn three times and reduced further in size and given a slight twist by a process called roving. In this process the silver is passed through rollers and wound on to bobbins set in spindles. This is done in a speed frame.

- **Combing**

The process is really a continuation and refinement of the carding process. Cotton yarns for fabrics are carded but not all are combed. Yarns that are only carded are not so clean where as combed yarns are fine, even and free from all woody stalk of the plant. These are used for finer quality fabrics such as voile and organdie.

- **Weaving and Dyeing**

The yarn is then knitted or woven in anyone of the variety of weaves and structure of fabrics. Warp yarns are usually more strongly twisted than filling yarns, since they must withstand greater strain in weaving and finishing.

Dyestuffs may be applied to raw cotton, yarn or piece goods.

- **Finishing**

The cotton cloth is now ready for finishing which includes starching, calendering, sanronzing, schreinerizing mercerising or other finishes as is necessary for the particular use for which the cloth is intended. These finishes may be applied to the yarns, but are usually applied to the fabrics. The fabrics may be given these special finishes before or after dyeing. Some of their finishes are durable, other semidurable. Scientists are improving on them everyday.

6.6 STRUCTURE OF FIBRE

The cotton fibre is short (½" to 2"long) and cylindrical or tubular as it grows. After repening, the sap inside the fibre dries up so that the fibre flattens and twists. This natural twist is of great importance, as it helps to keep the yarn firm and strong and makes it easier

to spin it into long threads. These twists are called convolutions. The fibres vary in the number of convolutions per inch, mature cotton fibres having as many as 300 per inch. Immature cotton fibres are lacking in covolutions. Long length and many convolutions help in the spinning of the fibres. The fibre of the yarn when untwisted appears straight and inelastic.

Microscopic appearance of the Fibre

Examined under the microscope, the fibre is seen to be narrow, flattened structure with a spiral twist with thick irregular edges. Mercerized cotton under the microscope appears smooth and cylindrical, and shows a slight suggestion of the twist, because usually all of the twist is not removed in the mercerizing process.

Quality of the Cotton

The quality of the cotton is based on the length and brightness of the fibre. This depends upon the species, quality of the seed and soil, mode of cultivation, and climatic condition. Thus the length of the fibres varies according to the plant on which it grows. Sea Islands (West Indies) cotton has the longest and finest fibres, with the highest lustre, then come the Egyptian cotton, the Amercian cotton and Indian cotton. Indian cotton has coarser and shorter fibres but is very strong.

The best qualities are those capable of being spun into the finest yarns, and these are found to possess the greatest hair-length with a corresponding decrease in diameter and a greater number of convolutions per unit length than in the lower qualities. The following table indicate the relations.

Type of Cotton	Length in mm	Diameter in mm	Convolutions per mm
Sea Island	45	0.014	14
Egyptian	40	0.014	12
American	38	0.019	8
Indian (High)	25	0.020	6

6.7 DIFFERENT TYPES OF COTTON FABRICS

Kapok

It is a cotton fibre from a tree in India and the East Indies, called silk floss. It is unsuitable for spinning as it has no natural twists but is useful for lifebuoys, belts and mattresses. Kapok is resistant to vermin, moisture drying quickly when wet. It is adaptable for articles that are constantly exposed to moisture. Kapok is used for sound proofing on airplanes and for insulating materials. Under the microscope, Kapok is easily distinguished from cotton as it appears to be a hallow circular tube with very thin walls. It has no twists.

Flannelette and Flannel

A soft napped cotton fabric, its warmth in wear being due to the fact that the nap entangles a layer of air between the warm body and the cold outside. In composition it is the same as ordinary cotton, but treatment in weaving makes it very inflammable. For this reason attempts have been made to make it fireproof by saturating the fibre with metallic salt but in general the fire-proofing does not withstand washing. Flannelette is napped on one side only and flannel is napped on both sides.

Organdie

It is a cool, very light, plain weave cloth also used for summer wear. The name is ,derived from the city of Mosul (Asicitic Turkey) where the fabric was first made. Muslins were not always plain, but as has silk and even gold stripes woven in, when made in Mosul, but as cotton grew plentifully around the town, and the women could spin yarns of great fineness, the cotton yarns gradually superseded silk.

During the first century A.D., Indian muslin and jamdanis became famous in Rome under such names as nebulla, gangetika, and venti textiles (woven winds). This translates the technical names of a special type of Dacca muslin current in Bengal, which industry was ruined by lancashire products.

6. 8 PROPERTIES OF COTTON

Physical Properties

Composition

The cotton fibre is essentially cellulose, consisting of carbon, hydrogen and oxygen in the proportion of $C_6H_{10}P_5$. Bleached cotton is almost pure cellulose.

Raw cotton contains about 5 percent of impurities, consisting principally of cotton seed oil, pectic acid, colouring matter, albumen and wax. The wax acts as a protective coating to the fibre.

Strength

Cotton fibres are quite strong as compared to the other fibres and this strength is increased on wetting upto 25% than when it is dry. This property has its significance that less care will be required while handling the cotton fabrics during washing, drying and ironing. Hardness of water has no effect but discolouration may result from the deposits of insoluble soap produced by the action of soap on the hardening substances, if present in washing water.

Shrinkability

The fibre itself does not shrink but the fabrics made from the same do shrink because while processing and weaving the fibres are pre-stretched.

Hygroscopic Nature

Long exposure to water or moisture has no harmful effect on cotton fabrics. The tensile strength of cotton is greater when wet than when dry. The strength of cotton increases about 25 percent when wet. This is important in washing and ironing. Fabrics which are stronger when wet can be handled with less care. Hardness of water has no action on the fibre but discoloration may result from the deposit of insoluble soaps, produced by the action of soap on the hardening substances in the water.

Effect of Friction

Friction can be applied and the fabric can be stretched without any harmful effect, but fineness of fabric and looseness of weave have to be taken into consideration, otherwise shirkage and undue wear may result.

Action of Alkalies

Alkaline substances, like ammonia, borax, caustic soda or Soda ash are not harmful for cotton itself. However such exposures may effect the colour of dyed cotton. Prolonged boiling with alkaline especially in the presences of air is likely to tender the fabric. Dilute caustic soda can be used with safety, the exposure to which rather increases

the strength of cotton. This reaction forms the basis of mercerization process.

Effect of bleaching agents

All the bleaches can be used with safety, but the use of oxidizing agents demands great care since they tend to weaken the fibre. Hence thorough rinsing is necessary to ensure the removal of all traces of acid from the fabric.

Effect of Moth and Mildew

Cotton is resistant to moth but if damp is readily attached and destroyed by mildews and silver fish especially if the environment is warm.

Effect of Heat

Heat is not harmful unless scorching takes places. The fibre can be safely exposed to moist heat at boiling point. It scroches readily when heat is applied by an over heated iron. Prolonged steaming at 99°C to 100°C has a tendering effect.

Effect of light

Effect of light tends to weaken the fabric.

Resiliency

Cotton fibres have low resiliency and hence wrinkle easily unless finishing is done.

Absorption

Cotton does not hold moisture as well as wool or silk. Thus if worn next to the skin, it absorbs perspiration readily and soon gives a sense of chill.

6.9 CHEMICAL REACTIONS

Action of Acids

Strong acids destroy the fibres rapidly. Dilute acids have little or no effect on cotton, but if allowed to remain in contact for longer periods, due to evaporation of water, the acid becomes concentrated to weaken the fibres integrity.

Affinity for Dyes

Cotton does not dye as readily as wool or silk, but its affinity for colours is considerably increased when the fibre is mercerised. Direct cotton dyes have great affinity

for cotton and can be applied from their aqueous solutions without the help of a mordant. Similarly azoic dye, sulphur and vat dyes have affinity for cotton. Cotton has no affinity for acid dyes which are used for dyeing wool and silk.

6.10 GLOSSARY

1. Carding

In this process the cotton fibres are smoothed and drawn together to form a loose rope or silver.

2. Drawing

The silver is then combed and smoothened & stretched with the help of rollers. This process is called drawing.

3. Combing

It is the process in which the cotton yarns which are not leaned and combed to make yarn clean and free from all body stuff of plants.

4. Organdie

A cool, very light plain weave cloth used for summer wear.

6.11 LESSON END EXERCISE

1. Write in detail regarding manufacture of cotton.
2. Discuss the physical properties of cotton.
3. Discuss the chemical properties of cotton.

6.12 SUGGESTED FURTHER READING

1. Dantyagi, S. (1974) Fundamentals of Textiles & their care Orient Longman, New Delhi.
2. Sushma Gupta, Neeru Garg, Renu Sain. (1991) Text book of Clothing & Textiles, 4th Edition, Jalandhar.

Unit I

MANUFACTURING AND PROPERTIES OF SILK

7.1 INTRODUCTION

In this chapter you will study about the manufacturing and properties of silk.

7.2 OBJECTIVES

This lesson aims to understand origin of silk, Classification of silk and manufacture and properties of silk.

7.3 INTRODUCTION OF SILK

Silk is considered as the "Queen of fabrics" even today. Its strength, lustre, softness and the graceful way in which it hangs makes it the most attractive of textiles.

Silk is the secretion of the silk worm. The cultivation, collection spinning and weaving

of silk is an ancient art, which has its origin in China thousands of years ago. According to the Chinese legend, it was the Empress Si-ling-chi, who had first reared silk worms, and had collected and spun silk thread. She made a robe of the silk thread and presented it to her husband the Emperor Huango-to, who ruled in about 2700 B.C. The Empress, later on, shared her knowledge of silk-making with others and thus the silk industry was born in China. The Chinese call Si-ling-chi the Goddess of Silk.

The Chinese kept the knowledge of the industry to themselves for nearly 3000 years and then round about 289 A.D., Japan and India acquired it and became experts in the art of silk making. From India in about 555 A.D. the knowledge and art of silk growing and making silk fabrics travelled to Persia, Central Asia and Sicily. The Western countries took to the industry much later than the Asiatic countries.

In India, the chief silk producing centres are Kashmir, Bengal, Mysore and Madras.

7.4 MANUFACTURE OF SILK

Silk fibre is a natural filament. It is a solid fibre which is smooth and transparent when obtained from widely growing worms. On the other hand, the silk produced through sericulture is more uniform and strong. Silk fibre is the longest of all natural fibres which range from 800 to 1200 years. Under microscope, silk fibres seems irregular, flattened strand, like baby ribbon with longitudinal marketing.

(a) Preparation of silk and its yarn:

Silk is the secretion of silk-worm. The preparation of silk fibre is produced by what is known as 'sericulture' which is carried out in stages before the silk is reeled off from the cocoons.

(b) The cultivation of Mulberry tree

The silk worm is fed on mulberry trees, and therefore, for rearing them, the growing of mulberry tree is the first essential step. These are grown by the usual agricultural methods.

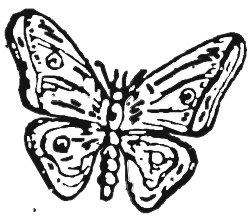


Fig. 7.1
Chinese Tussur Moth

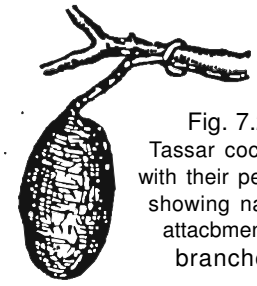
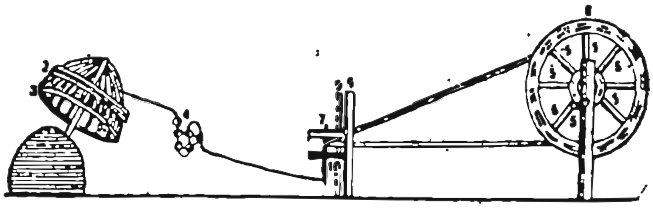


Fig. 7.2
Tassar cocoons with their pedicles showing natural attacbment to branches

FIG. 7.3 Larva of the Tassar Silkworm

VARIETIES OF WILD SILK (All Stages)

(There are many other varieties)



1. Vertical bar on hump of clay
2. Yarn on cone
3. Cone
4. Brass rings
5. Spokes of charkha handle
7. Spindle
8. Wheel tier
9. Spindle support
10. Yarn on spindle

The Process of twisting silk in Bengal on the Paraita and Charka

(c) The rearing of Silkworms

This by itself is in many places a cottage industry and is carried on by agriculturists, who grow mulberry trees. Silk worms have a short life of only about two months, during which these pass through four stages, namely :

(i) The Egg

(ii) Worm (Larva)

(iii) Chrysalis or Dupa

(iv) Moth

To get silk in the long strands the worm is killed at about the end of the pupa stage, otherwise, in emerging from cocoon as a moth, it will break the silk fibre into small unusable pieces. A few worms are, however, spared to grow into moth for laying eggs. The moth is made to lay eggs on a sheet of paper. The eggs are then sorted in cold storage for six weeks. The sheets with the eggs on them are washed in hot water and left to dry indoors.

The eggs take ten days to hatch. Even temperature, good ventilation and exclusion of dampness and hot sunlight are the necessary conditions for satisfactory hatching. In the second stage the young worms, on hatching out, are fed on finally cut mulberry leaves for

ten days. At this stage, the worms need special care, bamboo trays covered with straw mats are provided for item. The worm passes through five progressive periods and at the end of each period casts off the skin and grows bigger and bigger. At the end of the fourth period of the worm, it moves round its own body forming a figure of eight and in that position spins its cocoons from its secretion. The secretion is a gummy fluid secreted from two glands in its head which oozes out through a single opening. This fluid gets hardened when exposed to air, thus forming long fibres. The worm covers itself with that when this process of cocoon is completed. The worm sleeps for ten to fifteen days and turns into a pupa, the third stage of its life cycle. At this stage the cocoons are collected and are dipped in boiling water or steamed to suffocate and kill the pupa inside. These cocoons are then sorted for the filatures or establishment consisting of a larger number of reeling basin.

Which these pass through four stages: (i) egg, (ii) worm or larva, (iii) pupa and (iv) moth, (fig 7.4(a), (b) & (c) and 7.5

Fig. 7.4 (a) Silk: moth and the eggs

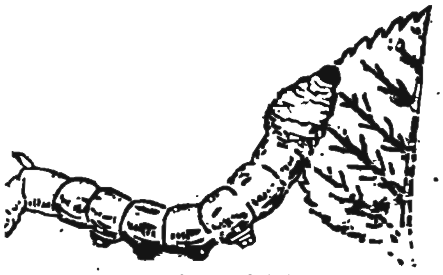


Fig. 7.4 (b) Larva

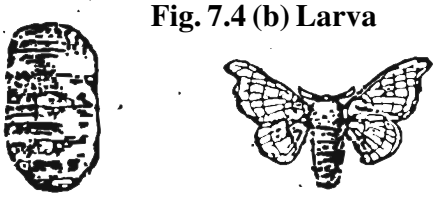


Fig. 7.4 (c) Cocoon Fig. 7.5 Male Moth

(d) Reeling:- Cocoons are placed in warm water to soften the silk. Fibres are pulled out from several cocoons and grouped together. They are then passed through a small hole in the reeling frame and then twisted and passed through another hole and again twisted on. The process of twisting continues until a round spools or in skeing. The skeing or spols are then sent for weaving. After the cloth is woven, it is boiled to remove the excess of natural gum and this process is called degumming of silk.

The short fibres which are unfit for reeling are collected, boiled to remove gum and then dried. These are combed and made to run parallel and are then drawn in film like sheets as for cotton fibres. The film-like sheets are passed through several rollers. Then the fibres are passed through a spinning frame. This process is called rowing and gives twist to the fibres and forms yarn. Silk fabrics made from this yarn are known as 'spun silk' velvets, satin and silk broad cloth are usually woven from spun silk yarn. Spun silk is commonly known as 'waste silk'. It consists of silk that cannot be unwound from the cocoons and reeled into skeins or it may be got from the damaged or unrealbel cocoons such as those from which the moth has emerged.

Spun silk requires more twist than reeled silk, to hold in all the short fibres. Twisting decreases lustre, so that spun silk appears less lustrous than reeled silk. It also has less tensile strength, less elasticity and a rather cottony feeling.

Spun silk is less expensive then reeled silk and is often used for the weft or filling threads in a cloth. These threads do not have to be so strong as warp yarn. Plush, velvet, satin and lace may have spun silk yarn saris, knitted ties, sweaters, scarver, hoisecy and upholtery materials like mixture. of spun silk & other fibres.

7.5 CLASSIFICATION OF SILK

Silk may be classified under two main types :-

(a) Mulberry or cultivated silk

(b) Non-Mulberry or wild silk

(a) Mulberry or cultivated silk

Mulberry silk is made by the silk worm of the Bombyside variety. Among the Bombyside variety there are two types. One is known as 'univoltine' and the other 'Muth voltne' the forms, which gives only one crop of silk during the year, is the ordinary European silk worm (Bombyxmori). The latter which gives more than eight crops passing through a

succession of generations during the year, in the Bengal silk worm. Every generation of cycle of the multi voltine is not utilised for a silk crop.

The cocoons of the univolline silk worms are of a firm and close consistency, so that the silk can be readily reeled off them, and the eggs require a certain degree of cold to hatch out regualarly and healthily. The eggs of multivotines hatch out healthily without exposure to cold and their cocoons contain a small amount of silk. The condition for univoltines are fulfilled in Kashmir, whereas those for Multi voltins prevail in Bengal & Karnataka State. In the South, Karnataka State alone contributes three-fourth of the total mulberry silk production in India and is reeled out of multivoline cocoons raising fibre to six crops in a year.

Wild silk or the non-mulberry silk.

The non-mulberry feeding variety insects are classed as the "satunidae". The most important species of the silk are as following:

(i) Tassar Silk

It is obtained from an oak-feeding type of moth, native of India & China. Unlike the mulberry cocoons, the tassar cocoons possess a peduncle attached to the mouth of cocoons, Which support the cocoons on the twigs of the forest tree as of sal, Asan and others. Indian tassar is sought in Europe and U.S.A. for men's suiting and other dress material and for use as tapestry and upholstry material.

(ii) Muga Silk

The mooga moth is a species that is to some extent domesticated in India. It is a native of Assam and in importance it is next to tusser moth. The Muga silk is superior to the tassar in point of view of gloss and other qualities. It is commonly employed for the manufacture of mixed fabrics and for some kinds of embroidery. Assam is the only place in the world where the rare golden yellow muga silk, an excellent material for embroidery is produced.

(iii) Eri or Endi Silk

The eri or arrindi moth of Bengal and Assam is fairly widely distributed in the east. The eri worm, feeding on coaster leaf is reared indoors in Assam, Bihar & West Bengal.

The cocoons are remarkably soft, white or yellowish and the filament so exceedingly

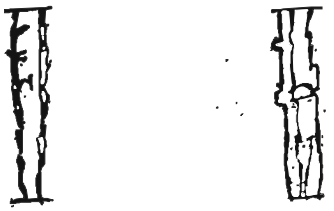
delicate making it impracticable to wind off the silk. It is spun like cotton.

Countries producing silk

Today, the silk is largely produced in China, India, Japan and the South of France. India is the fourth larger producer of the rave silk in the world. The main silk producing states are Mysore, Jammu and Kashmir. Besides producing Mulberry silk, India also produces all the three types of Non-Mulberry silk in substantial quantities a feature which is not associated with any other sericulture country. In fact, Assam is the only place in the world where the rare garden yellow muga silk, an excellent material for embroidery is produced.

Properties of Silk Composition

Silk is primarily composed of proteins but contains no sulphur. It consists of carbon, hydrogen, oxygen and nitrogen. The ratio of these constituents is as follows = $C_{15}H_{23}N_2O_5$



a. Cultivated Silk Fibre **b. Raw silk fibre much enlarged**

7.6 PHYSICAL PROPERTIES OF SILK

(a) Shrinkability

Silk is resistant to shrinkage. Neither it shrinks nor it stretches during washing.

(b) Hygroscopic Nature

Silk absorbs 10 to 30% of moisture without feeling wet to touch. However moisture does not spread readily on silk. Water has no harmful effect on 'silk, though long exposure to moisure tends to discolour white fabrics. Hardness of water should not cause any injury, through the amount of soap need to produce a lather makes rinsing more difficult.

(c) Resilnency

Silk has high resiliency and wrinkles easily, fade away during washing and wearing.

(d) Conductivity of heat

Silk is poor conductor of heat and does not allow body heat to rediate out. Therefore, it is warmer than cotton, linen, rayon and is preferred as a winter wear.

(e) Effect of heat

Intense heat weakness the strength of silk fibre, but is not affected by normal heat or ironing. Very hot ironing may turn white silk yellow.

(f) Effect of Friction

Silk is prone to friction which spoils the smooth texture of the fibre. So, excessive rubbing of silk fabrics during washing should be avoided.

(g) Effect of Air

Long time exposure of silk fibres results in fading of the colours.

In addition, hot air may weaken the fabrics.

(h) Static Electricity

Silk builds up static electricity, discolour it and cause it to tender. Weak household ammonia can be used. Mild soaps for washing silk fabrics should be used as lustre of fibre is diminished by use of strong alkalies.

Wild silk is less effected by alkali than cultivated silk.

(c) Effect of bleaching agents

Sunlight and chlorine bleaches damage silk fibres, cause it to turn yellow. So, instead of hypochlorities, Jevelle water should be used. However, mild oxidizing agents, like hydrogen peroxide and potassium permanganate can be used safely.

The yellow colour in wild silk is very persistent with the result at is very difficult to bleach at a pure white.

(d) Affinity for Dyes

Silk have high affinity for dyes and have a depth of colour or jewel like tone, not found in the man made fabrics which look like silk.

(e) Effect of moths and mildews

Silk is not harmed by moths and mildews.

7.7 CHEMICAL PROPERTIES

(a) Action of acids

Dilute acids have no harmful effect on silk, these are absorbed and retained with tenacity, as the case with wool, and dilute organic acids can be used without risk of injury. But strong acids destroys the silk fibres, especially when kept in contact for longer periods. Concentrated mineral acids rapidly dissolve the fibre, Wild silk is less affected by the action of acids and more slowly than is the case 'with cultivated' silk.

Increased brilliance and scroof are imparted to silk by treatment in a dilute solution of sulphuric, acetic and other acids, which are dried in the fabric. A mixture of -silk and wild silk treated in this way produces a silk crepe, the effect being due to the fact that the bath has little or no action on the letter liber.

(b) Action of Alkalies.

Strong alkalies have harmful effect on silk. Hot caustic solutions, completely dissolve the fibre, and dilute solutions are inclined to discolour it and to cause it to tender.

7.8 LESSON END EXERCISE

1. Write a short note on origin of Silk.
2. Describe the different types of silk?
3. Write in detail about manufacture of silk.
4. Describe in detail the physical and chemical properties of silk.

7.9 SUGGESTED FURTHER READINGS

1. Sushma Gupta, Nero Garg, Renu Sain (1991). Text book of Clothing & Textiles, 4th Edition Jalandhar.

2. Durga, Dewkar. Household and Laundry Work.

3. Sushma Dantyogi. Fundamentals of Textiles and their once. Orient Longman New Delhi.

Lesson -8

Unit II

MANUFACTURE AND PROPERTIES OF WOOL

8.1 INTRODUCTION

In the previous lessons i.e. Lesson No.6 and 7 you have studied in detail about manufacturing and properties of Cotton and Silk. In this lesson you will study about the origin of wool how it is manufactured, its types and properties.

8.2 OBJECTIVES

1. To study about the origin of wool.

2. To study the manufacture of wool by hand and by machine.
3. To study the properties of wool.

8.3 INTRODUCTION TO WOOL

Wool, at first, was meant to be the soft hair covering of sheep and camel. Now, its manufacture as a textile fibre includes hair of all kinds of animals provided the hair, either in their natural state or after some sort of treatment, lend themselves for being used for spinning or felting.

It is supposed that wool was used by man as clothing in the very early stages of human history. The primitive man first used the skin of certain animals to protect and to decorate the body. The practice still persist in the form of furs or pelts, which are popular even today. But these were and are obtainable only by killing the animals. Hence, an attempt to increase the supply beyond a certain limit was not only beset with utmost difficulties but was also bound to result, sooner or later, in the extinction of the particular species and the consequent drying up of the supply or resources. Thus, the difficulty of maintaining or increasing supplies adequately to meet the demand led to the search for .alternative covering. Man soon discovered the property of the hair of sheep getting interlocked and matted together under pressure and thus, the hair of sheep came into use for making woollen fabrics. The property of woollen fibres to get interlocked is called 'felting and the materials prepared in this manner are known as 'felts'. Felts must have been in us for many years until wool was found easy to spin and weave into fabrics.

Almost all countries produce wool, but the quality of wool is not the same. Some countries produce wool of good quality and of fine, soft texture. The famous Kashmir and Kabul 'pashmina' has yet to be surpassed for its soft and fine texture, so also the Persian carpets have no rivals. In Europe upto the 13th century, Spain was the only country which produced fine wool known as 'merino' wool. Australia, Africa and America imported the Spanish sheep for breeding and, thus, improved the quality of the wool produced by them. Now, these countries, as well as New Zealand and South America produce good quality merino wool. Australia produces more wool than any other country and that too of a good quality.

Hand-spinning and weaving of wool has been long in existence as a home or cottage industry throughout Central Asia on both sides of the Himalayan range and in

China. China leads the world in the supply of carpet wool with India as a close second today.

Woollen Fabrics. Wool fibres of different qualities and lengths are prepared in a special manner to be woven into different kind of fabrics. For clothing, beside felts, wool fibres are used for the manufacture of two principal classes of fabrics, namely (i) worsteds and (ii) woollens.

Worsteds are woven from long, tightly twisted fibres of 2 to 8 inches in length. These fabrics are usually woven into a design, or in a twill weave, and are given a smooth finish which brings out the lustre of the fabric, and the design of the weave. These fabrics are lighter in weight than the woollens and as these are woven with fine tightly twisted yarns, are strong enough to be able to stand hard wear.

Woollens on the other hand are soft, fluffy fabrics with napped finish. These are seldom constructed with figure weave. The twill weave is mostly used, as this gives a surface easy for napping. The weaving pattern is, however, indistinct. These fabrics are warmer than worsteds. The short fibre of about two inches in length are used for these fabrics.

Broad cloth and light weighted flannels are "examples of fabrics made with worsted yarns for warp and woollen yarn of filling.

Felted Fabric Examples of felted fabrics are blankets, rugs and Kashmir 'Pattu'. 'Namdas' (a floor covering manufactured in Kashmir) are made by this process.

8.4 VARIETIES OF WOOL AND THEIR ORIGIN

All wools are classified under four general classes of fine, medium, long and carpet wools.

(i) Fine Wools

The merino sheep is the outstanding example which supplies this type of wool. Fine wool may vary in length from 1½ to 5 inches. Botany wool noted for its quality and fineness is got from merino sheep.

It is interesting to note that the first merino sheep that were taken to Australia were from the state of Bikaner in India.

(ii) Medium Wool

These are furnished by such breeds as Oxford Shorophire, Hampshire, Suffollk and Dorset. These sheep are valued for mutton as well as for their heavy fleece. The fibres are of medium fineness and are from 2½ to 6 inches long. Shetland wool, from sheep raised in the shetland Island, has a special use in imported and domestic sweaters.

(iii) Long Wools

Large sheep as the Lincolns, Costwolds, Leicester, Romney marsh produce long, strong, lustrous wool. The fibre length varies from 5 to 6 inches, for a Romney marsh to 10 or even 15 inch for cotswords.

(iv) Carpet Wools

This type varies in length from as short as 1 inch to as long as 15 inches. Strength and resilience are its qualities. To get uniformity of properties several grades are usually blended in carpet manufacture. These wools are got from various cross breeds.

8.5 WOOL BEARING ANIMALS

The world's rarest, finest and most costly fibres, commercially known speciality fibres are got from certain animal which grow long, lustrous hair. These animals are the vicuna, cashmere goat, camel, llama, alpaca, angora-goat and angora-rabbit. They are noted here in order of their rarity and cost.

(i) The Vicuna

The vicuna is the smallest species of the South American branch of the Camelida. It yields what is thought to be rarest and finest fabric fibre known to man. The home of the Vicuna is in the highest plateaux of the Andes, mostly in Preu. Since this small animal is very wild, it has to be hunted to death in order to obtain its fibre. The fibres are extremely fine, of velvety softness, and vary in colour from cream to fawn and brown.

(ii) The Cashmere Goat

This animal lives in Tibetan region of Himalaya, receives its name from the province of Kashmir where the Kashmiri make the exquisite shawls from

the fine down of the goat. Several attempts were made to transplant the cashmere goat from its original home to other parts of the world but they have all failed.

The outer or beard hair of the goat is straight, long and coarse, while the under fleece is soft, and downy and rivals the vicuna hair in fineness. It has a distinct silky glass and smoother and warmer than wool. Its length is from 1½ to 3½ inches. Kashmir is the only place in the world which produces the famous 'ring shawls' or shawls which literally pass through a ring.

(iii) The Camel

The Bacterian or two-humped camel is found in Asia from the cold north of Siberia to the hot deserts of Arabia. The camel's hair protects him not only from the severe cold but also from extreme heat. This remarkable fibre is soft and rich in lustre and colour, possessing warmth giving, as well as cooling properties. Unlike sheep, which have to be short periodically, camels drop their hair continually in clump and these picked up by the characters of the animals.

8.6 MANUFACTURE OF WOOL

Hand process of manufacture of wool in India.

(a) Grading and Sorting

To begin with wool is graded and sorted. Sorting is the process of breaking up the fleece into distinct qualities. This very important work is done by machines in the western countries. In the Indian cottage industries the fleeces are spend out on sorting tables by hand and separated in accordance with the purpose for which they are to be used viz for carpets, blankets and good woollen cloth.

(b) Blending and Carding

Wool is next blended and carded. Carding is done with bow made of bamboo or crane, the ends of which are connected with string. The professional carders are called Penjari

(c) Drawing

The takli and charkha are used for the work of the drawing and twisting the loose-wool silver.

(d) Spinning and Weaving

To prepare the warp yarn board with a series of upright pegs arranged in a U-shape is frequently used. The yarn is wound on to selected pegs, according to the length required and this is repeated until the desired number of warp ends is obtained. In the case of blankets (Kumblies), there are usually 10 to 12 to an inch. When the yarn is removed from the pegs, the thread are arranged to give the required width and are then placed on a trestle. After they have been stretched tight, they are brushed with size made from crushed tamarind seed boiled in water.

Once it is dry the yarn is ready for the handloom. This is frequently a throw-shuttle, a type of 'pit' loom, which has the advantage of being both simple and cheap. The weaver uses a hollow cane or bamboo in which is placed the filling yarn, the shuttle is thrown backwards and forwards, the shed being opened as required.

8.7 MANUFACTURE OF WOOL BY MACHINERY

The sheep are washed in early summer, shearing being done a few weeks later. The wool is packed into bales and sent to the factory.

(a) Sorting and Cleaning

This wool is first of all sorted according to quality, and the dirt is removed by a machine known as a duster.

(b) Washing and Scouring

The wool is then moved and washed in a series of four connecting tanks, each containing warm soapy water and weak alkli. Thus wool grease and perspiration are removed. The fibres are washed in the first tank and rinsed in the other. The wool as it comes from the last tank is soft and white. Valuable by-products are obtained from the spent liquors in the scouring of wool. The most important of these in lanolin which is largely

used in the manufacture of cosmetics, adhesive plasters, disinfectants, ointments and a host of other preparations.

(c) Carbonising

Although scouring removes all grease and dirt some vegetable matter, such as seed and burrs, may still remains in the wool. Then impurities must be removed. The process used for this purpose is called carbonising. In it the wool is immersed in dilute sulphuric acid, the excess acid squeezed out and the wool dried under conditions of carefully controlled temperature. The cellulose of the burr is converted into a brittle state and is crushed to dust by rollers and shaken out.

(d) Drying & Oiling

Wool is next rinsed in clear warm water and spread out as racks until it is as dry as the air around it. The wool is kept soft and elastic by oiling. This also minimises the chances of fibres breating in the more violent process of carding, which follow.

(e) Carding

The clean wool is by no means in a fit state for spinning. Its fibres will be lying in all directions. It is therefore, blended, opened out and converted into a soft thin, guaze-like band. This preparation of wool is called carding.

The carding process introduces the classifications of woollen yarns should be somewhat rough or fuzzy, it is not desirable to have the fibres entirely parallel. By the use of an oscillating device, one thin film or silver of wool is placed diagonally and overlapping, another entanglad and somewhat parallel and the same time provides a fuzzy surface to the yarn. After this carding process, the woollen silvers go directly to the spinning operation.

In the manufacture of woollen yarns, the essential purpose of carding is to disentangle the fibres by passing the wool fiber between rollers covered with fine teeth. Since worsted yarns, however, should be smooth, the fibres are made to lie as parallel as this process will permit. Following this operation, the wool goes to the gilling and combing processes.

(e) Gilling and Combing

The carded wool, which is to be made into worsted yarn is put through gilling and combing operations. The gilling process is continued in the combing operation, which remove the shorter fibres of 1 to 4 inches in length, called combing noils, places the longer fibres called tops as parallel as possible, and further cleans the fibres by removing any remaining loose impurities.

The short-staple noils are not necessarily of poor quality. Combing noils may well be of quality, depending on the original sources of the wool. They may be used as fillers for other types of wool fabrics; however, such fibres must be classified as reprocessed wool.

The long staple tops which are over 4 inches in length excel in colour, feel and strength. They are used in the production of such worsted fabrics as serge, whipcord gabardine and covert.

(f) Spinning and Weaving

Wool fibres are then drawn out and twisted into yarn. Loosely twisted fluffy yarn is made into soft woollen material. The smoother tight and evenly twisted yarn is used for weaving worsted.

(g) Dyeing and Bleaching

Dyeing and bleaching may be done next. These processes may take place at any stage after scouring. In some cases, yarn dyeing is done, as for plaids. Bleaching is usually necessary for undyed woollens owing to the yellow colour produced by the scouring process.

Acid colours are extensively used in wool dyeing. They have direct dyes for wool requiring no mordant.

(a) Finishing

The beauty of woollen goods, depends largely on the finish of the cloth, and of worsted goods, in the weave. Worsted suitings, when taken from the loom, look much as they will be in the finished state, but the woollen fabrics are far from attractive quality, being coarse and rough and needing

many processes to develop their beauty. The wool fabric is dried and stretched during drying to retain the even width. The surface is brushed to raise the hairs, which are then cut into even lengths. The material is then pressed and folded ready for sale.

(i) Drawing

Drawing is an advance combing operation, which doubles and redoubles sliver of wool fibres. The process draws, drafts, twists and winds the stock, making the slivers more compact and thickening them into slubbess. Drawing is done only to worsted yarns.

(ii) Roving

This is the final state before spinning. Roving is actually a light twisting operation to hold the thin slubbers intact.

(k) Spinning

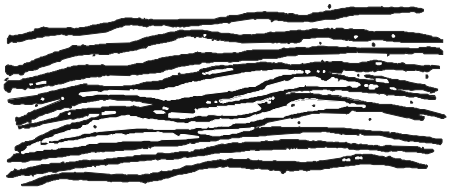
In the spinning operation, the wool rouing is drawn out and twised into yarn. Woollen yarns are chiefly spun on the mule spinning machine. Worsted yarns are spin on any kind of spinning machine-mule, ring, cap or flyer. There are two different systems of spinning worsted yarns.

Typical woollens are made from short-stapled fibre and have, a fluffy appearance. Examples; Suede cloth tweeds, flannel, broad cloth and wool crepe.

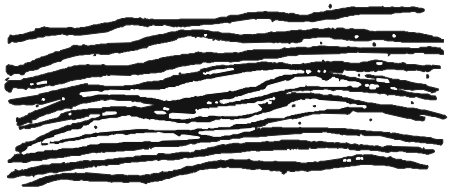
Worsteds are made from long fibre, which are laid almost parallel before being highly twisted. They have a disinctly visible weave, wiry feel, and are somewhat harsh. They are finely woven and free from nap and are smooth in appearance. Worsteds give very good service. Examples, Men's suitings, gabardine, crepes, and Bed ford cord.

(I) Special Finishes

Modem scientific research has enabled manufacturer to make wool proof against shrinkage, water and moths.



a) Parallel arrangement of fibres in worsted yams.



b) Random arrangements of fibres in woollen yarns.

Fleece Sorting
Blending
Scouring

For Woollens	For Worsteds
Carding	Combing
↓	↓
	(Removes short fibres; makes fibres parallel)
Spinning (yarns become fuzzy, thick, soft)	↓
↓	Drawing (Thins Slivers)
Weaving	↓
↓	Spinning (yarns become smooth thin, round, hard)
Finishing	↓
	Weaving
	↓
	Finishing

How the manufacture of Woollen and Worsted yarns differ

Unshrinkable Wool

Processes to make wool un shrinkable generally aim at removing modifying the scales on the fibre and so preventing the tendency to creep. For this purpose chlorine is often used to attack the surface of the fibre. In another process the surface of wool is partly digested by an enzyme called papain from the paw-paw tree, which grows in India, Ceylon and Africa. The action of papain renders the scaly surface of the wool fibre soluble, smoothens it and thus renders it shrink proof and glossy.

8.8 MICROSCOPIC STRUCTURE OF WOOL FIBRE

Untwisted from the yarn it has a kinky appearance. Its length varies - between 1 ½ and 1" the long fibres being generally coarser than the short ones. The fibre used for woollen are from 1 to 2 inches. If ignited the fibre burns or smoulders with a smell, like burning hair or feathers, leaving behind a black bead:

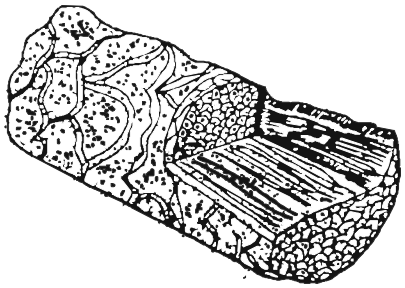


Diagram illustrating the structure of a wool fibre magnified about 5,000 lines. Notice the overlapping outer scales (the cuticle) and the elongated cells inside (the cortex): The coarser fibres have also a core of hollow cells (the medulla).

Microscopic appearance of the fibre

When examined under the microscope, the surface of the fibre is seen to consist of cells, irregular in shape and slightly overlapping like scales. These are called serrations.

8.9 PHYSICAL PROPERTIES OF WOOL

(i) Crimp:

The wool fibre grows in a more or less wavy form with certain amount of twist. This waviness is called crimp. The finer the wool the more crimps there are. In fine merino wool there may be as many as 30 crimps per inch and in coarse wools as few as two or one. Crimp is a most important

quality, since it is responsible for some of the elasticity which is so characteristic of wool garments. It aids elasticity, feeling power and spinning qualities. In finer wools there are more crimps per inch (15-30) while in coarse wools there are 2-10 crimps per inch. Though the crimp of wool is permanent, moisture alters it and it is possible to remove it completely in hot water. After drying, however, the crimp usually reappears.

(ii) Resiliency :

Wool is resilient. In other words it is able to spring back to its original form like a rubber band after being wrinkled or creased. It is a virtue which most fibres lack. If wool is slowly elongated, definite extension will result. When this tension is released, the fibre makes a partial recourses, and slowly loses its temporary, "set" if allowed enough time. Scientists tell us that it may be extended 10, 20, 30 and if the fabric is wet-40 or 50 per cent without breaking, and when you let, it go back, it returns to the original length, undamaged. This is very important property for the fibre used, say at the knee or the elbow of a suit. This is the one reason why good wool fabrics do not usually become permanently wrinkled or shapeless.

(iii) Warmth :

Wool keeps one warm. This is because the serrations or scale like projections of the fibre entangle air, which is a bad conductor of heat, around and in between the fibres. The more loosely a fabric is woven and knitted, the greater is the air entangled. Hosiery fibres have about 80 per cent air to 20 per cent fibres. Even tightly made worsted suiting has about to 70 percent air to 30 percent fibre.

(iv) Affinity for moisture :

Wool is the most hygroscopic of all fibres. It can absorb moisture from the surrounding air tip to 50 per cent of its weight and can carry up to one-fifth its weight in moisture without feeling damp. It dries slowly, thus preventing a chilling of the body through too rapid evaporation. Wool absorbs perspiration after violent exercise, acting as a thermostat which guards the body against quick changes in the temperature.

(v) Insulation :

Wool is the ideal protective fibres. It protects with comfort, because it insulates. Millions of tiny cells of air are trapped by the wool fibres and form an insulating layer between wearer and weather. For this reason wool is the best protection against both cold and heat.

(vi) Strength :

Wool loses 25 percent of its strength when wet. In general the longer the wool fibre the greater the yarn strength.

(vii) Felting :

Wool fibres interlock and contract when exposed to heat moisture and pressure. The scale like exterior of the fibre is one contributing factor to feltings Normally wool fibres repel one another. The fibres become softened in warm, alkaline solutions, the scales expand at their unattached edges, and with friction and pressure they lock and interlock arid ultimately few.

This very useful property of wool finds application in the manufacture of felts for hat, shoes, floor coverings and sound insulating purposes.

8.10 CHEMICAL PROPERTIES OF WOOL

(i) Action of Acids

Dilute acids have little effect on wool, but hot concentrated solutions may weaken the fibres or dissolve them. Chlorine and hypochlorites are harmful to wool. They make the fabric harsh to the touch over-chlorination weather wool.

(ii) Action of Alkalies

Alkalies tend to make white wool yellow, hard and felted. Strong solutions of sodium carbonate (washing soda) is highly injurious to the wool fibre. However borax and ammonia have no harmful effect on wool.

(iii) Action of Bleaching Agent

Strong bleaching agents like hypochlorites have a harmful effect on wool. Potassium permanganate, sodium peroxide and hydrogen, however can

safely be used for bleaching and stain removal.

(iv) Affinity for dyes

Wool dyes readily with most types of dyes. Though wool is the most satisfactory fibre in many ways it has some disadvantages.

(v) Effect of Moths and Mildews

Wool is easily damaged by moths that is why during storage of woollen garments special call is needed. However mildew do not affect wool fabric.

8.10 OTHER REACTIONS

(i) Water and friction

Water and friction affect the fibres, for when they are wet or damp, the scales which surround their length are raised up and roughened and tend to interlock or 'felt' as they are brought together by friction. Felting causes an article to become thick and to shrink. Hence, rubbing which is usual in washing cotton fabrics, causes serious injury to wool.

(ii) Long exposure to moisture

Long exposure to moisture is likely to cause shrinkage and so laundering processes should be carried out as quickly as possible and long steeping must be avoided.

(iii) Hardness of Water

Hardness of water causes no harm during the washing process if care is taken to preserve a good lather by the addition of more soaps when necessary, but if hard water is used for rinsing, insoluble soaps are likely to be deposited on the fabric. So it is important to use soft ,or softened water for the washing and rinsing processes. Though rinsing is essential for soap left in woollen fabrics causes an unpleasant smell, and it is responsible for yellowness in white wool after several washings.

(iv) Sudden changes of temperature

Sudden changes of temperature may affect the serrations on the fibre and

add to the danger of felting. Extremes of heat and cold water should be avoided.

8.12 GLOSSARY

1. **Carbonising** : The process of removing impurities from wool is called carbonising.
2. **Carding:** The clean wool is blended, opened out and converted into a soft, thin, gauze like band. This preparation of wool is called carding.
3. **Drawing:** It is an advance combing operation, which doubles and redoubles slivers of wool fibres.

8.13 LESSON END EXERCISE

1. Write a note on origin and development of wool.
2. Describe the process of manufacture of wool by Hand?
3. Describe the process of manufacture of wool by machine?
4. Explain the physical and chemical properties of wool.

8.14 SUGGESTED FURTHER READINGS -

1. Sushma Gupta, Neeru Garg and Renu Jain (1991). Text Book of Clothing - & Textiles. 4th Edition Jalandhar.
2. Dunga Delkar, Household & Laundry Work.
3. Sushma Dantyagi. Fundamentals of Textiles & their care, Orient Longman, New Delhi.

Lesson -9

Unit II

MANUFACTURING OF NYLON AND RAYON

9.1 INTRODUCTION

In this lesson you will study regarding the manufacturing process of Nylon and Rayon

9.2 OBJECTIVE

This lesson aims to understand the introduction and manufacture of Nylon and Rayon.

9.3 INTRODUCTION TO NYLON

Nylon was the fibre first to be synthesized from materials none of which had previously been fibrous in nature. It is known to be the first man-made fibre which is synthesized by organic laboratory chemicals. It is a polymide fibre. A

polymer is a large molecule made of several small moleules, generally of one kind, linked to each other in chains or in crisscross fashion. Nylon is made from coal, air and water. A mixture of two different coal-tar products, namely, a dibasic acid, 'adipic acid' and a diamine, hexamethylene diamine is heated in air to give a condensed product known as nylon polymer, which is then stretched into fibres.

History: The history of nylon dates back to 1928, when Dr. Stine, the chemical Director of du Pont company prevailed upon the company to start research work clothing to new fibres. The research continued for some time and experiments were made on cellulose derivations, particularly the esters and new types of esters, and also on certain nitrogen containing derivatives of cellulose. These experiments were not successful. Dr. Wallace H. Cenothen, at the same time made a study of play condensation whereby linear-polymer are produced and this eventually led to the invention of nylon. In 1938, du Pont company started a plant for nylon production. This fibre was known as fibre 66. Later, the name nylon was given to it.

9.4 PHYSICAL STRUCTURE AND APPEARANCE

Nylon is a round smooth fibre that, under the microscope, resembles cuprammonium rayon and dacryon. Since nylon is round in cross-section, and small in diameter it packs together leaving little dead and space in the yarn or fabric. For this reason nylon has less bulking power than the acrylic fibres. Nylon fabrics have natural translucency; consequently, filament nylon can be made into very sheer transparent fabrics. The transparency of the fibre has made it difficult to produce fabrics that are light in weight and yet are not too sheer. The first this opaque nylon fabrics were made by printing them with resin containing a white 'pigment. Recently opaque nylon has been developed.

Nylon fibre is found in three forms:

1. Multifilament
2. Monofilament
3. Staple

1. Multi filament Nylon Fibre

The yarn is made up of number of individual strand twisted together to one multifilament fibre. The number of these strands vary and also the amount of twist. These

are used in making blouses, bathing suits, upholstery etc. Multifilament nylon fibres are smooth, soft and luxurious and drape to fabrics.

2. Monofilament Nylon Fibre

The yarn is made up of a single solid strand of great length. They are used in hosiery products.

3. Staple Nylon Fibre

It consists of very short i.e. 1½ to 5 inches, strands of nylon. These types of yam show crimps which give springness to yarn. The fabrics made out of this type of nylon are light, smooth and soft to touch. They are very convenient to wash and are highly desirable because of woollen appearance. This fibre is used in the making of sweaters, pulloveers and socks.

Under microscope nylon fibre appear as fine, round, smooth and translucent cylindrical strands.

9.5 MANUFACTURE OF NYLON

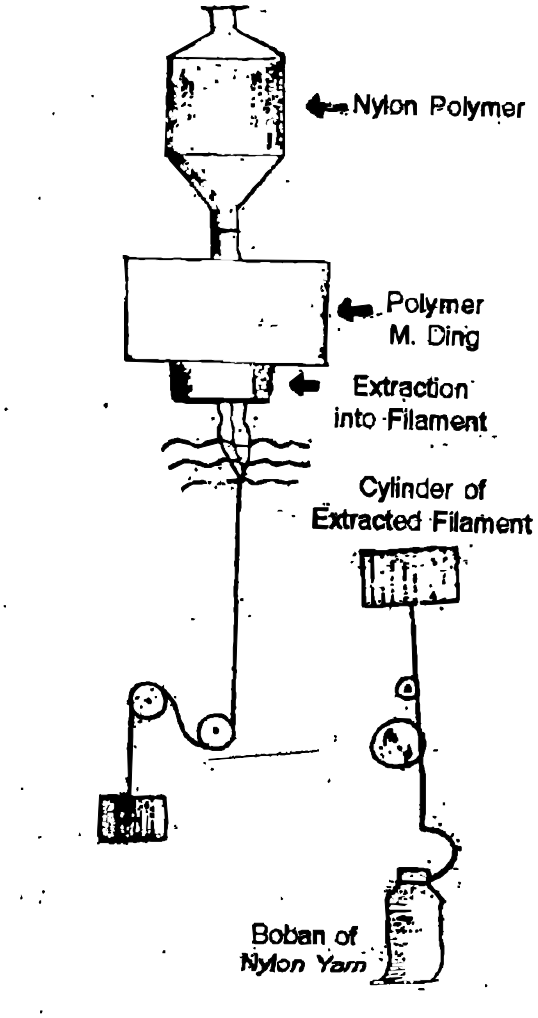
Nylon is made of coal, air and water, the actual synthesis is entirely different. Nylon 66 is produced from an acid and a diamine, which are produced from coaltar derivaties. A mixture of two coal tar products, a dibasic acid, adipic acid and hexamethylene diamine containing nitrogen is heated to give a condensed product known as nylon polymer. Nylon polymer is formed in an autoclave, a piece of equipment like a giant pressure cooker.

The nylon polymer is melted and passed on chilled rollers when it comes out in the form of rolls, these are than cut into chips and stored. The chips are remelted and filtered through special filter packs.

After filtering, the molten polymer is passed through the tiny holes of a metal disc called a spinneret and fine filaments are thrown out into air where these get hardened. These are then passed through a conditioner which moistens them so that a number of these filaments stock together to form a long thread which is wound on a reel. Next the yarn is stretched or 'cold drawn' between a system of rollers. An interesting change takes place during stretching. In the undrawn fibre, the long chain like molecules are arranged helter-skelter, like straws in a haystack, But drawing aligns the

molecules into an orderly array, places them parallel to one another; and brings them close together. Fibre diameter is also reduced in size. When nylon is cold-drawn it becomes very strong, tough and elastic and the yarn develops translucency and lustre. After drawing, filament yarns are carefully inspected and packed for shipping to. the weaving mill.

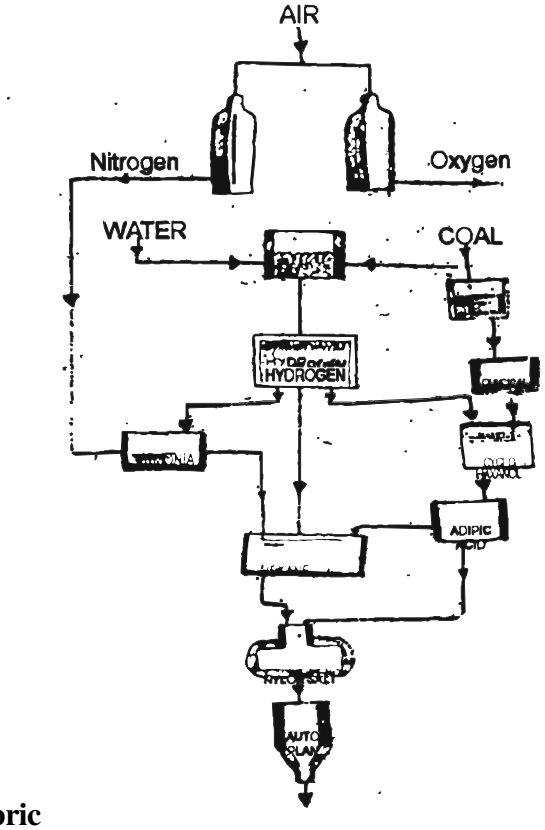
How a Nylon Yarn is made



Twisting of the yarn is also carried on at the same time by the use of suitable equipment for the purpose. Nylon staple is made by crimping continuous nylon filament low and then

cutting it into short uniform lengths. It is shipped in large 500 pound packs much like bales of cotton. Some Nylon staple is obtained by reprocessing nylon by a system similar to that used for wool.

HOW A NYLON POLYMER IS MADE



From Fibre to Fabric

Knitters and weavers use nylon in their fabrics in three basic ways:

- 100% nylon fabrics
- blends and combinations of nylon with other fibres
- as reinforcing material.

100 % Nylon Fabrics

These fabrics can give the full benefit of all the nylon's many properties -strength with light weight, resistance to wear and tear, shape retention and easy care. Examples are blouse, slips and socks that wash quickly and need little or no pressing.

Blends and Combinations

Some materials are made partly of nylon and partly of some other fibre such as 'orlon',

'Dacron' polyester fibre, cotton wool, rayon, acetate or silk. Such fabrics can be classified under two headings:

(a) Blends

(b) Combination

(a) Blends

In blends the various short staple fibres are mixed together before the yearn is made. These yarns are then made into fabrics. Blends of Nylon and wool can be higher and stronger than wool alone. If enough nylon is used in the blend, the fabric may need no special care to prevent noticeable shrinking or loss of shape after washing. Nylon and cotton blends can have greatly increased wear and tear resistance without loss of cotton's characteristics softness.

(b) Combination

In combination fabrics a yarn made entirely of nylon and a yarn made entirely of another, fibre are woven or knitted together. Many rayon nylon slip fabrics are of this type -such a fabric can have the drape and feel of rayon with the added strength, wear and tear resistance, and shape retention given it by nylon. An important combination of nylon and rayon a may result in the nylon fibres cutting the rayon fibres.

As a reinforcement

Here nylon is added in a small amount to a product, giving the article longer life. Nylon yarn knitted into only the toe and heel of socks made of another fibre is an example. The nylon greatly increases the socks wear life.

Nylon Fibre Blends

The consumer uses many textile products that do not possess all the properties he would like them to have. He would, for example prefer winter coats with sufficient warmth but less weight, cool, light summer clothes that would not lose their fresh, clean appearance on hot sticky days, fabrics that would wash readily, dry quickly and not lose their shape. Textile designer and engineers are producing new fabrics to meet such needs. These combine or blend two or more fibres to give the desired properties to the fabrics.

Nylon and Cotton

When properly combined with cotton, nylon adds strength, which allows the

development of unsually fine textures not possible to obtain from cotton alone. Nylon provides smoothness, silkness and dirt rejections. It also reduces the weight of the fabric and increases its wrinkle resistance. The cotton gives softness and moisture absorption. This combination permits the weaving of fabrics that are soft, supple, and extremely serviceable. If the combination is not properly balanced, the cotton may shrink, causing the fabric to pucher. Also the nylon fibres may cut the cotton fibres. A blend of at least 17% high tenacity nylon staple with cotton will produce an extremely durable fabric.

Nylon and Wool

The proper combination of nylon and wool will produce a lighter weight fabric with greater durability. Such fabric will retain the hand, drape, and warmth of wool as well as the elasticity, resilience and shape retention of nylon. The properties of fabric will be in direct proportion to the amount used of each of the two fibres. A blend of 10 to 15 percent nylon and the remainder wool is considered satisfactory.

Nylon and Rayon

In this blend, the nylon gives wrinkle resistance and strength and the rayon gives suppleness, drape and moisture absorption. Such a combination make possible fine quality fabric of extremely light weight. As with cotton of the combination is not properly balanced, the rayon may shrink causing the fabric to pucher. Also an improper blend of nylon and rayon may result in the nylon fibres cutting the rayon fibres. Like cotton, rayon staple blended with high-tenacity Du Pont 420 nylon staple can produce fabrics with 70% longer wear than all rayon fabrics is the nylon is blended in a proportion of at least 17%. This blend is desirable for such garments as classed as wash and wear type.

Nylon Acetate

The acetate in such a blend-provides a luxurious hand and the nylon gives light, weight and strength. As with cotton or rayon, improper blending may result in the nylon cutting the acetate fibre and in some fabrics puckering may occur.

Also neither nylon nor acetate absorbs much moisture. Such fabrics feel clammy and uncomfortable in warm and humid atmosphere.

9.6 INTRODUCTION TO RAYON AND ITS MANUFACTURE

Rayon is an artificial, man-made; or synthetic fibre made from cellulose. Commercially rayon was produced about 48 years back. Rayon produced at that time

were very lustrous, therefore, they were given this name which means 'reflecting the rays of skin.'

The main objective in manufacturing rayon was to provide a cheap substitute for silk. Rayons were originally known as 'artificial silks' because they resembled the natural silk and are soft, cool, light in weight and attractive in appearance. The imitation is done very cleverly and laymen is not able to distinguish silk from Rayons.

The idea of making rayon fabrics dated back to 1664 A.D. Robert Hook, an English Naturalist, prophesied in that year that a way would be found to make an artificial fibre which will resemble natural silk. Then two centuries later, in 1884 Count Hilarie Chardonet made a fibre which resembled silk, from nitrocellulose by dissolving it in ether, and produced it on a commercial scale. Count Chardonnet, is therefore, considered as the father of rayon fibre and the rayon industry. But the production of rayons did not make much progress. In the beginning of this century, U.K., Switzerland, Belgium, Austria, Germany and U.S.A. started making rayons. Since then much experimental and research work has been done to improve the process, as well as the quality of the yarn, during the course of which many processes were discovered and perfected.

India has been importing rayon fabrics and rayon yarn. In 1946, India's first rayon actery was started in Kerla. For the first time in the world bamboo and encalyptus have been successfully used for manufacture of rayon grade wood pulp.

Structure of Rayon fibre

When seen under microscope, the fibre appear smooth and rounded. It has characteristics markings which vary according to process. Viscose rayon fibres are rod like with numerous longitudinal, thread like secretion lines that are spiral or somewhat glossy.

Cuprammonium rayon

They are rod like with no serrations or markings. They are fine and lossy and resemble silk more closely than other fibres. The cross-section appearance is small, smooth and nearly round, occasionally slightly oval.

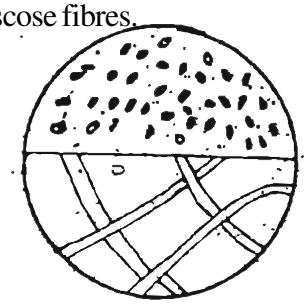
Acetate Rayon

They are rod like with only a prominent, broad, longitudinal serrations of line

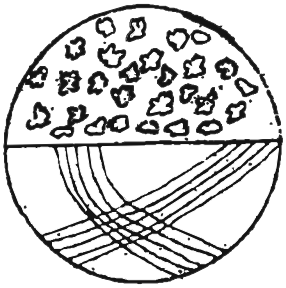
markings. They are less lustrous than viscose rayon or cuprammonium rayon fibres and sometimes show a central groove under the microscope.

The cross-section appearance is like a 'clover leaf' with individual lobes, which are round and smooth and in number 2 to 4.

It is the small number of lobes or serrations of these fibres that distinguishes them from numerous serrations of viscose fibres.



Microscopic Structure of Viscose rayon



Microscopic structure of Cuprarnmonium rayon

Principles of making Rayons

The basic principles of making rayon are as follows:

(i) to treat cellulose chemically for making and rendering it to a liquid.

(ii) to force the liquid through fine holes and

(iii) to change the liquid stream into solid cellulose filament.

9.7 DIFFERENT METHODS FOR MANUFACTURE OF RAYONS

All types of rayons are made from cellulose. There are four main procedures by which cellulose is transformed into rayon. These are :

1. The nitrocellulose process

2. The cuprammonium process

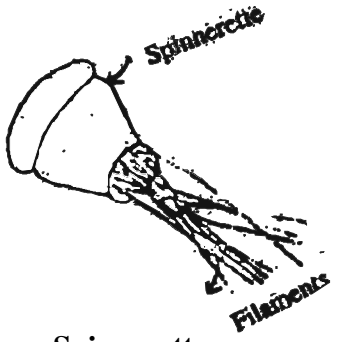
3. The viscose process

4. The cellulose acetate process

1. The Nitrocellulose Process

This method was first to be used for the production of rayon fabrics. This was started by Count Hilliare Chardonet in 1884 in France. In this process cotton linters or short stapled cotton is used. These are treated with sulphuric acid and nitric acid produce nitrocellulose. This inflammable materials is then dissolved in ether and solution is forced through tiny holes of spinnerette into air.

Spinnerette is a small temple like cup made of platinum or some other precious metals containing a number of gine holes from 0.02-0.05 inch a diameter. Each hole in the spinnerette forms one filament or strand. Either evaporates leaving the thread. In this form the fibre is highly inflammable so it is treated with sodium hydrosulphite render it non, inflammable. This method is expensive so little used today.



Spinnerette

2. The Cuprammonium Process

This process was first of all used in 1897 in Germany. In this cotton linters or wood pulp are used. These are first boiled in soda and soda ash, and then are bleached with chlorine. These are dissolved in a solution of copper sulphate and ammonium hydroxide. The solution is kept for ageing or ripening. This solution is forced through fine jets into dilute acid when it is turned into regernated celluiose filament. This rayon closely resemble silk. American Bemberg Corporation is a specialist in the production of these rayons.

3. The Viscose Process

This process was discovered in 1892 in England. In this process spruce chips are

used. Spruce logs are reduced to wood pulp and purified for cellulose base. Wood pulp is treated with caustic soda to form alkali cellulose. It is treated with carbon bisulphide to form cellulose xanltato. This is dissolved in dilute caustic soda solution. A reddish or orange liquid is formed. This liquid is filtered and then kept for agening until a thick fluid is formed is known as **viscose**. This fluid is forced through fine jets into a dilute solution of sulphuric and (coagulation bath). In this way cellulose is regenerated into continuous filament. The largest proportion of rayon is today manufactured by this process. The cost of production is comparatively low, and excellent fibres are produced.

4. The Cellulose Acetate Process

This process has been commercially developed since 1918. In this cotton linters are treated with a mixture of acetic acid and acetic anydride. Acetic acid is combined with cellulose and form cellulose acetate. This is kept for ageing until it has ripened. The cellulose acetate change into white flakes when the ripened product is washed with water. These are then 'dissolved in acetone and the solution is filtered. This solution is forced through fine holes in hot air. Acetone evaporates and leaves a fine fibre of cellulose acetate.

Manufacture of Bemberg Yarn

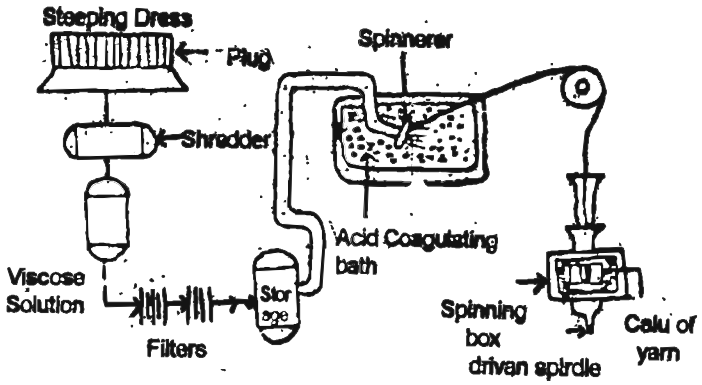
The most important 8 steps in the manufacture of cuprammonium cellulose yams by the 'Bemberg' stretch-spinning process are as follows:

1. Raw material used for the production of yarns may be cotton linters ,or wood pulp. Cotton linters formerly supplied the chief source of cellulose used in the production of cuprammonium cellulose yarn by the 'Bemberg' stretch-spinning process. Cotton linters are the fine, soft fibres adhering to the cotton seed after the long fibres have been removed during ginning. These fibres are separated from the cotton seed, cleaned and bleached before use for conversion into rayon yarns. Now 'highly refined wood pulps serve also as a raw material in this process.

2 Cellulose is bleached to a pure white in a washing machine. The only bleaching required for this type of rayon yarn is accomplished at this point.

3. Cuprammonium cellulose spinning solution is next prepared in a solution mixer by dissolving the cellulose at a low temperature in ' aqueous ammonia containing

basic copper sulphate.



4. The impurities are then filtered out in a solution filter. The pure, clean spinning solution is of a dark blue colour and the consistency of honey.

5. The spinning solution is allowed ,to mature or age in a storage tank.

6. The solution then passes through a spinning bath supply of purified, slightly alkaline water which comes coagulation of the filaments as they leave the spinneret.

7. This step depict the stretch-spinning apparatus where the spinning solution is forced through the comparatively large holes of the spinneret, which as filled into the top of a glass cylinder containing a long, tapering glass funnel. The water from the spinning bath supply is admitted at the bottom of the cylinder, flows up and descends through the funnel. The action of the water coagulates the spinning solution corning through the spinneret and at the same time stretches the filaments thus formed. Final coagulation and stretching of the combined filament is accomplished by passing the filament bundle through a dilute sulphuric acid bath to a driven collecting reel.

9.8 LESSON END EXERCISE

1. Write in detail about origin and appearance of Nylon.

2. Describe briefly how can Nylon be manufactured?

3. Write briefly the principles of making Rayon?

4. List all the methods by which rayon can be manufactured. Write anyone in detail.

Multifilament Yarn

It is made of number of tiny, almost endless strands twisted together into one yarn.

Monofilament Yarn

It is a single, solid strand of great strength and smoothness.

Staple

It consists of many short, wavy strands of nylon cut in lengths of varying from one and one-half to five inches.

9.9 FURTHER READINGS

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2. Dantyagi S. (1974) Fundamentals of Textiles & their Care. Orient Longman, New Delhi.

Lesson -10

Unit II

PHYSICAL AND CHEMICAL PROPERTIES OF SYNTHETIC AND BLENDED FIBRES

10.1 INTRODUCTION

In the previous chapter you studied about origin and manufacture of Nylon and Rayon. In this chapter we will study regarding physical and chemical properties of synthetic and blended fibres.

10.2 OBJECTIVES

- This lesson aims to understand:
- Meaning of synthetic and blended fibres.
- Properties of synthetic and blended fibres.

10.3 INTRODUCTION TO SYNTHETIC FIBRES

The synthetic fibre industry has made fantastic progress in the past fifty years. As early as 1884 Count Hilaire Chardonnet made a fibre which resembled silk, from nitrocellulose by dissolving it in ether. The first truly man-synthesized fibre, nylon was produced in 1938.

All man-made fibres have some processes in common. They have been produced from non-fibrous materials or if fibrous material were used originally, then they have lost their fibrous structure during processing. This is done by forcing the solutions through spinnerets. These fibres are then allowed to harden during a specific time and then are wound on bobbins or cones or they are deposited in "pots" as cakes of yarn.

The non-thermoplastic groups of man-made fibres have several origins, *e.g.,* cellulosic, alginates, minerals and protein base fibres. Except for the mineral-based fibres, these non-thermoplastic fibres can be cared for as cotton, silk, wool whichever. They resemble most in their physical and chemical reactions. Heat will not melt them but they scorch easily at high temperatures. They are soft, absorbent, comfortable to wear, do not discharge static electricity and are mothproof. Like all other man-made fibres, under the microscope they appear as smooth rods, with black specks, as if they are delustered. None of these fibres can be positively identified in longitudinal sections by the microscope.

The first thermoplastic fibre to be made was acetate followed by nylon. Now besides the acetates and nylons, there are acrylics, modaacrylics, nefrils, olefins etc.

These thermoplastic fibres react very quickly to heat. They soften, and become pliable. This softening point varies with different fibres. When these fibres are at the softened

stage, they can be shaped, pleated or embossed.

These fibres, like other man-made fibres, must be stretched to orient the molecules in order to increase fibre strength, their tenacity, or to give them dimensional stability. Nylon is usually heat set to stabilize the twist of yarn, to remove shrinkage, to increase wrinkle resistance, to set the grain in the fabrics, or to make washable pleats.

These thermoplastic fibres have a number of properties in common. Their hygroscopicity is low. Therefore they are uncomfortable in hot humid weather. They are washed easily and dry quickly. Water soluble stains are removed easily but not grease or oil. Most of these fibres accumulate charges of static electricity. They are mostly wrinkle resistant.

A microscopic examination reveals that they have the same longitudinal appearance as other man-made fibres. But their cross-sections vary and they can be identified with these.

Synthetic fibres have been produced from non fibrous materials, this is done by forcing the solutions through spinnerets. These fibres are then allowed to harden during a specific time and then are wound on bobbins or cones or they are deposited in "pots" as cakes of yarn. Synthetic fibres are those that soften and become pliable or plastic with heat, namely Acetate, Nylon, Dacron, Orlon and Vinyon. Their softening points vary from quite low to very high. They will also melt if they come in contact with too hot an iron or other hot surface; if they come in contact with flames or heat from blasts or other sources which have temperatures above their melting points, such as hot cigarette ashes.

10.4 INTRODUCTION TO BLENDED FIBRES

Blended fibres are those in which the various short staple fibres are mixed together before the yarn is made. These yarns are then made into fabrics.

10.5 PHYSICAL AND CHEMICAL PROPERTIES OF SYNTHETIC AND BLENDED FIBRES

Nylon

Nylon is known to be the first man-made fibre which is synthesized by organic laboratory chemicals. It is a polyamide fibre. A polymer fibre Nylon is made from coal, air and water. A mixture of two different coaltar products, namely, a dibasic acid, 'adipic acid

& a diamine, 'hexamethylene-diamine' is heated in air to give a condensed product known as nylon polymer, which is then stretched into fibres. Nylon is a round smooth fibre, that under the microscope resembles with rayon and dacron. Since nylon is round in cross section and small in diameter, it packs together leaving like dead air space in the yarn or fabric.It is made up of organic compounds comprised of carbon, hydrogen, oxygen and nitrogen in different proportions.

10.5.1 Physical Properties of Nylon:

(i) Strength

Nylon is very durable because it is very strong, elastic and resistant to absorption. Its strength varies from 4 to 7 grams per denier. Scissors and clippes need frequent resharpening if used on nylon. Snagging of filament yarn fabrics are problems resulting from nylon's high strength. When snagging occurs, nylon fibres do not break as weaker fibres, do, but pull and cause the fabric to pucker.

(ii) Elasticity

Nylon is one of our most elastic fibres. High elasticity has also created problems for both manufacturer and consumer in the puckering of seams sewn with nylon thread.

(iii) Resiliency

Nylon has good resiliency, but it will wrinkle unless made in construction such as knits, cleps, or puckered fabrics.

(iv) Effect of Moisture

Nylon fabrics absorb moisture to a very less extent. The low absorbency of nylon is an advantage in quick-drying fabrics, but is a disadvantage in comfort, in clothing. This problem is being solved by the use of open work or lacy designs and by the use of finishes.

10.5.2 Chemical Properties

Nylon contains carbon; hydrogen, oxygen and nitrogen. Nylon chains have the ability to 'bond' or cross link (heat-set) very tightly together when a yarn or fabric is exposed to hot water, steam or high temperature for the first time. This bonding gives nylon a shape and size that can only be changed by exposing it to a higher temperature. It has good wrinkle resistance and crease recovery.

Raised design fabrics, such as the new nylon damasque (sculptered nylon) are made by shrinkage with chemicals. The raised areas are created by printing phenol on that part of the fabric which is to be the background. The phenol causes the nylon to shrink, their the untreated areas pucker. The background is usually printed with a metallic pigment of either copper or aluminium colour. These fabrics are washable.

Nylon is resistant to most chemicals but is damaged by strong oxidizing bleaches and concentrated acids. Hydrochloric and sulphuric acid of concentrations or low as 3.0 per cent will damage nylon. Soot from smoke in industrial cities contains sulphur which, on damp days combines with atmospheric moisture to for sulphuric acid.

Nylon fabrics are resistant to perspiration. The colour, however, may be affected.

Nylon-Fibre Blends

The consumer uses many textile products that do not possess all the properties he would like them to have. He would for example, prefer winter coats with sufficient warmth but less weight, cool light summer clothes that would-not lose their fresh, clean appearance on hot sticky days, fabrics that would wash readily, dry quickly, and not lose their shape. Textile designers and engineers are producing new fabrics to meet such needs. These combine or blend two or more fibres to give desired properties to the fabrics.

Properties of Nylon-blended Fibres

10.6 Nylon and Cotton

When properly combined with cotton, nylon adds strength, which allow the development of usually fine textures not possible to obtain from cotton alone. Nylon provides smoothness, silkiness and dirt rejections. It also reduces the weight of the fabric and increase its wrinkle resistance. The cotton gives softness and moisture absorption. This combination permits the weaving of fabrics that are soft, supple and extremely serviceable. A blend of at least 17% high tenacity nylon staple with cotton will produce an extremely durable fabric.

Nylon and Wool

The proper combination of nylon and wool will produce a lighter weight fabric with greater durability. Such fabric will retain the hand, drape and warmth of wool as well as the elasticity, resilience and shape retention of nylon. The properties of the fabric will be

in the direct proportion to the amount used of each of the two fibres. A blend of 10 to 15 per cent nylon and the remainder wool is considered satisfactory.

Nylon and Silk

In this combination, the silk improves the hand and provides moisture absorption. The nylon improves the stability or shape retention, as well as the elasticity and strength.

Nylon and Rayon

In this blend, the nylon gives wrinkle resistance and strength and the rayon gives suppleness, drape and moisture absorption such a combination makes possible a fine quality fabric of extremely light weight. As with cotton if the combination is not properly balanced, the rayon may shrink causing the fabric to pucher. Also an improper blend of nylon and rayon was result in the nylon fibre cutting the rayon fibres.

Nylon and Acetate

The acetate in such a blend provides a luxurious hand and the nylon gives light weight and strength. As with cotton or rayon, improper blending may result in the nylon. Cutting the acetate fibre and in some fabrics puckering may occur.

10.7 Dacron or Terylene

Dacron or terylene was discovered during the Second World War. The name dacron is a track mark owned by E.I. du Pont De Namours & Company for a particular synthetic polyster fibre. The basic work for the development of Dacron polyster fibre was done by Dr. W.H. Carothers in his experiments with giant molecular structures, but he devoted the major portion of his research to polyamiders which resulted in the development of nylon.

Microscopic Appearance

They are uniform in diameter, have a smooth structureless and straight surface and are highly transparent. In the cross-section, the fibres appear round with uniform diameter. It is very much like nylon.

Composition

Dacron is a polyster fibre. Chemically, Dacron and Cellulose' acetate are both

esters, and for this reason have similar dying properties.

10.7.1 Physical Properties of Dacron

(i) Resiliency

Dacron has excellent resistance to wrinkling and creasing, both when dry and wet. Durable pleats can easily set in Dacron. It retains its shape and recover easily to original shape.

(ii) Wicking

Dacron has wicking property that makes it comfortable to wear in hot weather, even through it is not absorbent. Wicking is the ability of the fabric, or fibre to pick-up moisture and allow it to travel along the fibre, without actually absorbing it. Thus the moisture is carried from the skin of a wearer outward, where it evaporates.

(iii) Effect of Moisture

Dacron fabrics have a low moisture absorbency. It is easily washed and dries quickly.

(iv) Effect of Friction

There is no effect of friction. It is very strong and has high resistance to rubbing.

(v) Heat Conductivity

Dacron is a good conductor of heat. Sunheat can easily penetrate through Dacron. It is suitable for making both summer and winter wear.

(vi) Crease-resistant

It is crease-resistant and will keep its shape wet or dry.

(vii) Strength

It is very strong and has a high resistance to rubbing.

(viii) Moth Proof

It is moth proof, mildew proof and immune from attack by other insects and bacteria.

(ix) Chemical Properties of Dacron

Action of Acids :It is resistant to all acids, even when concentrated and after a long exposure of 72 hours at a temperature of 176°F. It is resistant to Hydrochloric acid, sulphuric acid and nitric, acetic, formic and oxalic acids.

(x) Action or Alkalies

Dacron is resistant to weak alkalies, but is soluble in boiling 5% sodium hydroxide solution.

(xi) Effect of bleaching agents

Dacron is naturally quite white and does not need bleaching. It is resistant to oxidising bleaches and is not damaged by them.

(xii) Affinity for dyes

Dacron has a fairly good affinity for dyes and can be dyed in a complete range of colour.

(iii) Effect of moth & mildew

It is moth-proof, mildew-proof, and immune from attack by other insects and bacteria.

10.8 Dacrons Fibre Blends

Dacron polyester fibre has been successfully blended with many other fibres. Various effects and combinations of properties are derived from these blends depending on the fibre and on the percentage in the blends. One of the most important characteristics that decron provides is its high degree of shape retention for garments that require little or no ironing.

Properties of Dacron Fibre Blends

Dacron and Cotton

For satisfactory wash and wear purposes, fabrics for rainwear tailored clothing, dress shirts and sports shirts should have a blend of at least 65 per cent dacron with the cotton. Dacron will provide wrinkle resistance and shape retention. Cotton will provide

absorbency and consequent comfort. However, unless properly constructed and properly cared for a fabric of a dacron and cotton blend may pucher and lost its shape if the cotton shrinks or if cotton thread is used in sewing. Dacron & cotton blend are well suited for fabrics to be given a permanent press finish.

Dacron and Wool

In combination with wool, dacron provides outstanding wrinkle resistance and crease retention so that wet or dry, the shape retention is improved according to the proportions used. The great abrasion resistance of dacron also provides longer wear. The wool constitutes good draping quality and elasticity.

Dacron and Rayon

In the blend with viscose rayon, Dacron gives greater resiliency, shape retention and durability. The viscose rayon provides absorbency and variety of colour and texture. A blend of 65 percent dacron and 35 percent high wet modulus rayon provides a strong, durable and serviceable fabric. The fabric has a good hand and drapes well. The rayon again provides the absorbency that dacron lacks.

Dacron and Nylon

Nylon contributes strength and abrcision resistance. Docron contributes outstanding wrinkle resistance. Such a combination offers stability, easy laundering, quick drying and resistance to damage from mildew and insects. The fabric will be clammy to the slim, however in warm, humid weather. Since both the fibres are thermoplastic and neither is very absorbent any combination in the blend will provide good wash and wear characteristics.

10.9 Orlon

Orlon first made its appearance in 1948. 'Orlon' is really the registered trade mark for the acrylic produced by E.I. du Pont de Nemours. Other companies also manufacture acrylic fibres, but the mark 'orlon' applies only to Du Ponts' acrylic fibre.

Orlon is made from a chemical compound called acrylonitrile, which is formed by the reaction of ethylene oxide and hydrochloric acid.

Microscopic appearance

The cross-section of orlon shows a distinctive dog bone or dumb bell shape.

10.9.1 Properties of Orion

'Orlon' is well known for its soft, luxurious, hand. It is warm and pleasing to the touch. Staple fibre of 'Orlon' adds a feeling and appearance of luxury to garments at a relatively low cost.

(i) Effect of burning

Orlon burns like cotton, rayon and acetate, leaving a residue similar to that of acetate. It does not ignite easily, however some orlon fabrics spulter as they burn, the flame almost dies out momentarily then flares up and resumes burning with continuous alternate dying down and flaring up.

This manner of burning can be dangerous if it is unaware of this possibility. The safe ironing temperature is 300°F.

(ii) Effect of Light

Orlon has outstanding resistance to the effect of light. Its resistance to such degradation makes it especially useful for such outdoor purposes as ownings, curtains, draperies and uniforms.

(iii) Resistance to mildew and moth

Mildew may form on the surface, but it will have no effect on orlon fabric. It may be easily wiped off. Orlon is unaffected by moths or by carpet -beetlers.

(iv) Reaction to alkalies and acids

Orlon has fair to good resistance to weak alkalies. Orlon is exceedingly resistent to strong mineral acids as well as organic acids.

(v) Resistance to Perspiration

Orlon fabrics are not readily deteriorated by perspiration but the colour may be affected.

(vi) Affinity for dyes

Orlon can be dyed in a wide range of colours.

Use

Orlon has taken over a large pact of the sweater market and is being used alone or in blends in many types of knitted goods. Printing of sweater and jersy fabrics has been successful. It is used in dresses as blouses, suits and coats. Washable fleece coating material has been made from alia because of its bulk warmth and light weight. Orlon is often used in making stimulated for coats. Permanently pleated washable skirts of orlon and wool blends have proved to be very popular.

Orlon has been popular in the clothing industry, textile furnishing field and industrial area. Because it has been found that knitted garments of orlon tend to shrink and disco lour in dry cleaning, they are more satisfactorily cared for by washing them with water.

10.10 Orlon Fibre Blends

Orlon has many desirable properties that may be imparted to fabrics containing fibres other than orlon, depending on the relative amount of each fibre used.

Properties of Orlon blended Fibres

Orlon and Cotton

In combination with cotton, orlon adds light weight and body. The cotton contributes strength and absorbency. The fabric is wrinkle-resistant, retains its shape well.

Orlon and Wool

One of the outstanding characteristics of orlon is its bulk so that when the staple is blended with wool, the resulting fabric is light weight and yet warm. It also has a soft hand but there may be some piling. Fabrics of this combination have very good crease retention and wrinkle recovery. These blends are washable. Where there is a good proportion of orlon, the fabrics seldom need pressing. A good blend for wash and wear tailored garment should have 60 per cent or more orlon with the wool, though too much orlon makes the fabric too bulky. Such a blend will also be stronger than an all-wool fabric.

Orlon and Silk

Orlon and silk provides interesting cross-dyed and textured effects. Such blends have outstanding hand and excellent stability. In addition to the good appearance, the

combination gives long wear. The Orlon contributes easy care and shape retention; the silk contributes absorbency and strength. The fabric is very resilient and may be warm, depending on its weight.

Orlon and Rayon

To the versatility of rayon, Orlon adds wrinkle resistance and stability. New and unusual surface and dye effects, including cross dyes are possible. Orlon provides a dry, warm, and soft hand. A wash and wear blend should have at least 70 per cent Orlon with the rayon. Orlon blended with a high wet-modules rayon will provide a stronger fabric with the some general properties as that of a blend with regular rayon. An Orlon and modified rayon blend could therefore, have a lower proportion of Orlon.

Orlon and Acetate

A combination of Orlon and acetate in a fabric provides a soft, luxurious feel and excellent drapability. It also has excellent shape, retention and good resilience. The fabric launders easily with milk soap and warm water, dries rapidly and is easy to iron. The Orlon also provides greater resistance to sunlight. Neither Orlon nor acetate, however, is particularly absorbent, which presents a disadvantage in warm, humid weather. Such blends will be warm and clammy.

Orlon and Nylon

The strength and abrasion resistance of nylon combined with a polyster fibre, giving better body comfort and warmth. Similar qualities of orlon and nylon, such as wrinkle resistance, creak retention and easy care are increased when these fibres are combined. But such fabrics will not be very absorbent.

Orlon and Polyester

Orlon impoves the hand of a fabric when combined with a polyester fibre, giving better body comfort and warmth. The polyster fibre contributes even greater wrinkle resistance, especially under humid conditions. 450/50 blend will provide good wash and wear characteristics. Such a fabric will generally wear well because of the strength of the polyster fibres and the good abrasion resistance of Orlon, however, it is likely to kill if care is not excercised.

10.11 Vinyon

Vinyon is a manufactured fibre in which the fibre forming substance is any long chain synthetic polymer composed of at least 85% of by weight of vinyl chloride units.

10.11.1 Properties of Vinyon

1. Vinyon is warm to touch and feels like silk.
2. It is water resistant.
3. It is non-flammable.
4. It is not attacked by bacteria, moulds & fungs.
5. It is non-conductor of electricity, and as water does not affect it, it is an excellent insulator.
6. It is satisfactorily resistant to sunlight. .
7. Unlike most man-made fibres, vinyon has the same tensile straight in both dry and wet states.
8. It is thermoplastic and exceptionally resistant to mineral acids and alkalies.

Use

The short fibres of vinyon can be blended like rayon, with natural fibres, such as cotton and wool. The short fibres are mixed with wool and used for felts. They make excellent fabrics for pleated garments, as vinyon serves as a binder and the garments do not shrink whilst the pleats are held well.

Because of its water and fire-resistant properties, vinyon is used for umbrellas, waterproof garments, bathing suits, tents, draperies, fish nets, awnings, industrial filter cloth etc.

10.11.2 Characteristic Importance to Consumers

Characteristic	Importance to Consumers
Wet strength is comparable to dry strength	No danger of holes due to agnition or abrasion during washing.
Elasticity and elongention like wool	Maintains air space for warmth. Regains shape after scratching. Affects stiffness, drape, resiliency.
Low moisture absorption	*Advantages* 1. Resists spots, easy to remove 2. Washable 3 Dries quickly *Disadvantages.* 1. Different to dye

	2. Builds up static electricity charges
High tensile strength and abrasion resistance	High durability to pulling & rubbing in wear
High chemical resistance	Not rapidly destroyed by acids, alkailies, bleaches, detergents. Not-hazardous skin irritant
Heat Sensitive	Melts with (1) hot iron (2) hot tobacco ashes (3) contact with any hot objects Heat
Setting	will keep 1. Crush resistant pile 2. Permanent pleat 3. Original size & shape 4. Knits do not need pressing after washing 5. Embossed designs
Resilient	Loses wrinkles easily
High resistance to moth, mildew, insects, mould, etc.	Simplifies storage problems. Economy of little loss from these causes

10.12 LESSON END EXERCISE

1. Write a note on synthetic fibres.
2. Write in detail about physical and chemical properties of Nylon.
3. Write down in brief physical and chemical properties of Dacron, Vinyon and Orlon.

Lesson-11

Unit II

LAUNDERING OF NATURAL FABRICS

11.1 INTRODUCTION

In this lesson you will study about the laundering process of natural fabrics.

11.2 OBJECTIVES

This lesson aims to understand the laundering of natural fabrics

11.3 LAUNDERING AN INTRODUCTION

Laundry probably was first done at the river bank, substituting sand for detergent pounding or stamping for agitation. Eventually, the invention of soap, the laundry tub and scrub boards moved this process into the home. As time passed, more of the laundary equipments were invented and applied to ease the problems of washing clothes at home various equipments used in washing clothes are :

1. **Cloth Basket or bag :-** For storing dirty clothes plastic bag or buckets

are more desirable due to light weight and durability. They need to be protected from sunlight or other heat source.

2. **Tub, basin and basket :-** There are used for storing the water and soap solutions, for immersion of clothes during pre-soaking and wash period as well as final since of washed clothes in winter. The buckets are also used to apply blue and starch.

3. **Sink:-** This is a deep trough, with drainage boards on both sides and is generally situated below the source of water. The drainage boards have their slant towards the centre of sink and help in draining out the excess water from clothes under the force of gravity.

4. **Boiler:**- White cotton garments when very dirty, require boiling in soap solutions, which can be done in a pan or deep vessel. A boiler may be heated by a fire or angithi, gas or electricity.

5. **Wash Boilers :-** These are washers which include an accessory for heating and warming up to water during washing. The dirty water can be drained off from an outlet provided just above the base to that small amount of water sufficient to keep the element immersed, remains in the washer.

6. **Enamelled bowls :**- These are used to make solutions of starch, blues or dyes and also for keeping different reagents for use during stain removal. These should not be used for direct heating to heat or boiling water.

7. **Laundry reagents and containers** :-Different types of laundry reagents like washing soda, blues, optical bleaches and other chemicals used in stain removing are kept in containers. These should be kept away from the reach of children.

8. **Scrubbing Brushes** :-Several types of brushes are used for rubbing the very dirty parts of spoiled clothes with soap solutions. These are formed from plants and are available with hard as well as soft bristles.

9. **Scrubbing boards** :-A scrubbing board has either a corrugated surface or a board made of parallel wooden strips fixed on a rectangular wooden frame. After a short exercise the dirt is loosened from the cloth which is then rinsed off in clean water.

10. **Hand Mug or Soap Case** :- A hand mug is very useful for handling and shifting of water during washing. Soap case is a small box with perforated base which is used to store during washing. The perforated base helps to drain out the excess water to prevent its wastage in water.

11. **Suction water** :- The delicate fabrics which do not stand rubbing and beating can be washed with the help of a suction washer. This appliance consist of hollow 'cup' of copper or chromium attached to a long 'wooden handle'. During washing the cup of washer is maned up and down over the clothes dipped in soapy solution. During this action, the air and dirt is drawn in the cup, because of the low pressure developed in it and hence dirt freed from the clothes.

12. **Beater:-** A beater is an elongated block of wood or hard plastic with one phase rounded and the other flat. One end of this block is tapered to serve as handle of beater. Due to beating pressure, the soap solution rushes out along with dirt from sides. However, beating results in loosing the strength and texture of the fabrics. Therefore, it is used in rural areas for washing of cotton fabrics with thick texture only.

13. **Washing Machine** :- The development of washing machines of washers, for washing of clothes had simplified the job of a house wife. Two types of washers are available agitator type and cylinder type.

11.4 LAUNDERING

A number of factors govern our choice between laundering or dry-cleaning of a textile, the main one being the type of fibre of which the fabric is made. Certain fabrics, because of the fibre content, the finish, the fabric construction or the dye used may have to be only dry-cleaned, while other cannot be dry-cleaned because they comprise a component such as bonding agent or a resin, or a dye that would be adversely affected by the dry-cleaning solvent. Individual properties that influence the manner in which a garment or household item is to be cleaned are:

Fibre Content: A 100% cotton fabric can withstand frequent laundering and rough handling when wet. Whereas a 100% wool fabric has to be

washed gently. A 100% polyester or polyamide fabric cannot be ironed with the iron at the same temperature as pure cotton fabric.

Yarn Construction: Fabrics of the same fibre content but of different yarn construction possess different qualities. Fabrics made from filament yarn, staple yarn, carded or combed, simple yarn or fancy yarn, loose twist or tight twist all perform differently.

Fabric Construction: Various knitted fabrics may necessitate being handled differently. Lace fabrics may have to be treated with much greater care than woven fabrics. Woven fabrics with long floats also need careful handling.

Finishes: Today many different finishes, physical and chemical are applied to fabrics. These have to be taken into account. Fabrics with chlorine retentive finishes like resin finishes, cannot be treated with chlorine bleaches as they would yellow

.

Dyes: The fastness properties of dyes need much attention. Coloured clothes if they are not of guaranteed fast colour should be washed separately as these would bleed and could stain the other clothes. The method of drying coloured garments will differ. They are normally to be dried in the shade or if exposed to sunlight they need to be turned inside out and also removed as soon as dry.

11.5 LAUNDERING OF COTTON AND LINEN

Cotton and linen are easy to clean and are, therefore, popular for clothing. Cotton is the main fabric in India and is cheap. It is used much -more than linen which is more expensive. Cotton is similar in many respects to linen, but linen gives a better finish in laundry. Both are obtainable in many varieties and with different finished surfaces and colours. The processes used for laundering of these fabrics and governed by :-

1. The texture of the fabric,
2. The fastness of its colour,
3. The finish appropriate to it.

In washing cotton and linen care must be taken :-

1. to avoid the use of such methods and cleansing reagents as are likely to weaken the fibres,

2. to preserve the whiteness of the white, and the colour of the coloured articles,

3. to clean, stiffen, finish and to freshen the appearance of the fabric, and make it look as new as possible.

WASHING OF BLEACHED COTTON AND LINEN

Examination of Articles. Examine the article for tears, holes and stains and mark them with a light pencil. Mend all the tears, and holes before wetting the garments. Also remove such stains as are not likely to disappear in the process of washing.

Sorting: Sort the articles in the following groups. Each group is required to be steeped in separate containers of water :-

1. Coarse articles, such as jharans, aprons used in the kitchen.

2. Coarse articles for cleaning and dusting.

3. Bed linen and other personal clothes.

4. Table linen.

5. Handkerchiefs.

Steeping: This process is very important in the washing of cottons and linens as it economises time, labour and soap. Loose and soluble dirt is removed by the pedesis of the water particles. The material gets thoroughly soaked, which helps in the removal of fixed dirt. Stains soluble in water helps in the removal of fixed dirt. Stains soluble in water are removed and the starch of the previous laundering is softened. Since cotton and linen are not weakened by water, all articles made of these fibres should be steeped. The length of time allowed for steeping depends on the percentage of dirt in the garment. It may be shortened if warm water is used as it quickly dissolves the dirt. **Hot water should not be used as this hardens the protein matter and fixes the dirt.**

***Rules for Steeping* :-**

1. Use a clean tub that has no rust marks.

2. The tub, bucket or basin should be sufficiently large to hold a sufficient quantity of water and the clothes.

3. Steep household articles, such as kitchen jharans, aprons table and bed-linen overnight and the personal garments for an hour at least. Kitchen jharans should be steeped in water to which washing soda should be added (one teaspoon to a gallon of water).

4. Add salt and a little disinfectant to the water in which handkerchiefs are soaked. Salt helps to dissolve the mucous, thus making the washing easier.

Washing. The method employed in washing is determined by the texture of the fabric, the type of article, its colour, and the type of dirt present in it. For this reason also it is necessary to sort out articles in different groups.

It may also be mentioned here that while the table on the next page only gives the type of soap to be used anyone of the modern detergents like surf, etc. can be used with good results. The method used in washing with these chemicals is always given on the boxes in which they are sold.

Boiling. All white cottons and linens are boiled. Table linen with coloured patterns and designs which are fast in colour can also be boiled.

Boiling disinfects, whitens and freshens the clothes.

Preparation and method of boiling. Water used for boiling must be soft and soapy. Use soda and shredded soap in the proportion of one teaspoon of soda and one tablespoon of soap to a gallon of water to soften water. The proportion may be altered according to the hardness of water. Soda alone should not be used as it may damage the fabrics. Soda must be first dissolved in a little water.

Half fill the boiler, add soda first, dissolve and then soap. Heat and agitate the water to form a lather. Open out the clothes and drop into the boiler, bring to boil, and boil for 15 minutes. Overboiling causes white clothes to become yellow. Very dirty or discoloured articles are kept below boiling point for one or two hours to bleach the fabrics.

Use a boiling bag for all clothes so that these do not come in contact with the scum. Scum may cause discolouration and it adheres to the clothes and is difficult to remove.

TABLE

Articles	*Cleansing Agents*	*Water*	*Method of Washing*
1 Coarse materials, such as jharans, aprons, bath mats etc.	Hard bar soap or paraffin wash for very dirty articles.	Warm.	Application of hard friction or scrubbing with a scrubbing brush (for very dirty articles).
2. Strong white articles, such as table linen, bed linen, personal clothes, such as latha salwars, petticoats, white shins, white trousers.	Sunlight soap or any soap cake.	Warm.	Application of light firction for washing the article on a scrubbing board.
3. All coloured articles and fine materials, such as organdie, muslin, etc.	Soap jelly or soap solution or soap flakes.	Lukewarm.	Application of light pressure, i.e., kneading and squeezing.
4. Heavy articles, such as cretons, curtains, durries, etc.	Bran wash or soap jelly.	Warm.	Suction washing.

Note.. When washing personal garments, the neck band, the cuffs, and the arm holes need special attention. These should be given an extra rub. Rinse in clean warm water to remove thoroughly all soiled soap, water from the clothes before putting the clothes in the boiler. More than one rinsing may be necessary.

Boil separately the kitchen jharans and aprons, which are full of strains and grease for half an hour with a little more washing soda added to the water.

Remove clothes from the boiler with a wooden rod or a pair of tongs.

Rinsing After boiling, rinse the clothes in several warm waters to remove all traces of soap from the fabric. Give a last rinse in cold water to restore the whiteness. Wring out the moisture.

Stiffening and Blueing It is done as one process. Shake a bag of blue in the prepared starch to get the desired shade. All white clothes are blued. To economise water to get good result and to save wastage of starch and blue, starch and blueing are done as combined processes. All cottons and linens except bed linen and underwear are starched. Articles, such as table mats, tray clothes, table napkins, etc. are heavily starched while personal clothes are given a light stiffening. 'Nurses, caps, men's dress shirts, and collars need an extra stiffness and so they are stiffened with cold water starch.

Rules for Starching and Blueing :-

1. Stir the starch and blue water together well before putting in the articles, because the blue particles settle at the bottom and may cause patches on the articles.
2. Squeeze the article well to get a thorough penetration of the starch.
3. Articles with borders, or with fringed lace and crochet edges, need special attention, as such edge & spoil their appearance if starched. Therefore, while starching such garments, gather the edges in the hand and dip the rest of the article in the starch water carefully. The edges may be then treated with a dilute solution of starch.

Removal of Moisture Use of a mangle is very effective for removing all the moisture. The article is folded and then passed through a mangle. For delicate article, rubber wringers are used as they neither spoil the texture of the fabrics nor stretch nor tear the cloth.

Drying Out door drying is best for all white articles as sunlight helps to bleach the cloth, quickens the drying, disinfects and freshens the clothes. Cottons and linens do not hold much moisture and, so, are easily hung out to dry without causing any harm to the cloth. Articles should hang out on a line by the selvedge thread and then clipped to the line with wooden clips. They should not be left out in the sun too long but removed as soon as they are dry. Hot sun causes white clothes to become yellow.

***Important variations of the foregoing processes when applied to* :-**

(a) Unbleached cotton and linen fabrics.

(b) Coloured cotton and linen fabrics.

(c) Cretonne and chintz.

(d) Organdie.

(e) Velveteen.

(f) Flannelette.

(a) Unbleached cotton and Linen Fabrics: Their characteristic colour, shade and texture must be preserved. Therefore,

1. None but very soiled articles are to be steeped.
2. Use stain removal agents in solutions only.
3. Bleaches are sparingly used and with care.
4. Water used for washing has to be at a lower temperature.
5. Slightly thinner starch (with no blueing) is used.

(b) Coloured Cotton and Linen Fabrics*:* For colours are generally used in these fabrics, yet it is not safe to take it for granted. Precaution must be taken to test their permanence. An easy test is to wet a corner of the material and to place it in between dry pieces of white cloth and then press it hard with a hot iron. If the colour is unstable, it will come off on the white cloth.

Fast coloured articles gradually fade and get dulled by age and repeated washings. Therefore, care must be taken to preserve the fastness of the colour after washing, by not using such reagents and processes which have a harmful effect on colour.

Factors which affect colour are (i) long contact with moisture, (ii) excessive heat, (iii) acids and alkalies, and (iv) friction. Articles of loose colour are difficult to wash and are better dry cleaned, as there is no harmful effect of dry cleaning reagents on colours. But dry cleaning is expensive, and so, washing is practically unavoidable. The processes of washing such garments must be carried out in quick succession. Some mordant, such as common salt or vinegar, is used in washing and rinsing waters to fix the colour and thus

minimise its bleeding.

Rules for Washing Coloured Articles: Stains are to be removed with water and soap as far as possible. Solutions of chemical reagents are to be carefully used and only when absolutely necessary. Rinsing is to be done quickly and thoroughly in water. Coloured articles must not be steeped, but very dirty articles may be steeped for a short time with a mordant added to the water.

Wash all the articles by either suction washing or by kneading and squeezing. Use warm water (100°-110°F) and soap jelly or solution, which is free of alkali. Add a mordant to the washing water, if necessary.

Rinse in 2 or 3 warm waters till all the soap is removed. Last rinse must be of cold water to which acetic acid or vinegar is added to fix and freshen the colour. (One teaspoon of acetic acid or 2 table spoons of vinegar to a gallon of water.) The acid or vinegar need not be used for articles, of which the colour is guaranteed to be fast.

Coloured articles are neither boiled nor blued except blue articles, which are blued in deep blue water to restore any lost colour. Use boiling or cold water starch as may be needed by the article.

Remove moisture thoroughly before hanging the article to dry, to avoid getting dark patches on the lower side of the article. Dry the articles in the shade in prevent bleaching caused by sunlight.

Finish the articles using a moderately hot iron.

(c) **Cretonne and Chintz:** These are heavy materials used for household furnishing; Chintz has a thinner texture than cretonne, and is stiff and has a glazed surface. These are available in all colours and patterns. The principles which apply to the cleansing of coloured cottons apply to these materials also. But extra- special care must be taken to test the fastness of the colours. Cleansing with bran water is more suitable than soap. Bran helps to fix the colour and gives some stiffness to the material. A suction washer with a long handle is convenient for washing these. A wooden beater as shown in Fig. 88 may be used in place of a suction washer. A washing machine is a great help for these heavy articles. Boiling water starch is used for stiffening, the strength depending on the texture of the fabric. A wooden

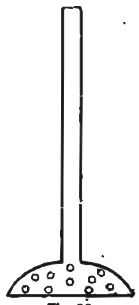


Fig. 88.
A wooden beater

beater The usual proportion is 1-10. Let the starch dry, well in the fabrics. Damp evenly, roll it up for half to three quarters of an hour before ironing.

(d) **Organdie:** This is an expensive materials. It is woven from good quality yarn of many twists, and is given a special finish to produce transparent stiff fabric. It is either white, coloured or printed. Organdie is washed like coloured cottons. New organdie materials do not require stiffening. To restore the natural stiffness of the materials, it is ironed immediately after washing while it is wet. After several washes, old organdie materials lose their natural stiffness, when dilute boiling water starch, diluted to 1 to 12 strength, is used. Gum water is used for very expensive organdies.

(e) **Velveteens:** Velveteen is a pile cotton fabric, which looks like velvet. This also is an expensive fabric and is available in many colours.

Velveteen with fast colours are usually washed. Dry cleaning is advisable if the colours are doubtful.

The processes used in cleansing these material are similar to those used for coloured cottons, but precautions must be taken to restore the pile effect, and the softness of the fabric.

Special rules to be followed are **:-**

1. Wash by squeezing, not by kneading the material.
2. Suction washing is better. Add acetic acid (one teaspoon to a gallon of cold water) to the final rinse.
3. Hang up the garment after the final rinse and allow the moisture to drip or lightly press the article in between a dry towel.
4. Hang up to dry in a warm place.

   It is better to hang it up in front of a heater with the wrong side facing the heater. The steam generated by the heat will thus pass through the wrong side to the right and help in raising the pile and restoring the fluffiness of the material. In this way the drying and finishing go on side by side.
5. If a heater is not available, steam-press the material after drying.

(f) Flannelette: It is a fabric woven entirely out of cotton, but in such a way that with its soft, fluffy surface it closely resembles wool flannel.

It is laundered in the same way as coloured cottons. As it holds much moisture it has to be wrung thoroughly dry and is finished when nearly dry with only a moderately hot iron.

Fire-Proofing of Flannelette: Flannelette is very inflammable because of its texture. It is advisable to treat the fabric with such reagents which will make it non-combustible.

The most satisfactory and effective method consists of making a tepid solution of 2 oz. boric acid and 4 oz. of borax in a quart of water, The material is immersed after the last rinse in the solution from quarter to one hour, according to the time it takes to penetrate a particular fabric. The material is then squeezed out well, dried and finished in the usual way.

11.6 LAUNDERING OF WOOL

Wool is an animal fibre of delicate texture. It needs careful treatment in laundering because of the tendency of woollens to shrink or stretch in the process of washing. The fibre is covered with overlapping scales of the gelatinous nature. ***Moisture, heat and alkali*** soften the scales of a fibre; and if friction is applied, whilst the fibre is in this softened state, it will cause interlocking of the scales, which will result in shrinking and felting. Alkali also spoils the texture of the fibre which becomes hard and yellow. Uneven temperature too is harmful, as it causes sudden dilation and contraction of the scales and thus, produces shrinking and felting of the fabric. Wool retains a large amount of moisture and is very heavy when wet, and if it is hung up in this state, it stretches downwards and gets out of shape. Therefore, in the laundering of wool, the following should be avoided:

1. Application of friction.
2. Uneven and high temperature.
3. Hanging up of the fabric while wet.
4. Use of alkali.

Preparation: Woollen fabrics are of loose structure and so hold dust particles. Shake the articles to remove the dust. Repair the holes and thin places as these are likely to enlarge during washing.

Hand-knitted garments are liable to felt or loose their shape as they are very

loosely knitted. To prevent the felting or spoiling of the shape mark out the outline of an article before wetting it. Spread out an old newspaper on a table. Place the article on it, pull it to its regular and original shape, and then draw its outline. After washing and removing the moisture, the garment should be placed on the paper and pulled back to its original shaped guide by its outline. The garment should be allowed *to dry flat on the paper,* as only thus will it keep its shape. Drying over a cane surface is better than wood, because of better circulation of air. If on a table, the garment must be turned over from time to time.

Stain Removal: Wool does not absorb colouring matter rapidly, so fresh stains are easy to remove. They should be treated at once with cold or warm water according to the nature of the stain. For removing old and stubborn stains, use reagents in weak solutions. Weak acids are less harmful than weak alkalies. If bleaching is done, use only hydrogen peroxide or sodium perborate at a moderate temperature. Javelle water should never be used on wool. All reagents must be used in solutions.

Steeping: For woollens, steeping is not generally used, as long immersion in water weakens the fabric. It is, however, necessary to steep the new woollens, the first time they are washed, to remove the sulphurous acid left over in them from bleaching. It should be done for five to six minutes in warm water, made lightly alkaline with dissolved borax. Children's clothes, which are dirty, should be steeped for ten to fifteen minutes in slightly warm water made alkaline 'with borax.

Preparation of Water: In washing of wool, preparation of water is important. The water must be soft and just warm. The woollens should be washed and rinsed in water of constant temperature which is 100°- 100°F, or luke warm water. So plan the wash and keep enough warm water ready. Alkalies, except borax, damage the texture of the woollen fabrics and so avoid using them. If the water is hard, add a few drops of ammonia to the water for white woollens and borax for white as well as coloured woollens.

Soap: Any neutral soap (such as soap flakes) is good for woollens. Soap jelly can also be used. A soap containing a grease solvent is useful for very soiled articles. Soap solution should be used.

Method of Washing: Prepare a permanent lather with warm water and soap flakes. If the articles are heavy use soap jelly with ammonia to make the lather. For one woollen jacket a cupful of soap jelly, teaspoons of ammonia or borax is needed. For very soiled articles, use the cleansing fluid to make a permanent lather. Wash small articles by

kneading and squeezing, and the bulky ones by suction washing. Renew the soap solution if the dirt is not removed.

Rinse in several waters of the same temperature for the thorough removal of the soap. If any soap is left in the fabric, it will damage the fabric and give a bad smell to the articles. Use citric acid, i.e., a squeeze of lime juice to the last rinse for white woollens and vinegar for coloured woollens. This will counteract any alkali that is left in the fabric and freshen it.

Removal of moisture is very important as wool retains much moisture, and so takes long to dry. The weight of the moisture may cause stretching if it is not removed thoroughly before drying. But these should never be wrung for removing moisture as the twisting will damage the fabric and also cause felting. The best method is to wrap the articles in a dry cloth or towel and press between the hands if the article is small. Bulky articles should be spread on a flat surface and then pressed with a suction washer or with a wooden roller. If a mangle is available it should be used, for removing the moisture from woollen articles. Pass the articles folded through the mangle at a low tension two or three times till all the moisture is removed.

Drying: Outdoor drying is not advisable as strong sunlight and intense heat affect the texture of the fabric. Dry the woollens in a warm and dry place in a thorough drought. After removing the moisture, shake the article, pull it to shape, and put it for drying as flat as possible. During drying, lift, shake and turn occasionally and pull it to its shape. Large articles which have to be hung, should be put on two or three *laths* or drying rack like a saree so that they do not hang down heavy. Garments should be hang up by their strongest parts.

11.7 LAUNDERING OF SILK FABRICS

Silk is another animal fibre of delicate and fine texture which needs special care in laundering. It is, however, unlike wool in some important respects. It does not shrink and felt or lose its shape like wool. This is so, because the silk fibres are long, smooth and without the characteristic scales of wool. It is cleaned in very much the same way as wool. In case of silk, strong alkalies, heat, and friction are equally harmful. Since it is an animal fibre with the nitrogenous content, the alkali and heat harden the texture of the fibre and discolour it, specially the white fabrics which become yellow. Too much friction weakens the strength of the material.

Silks are available in many qualities with different textures, such as velvet, georgette, crepes etc. Silks are also mixed with wool, cotton and linen. Special rules are observed in their treatment, of which the basic principles are the same, namely, to avoid *heat, friction and alkali.*

Preparation: Repair tears and openings in the seams, if any, before washing, as these are likely to enlarge during the washing process. The knitted silks must be examined for ladders and these must be mended.

Stain-removing: Fresh stains are preferably removed, if possible, with cold or warm water according to the nature of the stain. Strong acids, and alkalis and strong bleaching agents are harmful to silk. Acid stain removing reagents are less harmful than alkali (as in the case of wool). For old stains which are difficult to remove, use weak reagents, such as weak solutions of borax, or sodium perborate for coloured silk, and hydrogen peroxide with a few drops of ammonia for white silk. Javelle water should never on silks as this will damage the fibre very much. When using reagents and bleaches, special care should be taken as regards the strength and temperature of the reagent and the length of its contacts with the fabric. Grease spots are not removed in the process of washing and so, these too should be removed with a grease solvent before washing.

Steeping: Steeping is not essential because silk is cleaned easily. Very soiled white and pale coloured silks which are discoloured by wear may be steeped in warm water for a short time. A small proportion of borax, added to the water, will make it more effective.

Soap and Water: Silk material is of fine texture and is usually an expensive fabric, so a good neutral soap should be used. Soap flakes are suitable, so it soap fluid and reetha nut solution. Water for silk must be soft.

Preparation of Soap Solution: Dissolve soap in hot water and then add sufficient cold water to reduce the solution to lukewarm temperature (100 to 110°F). If the water is hard, then add 1½ a teaspoonful of borax or ammonia to soften it.

If reetha-nut solution is used, strain it through a muslin before mixing it with more water.

Process of Cleansing: Cleansing is done by kneading and squeezing or by suction washing. Place the article in the washing solution, allow it to be saturated with soap and

then either knead and squeeze or suction-wash, according to the size of the article. Rub lightly the most soiled parts with additional lather. If the articles are very soiled, add a little more borax or ammonia to the cleansing solution. Cleansing fluid may also be used for very dirty silks

Rinse the silks in two or three warm waters to remove the soiled soap from the fabric. Add a few drops of citric acid (Nimbu Ka Ras) or acetic acid to the last rinse, which should be of cold water. The additions of citric or acetic acid to the final rinse improves the sheen of the fabric.

Stiffening of Silk.: There is a natural gum in the silk fibre, which is stiffened by the final cold rinse, giving a light stiffness to the article. If extra stiffness is necessary, add gum water to the last rinse (2 tea spoonfuls to a quart of water). For shirt fronts, cuffs and cottons, more stiffening is required and so, move gum water is added. Silks should be sequeezed lightly by hand to remove the moisture.

Drying: Heat must to avoided an so, drying of silk is not done in the sun. Small articles need no drying. After removing the moisture these are rolled in a dry cloth for half an hour before ironing. Big articles and thick silks should be partly but evenly dried by hanging these in a shady place or indoors. Silks cannot, subsequently, be damped for ironing, as the silk fibre is not hygroscopic and the moisture will not be distributed evenly, and will leave water spots. So silk is not to be completely dried but kept slightly damp for finishing. But wild or Tussore silk should be dried completely before finishing. This type of silk has more natural gum, which melts with the heat of that iron, and smoothens the material, and thus, makes the ironing easier.

11.8 LESSON END EXERCISE

1. Explain the laundry of cotton and linen fabrics.
2. Make a list of equipment necessary for laundering. Write in brief about each type.
3. Write in detail about the laundering of wool.
4. Write a note on laundering of Silk.

Lesson -12

Unit II

FINISHING OF NATURAL FIBRES

12.1 INTRODUCTION

In the previous lesson i.e. Lesson No. 11, you studied about laundering of cotton, linen, wool and silk. In this chapter we you study about the finishing of natural fabrics (cotton, linen, wool & silk).

12.2 OBJECTIVES

- To study finishing of cotton and linen.
- To study finishing of wool.
- To study finishing of silk.

12.3 FINISHES: AN INTRODUCTION

Fabrics, as they come out of the loom, are not at all attractive. They get dirty during the processes of spinning and weaving. In order to clean them, improve their appearance, bring out their distinctive characteristics; and prepare them for the market, they are made to undergo certain additional processes after they have left the loom. 'Finishing' is the term used to cover all these processes. The aim of the process of finishing may be enumerated as follows :-

1. ***To improve the appearance and enhance the attractiveness of the material:*** Some fabrics, which look dull and drab in colour because they have been soiled in the spinning and weaving processes, need cleaning and bleaching. Sometimes knots, some loose threads or thin places are overlooked and left in the fabric during the weaving process. So the fabrics are examined to discover and remove these defects. Finishes like napping and raising the fuzz on the surface will remove or cover such defects. Then the fabrics which do not naturally have a smooth texture or a desirable feel to the touch, such as cotton, need a treatment like calendering to smoothen the texture.

2. ***To improve suitability and utility****:* Some fabrics are not quite suitable for dresses because they are lump, lifeless, and lack the qualities of draping and preserving the shape and style of the garments. These qualities are imparted to such fabrics by producing in them the 'crepe effect'.

To further improve the draping quality, the fabrics are also treated with crease resisting finishes. Then there are other treatments which have the effect of making fabrics water-proof, fire-proof and mildew-proof.

Finishings are also given to resist shrinkage. The treatment of sizing and calendering produces a dust resisting effect in the fabric and thus increases its capacity to give more and better service.

3. ***To produce variety:*** This is done either (i) by varying the surface finish e.g., napping, beetling, creeping or smooth finishing, or (ii) by dyeing or printing in different colours or designs. Sometimes, the yarn is dyed before it is woven.

4. ***To increase the weight of stiffness****:* This is done by treating fabrics with starch or gum. Some fabrics are treated with chemicals to increase weight, and produce e.g., weighted silk.

5. ***To produce imitations****:* Some finishing processes are used to alter the original appearance of a fabric and so produce imitations, e.g., cotton is mercerised to produce a silky smooth texture or it is napped to look like wool, *e.g.,* flannelette.

Some fabrics need many more finishes than others. Silk and linen fibres are long, smooth and straight and have certain other intrinsic properties which naturally give these fabrics a smooth and glossy texture and an attractive appearance. But cotton and wool have to undergo a number of finishes before these can be presented in the market. Worsted fabrics need less finishing than woollens. Most of the synthetic fibres are also lustrous, smooth and long, and so need but little finishing.

The processes of finishing are many and varied and their suitability for a particular kind of fabric is determined, to a large extent, by the following factors :

1. ***The nature of the fibre,*** that is, its physical properties such as its power of absorption, swelling capacity and the reaction of the fibre to the application of friction and pressure. Also, its chemical nature and its reaction to the chemical compounds.

2. ***The type of yarn and the kinds of weave****,* as these affect the power of absorption. Plain weaving responds to a number of finishing treatments but a fancy weave does not lend itself to many of these processes. Some finishes are of a permanent nature, others wear off with age and laundering.

Most of the simple finishing processes consist of the application of pressure, moisture and heat. These may be grouped under physical or mechanical processes. This group includes stretching or tentering, calendering, beetling, napping, embossing and glazing.

Another group includes the processes which give a filling to the cloth, and add to its weight. The filling agents used are starch, gum, epsom salt, china clay and other material fillers.

Yet another group includes the processes of softening which is carried out by the application of oils, fats, waxes, glycerine, glucose and magnesium chloride.

Then there are the chemical treatments, such as mercerising, chlorination of wool, water and fire proofing etc.

The chemical finishes are of a more lasting nature.

All fabrics undergo certain processes, such as mending, scouring, straightening,

pressing and drying. The fabrics after they are taken off from the loom, are inspected for defects, such as thin places, knots etc. The holes and thin places are mended, the knots are brought to the surface and are clipped off. Then the fabrics are washed and boiled (scouring), straightened, pressed and dried.

Bleaching, where necessary, is done after the mending process.

12.4 FINISHING OF COTTON AND LINENS

Cottons and linens are generally starched and, therefore, need a good finish. Most of these are finished by ironing except velveteen, which is steam-pressed. In order to get a good and even finish, the starched articles must be well-dried, as ironing gives a very poor finish if the starch in the fabric is not completely dry.

Preparation for Ironing

1. Damp the articles.
2. Roll each of them separately and keep aside for at least half an hour before ironing.
3. Prepare a table or an ironing board.
4. Place a small bowl of cold water and a piece of muslin on the left- hand corner of the table or on a high stool.
5. Place a stand for the iron on the right-hand corner and keep handy the iron-holder, sewn out of some old material.
6. Select irons of a suitable size and shape for the work. Large and heavy irons are used for articles like curtains, sheets, table-cloths, bed-linen etc., and small irons for gathers, and delicate articles, such as muslin and organdies.
7. Heat the iron. The correct temperature of the iron is very important. The iron must be hot enough to remove creases and give smoothness but not so hot as to scorch the fabrics. For ironing cottons and linens, the iron must be really hot. If the iron is cold, starch from the fabric will stick to it and cause difficulty in ironing. It will also leave brown marks. Therefore, test the heat of the iron before beginning to use it.

Tests for Heat:

1. Hold the iron over the back of the hand and learn to judge the heat.
2. Flick a drop of water on the face of the iron and note the reaction.

(i) A dull sound and a definite mark on the iron indicates a cold iron. (ii) A

moderately sharp sound and a slight mark indicates a moderately hot iron.

(iii) A sharp hiss and no mark indicates a hot iron.

12.4.1 General Rule for Ironing

1. The surface to be ironed (or its cover) must be clean, smooth and free from patches or stains.
2. The iron must be cleaned and its surface well polished. An electric iron has a chromium or nickel surface, which is highly polished and easy to clean.
3. The articles (previously damped) should be opened out, shaped carefully and placed on the table. Use the left hand to smooth the cloth and to hold the article where necessary while ironing.
4. For flat articles and pleats, heavy and even pressure is used, but for gathers, lace borders and scallops the pressure should be concentrated on the toe of the iron.
5. Ironing is always done along the selvedge threads of the garments from hem to neck.
6. Materials requiring a glossy surface should be ironed on the right side. The embroidered materials and laces are ironed on the wrong side over a flannel pad.
7. All double or thick parts and seams are ironed first on the wrong side. Stitching and hems are pressed heavily till the material is dry to avoid rough drying afterwards. Then small parts and trimmings are ironed. Next the sleeves and cuffs are ironed on a single material or on a sleeve board. Then the collars are ironed.
8. Ironing is begun at the end of farthest part of the garment so that the ironed parts can be slid away from the worker, thus bringing the portion to be ironed under the worker's hand.
9. Materials must be ironed to complete dryness and give a finish.

12.4.2 Ironing and Folding of Various Articles

Sarees

1. Cotton sarees are starched and so, must be damped.
2. Open only about ½ a yard length at a time for ironing and begin with the border and then iron the remaining portion, working the iron along the selvedge thread.

3. Roll the ironed length lightly and shift aside. Open out the next half-a-yard and iron in the same way. Continue till the entire sari has been ironed.

4. Fold the length into two and keep on folding and refolding eight times till it measures about a foot in width.

5. Fold the width of the sari lightly in four folds but do not press along the folds.

Salwar

1. Cotton salwars are heavily starched and, therefore, thorough darnping is necessary.

2. Open out one leg from the fork line and lay it flat on the table.

3. Iron the hem of the leg *(paicha)* and the waist band *(naifa)* first on the wrong side, and then on the right side.

4. Iron the rest of the leg working along the length of the garment.

Fig. 1 Use of a Sleeve board.

5. Repeat the process on the other leg.

6. Fold the *salwar* into two along the fork line centre.

7. Fold the *salwar* from the *paicha* in a straight line up to the *'naifa'* and press down the fold.

8. Turn back the *'miani'* over the fold, thus making a three screen fold at the *naifa.*

9. Fold the length into two and refold it.

Blouse

1. Open out the damped blouse.

2. Iron hems and double parts on the wrong side.

3. Slip the sleeve on a sleeve board. Iron the shoulder and work downwards till the whole sleeve is ironed (see Fig.1)

4. Iron out the right half of the blouse, then the back of the blouse and lastly the left half, taking care to press along the selvedge threads.

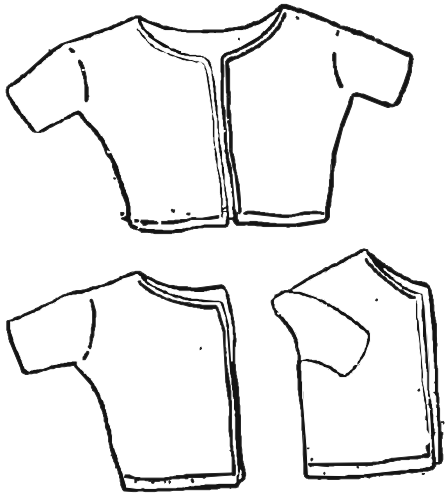


Fig. 2 Fold of a blouse

5. Leave it to air on a hanger for a short time.

6. For folding, fasten the blouse and place it on the table facing downwards. From the centre of the shoulder, turn the sides towards the centre back. Turn back the sleeves, as shown in Fig. 2, to get a tidy strip. Fold the length into two.

7. An alternative method of folding is to fasten the blouse and holding the centre

back and front with both hands to fold it into two. Turn the sleeves from the shoulder point towards the centre. This prevents the sleeves from getting crushed.

Note :- Blouses should not be kept away in cupboards folded but on hangers. Folding is unavoidable for packing in trunks or boxes.

Sari Petticoat

1. On a skirt board, if available, open out the damped petticoat. Iron the hem, double parts and seams and waist bands on the wrong side. Slip the petticoat on a skirt board, keeping the waist band on the left side, iron along the length. Keep on turning each ironed portion till the whole petticoat is ironed.

2. On a table, if a skirt board is not available, open out the damped petticoat, iron the hem, double parts, seams and waist bands on the wrong side. Stretch it flat on the table along one of the seams, keeping waist band on the left. Straighten out one franel and iron it, working from hem to waist. Repeat on all the remaining panels. Fold the width into two and then again into two. Fold the length likewise.

Shirt (including *Kameez)*

1. Open out the damped shirt.

2. Turn the shirt wrong side out. Iron the yoke, seams and other double parts, in that order.

3. Turn the shirt back to the right side out and iron again the about mentioned parts in the same order.

4. Iron the collar, first on the wrong and then on the right side.

5. Iron cuffs and sleeves.

6. Slip the shirt on a skirt board and iron the back first.

7. Turn the front uppermost and iron working from the shoulder downwards.

8. Press down the centre pleat. Apply heavy pressure.

9. For folding, button the front, lay the shirt back uppermost and fold the sides towards the centre from the centre of the shoulder. Turn the sleeves back. If the cuffs are double, they are turned up and pressed before the shirt is finally folded.

Trousers and Knickers

1. Open out the damped garment, turn it inside out and iron the seams and all the double parts including the trouser ends on the wrong side and then turn it right side out and iron it on the right side the same way again.
2. Fold one leg along the centre crease and iron on the inner side and then on the centre.
3. Iron the other leg in a similar manner.
4. Fold the trousers into two by placing the inner sides together. Bring back the extra fullness at the fork line towards the centre to form a harrow even strip. Then press the strip. Turn up the trouser ends and press them double.
5. Fold teh length once, or, if preferred, twice.

Frocks

1. A skirt board and a sleeve board facilitates the ironing of a dress or a frock.
2. Open out the damped dress and iron hems, seams and all double parts.
3. Iron sleeves as for blouses.
4. Iron the top portion, slip it after ironing over the end of the board or table, spread out the rest of the skirt on the board and iron.
5. Pleats and gathers have to be ironed and pressed differently. In pleats, ironing is done on single material with the point of the iron along the seam under the lip or the fold of each pleat. Then the pleats are arranged, damped and pressed. If the material is gathered then the gathers are not pressed or ironed. The gathered material is spread out as much as possible and then ironed (on single material). The point of the iron is used in ironing the material closest to the seam which gathers it. When the garment is hung up for airing the folds of the gathers will form again.
6. Folding spoils the finish of the frocks and dresses and so they must be put on hangers before being put away.

Muslin Dupattas or Chunnies

These are heavily starched after washing and are not ironed but finishing by gathering up the width of the dupattas in fine gathers and by folding the length into 3 parts and twisting it up.

Table Cloth

1. Damp and smartly shake the cloth. Fold it in the four screenfold. Roll it and keep it aside for half an hour.
2. Open out the roll and place the folded cloth flat on the table. Stretch and smooth it out. Iron the centre fold. Open out half the cloth from the centre fold and place it flat on the table with the right side uppermost. Iron it, working along the warp threads.
3. Slide ironed part over the edge of the table and spread out the second half and iron it.
4. Refold in a four screen fold. Press in the folds.
5. Fold into four screen fold across the length. Press in the folds.

Tea Cloth

A plain tea cloth is damped, ironed and finally folded in the same way a table cloth.

An embroidered tea-cloth is ironed on the wrong side placing the article flat on the table. The embroidered parts are pressed down heavily on a thick flannel padding. It is folded on the wrong side into two folds, the first fold being along the selvedge threads and second along the warp threads. Turn over one corner to the centre point, thus displaying the embroidery.

Table Napkin

1. Damp, straighten and fold into three screen folds shown in Fig. 3 Roll and keep it aside for half an hour.
2. Open out the roll and place the fold flat on the table. Iron it. Open out ½ of the fold and iron the $^{2}/_{3}$ of the napkin. Turn back the third fold, thus forming the three-screen-fold.
3. Iron. Press heavily over the folds.
4. Fold the length into three screen fold and press in the folds.

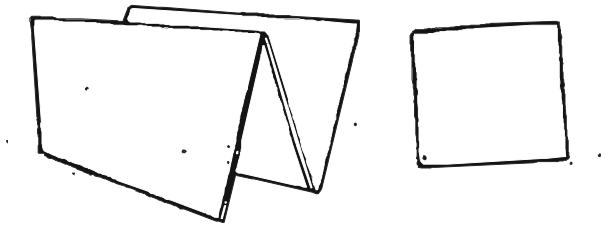


Fig. 3 : *Three screen fold of a table napkin. .*

12.5 FINISHING OF WOOL

The elasticity of woollen fibre is spoiled, if excessive finishing is applied. So special care must be taken as regards the heat of the iron and the process of finishing applied. All woollens are finished by pressing except the woven fabrics, such as flannel and serge which should be ironed lightly. The woven fabrics should be finished when they are slightly damp. When these materials are dry, place a damped musline over them and press or damp them lightly by rubbing a wet pad of muslin over the surface evenly and then press.

Knitted jumpers and other small articles need very little finishing if they are shaken and pulled into shape during drying. They are pressed lightly on the right or wrong side according to the colour and the type of garment when they are dry. The inherent moisture content of the fabric is sufficient to give the required dampness for finishing. Knitted woollens that need a very smooth finish, should be steam-pressed when dry on the right or wrong side according to the type of the material. Woollens with a fluffy finish, e.g., rabbit wool is finished when dry by brushing it with a dry stiff brush or a teasel brush.

Crepe woollens shrink to a large extent in washing and special precautions have to be taken. These should be measured before washing, stretched during drying process and steam-pressed (on the wrong side) to the correct shape and size in finishing. It is better to dry-clean them.

Coloured Woollens. For fast coloured woollens, the method given above should be followed. To retain the colour of the fabric, the important factors to be avoided are (i) heat, (ii) the use of alkali, and (iii) long immersion in water. If running is noticed, add acetic acid, vinegar or lime juice to the final rinse to revive the colour.

For *woollens not fast in colour* use reeta nut solution for washing and add acetic acid or vinegar to the washing and rinsing waters. Washing must be done quickly. Remove the moisture carefully and thoroughly to prevent colour spreading. It is advisable, if the colour bleed too much use an old piece of cloth between the folds of the materials, while the material is squeezed to remove the moisture. Place the article as flat as possible without folds for drying. Place it where drying can take place speedily.

Finishing is done on the wrong side for all types of coloured material to avoid glaze. Care should be taken to clean the iron and change the ironing sheet, if stained, before using them to iron other garments.

Laundering of Blankets and other heavy articles. It is not very easy to clean heavy woollens, such as overcoats, rugs and blankets. These get very dirty and need a thorough treatment when cleansing is attempted All the rules given above for washing of woollen are also applicable here. Suction washing is the most practicable method of use for cleaning them. A big tub and a long handled suction washer are necessary. For coloured articles reeta nut solution is safe to use. Take sufficient reeta nut solution to give a permanent lather. Add warm water enough to cover the blanket To this solution add 1½ to 2 tablespoons of borax and 2 oz. of methylated spirit. Shake the solution thoroughly with the soap. Place the article in for five minutes to saturate it. Then work the suction washer for three or four minutes at a low rate. If the article is still dirty, use a fresh mixture of cleansing solution and repeat the process. A number of articles can be washed at the same time, but care should be taken to allow plenty of water to soak through and cover the articles thoroughly.

Rinsing must be done thoroughly as heavy woollens have a tendency to retain soap. Rinse in several waters of the same temperature. Remove the moisture as much as is possible by pressing the articles on a flat surface. Use of a mangle is very convenient for this purpose and ensures the removal of moisture. Heavy woollens retain much moisture and take a very long time to dry and so should be dried out of doors in the shade. Rugs and blankets should be folded in half and hung on a taut line and fixed with pegs to ensure their drying in shape. Shake and turn during drying and thus no finishing will be required. Moisture is harmful, to woollens and so, always wash them on a dry day, so that they can be dried out of doors.

The overcoats and dressing gowns should be hung by the shoulders and pegged

securely to the line. A wooden rod or a hanger may be passed through the sleeves to give a good support to the heavy parts of the article. These may be finished by pressing on the wrong or right side according to the colour of the article. If the fabric of the article is fluffy in appearance, steam finishing should be done.

Pashmina Shawls. These have a fine, and soft texture and should be cleansed with great care.

Use reeta nut solution, and wash using a suction washer. Rinse several times. To the final rinse add lemon juice and glycerine in the proportion of 2 teaspoons and 1 teaspoon respectively to one gallon of water. Remove the shawl from the rinsing water and press it in between a towel to remove the moisture. Place it to dry as for blankets. Shake it several times whilst drying. This does not need any finish.

Note. If the shawl is very dirty, add ½ tablespoon of cleansing fluid to the reeta nut solution.

Serge and Gaberdine: Magnesium salts are added as dressing in serge and gaberdine, and these cause considerable difficulty in washing, if soap is used. Soap leaves white and streaky marks on the garment, which are more pronounced on dark coloured articles. These fabrics, therefore, should be cleaned either with glue wash or with Sal Aminoniac (Naushadar). If very dirty, a mixture of reeta nut and cleansing fluid *(*½ a tablespoon cleansing fluid to a gallon of reeta nut solution) may be use. Dark coloured, especially blue serges, should be rinsed with warm blue water. This helps to restore the colour.

Note : Even though good care is taken white woollens develop a yellowish colour after a number of washes. These, therefore, need bleaching. Either of the treatments given below is quite effective.

Method 1: Dissolve 1 oz. of oxalic acid in one gallon of water, in a wooden tub. Dip-the article (previously washed and dried) in the bath, let it soak for five to ten minutes, turning it over and over now and then Remove, wash and rinse thoroughly to remove all the traces of oxalic acid blue and dry the articles.

Method 2: Place a piece of rock sulphur (Gandhak) on live charcoal in an earthen bowl. Cover this with a clean wicker, bamboo or cane basket. Spread the half-dry washed article on the basket Cover the basket with a big tub or a tin, which should not touch the

material and allow the fumes of sulphur to collect and pennate through the article for five to ten minutes. These fumes will bleach off the yellow stains. Air the article to remove sulphur smell.

12.6 FINISHING OF SILK

Since silk is an animal fibre, and liable to be spoiled by the appliance of excessive heat, special precautions must be taken in finishing it. A hot iron will scorch the silk, whilst a cold one will drag and crease the surface of the silk instead of giving it a smooth finish. The heat of the iron should be tested on a piece of paper. If no mark is left on the paper until you have counted three, the temperature is correct for the silk.

Wild or Tussore silks are ironed on the right and wrong sides , according to their colour and surface finish. All dark colours and ironed on the wrong side to avoid a glaze.

Cultivated silks must be ironed, when evently damp, to get a uniform and smooth finish. Uneven dampness will give patches or water marks and creases. All silks should be ironed till they are dry or creases will reappear on the portions left damp.

Coloured Silks: Fast coloured silks are treated in the same way as white silks. To revive the freshness of the colour, use vinegar or citric acid in the last rinse. Never use salt to prevent the colour from bleeding.

Silks of doubtful colour should be tested for colour bleeding on a portion of inner seam or some other unimportant part of the article. *Dry* cleaning is advisable for unstable colours. Silks with doubtful colours, if washed, should be treated with special care. Steep the article for one or two minutes in cold water with two or three teaspoonfuls of vinegar or a few drops of acetic acid. Then wash quickly in luke warm or almost cold water. Rinse in several waters. In case of colour bleeding, use acid in all the rinsing waters. Squeeze out the moisture, then place it in a white cotton with another piece of cotton between the folds and press the moisture out. This will prevent the uneven colour patches on the surface. Half dry and finish as explain above.

Knitted Silks: These have the tendency of losing their shape and so, it is advisable to measure them before they are wetted. Treat these in the same way as woven wool except that care should be taken not to pull or stretch them while wet. Squeeze in a turkish towel to remove moisture After washing, measure and draw these to their original shape and size. Dry as flat as possible to prevent stretching. Finishing is done by pressing these

on the wrong side when damp. Ironing will stretch the material.

Neckties: These are best dry cleaned. If washed, the padding must be tacked allover. If the colour is doubtful, the padding should be removed before laundering. Place the ties flat on a board after wetting them. Apply soap lather and scrub these lightly with a soft brush until clean. Rinse in two or three lukewarm waters and finally in cold water. Then place them to flat on a turkish towel, and press them to remove moisture. Pull them to their original shape and allow to dry. When almost dry, press with a moderately hot iron on a thick flannel pad. The tacking on the padding when done, should be removed, *before* pressing. Ribbons are treated in the same way as neckties except that the temperature of the water should be much lower.

Scarves are washed in the same way as silk, according to their colour and surface finish. But special attention must be paid to their ironing. Scarves are usually made on cross-cut or bias material. To retain their shape, they must be ironed along the warp threads.

Velvet: This is a silk pile fabric. Washing is not very suitable as the soft pile is spoiled. Velvet articles, which are very old and very dirty, can be washed in reeta nut solution by gentle kneading and squeezing process. Before wetting the article, it should be brushed thoroughly to remove lose dirt. Rinse the article well in two or three waters and then gently press it to remove the excess of water. Brush it lightly on the right side while wet, and half dry it. Then press it lightly on the wrong side with a warm iron and then stream it to raise its fluff.

Method of Steaming: Boil some water in a deep vessel. Cover its mouth by tying a piece of fine muslin. When the steam comes out, hold the right side of the article in contact with the steam only for two or three minutes. Then turn it, to let the steam pass through the fabric from the wrong side to the right. At intervals, brush the right side gently and continue this process until all the pile is raised and the article is dry.

New Velvets Washing should be avoided. If dry cleaning is not possible, these should be steamed by passing alkaline steam through the dirty part of the garment and brushing it gently. Alkaline steam is obtained by adding reetha nuts or soap flakes to the boiling water. Dirt spots can also be removed with soap lather. Add ½ teaspoon of kerosene to the soap solution and apply the lather to the dirty part with a circular movement. Finish it by steam pressing. Stand a moderately hot Iron on its heel and cover it with a damp

cloth. Hold the velvet in front of the iron so that the steam passes through the fabric. Hang the velvet again to dry or else it will crease again if any dampness is left from steaming.

Dry Cleaning of Velvets: Any dry cleaning solvents such as petrol benzene or mineral turpentine, or any absorbent, such as French chalk or talcum powders can be used. If absorbent powders are used, the powder should be sprinkled and left for 24 hours. Then it should, be brushed off thoroughly. Steam press it to finish the article. If solvents are used to clean velvet, precaution should be taken to see that all of the solvent has evaporated before it is steam pressed.

Georgette and Crepes: Pure georgettes and crepes are easier to launder than the mixed fabrics. Georgettes, with deep crepe finish, and with the mixed yarn are liable to shrink in washing. It is best to dry clean them. Crepe de chine, which has a slight crepe finish, can be washed successfully. Use soap flakes, a neutral soap, or a grease solvent prepared in solution, to cleanse these fabrics. Treat them in the same way as silks, according to their colour. Squeeze out lightly to remove moisture. Stretch it lightly to regain its size and let it dry. Whilst drying pull the fabrics once or twice to stretch it. Stretch a portion of the article at a time to its original size and then iron it till it is completely dry. These fabrics are ironed on the wrong side. A thick towel may be used on top for ironing. This makes the ironing easy and gives a uniform finish.

Sarees usually shrink, and cause much difficulty in laundering. While stretching to its original size, use of a wooden roller of a thickness of 2" in diameter and about 50" in length makes the work easy. Before wetting the saree, mark its width on the roller. After washing and removing the moisture, roll the sari firmly and evenly on the roller, stretch it to its original width, which has been previously marked on the roller. The stretching and the tight rolling will also minimise the shrinking in length. The sari should be left to dry on the roller. When the top layers are dry, unwind these gradually and roll them on to another roller. This will quicken the drying. This device minimises the finishing process as the saree treated as above needs only light pressing.

Chiffons: These are pure silk fabrics or a mixture of silk and artificial silk. These are best dry cleaned. If washed, these are treated like georgettes and crepe.

Weighted Silks: These are not suitable for wear as they are usually destroyed by perspiration. The housewife should avoid buying these silks. The burning test will help her to identify this type. The weighted silk blackens and retains its shape after burning, whilst

the pure silk forms a brittle ball.

Dry cleaning of these is better than washing. The ironing also must be done very carefully. Too hot an iron or too much pressure should be avoided as either will destroy the fabric.

12.7 LESSON END EXERCISE

1. Explain finishing and write a note on aim of the process of finishing.
2. Write in detail about finishing of cotton and linen fabrics.
3. Write in brief finishing of wool and silk.

Lesson-13

Unit III

FINISHES: SANFRONISING, MERCERISING, TENTERING, CALENDERING, NAPPING, WATER-PROOF, WATER REPELLANT FIRE PROOF, CREASE RESISTANCE, MOTH PROOFING, MOIRING EMBOSSING, CRINKLED OR CREPE EFFECT.

13.1 INTRODUCTION

In this lesson, you will understand about various types of finishing process used in clothing and textiles.

13.2 OBJECTIVE

To study about various finishing process.

13.3 FINISHES: INTRODUCTION

A finish is defined as anything that is done to fibre, yarn or fabric before or after weaving, to change the appearance, feel, serviceability and durability. Fabrics as they come out of the loom are not at all attractive. They get dirty during the process of spinning and weaving. In order to improve their appearance, bring out their distinctive characteristics; and prepare them for the market. They are made to undergo certain additional processes after they have left the loom and the finishing is the term used to cover all these process.

13.4 SANFRONISING

Any textile fabric is made up of threads which are in the state of deformation for the reason that they are interlaced with each other. In the weaving or knitting of this fabric it is impossible to avoid that the threads are strained or stretched, so that a freshly made fabric is not stable. It is larger than it would be if the strains were relieved.

When finished the cloth is obliged to pass through calendering or other machines to bring it into a smooth condition, the fabric is further stretched. In some cases furnishers intentionally stretch fabrics with a few to producing longer or wider fabrics, than is warranted by their structure.

With the modem revolt against fabrics and garments which in the shop appear to have a certain size but after the first wash are found actually to be much smaller, the finisher is now called upon to secure his effects to handle and appearance without stretching the

fabric. In fact he is called upon to conform to a specification that the finished fabric will not, on washing, shrink beyond certain reasonable limits. The result is that today it is possible to purchase a wide variety of goods carrying a guarantee that they will not shrink on washing.

There new requirements have involved the use of new machinery so that the stretched fabric can be cleared up without impairing the finish. Sanforing is one of the processes in which the length contraction is brought about by passing the puckered cloth between a blanket and the surface of a large-heated metal cylinder. As the fabric passes around this cylinder being pressed against it by the blanket, it is set and smoothed in its closed-up-state.

13.5 MERCERISING

The action of caustic soda, applied under certain conditions to cotton fabrics, produces a silky lustre and gives the material a beautiful sheen. It also gives the cloth a greater affinity for colouring matters; deeper and brighter shades are obtained and less dyestuff is used.

Mercerising consists of impregnating the cloth with 18 to 20 per cent concentration of caustic soda for one-half to two minutes at room temperature stretching the cloth whilst saturated and washing out the caustic soda while the cloth is still under tension. This treatment produces a permanent change in the structure of the cotton fibre.

13.6 TANTERING

One of the most important operations in finishing is to bring the fabric to the required dimensions of width and length. To bring it to the right width, the fabric is passed through a tentering machine. This machine may be 20 to 90 ft. long and is so arranged that the cloth is carried through it by two moving chains of clips or pins, one on each side. The clips grip the selvedge firmly so that it cannot slip out of their grip. The fabric which has been pulled in length during bleaching, dyeing and drying is generally narrower than the required finished width. So it is arranged that dip chains diverge from the entry end for about one quarter or slightly less than the length of the machine. Thus as the cloth is carried forward, gripped on either side, it is gradually widened. .

In order that this stretching may take place easily the cloth is slightly dampened or steamed. After stretching, it is passed through a hot-air chamber so that it is dried and set

at this width.

13.7 CALENDERING

Calendering is essentially an ironing process. Most textile yarns and fabrics become very firm and boardy when wetted and dried under tension. But this is easily broken down by running the fabric through a calender which give it a surprising surface degree of softness. At the same time, it flattens the fabric and so makes it more lustrous. A great deal of pressure is applied by passing the cloth through the nips of heavily weighted bowls of compressed cotton and steel. Rayon fabrics are not calendered so heavily as cotton or line. But silk fabrics often have a fairly heavy calendering. There are various types of calenders, some using friction, other waxy substances to give added lustre in addition to the treatment of the steamheated pressure bowls.

Calendering flattens and clases the threads of the fabric to give it the require smooth feel and appearance. The finish depends chiefly on pressure temperature and moisture.

13.8 NAPPING

This process is used to produce a raised effect on the cloth and to impart to it a soft and pleasing feel. It also covers up defects, if any, and renders the fabric warm because of the spaces created between the raised fibres which trap and hold the air.

The fabric is first passed over a revolving cylinder covered with teasels or short bent wires. There teasels or wires scratch the fibres up to the surface so as to form a nap. The nap is then clipped to a uniform length by passing it through a shearing machine. Napped surfaces may be given a variety by pressing the naps flat or by causing the raised fibres to cure or ripple or by giving it a high glass.

Cottons and woollen are finished by this process. Cotton after this fuzzing finish resembles wool e.g. flannelette.

13.9 WATERPROOF

The production of water-proof fabrics is an important section of the textile trade both for garments and industrial use. For the rougher heavier type of water proof fabrics, such as tarpaulins, etc. it is usual to employ a coating composition which comprises tar products, since these are cheap and can be thickly applied. Appearance on handle of such

fabrics is not of much importance. But with fabrics to be used as garments, rain coats etc. a soft handle is necessary. For many water proof garments it is most satisfactory to coat one side with a layer of rubber. But now rubber is being replaced by synthetic resins. A characteristic of such proofed fabric is that whilst being resistant to water they are also adversely affected by grease or oil.

A water-proof fabric is one in which no water can penetrate. A water repellant is resistant to wetting but if the water comes with enough force, if will penetrate the fabric.

13.10 WATER REPELLANT

Water-repellant fabrics are high count fabrics with a finish which coats the yarns but does not fill up the interstices of the fabric. There fabric are pliable, and are not different from untreated fabrics. There fabrics can breath. It is difficult to select a water repellant coat than water-proof coat because the finish is not obvious, and one must depend on the label for information. However, some guides can help the consumer to recognize there fabrics (a) the cloth construction is for more important than finish. The closer the weave the greater the resistance to water penetration. (b) The kind of finish used is important in selection because it influence the cost of up-keep and (c) Two layers of fabric gives increased protection. Two layers cross the shoulders are very important but the inner layer must have a water-repellent finish, otherwise it will act as blotter and cause more water to penetrate.

13.11 FIRE PROOF

In order to make a fabric resistant to fire, it is necessary to impregnate it with inorganic preparations so that it becomes incapable of supporting combustion. There are many such preparations that make the fabric fire- proof but there are not permanent and are affected by water. One such agent is inorganic borophosulphate which is soluble only in water. A satisfactory flame proofing compound for cotton fabrics consists of chlorinated paraffin wax, synthetic resin, insoluble metallic oxide pigments and other volatile organic solutions.

These fire retardent compounds either cut off the supply of oxygen to the fabric by forming a coating or by producing a non-combustible gas or chemically alter the fibre so that it forms a non-volatile charred residue rather than the usual flammable tarry product.

A simple home method can be used to make the fabric fire proof. This is done by

immersing the fabrics in a solution of 7 oz of borax and 3 oz boric acid in 2 quarts of hot water wring and dry.

Fire proof finish can also be created when it functions as a fire extinguisher. Carbon tetra chloride or carbon dioxide has this effect. They cut off the supply of oxygen necessary to make fire burn.

13.12 CREASE RESISTANCE

The process is used mostly for cotton because cotton, owing to its natural inelasticity, wrinkles badly. In this process the fabrics are impregnated with a solution of synthetic resin, such as (i) phenal formaldehyde, (ii) urea formaldehyde and (iii) acrylic resins, and dried by a fairly high temperature in a moist atmosphere. This form a clear insoluble resin in the fibre, which improves the resilience of the fabric urea formaldehyde is colourless and can be used for white and light coloured fabrics but phenol formaldehyde being dark coloured is used for dark coloured fabrics only.

13.13 MOTH PROOFING

Alone, among all the textile fibres, wool is subject to being reatitily attacked by moth. Many people have a mistaken idea as to how moths attack wool, but the matter is quite simple. Moths alight on a wool material and lay eggs. Later these eggs hatch out into grubs or worms, and it is there and not the moths which do the damage. The grubs are ravenously hungry and they eat the wool fibres-wool being an excellent food for them. These grubs cannot live on other fibres such as cotton and linen and would starve, on them. Naturally, holes in the wool material are soon formed as the grubs eat the fibres, and thus is produced the so called "moth eaten" wool fabrics with which we are all unfortunately acquainted.

Some of the means of controlling moth damage abroad are cold storage and contact poisons. Fluorides and silico fluorides are used as a finish on wool fabrics. They are fast to dry cleaning, but not fast to washing. DDT is very effective but require frequent application. Another means of controlling is to change chemically the fibre to make it unpalatable to the larvae. Chemicals causing there changes are added during the dying process and are fast both to washing and cleaning.

There is only one certain preventive moth attack. It is to have substances present in the wool material which either render the wool fibres absolutely uneatable by the grubs or which actually poison them when eaten. Moth proofing substances are known and are

available. The most satisfactory solution of the moth damage problem is to have there applied during the dyeing and finishing of wool materials.

13.14 MOIREING

This process produces a watery line effect on the material. The machinery consists of these steam rollers. The top roller is covered with cloth. The material passes between the first and the second roller and then under the 'top' roller which rotates at a greater speed and presses the fabric heavily and produces the desired effect.

Rayons are generally finished by this process. This finish on acetate rayons as very permanent.

13.15 EMBOSSING

By this process, a pattern or a design is embossed on fabric. This machine consists of two rollers, one of them is covered with cloth arid the others engraved with the design. The cloth, covering one of the rollers, is moistened with soapy water. When the machine operates the impression of the pattern is taken on the covered roller. Then the material is passed through these rollers which are hated by steam. As the material is pressed between the two rollers, it gets the imprint of the design. Cotton linen, silk and rayon are often given this finish.

13.16 CRINKLED OR CREPE EFFECT

The creeping process is accomplished either by mechanical or by a chemical treatment. The mechanical process consists of passing the material between two hot rollers. The rollers have regular indentations at regular intervals which produce the waved and crope effect on the material. This effect is not very lasting.

13.17 CHAPTER SUMMARY

To conclude we can say that a careful choice of surface processes and conditions are essential for successful finishing. The group of finishing that are used for many type of fabrics are many. These finishes may be applied in conjuction with, or before or after manufacture.

13.18 LESSON END EXERCISE

Q. 1. Explain in detail Sanfronizing, Mercerizing, Tentering and Calendering.

Q. 2. Write a note on waterproof, water repellant and fire proof-finishes.

Q. 3. Explain the term Crease resistance, Moth proofing, Moiring, Embossing and Crinkled.

PRINTING: SCREEN PRINTING, BLOCK PRINTING. PRINTING BY MACHINE

14.1 INTRODUCTION

In this lesson you will understand different types of printing i.e. Screen Printing, Block Printing and Printing by machine.

14.2 OBJECTIVES

This lesson aims to understand different types of printing i.e. screen printing, block printing and printing by machine.

14.3 INTRODUCTION TO PRINTING

Printing was practised in India thousands of years before the Christian Era. Printing is application of colour in the form of a design. The designs were either drawn by a brush or were stamped on the material by wooden blocks carved or cut in relief. A simple method of printing used at first consisted of dipping the carved block in a paste of colour and then stamping the fabrics with it in a definite pattern. This method is still used extensively.

Later a screen made of fine wires (wire-cloth) or silk bolting cloth came into use. In machine printing engraved copper rollers, or cylinders are used.

The dyes used in printing are the same as those used for dyeing but these are used in the form of pastes. If mordants are necessary, the fabrics are treated with mordant solution before being printed.

14.4 BLOCK PRINTING

Block printing was practiced by Chinese and Indians some two thousand years ago. Blocks are made of wood or wood and lino. The design is carved on lino which is generally cut to a thickness of ¼ inch. This cut piece of lino is stuck to wooden piece of same size. Many printers use only wooden blocks on which the design has been carved. These blocks are dipped in paste of colour and then pressed on the fabric so that coloured pattern is produced on the fabrics. First a block carrying the paste of one colour is stamped on the fabric and allowed to dry. Then other colour carrying the paste of a different colour is stamped over it to form the multi-coloured patterns. The process is repeated over the entire fabric surface which is to be printed.

It is costly and a slow process, uniform pressure is needed to transfer the colour. The intensity of colour cannot be the uniform throughout.

14.5 SCREEN PRINTING

In this method the cloth to be printed is stretched on a table which is padded and covered with oil cloth. The screen consists of wooden or metal frames over which gauze of silk or nylon has been stretched. A separate screen is required for each colour. Over the screen a line is drawn of such portions of design that are to take one colour. The areas of screen which are to be used to prevent the spreading over of colour are filled with water proof varnish (of hardened gelatin), enamel or some other insoluble filler. The screen is then placed on the material and the paste of colour is brushed over its surface and then lightly pressed. The colour is allowed to dry. The another frame carrying a different colour and different outline is used. A separate screen is required for each colour in the design. The size of screen is generally 4 ft to 6 ft.

14.6 PRINTING BY MACHINE

1. Direct Roller Printing :- Roller printing was developed in 1785. By this method of printing thousands of yards of coloured designed fabric and produced in an hour.

This printing consists of several copper cylinders or rollers which are engraved with design. The actual printing of the design on the cloth by this method takes very little time, but the engraving of the designs on the rollers means hard and careful work lasting man days. The roller is as wide as the cloth. The numbers of rollers required depends on the number of colours used in the design. One roller print one colour only.

The roller printing machine comprise a large central cylinder around which passes the fabric to be printed. This cylinder rotates with the moving fabric. Against the fabric and this central cylinder, press a number of colour printing rollers. Each roller contributes one colour. Thus if there are five colours in the design there are five colour printing rollers. Each of these rollers is made of copper and engraved on it is that portion of pattern which it contributes. Placed closed to these are Furnisher Rollers which move in at intervals, containing the colour or the dye. The dye is absorbed by the brush like surface and transferred to the design engraved rollers.

Next to the design roller is a big iron cylinder or roller around which the cloth is drawn as it is printed. The cloth to be printed, a rubberized blanket (for padding) and gray cloth pass between the engraved rollers and the cylinder. The blanket gives a good surface for sharp printing and the gray cloth protects the blanket beside absorbing the excess dye.

Printing machines of this kind can be provided with upto fourteen color printing rollers, as they are able to produce patterns in fourteen colours.

As described above, this machine prints only one side of the fabric. If it is required to print both sides, then the central cylinder, with its accompanying printing and furnishing roller etc is duplicated. Thus the fabric is printed first on one side, and then with the same pattern on the other side.

2. Discharge Printing :- This type of machine printing is usually favoured for fabrics with dark backgrounds. The fabric is first dyed. A discharge paste which contains chemicals to remove the colour is then printed on the fabric. For example, to produce a white pattern on a ground colour, the fabric is first dyed with the ground shade say brown. Then it is printed with a paste containing chemical capable of bleaching the brown colour to a white. Such a paste is called discharge paste. If the colour is desired in the discharge area, dyes which are not formed by the discharging materials are mixed with the printing solution. The fabric is then steamed to develop the printed design either as white or coloured areas.

Discharge prints are found on cottons and rayons and in some pattered silks with dark backgrounds. The chemicals that discharge the dye tends to weaken the fabric in the area of the design.

3. Resist Printing :- This is just opposite of discharge printing. In this a resist paste is printed first on the white fabric, and the fabric is then piece dyed. The dye penetrates into areas covered by resist paste.

4. Pigment Printing :- It originated in America and is known as the Air dye process. In this pigment dyes are used which are insoluble in water and very fast to light and other adverse influences. These pigments are made into colour printing paste, using various ingredients, especially resin to act as binder of the pigment to the printed fabric. The pastes are printed to the fabric by any of the usual methods, such as roller or screen printing. The fabric is heated to bind the pigment to the fabric. The coloured materials obtained by this Ari dye process have excellent fastness to washing and light.

14.7 LESSON END EXERCISE

1. Write a note on printing of fabrics and describe printing done by machine.
2. Explain various types of printing done on fibres.

Lesson -15

Unit III

DYED AND PRINTED TEXTILES OF INDIA: KALAMKARI (PAINTED AND BLOCK PRINTED) PATOLA, TIE AND DYE OF GUJRAT AND RAJASTHAN, ANDRA PRADESH POCHMPALLY, TELIA RUNALS. TIE AND DYE OF TAMIL NAIDU, SUNGANDI, IKATA OF ORISSA J&K EMBROIDERIES.

15.1 INTRODUCTION

In the previous lesson you have studied different types of printing while in this lesson, you will study wore about dyed and Printed Textiles of India i.e. Patola, Tie and Dye, Kalam Kari, J&K Embroideries.

15.2 OBJECTIVES

This lesson aims to understand the basics about dyed and printed textiles of India.

15.3 DYED AND PRINTED TEXTILES OF INDIA INTRODUCTION

The India of today succeeded to a rich heritage in Architecture, Music and other Fine Arts and Crafts, which for scores of centuries had been steadily growing despite the

rise and fall in the destinies of its people. .

Aliens who came, whether as traders or as invaders, ended with the solitary exception of the English by making India their. home and by getting absorbed in its original inhabitants. The intermingling of races did start new currents and cross currents in the flow of our culture, but is made our culture richer and fuller.

The culture, India invariably shared with its neighbours and others, thereby earning for itself an honoured place-second to none-amongst the nations of the world. Its fame spread to lands far and near, even in those remote ages of which no written historical record exists. Whilst the missionary zeal of our religious emissaries carried the spiritual aspects of our culture to the distant comers of the globe, the spread of our culture on its temporal side was entirely due to our traders and exporters who were our cultural ambassadors abroad. Through the export of its famous textiles the exquisite beauty and fineness of which was almost legendary, ancient and medieval India attained an unrivalled position in the international textile trade, which she maintained till not-so-very-long ago. According to George Birdwood, India "was probably the first of all countries that perfected weaving and the art of its gold brocades and filmy muslins." Can it be wondered then that the textile products of the Indian carftsmen were eagerly and even anxiously looked for and awaited in the markets of the world? How could competitors ever hope to catch up with a country that was thousands of years ahead of them in this art? They could only ban the use of the Indian fabrics within their own country. The Roman Senate was probably the first to pass a law (about 1600 A.D.) prohibiting the wearing of the Indian silk garments by men. A little more than a century later England prohibited by law the use of the Indian calico. This was the beginning of the two-centuries-long unremitting war against India's supremacy in textiles.

As is only natural, a crop of legends has collected around the fineness and the delicacy of the fabrics which the Indian weavers produced with the aid of little more than bare human hands. One such, which is widely believed to be authentic, might be related here. The austere Mughal Emperor Aurangzeb chided his gifted daughter Zebunnisan, for not being properly dressed because her body could be seen through. "But I have no less than Seven suits on" protested the lady "one on top of another". "Put on some more then" commanded the Emperor "to obscure the transparency".

As in Architecture, Music and other Fine Arts, India has its own distinctive

contribution in the production of textiles so far as artistic designs, harmonious and beautiful colour schemes and, of course, the fineness of the fabrics are concerned. Hand spinning and weaving though carried on a small scale and developed slowly as a cottage industry had yet reached a high stage of perfection, even as early as 327 B.C. We catch glimpses of it in the descriptions, sent home by Alexander's soldiers, of the costumes worn by the people of India. Foreign visitors to this country, on their departure, always carried away with them, as priceless treasures, pieces of silks, brocades and muslins. Cargoes, laden with our ,wondrous fabrics, were invariably welcomed by other countries. This marvellous technique of the craft which has raised it to the status of a 'Fine Art' has developed through hundreds of generations of craftsmen who formed an exclusive class or guild and handed down from father to son, the know ledge gained and the progress made so that each successive generation of craftsmen added something to it and became more and more efficient, producing better and yet better results. Another characteristic of traditional Indian textiles common to all artistic creations of human hands is that, each piece bears the stamp of the individuality of the craftsmen who produced it. Thus, it has a human interest of its own. As the gifted writer Kamla Dongerkery has said, the traditional textiles of India "reveal the background of rich culture, they give artistic shape and form to the ideas and ideals which inspire the lives of the people" and thus provide one of the most reliable hallmarks of the cultural development of the people.

The craft was carried on in the villages of some of the important provinces of India, especially around the coastal towns and cities. It was not restricted, as a profession, only to men alone, but women too, in their own leisure hours, helped their men in spinning and weaving and thus, added to the family income. Indeed, in certain provinces like Assam, tradition required women to achieve some degree of skill in the art of weaving and spining and even today umarried girls in Assam are not considered quite eligible for matrimony, unless they have acquired some grounding in this useful art. But the craft flourished mostly as a result of the patronage extended to it by the royalty and aristocracy, which played a vital role in its development. To suit the tastes of the royal and noble families, the standard of production had necessarily to be very high and ever progressive.

Different types and varieties of textiles were produced in different parts of India and thus we hear of Banaras and Surat Brocades, Dacca Muslins, Cashmere Shawls, Gujrat Patolas and Bandhanis, each famous for its design, quality and colour. In the following pages, an attempt has been made to present, in bare outlines, the chief characteristics of

some of the outstanding traditional textiles of India. Illustrations of several of these fabrics have been added to their descriptions.

It would perhaps interest our readers to learn that in a number of ancient families are cherished, even today, as valuable heirlooms, some beautiful specimens of our traditional textiles. A good few of these have been presented to some national museums which proclaim to the nation and to the world of Fine Arts "the glory that was India".

15.4 PATOLA, TIE-DYE OF GUJARAT AND RAJASTHAN

Patola is an artistically ornamented fabric. It is a specimen of wonderful combination of the craft of tie-dying *(Bandhana)* and weaving. *Patola* is mostly in use as a wedding sari in Kathiawar and Gujarat. In Java and in Indonesia too the *Patola* fabric is used for wedding dresses. The fabric is so exquisitely and so highly valued that it is handed down from generation to generation in the family. Women of Gujarat and Kathiawar treasure the possession of a *Patola* with pardonable pride.

Patola, unlike the other ornamented fabrics, is invariably woven in just the plain weave. The elaborate and intricate patterns which mark the *Patola* saris are produced by the wonderful art of *Bandhana* or tie-dyeing. The silkyarn with which Patolas are woven, is first dyed by the *Bandhana* process before it is put on the loom. The yard, both warp and weft, are dyed in the lightest of colours. Then they are stretched on the ground, and the dyer proceeds to mark certain portions to indicate the lines of the desired design. His wife who helps him in his work, then ties up the marked portions with cotton thread so tightly that the next dye cannot

Fig. 60 : Patola

penetrate through to the tied up portions. The yarn is then immersed in dye- baths of the desired colours and shades. The operation of tie-and dye is repeated several times until all the colours and shades required for the planned design have been applied to the yarn. The dyer begins with a light colour, passes next to a bright one and applies the dark colour at the very last. Then the weaver starts on his job. The warp threads are arranged in pre-arranged sequence, and the weft is then interlaced one by one very carefully to form the planned design. The process of producing a *Patola* is, therefore, a very laborious one and is extremely complicated too, Meticulous care and a good deal of creative imagination is needed for making the correct portion on yarns for dyeing in different colours of the pattern. A very retentive memory is another essential requisite for registering and recalling accurately the sequence of the coloured threads in the pattern. Thus only a few traditional designs are used for *Palata patterns.* The following eight are used by the weavers of rattan as described by Mr. G. V. Patel :-

1. *Nari-Junjar bhat* or dancing girl and an elephant design. It has necessarily a parrot included in it.

2. *Pan bhat* or leaf design. It is said to be the leaf of the sacred *pipal* tree. *(Ficus Religiosa).*

3. *Rattan chawak bhat* or the cross, of diamonds design. It has interspersed diamond also.

4. *Okhar bhat* or water crest design. The real name of this design on investigation at rattan, appears to be *akhrot boot, i. e.,* the walnut design.

5. *Phulvadi boot* or floral design is generally enclosed in diapers outlined by a single line. Each diaper contains three flowers.

6. *Wagh-Kunjar bhat* or tiger-elephant design. The animals alternate with each other in the design.

7. *Chabri bhat* or basket design. Here each enclosure containing an elephant is made up of four quadrants which look as if forming a basket when two of them are taken together.

8. *Chowkhadi bhat* or a diaper with a double outline design. Each diaper includes three flowers borne on a stem."

There is one more design which is used for *dhoties* (the loin cloth worn by men). This design consists of the *devnagri* alphabet and the forms of the letters follow those of the *mantras* (hymns) in religious book.

Pattarn, a place in Kathiawar, is reputed to be the (birth place of *Patola).* The weavers of Pattan later migrated to Bombay, Ahmedabad and Surat and the making of *Patolas* started at these places also.

Orissa weavers also have adopted the *Patola* technique for weaving their special fabrics like curtains, bed spreads, odhnis (scarfs worn over the head and draped round the shoulders and waist by women) and saris. The famous Sambalpore saris are woven like *Patolas.*

Tie and Dye

Tie and dye was practiced as far as sixteenth century in India. It is said that through the art of dyeing, tie and dye developed especially in the regions of Gujarat and Rajasthan. People of Jaipur are particularly skilled in this craft.

During the Mughal period, best tie and dye pieces were mainly produced in Gujarat and Rajasthan known as "bandhani". There were also chunaries which were classified according to the number of knots in a repeat. These were mainly in circles and squares in groups. Some other designs represented human figures, dancing dolls, the horse, the elephant, the tiger, the lion, the tree and the birds such as parrotes. Tie and Dye is a village craft carried on mostly by women in village of India. The workers are known as "Bandhanris" who always grow the nails of their thumbs or fore-fingers long enough so that they can act as pair of pincers, while tying the knotes on cloth.

Bandhanis *Bandhanis* or *Choonaris* are the colourful saris and *odhnis* dyed by tie-and-dye process. These are popular amongst the women of Gujarat, kathiawar, Rajputana and Sindh. Premlata Jayakar in her article on 'Tie Dyed Fabrics of India,' in "Marg" refers to *Bandhanis* in the following words :-

"It is an auspicious garment. A symbol of youth and romance, love play and the *'Sohag'* (wifehood) of Hindu women. It is a garment of laughter."

Indian women are known for their love for bright colours. Also the tradition and the customs of wearing special colours on different festivals, makes it necessary for them to become familiar with the art of dyeing at home. Thus besides the expert professional

dyers almost every Indian girl learns by practice a good deal of the art of dyeing and *Bandhani* work.

Bandhanis differ from *Patola* as regards the stage at which they are dyed. Like *Patolas* they are dyed be the ties and dye process, which, however, is done after the fabric is woven. The fabric is folded over several time until reduced to a small thick square or a rectangular piece. The piece is then damped and pressed on a block on which a design has been carved. The impressed portions are picked up by the finger nails dye nails are allowed to grow specially for the purpose and are used as a sort of pincers and are then tied up with cotton thread in a thickness sufficient to resist the dyes. It needs training and great skill to pick up all the layers at once and make it crinkle in a particular given manner. The *Bhandhanari* or the woman who does the tieing up work works swiftly and ties up all the impressed portions without cutting the thread but carries it over from one point to the next. The dyeing process is carried out in the same order as in *Patolas,* starting with the light colours and finishing with the dark ones. But each time, before a new shade or colour is applied the tieing up process has got to be repeated.

Usually, the designs used are copies of a few traditional ones and by the practice of tieing-up the same design over and over again the *Bandhanaris* become expert to such an extent that they are able to dispense with the process of impressing the fabric with the design.

The motif of the traditional designs used for *Bhandhanis* represents animals, birds, flowers and dancing dolls. When elaborate designs are used the *Bandhanis* are known as *'Ghar chola'*. In some of the expensive *'Gharchola'* gold threads are woven in to form checks or squares, and then the designs are formed in each of the squares by the tie-and-dye process. The *'Choonaries'* are very light fabrics, and the designs for these consist of dots or pin heads irregularly spread allover the field of the cloth. Sometimes the dots are grouped together to form a design, and the design is known as *'Ek bundi'(one* dot), *'Char bundi'* (four dots) and *'Sat bundi'* (seven dots).

It might interest our readers to know that in some parts of Rajputana, *e.g.,* Alwar, professional dyers existed till a couple of decades ago, who could dye even the finest muslin in two different colours, one on each side of the fabric at the modest charge of only annas four a yard. This art too is now extinct but specimens can be found in some museums.

15.5 KALMENDAR OR KALAMDAR

This is the name given to the handpainted cotton fabrics. They are so called because the artist works out the designs on the material with a fine steel brush not unlike a pen *(Kalam).* The process is very much the same as used for *Batik work.* The basic principle, namely, resist-dyeing, being common to both. The material is first dyed in pale pink and then stretched out tight. The artist then traces the outline of the design with his *Kalam* or fine steel brush dipped in melted wax. The fabric is then dyed deep red and finally washed in hot water to melt away the wax. This produces the design in deep red on the background of pale pink.

Kalamdar fabrics are also called *Palampores* in the textile trade. They are available in rectangular pieces and are popular with Hindus and Muslims alike. The former use them as canopies for the images of their gods and the latter as praying carpets. Those designed for Hindus portray scenes from the Hindu mythology, whilst those intended for Muslims are of Islamic origin. The latter depicts the conventional *Mirhab* with panels forming a frame enclosing the 'Persian Tree of Life' complete with birds and the branches and animals resting under its shade. The craftsmanship and the skill of the dyer is amply borne out by the excellent portrayal of the minutest details with amazing accuracy. The French traveller Bernier who visited India in 1663, during the reign of Emperor Shahjehan, thus describes the fabric which formed the drapings of the Imperial courtyard.

"And lined within with those *chittes,* or cloth painted by a pencil of Masulipatam, purposely wrought and contrived with such vivid colours and flowers, so naturally drawn, of a hundred several fashions and shapes, that one would have said it was a hanging parterre".

15.6 J&K Embroideries

Embroidered fabrics of Kashmir are world famous. The Pashmina shawls, the silk saris, the Namdas and the various other silk and woollen articles are praised as works of art. The Kashmir embroidery is known as *Kaseeda,* and the stitches used are the satin stitch, the stem stitch and the loop stitch. The darning stitch is also used. The herring bone stitch is used for the edges of the finished pieces.

The craftsmen, in Kashmir, are generally men and are in variably assisted by boys, often of a tender age, who do the actual embroidery. It is interesting to observe the young

boys at work. The master craftsman calls out from the design before him, the kind and the number of stitches to be put in. As the instructions are called out the boys work swiftly and deftly with needles and the stitches are completed almost as soon as the master has finished calling them out. The scene resembles that of a small class in a school with the boys taking down the dictation of the teacher.

Nature's bounteous gifts appear to have been literally showered on Kashmir and it is considered by many to be the nearest approach to "a paradise on earth". Kasheeda artists, therefore, under the inspiration of the beauty of the natural surroundings which they have succeeded in reproducing in their embroidery with such amazing skill, that in the words of Kamla Dongerkerry, "competes with the wealth of Nature's charms." The Kashmir artist has a inexhaustible treasure of motifs in gorgeous colours, ready at hand from which he can draw his designs. In Kashmir 'embroidery, therefore, we find bunches of fruits, foliage and birds of brilliant hues and in-numerable shades of colour lend themselves as charming compounds of varied designs. And the *Turanj* (or the mango) is not ignored either. Indeed, it finds a place in almost all the *Kasheedas* of Kashmir.

The outstanding characteristics of Kashmir embroidery is its elegance and the harmonious grouping of the brilliant colours in the design which produces a restful and soothing effect. The workmanship is so neat and the stitches so fine that one wonders how bare human hands and that too of young boys could produce such work. It must however, be remembered that the training of generations (the art is handed down from father to son in each of the families) has equipped the artisans with most an intuitive aptitude for the work which has become second nature to them. On the other hand, the art lives only so long as the line of the craftsmen continue and is likely to become extinct with the line. This, alas, is what started to happen some time ago due mainly to the rage for replacing human hands by lifeless machinery. Paradoxical as it might appear science is fast stifling and killing art by restricting the scope of arts creation only to such articles as lend themselves to mass productions by mechanised processes.

The modern products of Kashmir are no longer as fine and delicate as in the past, and tend to lose their natural charm.

The embroidery is best done in silk but the identical patterns are also repeated in wool. Besides the *Pashmina* shawls and the silk saris, the industry produces many articles for use in the home.

Namdas are the embroidered rugs. The rug is a felted thick fabric manufactured by the process of pressing wool and cotton together. They are then embroidered in thick wool in bright colour designs similar to those on *Pashmina.* Kashmir Silk embroidered fabrics besides being colourful and rich in design and comparatively inexpensive, are within the means of middle class people. Thus a wider patronage supports the industry and the art has flourished not by the patronage of the great and the rich alone.

15.7 LESSON END EXERCISE

1. Write a note on dyed and printed textiles of India.
2. Describe Patola and Tie and Dye of Gujrat and Rajasthan.
3. Write a note on J&K Embroideries.

PROPERTIES OF GOOD LAUNDRY SOAP, MATERIAL USED IN SOAP MAKING, SYNTHETIC SOAPS OR DETERGENTS.

16.1 INTRODUCTION

In this unit i.e. Unit No. IV you will study regarding different soaps and detergents, their properties and material used in making of soap. We will also study about starches, Blues, Bleaches and about grease removers.

16.2 OBJECTIVES

-To study properties of good laundry soap.

-To study material used in soap making.

-To study about synthetic soaps.

16.3 INTRODUCTION TO SOAP

Soap has held the field for centuries as the chief substance that removes grease and dirt from fibres. For centuries no body understood exactly how it worked, only lately its how and why has been discovered with the result that a new class of synthetic soaps or as they are now called detergents has been discovered. This has revolutionised washing in the homes and industry. All the substances that wash clothes are called detergents, soap being one of them.

Soap, as is well known, is a compound of fatty acids and alkalies. It is interesting to note that the discovery of the cleansing properties of this compound originated in an accidental mixture of left-over cooking fat and wood ash. Wood ash had been in use till then by the primitive people for cleaning their garments. It contains salts such as *hydroxides* and *nitrates* of *sodium* and *potassium* and so, the ash has an alkaline effect and has a cleansing action to some extent. Later on, fat was mixed with salts of potassium and sodium to make crude soap. Till the end of the eighteenth century, soap industry was entirely a home industry. In the beginning of the 19th century, small soap factories were established and now it is one of the big industries in India and the world.

Action of Soap

1. Soap makes the penetration of water into the fabric easier. It helps to break down the surface tension or the surface resistance of fabric and thus, soap solution will wet the fabric more readily than plain water.

2. The dirt in the fabric consists of grease and dust particles. The soap solution breaks up the grease into small particles, which come off the fabric and float in the solution. With the removal of the grease particles, the dust particles also are loosened, as they have a greater affinity for soap than for the fabric. Thus, the fabric is made free from both, grease and dust.

3. When soap comes in contact with water, alkali is liberated by the action of water on soap and helps the emulsification of greasy dirt, thus facilitating the washing process.

4. Most of the non-greasy dirt is removed in steeping by the pedesis of water or the movement of water particles. Soap in water increases the pedesis and thus, quickens

the removal of non-greasy dirt.

16.4 VARIETIES OF SOAP

There are many brands of soap - the variety is brought about by the incorporation of special oils, perfumes and colours.

The two main classes of soap are (i) *hard soaps,* and (ii) *soft soaps.*

Hard soaps are those which cannot be easily robbed on to the surface to be cleaned. They do not dissolve easily in water and hence, do not give free lather. This means more labour and so more time to launder a dirty material.

Soft soaps, on the other hand, dissolve readily in water and give free lather; but because of these very properties they are wasted more in use.

The hardness or softness of soaps depends on two factors, namely- *(i)* the kind of fats and alkalies used, *(ii)* the process of soaps making.

Fats, which are composed of the higher series of fatty acids, such as stearin and palmitin in large proportions and so, are termed "hard fats," make hard soaps; *e.g.* Tallow and Coconut oil produce a hard soap with a firm texture; while castor oil or linseed oil makes very soft soaps.

The alkalies used in soap making are *(i) caustic soda* and *(ii) caustic potash.* Soaps made from caustic soda are generally harder than the soaps made from caustic potash.

The processes used in soap making are of two kinds -the cold process and the hot process. Soaps produced by the hot process are, as a rule, harder than those made by the cold process.

In addition to the laundry soaps there are other varieties too, e.g. toilet soaps, disinfectant soaps, shaving soaps, transparent soaps etc. In these also a large variety is brought about by the variation of different oils, perfumes and colour.

Colour and perfumes are not used in laundry soaps. These are either white, cream yellow or dark. They are sold in the market in bars, chips, cakes or flakes.

Some bars soaps and other cheaper household soaps are of a dark colour which is due to the presence of resin which decreases their cleansing action. Sodium carbonate,

chloride or sulphate slightly increase the detergent property of soap. But these alkalies made the soap hard and further allow a much greater proportion of resin and water to be included in the components of the soap. Soaps containing a large quantity of resin and water, will have little real cleansing action, and will be expensive in use as they waste away rapidly when in contact with water.

Soap flakes are neutral soaps. These are white in colour and are obtained by flaking a fairly hard, good quality white soap which has no free alkali. These have best cleansing properties and are used particularly for cleansing expensive silks and woollens.

Thurpentine is sometimes added to improve the cleansing power of soap that is used for very greasy articles.

16.5 PROPERTIES OF A GOOD LAUNDRY SOAP

A good or genuine soap should -contain 30% of water and 61- 64% of combined fatty acids; (soaps containing less water dry on exposure to air); (ii) be free from alkali and resins; (resins, which consist chiefly of the sodium salt of abietic acid, are very much used for the fatty matter of the soap, but these soaps, if continually used, make clothes yellow and hard) and (iii) be readily soluble in water and also give a good lather.

16.6 MATERIALS USED IN SOAP MAKING

The two chief materials in the making of soap are fats and alkalies. Other substances such as silicates, starch and soap stones are added as filling agents.

Fats: A fat is a combination of fatty acids and glycerines. Example of pure fats are stearin, palmitin and olein. Most of the natural fats are made of a mixture of these and others esters. A fat is hard if it consists of a large proportion of stearin and palmitin.

In soap making, both animal and vegetable fats are used. The animal fats are *(i) Tallow (ii)* Lard and the vegetable fats are *(iii) Coconut oil and (iv) Cotton seed oil.* Generally, the animal fats are harder than vegetable fats and make hard soaps with the best cleansing power.

Tallow is composed of stearin, palmitin and olein. This makes a soap uniformly compact in texture, does not give free later has very good cleansing and keeping properties. Tallow is usually blended with other oils and fats in impart firmness to the soap.

Lard is composed of stearin and olein. It gives a better soap than tallow, which

lathers freely in water but owing to its high price is used only in toilet soaps.

Coconut oil is the most important fatty substance used in soap making in India. It is available in abundance and makes a good white soap. It is used for making marine and hard water soaps. Another advantage of this oil is that it saponifies readily and thus soap can be easily made by the cold process with this oil as a component.

Cotton seed oil when refined makes quite a good soap with a high detergent (washing power) property. The soap is more soluble in water and lathers freely, but the lather is not of a permanent type. Hence, the addition of tallow improves the washing property of soap. Soap, made with this oil, will be comparatively cheaper, as this oil is available in abundance in cotton growing areas.

There are other oils such as *palm oil, castor oil* and *groundnut oil,* which are used to some extent in combination with the other oils. *Mahua oil* is cheap and is much used in making laundry soap. It makes a good, soft soap, and, therefore, tallow and coconut oil are mixed with it.

In soap factories, a mixture of animal and various vegetable fats is generally used in order to improve the quality of soap and cut down the cost.

Alkali: The chief alkali used in soap making is *caustic soda.* Sometimes *caustic potash* is also used. There is only a slight difference between the soap produced with either of these alkalies. Soap with caustic potash is softer in consistency and more soluble than the one made with caustic soda. Hence, in making soft soaps caustic potash is used; but for ordinary household soaps, caustic soda is used. Caustic soda is available in the form of sticks, flakes, blocks and solution. The sticks and flakes are very expensive the solution has impurities hence, the alkali in blocks is used in soap making.

Sodium Silicate: It is a brittle substance, which resembles glass. Liquid sodium silicate is a viscous liquid. It is generally of an alkaline character and possesses good detergent properties. Neutral silicate containing a smaller proportion of soda is used in the proportion varying from 5% to 25%. If too much is used, the soap becomes pasty and is wasteful in water.

Starch: It has the property of combining with water in the presence of alkalies into a gelatinous mass which is soluble and so it is added to make the soap firm. This does not affect the appearance of the soap but it deteriorates the cleansing action. Generally 2% is

a safe quantity to use. In the cold process upto 20% is used.

Soap Stone: Soap stone or French Chalk is often used a filling agent to the extent of 15 to 20 percent. But soap stone has neither the detergent properties of silicates nor the binding power of strach.

Salt: Salt is used for graining the soap out from a mixture of oils and alkali. The usual proportion is 100 parts of oil to 12½ parts of salt.

Resin: Resin is used in soap making to reduce the cost The disadvantages of the use of resin are that it has less cleansing power than soap, and it tends to give a yellow colour to white materials. It should not be added more than 15to 20% of the fat.

16.7 MANUFACTURE OF SOAP

The usual method of soap making is by the process of saponification. When fat is mixed with alkali, the fat splits up into fatty acids and glycerine' and the fatty acids combine with alkali to form a compound which is soap. This process is called saponification.

(a) **Boiling Process:** This is generally carried out on a large scale:

1. Fats, oils and the alkali (caustic soda) are purified.
2. Fats (animals or vegetable) are melted in a large pan.
3. A weak solution of caustic soda is added gradually and the mixture is boiled by steam passed directly in the pan.
4. Some of the fat is saponified, and the soap formed forms an emulsifier of the whole mixture. More caustic soda solution is added at intervals and the process of boiling is continued for two or three days.
5. The contents of the soap pan are soap, glycerine, excess of caustic soda and impurities. Brine solution is added which separates the soap out, and this forms a layer on the top. The liquid under this layer consists of glycerine and impurities and is known as "Spent lye."
6. Spent lye is taken out and glycerine is distilled and stored.
7. The soap layer is mixed with water and boiled and made into a paste. This may contain some un saponified fat and, therefore, more caustic soda is added till saponification is complete. Brine solution is added as before and spent lye is taken

off.

8. The soap is then boiled with steam and left to stand until four layers are formed. The top layer is just a forth, the second layer is the genuine soap, which is run off by a pipe, the third layer is an impure, dark coloured soap and the fourth layer is some alkaline liquid.

9. The genuine soap is passed into crutching pans when colours or perfumes or some adulterants are added. Then the soap is moulded and cut or made into flakes or powders.

(b) Cold Process: This is a simple and quick method of soap making. One of the oils is mixed with caustic soda. The heat given off by the mixture is sufficient to carry out the process of saponification which takes at least a day or two to be completed. It is necessary to take the correct proportion of the ingredients. This soap has more cleansing power in cold water than in hot.

METHOD

No.1

Caustic soda	...	250 gms.
Water	...	4 cups (large size)
Coconut oil	...	1 kilo
Gram powder (Besan)	...	250 gms.

NOTE.. Care should be taken to beat the mixture in one direction only.

Preparation

1. Dissolve caustic soda in water, stand the solution in an earthenware pot for 3 to 4 hours.
2. Mix gram powder (Besan) and oil in a big bowl.
3. Add caustic soda solution to the mixture of oil and *be san* a little at a time and beat it in. Continue beating till the mixture is of a thick consistency.
4. Pour the mixture in moulds, and allow the soap to set.

No.2

Caustic soda	...	250 gms

Water	...	8 cups
Mahua oil	...	1 kilo
Wheat flour *(maida)*	...	500 gms.

Preparation

Some as for coconut oil soap.

No.3

Caustic soda	...	1 pao-8 oz.(250gms.)
Water	...	5 cups
Coconut oil	...	1½ seer -3 lbs. (1.5kilo)
Maida or besan	...	1 ½Pao-12oz. (375gms)

Preparation

I. Dissolve soda in water.

2. Warm the oil, mix maida and oil.

3. Add the caustic soda solution to the mixture of oil and maida. Stir in one direction. Continue stirring until a thick consistency is formed.

4. Pour in moulds and allow to set.

16.8 SYNTHETIC SOAPS OR DETERGENTS

Soaps molecules consists of two parts, one part consisting of sodium is soluble in water and the other part stearate soluble in grease. So if there is another cheap substance which has the same kind of molecule should also behave like soap. When such compounds were synthesised it was discovered that they were even superior to soap in their cleaning properties, and further in their manufacture to edible oil was used. They were manufactured form such inexhaustible materials as hydrocarbons. These hydrocarbons were obtained from crude oil which is pumped out of oil wells. They are what we now call petro-chemicals. To these hydrocarbons oxygen, hydrogen and sulphur are attached to form the soluble part of the molecule. Today the synthetic detergents comprise thousands of different compounds, with new ones discovered everyday. Mixed with foaming agents they form different types of shampooing material. These detergents are rapidly replacing soap. This has also meant a saving of millions of pounds of edible oil.

16.9 PROPERTIES OF SYNTHETIC SOAPS

They are superior to soap in many ways. They are dry powdery substances easy to handle and if the clothes are kept in a solution of these detergents, the clothes only need a little rinsing and hardly any hard washing. No greasy curds or rings are seen clinging to the tub or pan. It is immaterial to them what type of water is used whether it is hard or soft as these detergents are not effected by it. Manufacturers, to save the housewife further trouble and make washing pleasant, add blueing and foaming agents and some perfume. There is hardly a home in India now where these detergents are not used. They go under various names. Surf Rinzo, Det, Persil etc. are the most familiar.

16.10 LESSON END EXERCISE

1. Write a note *on properties* and *varieties* of *laundry soap.*
2. Discuss in brief regarding material used in soap making
3. Explain synthetic soaps and write about their properties.

Lesson -17

Unit IV

STARCHES AND BLUES

17.1 INTRODUCTION

In this lesson, you will learn study about starches and blues.

17.2 OBJECTIVE

-To study stiffening agents (starch) and their types.

-Preparation of starch.

-To study laundry blues, their types and blueing process.

17.3 INTRODUCTION OF STARCH

Starch is well-known stiffening agent used in laundry work for cotton and linen fabrics.

Gum and gelatine are the stiffening agents used for silk.

A certain amount of stiffness in the washed clothes gives them a smooth glossy surface, which is resistant to dirt and dust. The stiffness, however, must not impair the pliability of the garment too much. This is ensured by using only such starch solutions as can penetrate the fabric and not coat its surface. The housewife will know what are the appropriate varieties to be used from the detailed description given below.

Suitable starches are stored by nature in the stems of certain plants *(e.g.,* palms) but more often in grains or seeds *(e.g.,* rice, wheat, maize etc.) and in roots and tubers such as potatoes, sweet potatoes, arrowroot etc. Starch is a carbohydrate and the physical appearance of the starch from all these different sources is very much the same. Even chemical tests are not helpful in distinguishing one from the other. But these differ a great deal, so far as the character of the stiffness imparted to the fabrics by their solutions is concerned. Only a microscopic examination of the grains reveals the fact that they differ in shape and size.

17.4 VARIETIES OF STARCH

Rice Starch These starch grains are the smallest and make a viscous solution which is suitable for stiffening the fabrics. It gives sufficient stiffness with pliability. This starch is suitable for cold water starching as the size of the grains is small enough to effect an easy penetration into the fabric.

Wheat Starch The starch grains are of two sizes; large and small, and give a strong viscous solution, which also produces stiffness with pliability in the fabric. But it is very expensive and so it is not economically useable in laundry work.

Maize Starch This starch gives a strong viscous solution but produces undersirable stiffness which feels rough to the touch.. It is cheap and may be used after blending with other starches.

Potato Starch These starch grains are very big and so it is not suitable for laundry purposes.

Commercial Starches Various brands of commercial starches are available in the market. These are usually manufactured by blending two or three different kinds. Colman's starch has been in the market for a number of years and gives satisfactory results.

'Dip' is one of the latest stiffening agents in western market. It is a synthetic product. The chief advantage of this product is that it gives a stiffening which lasts even after the fabrics are washed several times.

17.5 DIFFERENT METHODS OF STARCH PREPARATION

Preparation of Boiling Water Starch

Recipe	1	table spoon starch
	2	table spoons cold water
	1	pint boiling water
	½	tea spoon borax
	¼	tea spoon wax

Method : Mix the starch to a smooth paste with cold water in a basin. Add borax and wax. Pour over the boiling water quickly, stirring all the time till a colour change takes place, which shows that the starch grains have burst and a colloidal solution has been formed. This is the full strength starch. It should be diluted immediately by adding to it an equal volume of cold water. If it is allowed to remain without dilution, it will form a solid lump as it cools.

Use : The starch must be dried well in the fabrics. Then the fabrics are damped evenly before ironing to get good results.

Cold Water Starch

Recipe	1	table spoon of starch
	1	table spoon of boiling water
	½	tea spoon borax
	¼	tea spoon wax

Method : Place the strach in a basin. Dissolve the borax and wax in boiling water and add to it the strach in the basin. Then add the cold water and stir the mixture. Strain through a muslin. Cover and leave it for half an hour before use. This allows the starch grains to soften. Stir thoroughly before use.

Use : The article to be cold-water-starched must be dry. Knead and squeeze the dry article in the starch mixture. Squeeze out. Rub off the surface starch grains with a wet muslin. Iron immediately. It is important to have a clean, hot iron and also to use quick movements of the iron. This starch gives stiff effect and so is used for thin muslin articles,

collars, cuffs, shirt fronts, frills etc.

The strength of the starch used dep.ends upon two factors:

1. The thickness of the fabrics.

2. The stiffness required in the article.

Thin texture fabrics need heavy starching, whereas the thick fabrics need light starching. Full strength starch is, therefore, diluted with cold water to the required strength.

Table showing the strength of starch for different articles

Full Strength of Standard Starch	*Cold Water*	*Articles (Cotton and Binen)*
1 part	1 part	Caps and hats.
1 part	2-3 parts	Table mats, cotton dupattas, cuffs, tray cloth, damask table cloth,
1 part	4 parts	Thin curtains, blouses (thin), table napkins, salwars.
1 part	5 parts	Thick curtains, thin blouses aprons
1 part	6 parts	Blouses, saris.

Rice Strach

Recipe	1	table spoon of rice
	1	cup of water
	½	tea spoon of borax
	¼	tea spoon of wax

Method : Boil the rice in the water till it is thoroughly cooked. Then, rub through a muslin to get a smooth paste. Dissolve borax and wax in boiling water and add it to the strained rice mixture. The starch is now ready.

Use: Dilute the prepared starch with cold water and use it as a hot water starch.

Note. Addition of borax and wax to the laundry starch will whiten and freshen the clothes. Borax gives whiteness, and wax gives glossiness.

Gum Water: It is a preparation made with gum-arabic, a gelatinous fluid from the tropical acacia tree, which dries by exposure to the air. Gum water is used for stiffening

silks and rayons.

Recipe. 4 oz. of gum-arabic.

1 pint of water.

Method : Soak the gum in the water o.vemight in a jar. Stand the jar in hot water to dissolve the gum. Stir occasionally straight through a muslin and bottle.

Use: Rinse the articles in water to which the gum water is added in the proportion of a tea spoon to half a' pint of water shirt the water well before putting in the article.

17.6 LAUNDRY BLUES : AN INTRODUCTION

Blue is used in the last rinse for bleached cotton andclinen. Bleached fabrics after wear and washing lose whiteness and get a yellowish tint. To counteract this yellowness, its complementary colour, blue, is used and the whiteness is restored. It is obtained from chemical, vegetable and mineral sources and in the form of powder, liquid, balls and cubes. The colour varies according to the sources from violet to blue or from greenish blue to bluish green. They also differ in their solubility. The chemical blues such as such as the coaltar dyes are completely soluble.

17.7 TYPES OF BLUE

Ultra Marine Blue is generally used in laundry. It was originally a mineral substance but now it is known to be manufactured from soda ash, sodium sulphate, charcoal, sulphur and clay. All these are heated and then ground. It makes a fine powder and thus becomes a suitable blue for laundry. It is safe to use as it is not harmful to the fabrics. It gives a violet blue colour and is available in the form of powder, cubes and balls.

Prussian Blue This is ferric ferrocyanide. It was discovered in the eighteenth century. It is a mixture of iron sulphate with potassium ferrocyanide. It is not very suitable for use, as it is likely to leave rust marks on the fabric after ironing.

Indigo This is directly prepared from the leaves of certain plants, and is not manufactured synthetically. It is expensive and is not very much used in laundry. It has a dull blue colour which is not very suitable.

Aniline Blue This is made from coaltar dyes. This colour may vary from purple to blue. It is of two kinds, one gives best results in an acid medium, and the other in an

alkaline medium. This is readily soluble and is, therefore, the best to use in laundry. Indigo and ultra marine are not completely soluble in water and remain in suspended particles. Suspended blues will not give an even colour of the fabrics; besides, the particles may stick to the cloth and thus leave marks.

Method About a tea-spoon of blue should be tied in a piece of muslin. This should be shaken in the water to be used for the last rinse till n it becomes the desired shade of blue.

17.8 TESTS FOR THE DEPTH OF COLOUR BLUEING

1. Take some of the blue in a glass, hold it up against the light. The colour should be a pale blue.

2. Dip a piece of white rag, test the colour to see if it is even and pale.

3. Take a little solution in the palm of the hand and note the shade. The colour should be pale blue.

Too much blueing will give the cloth a dull greyish colour and will make the white cloth unattractive.

Use Every time an article is put in the blue water, the water must be stirred thoroughly. The article must be opened out before being put in, otherwise, patches will form as the blue settles on the cloth instantly.

If the article has taken on a deeper shade than desired, it must be rinsed immediately in another bucket or tub of water to which a little vinegar has been added. This will lighten the colour.

17.9 THE BLUEING PROCESS

Great care must be taken to see that blueing is done only when the fabric is free from soap. The process, therefore, follows the last rinse.

The blue is tied in a piece of muslin and squeezed in cold water until the required depth of colour is obtained. Ultramarine blue being insoluble in water, the colouring matter is held in suspension, and so the water must be stirred each time before use.

The article is dipped up and down in the solution once or twice in such a way that the water is not retained in pockets or other bag-shaped parts. Articles should not be allowed to remain in the bath, but must be moved about all the time. Blueing and a

starching process may be combined where necessary. The blue should be tied in a piece of thick material to prevent the too free passage of the particles of blue into the water . Squeeze the blue bag in cold water until a pale blue colour results.

Yellow articles should not be blued, since they turn greenish. Overblueing is easily removed from fabrics by treatment with acetic acid. Sunlight is the best natural bleach. In India, where there is strong sunshine for nine months in the year, blueing should not be necessary for properly washed goods.

17.10 LESSON END EXERCISE

1. Write a note on starch and its different varieties.
2. Describe different methods of starch preparation.
3. Explain in brief about laundry blues and mention its types.

Unit IV

BLEACHES (TYPES AND THEIR USES IN LAUNDRY) GREASE~REMOVERS, GREASE SOLVENTS AND ABSORBENTS

18.1 INTRODUCTION

In this lesson, you will understand regarding classification of Bleaches, their use in laundry, grease removers, grease solvents and absorbents.

18.2 OBJECTIVES

- To study about bleaches and their types.

- To study about Grease removers, Grease solvents and absorbents.

18.3 INTRODUCTION

Bleaching means the process of removing colouring matter from fabrics. Bleaching agents (bleaches) chemical which used for discolouing the coloured fabncs mto white. The so

called bleaching process in laundries is more or less limited to the removal of stains on fabrics.

18.4 CLASSIFICATION OF BLEACHES

On the basis of mode of action, bleaching agents can be classified into three groups as below :

1. Oxidising bleaches

2. Reducing bleaches, and

3. Opitcal bleaches.

1. Oxidising Bleaches

These agents work through liberation of oxygen, which combines with stain to form an oxidised colourless compound, *.e.g.,* Sodium hypochlorite, sodium perborate, hydrogen peroxide, potassium permanganate and also sunlight.

The fabric should not be treated for long period with these oxidising bleaches as these cause weakening of the fabric strength.

2. Reducing Bleaches

These agents work through removal of oxygen from the stain to form reduced colourless compound, e.g., sodium hydrosulphite, sodium bisulphite and sodium thiosulphite.

The oxygen of the air may sometime tend to return the original colour of stain due to reoxidation.

3. Opitcal Bleaches

These bleaches neither reduce or oxidize the colour of stain, as they are not actually bleaching agents. Rather, they are used for giving a more whiter effect to white fabrics only, e.g., Tinopal. The compound is absorbed by the fabric and emits a bluish appearance which makes the yellow tinge developed in the fabrics due to washing. The optical bleaches include one or the other florescent colourless dyes which when absorbed by the fabric, react with ultraviolet rays present in sunlight, to give white visible effect.

18.5 TYPES AND THEIR USE IN LAUNDRY

1. Oxidising Bleaches

(a) Sodium hypochlorite bleach

Ingredients: Washing soda-l lb. (about 450 g)
Chloride of lime-1/2lb (about 225 g) -
Cold water-2 quarts (about 2 litres)
Boiling water-quart (about 1 litre) ...

Procedure Separately dissolve washing soda in boiling water and chloride of lime in cold water. Mix the two solutions. The white precipitates of calcium carbonate will be formed. Let the precipitates settle down. Strain the clear supernatant and store in dark coloured bottle as the hypochlorite formed is unstable to light. This solution is termed as 'Javelle water' and gives out oxygen which is a powerful bleaching agent.

Applications It is used for bleaching white cotton and linen only. For application to these fabrics, dilute the javelle water with half volume of hot water. Dip the stained part of fabric in this solutions is bleached. Do not dip the fabric for more than 20 minutes. Therefore, rinse the fabric in the plain water to wash out any residual amount of bleach.

(b) Hydrogen peroxide bleach

It is a mild but very useful bleaching agent. It also acts as an antiseptic and deodorant. Though mild in action, it should be used very carefully as it may harm the fabric. The compound is available in market as solution of different concentrations. The chemical is very unstable in air. Hence, to maintain the strength for longer, it should be stored in dark air tight bottles at low temperatures. Hydrogen peroxide readily splits up into water and oxygen. The oxygen so liberated bleaches the stain. It is a very safe bleach.

Application Hydrogen peroxide can be safely used for whitening of wool and silk in addition to cotton and linen, which show yellowness due to repeated washings.

For use, one part of 10% hydrogen peroxide is diluted with 6 volumes of water. Little ammonia is then added to make the solution alkaline. For bleaching cotton and linen with hydrogen peroxide there is no need for dilution and the chemical can be used as such.

The stained portion of fabric is then dipped in the solution until the stain is removed. Then articles' is rinsed in plain water to wash off the residual chemical.

(c) Sodium perborate bleach

This chemical is produced by reaction of borax with caustic soda and hydrogen peroxide, Sodium perborate dissolves quickly in water to liberate hydrogen perioxide which releases oxygen to act as oxidising bleach.

Preparation: Dissolve one ounce (about 28 g) of chemical in one gallon (about 4 litre) of water. For treating animal fibres, neutralise the soution with acetic acid and for bleaching action make it slightly alkaline with ammonia.

Application: The undiluted bleach is used to bleach the fabrics of animal origin only, e.g., silk and wool, in the same manner of hydrogen peroxide.

(d) Potassium permanganate bleach

This bleach has high content of oxygen which oxidizes the colour of stains due to perspiration and mildew. It can be used to treat the fabrics with both animal and vegetable origin. The use of potassium permanganate, however, produces brown stains over all the fabrics immersed in it, due to manganese dioxide, which needs to be removed before treatment is complete.

Preparation: One ounce (about 28 g) of chemical is dissolved in one gallon (about 4 litres) of water for cotton and linen fabrics. For animal fabrics the above solution is diluted 2 fold with water.

Application: The fabric is steeped in the bleach for few minutes, and then the excess bleach is rinesed out of fabric which has now stained the characticstic brown colour. The article is then dipped in one of the following solution until the brown stain due to bleach is removed:

-Sodium hydrosulphite (see under reducing bleaches)
-Oxalic acid solution (28 g in 4 litres of water); or
-2% hydrogen peroxide acidified with acetic acid (1 teaspoonful of vinegar for 500 ml of bleach).

The fabric must be rinsed thoroughly in water after treatment with above chemicals.

(e) Sunlight

Sunlight and open-air bleaching is in use since centuries. In countries like, India,

the fabrics are spread out on grass, sprinkled with water and left in open exposed to rain, dew and sunlight until they are bleached. The bleaching action of sunlight in combination with spreading of fabrics on grass in view to evolving of oxygen during photosynthesis by chlorophyll containing green grass and this action is most active under direct sunlight and in day time. Sprinkled water, or from rain and dew wettens the fabrics for reaction of oxygen with unwanted colours.

Before bleaching with any of the oxidizing chemical, the metallic buttons and other similar parts if any, should be removed since their oxidation may cause black stains on the fabric.

2. Reducing Bleaches

(a) Sodium hyposulphite bleach This is one of the most widely used bleach for almost all types of fabrics. However, it is practiclly useful for wool and silk cannot be bleached with sodium hypochlorite.

The sodium hypo sulphite dissolved in hot water redu:ces the stain by taking out oxygen and itself is oxidized to sodium metabisulphite. The later compound when exposed to air splits up into sodium sulphate and sulphur dioxide, the latter substance being itself a reducing agent.

Application For bleaching in solution, the fabrics are steeped for few minutes in solution of 1 to 4 teaspoonfuls of the chemical in 1 pint (about 500 ml) of hot or boiling ,wafer. The concentration of solution varies according to the resistance of stain and the nature of fabric. The fabrics then should be rinsed thoroughly in water containing high concentration of soap.

Uses The bleach can be used in spotting treatment for many stains due to grass, dung, boot polish, mildew, ink, potassium permanganate and dye stains.

The bleach can also be used for coloured clothes. In such cases, sometimes bleach may accidentally run into the colour to change it. Immediately dipping into an alkaline solution or immediate application of soap may rectify this problem.

Precautions The bleach is sensitive to decomposition by moisture, heat and oxygen. Sometimes, it may take fire. Therefore, it must be stored in air tight, moisture free containers. The bleaching work should be done in the open or near the window to let the released sulphur dioxide escape, which otherwise may cause irritation to throat and lungs.

Further care should be taken during use in avoiding the contact of bleach with metal parts, as it may cause black stain on all fabrics. Vessels of wood or earthenware only should be used.

(b) Sodium bisulphite bleach. This is very mild reducing agent and is obtained by the partial neutralization of 'sulphuric acid' with' caustic soda'.

The bleaching effect of this chemical is due to release of sulphur dioxide which reduces the stain by removing oxygen, to discolour it.

Ingredients: Sodium bisulphite - 2 tb. sp.

Water - 1 pint (about-500 ml).

The solution is obtained by mixing the two components.

Application The stained part of fabric dipped in the bleach until the colour is removed. Thereafter, it is thoroughly washed to remove residual chemical and air dried. The ast step is essential as any residual sulphur dioxide may absorb atmospheric air to form sulpher trioxide which with water forms suI ph uric acid.

c) Sodium thiosulphate bleach This chemical is also a reducing agent which acts through liberation of sulphur dioxide. For bleaching of cotton fabric, hypo solution is obtained by dissolving one ounce (about 28 g) of sodium thiosulphate and ½ ounce of 36% acetic acid in 8 quarts (about 8 litres) of water. The fabrics are then treated as with sodium bisulphite bleach.

Over bleaching

The overbleaching of cotton and linen fabrics is one of the main cause of general weakness of the fabrics. The fibres become brittle and harsh and give a distinct 'crackle' when rubbed together.

To overcome this problem, following precautions should be used during all beaching operations:

(i) Use bleach of known strength.

(ii) Keep temperature below 60°C.

(iii) Always measure quantity of bleach accurately and

(iv) Always dilute bleach and add gradually.

In most cases, over-bleaching is due to chlorine bleaches, but oxidizing agents do have the same effect on cotton and linen. Chlorine bleach should never be applied at temperatures exceeding 160°F (71°C).

Grease stains may be just grease spots or some colouring matter fixed with grease. These include better, curry, oil-paint, varnish and tar stains. In removing these stains, some grease solvent or an absorbent is first used to dissolve or absorb grease before the removal of the colouring matter. A solvent soap is also very effective for removing these stains from washable fabrics.

18.6 GREASE REMOVERS

Grease removers fall into two groups, according to the way in which they act. One group is known as *Solvents* because they dissolve the grease and thus facilitate its removal. The second group is known as *Absorbents* because they absorb the grease and thus remove it.

18.7 GREASE SOLVENTS

Grease Solvents are liquid in form. Petrol, benzene, acetone, turpentine, paraffin, methylated spirit, may be classed under this group. They are obtained from shale oil or petroleum excepting benzene, which is obtained from coaltar. They differ in their ranges of boiling points. But it must be remembered that they are inflammable. Petrol, benzene and methylated spirit are equally inflammable and spread rapidly. So, care must be taken not to use them near an open fire or a naked light.

18.8 GREASE ABSORBENTS

Grease Absorbents are dry and powder like. Bran (outer cover of the wheat grain), Fuller's earth, French chalk fall under this group.

Bran is heated before its use as an absorbent.

Fuller's earth is a natural clay and is obtainable in natural or bleached form.

French chalk is mainly magnesium silicate. It is white and its action is similar to Fuller's earth. It is obtainable in perforated containers.

18.9 LESSON END EXERCISE

1. Name the bleaches that can be used for different fabrics and fibres.
2. What are the types of bleaches? Explain oxidizing bleaches in detail.
3. Write a note on Grease removers.

Lesson No. 19

Unit V

COMPUTER BASICS

MS-WORD I

19.1 INTRODUCTION

In the present lesson, you will get to know basics of computer i.e. MS Word.

19.2 OBJECTIVES

This lesson aims to help you understand -

- MS- Word (Introduction)
- Creating and formating a document

19.3 MS-WORD (INTRODUCTION)

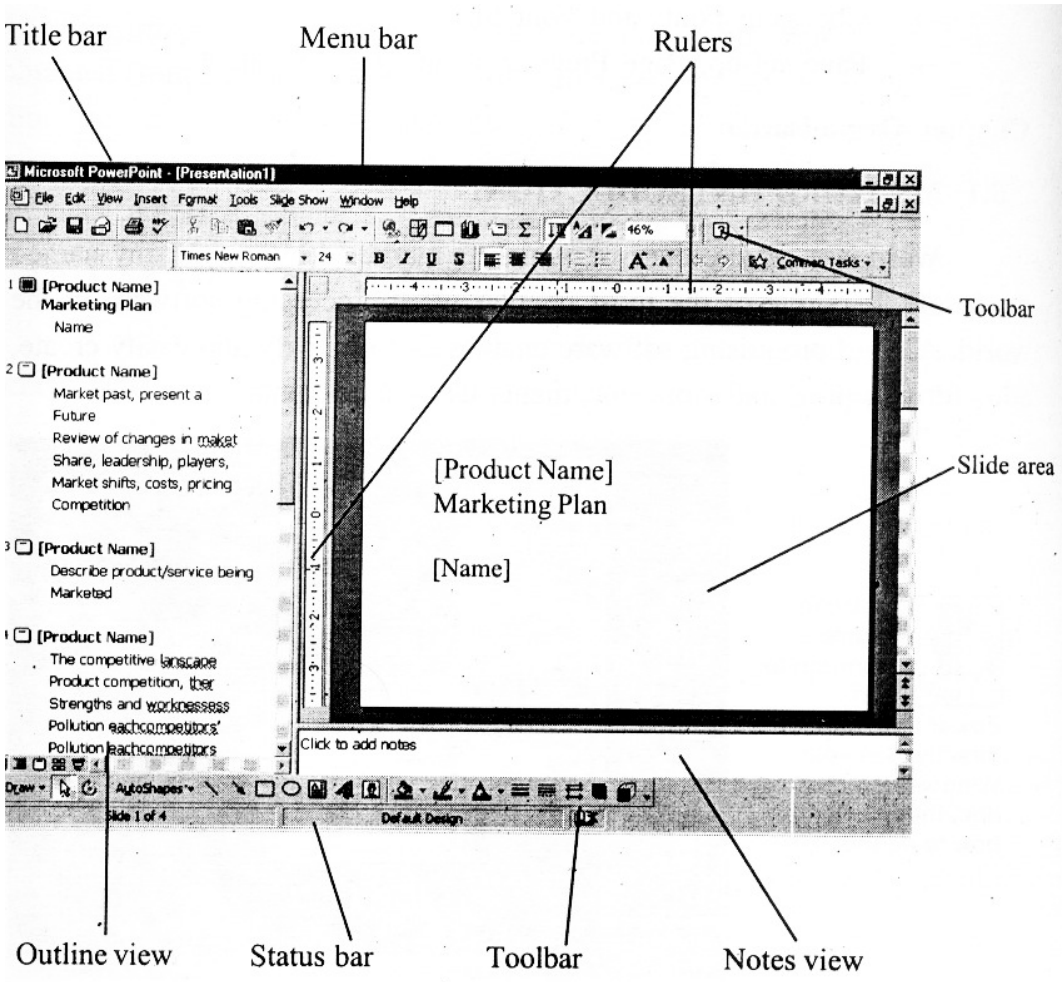
Word is a word processor, which is marketed by a company named microsoft. It is one of the most popular word-processing software in the world. A word processing software enables us to quickly and easily create, edit, format, print and store documents using a computer.

The steps to activate Word are:

1. Click on the start button in the taskbar.
2. Select the programs option from the start Menu.
3. Click on the Microsoft Word option.

   This involves MS-Word and displays a document window.

Components of a Word Window are



Menu Bar: The menu bar contains nine options. File, Edit, Insert Tools, Table, Window and Help. Each of these menu bar items has a dropdown sub menu. A drop down sub-menu comprises a list of options, which are displayed when we click on the Menu bar item.

Title Bar : Title Bar displays the name of the document, which is currently open.

Tool Bar : It is a collection of buttons which are used to perform action similar to those performed using the menu items. The default tool bars are :

Standard tool bar -provides shortcuts for menu commands.

Formatting tool bar -helps in formatting text in a document.

Work space -is the area where the text is typed.

Insertion point -is the blinking vertical cursor that indicates the position on the screen where the text or graphics have to be inserted. It is also called a cursor.

View buttons -enable us to view a document in different formats.

Status bar -status bar display the page number, column and line number on 'which the cursor is positioned in the active document.

Vertical Scroll bar -is used to scroll the document vertically.

Horizontal Scroll bar -is used to scroll the document horizontally.

19.4 CREATING AND FORMATTING A DOCUMENT

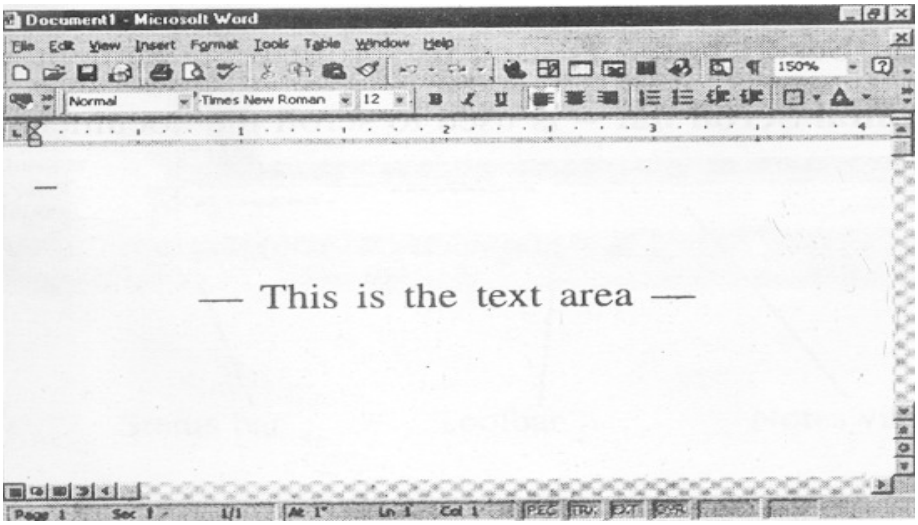
19.4.1 Creating a Document

Steps to create a new document are :

1. Select the New option from File Menu

   A New Dialog Box is displayed.

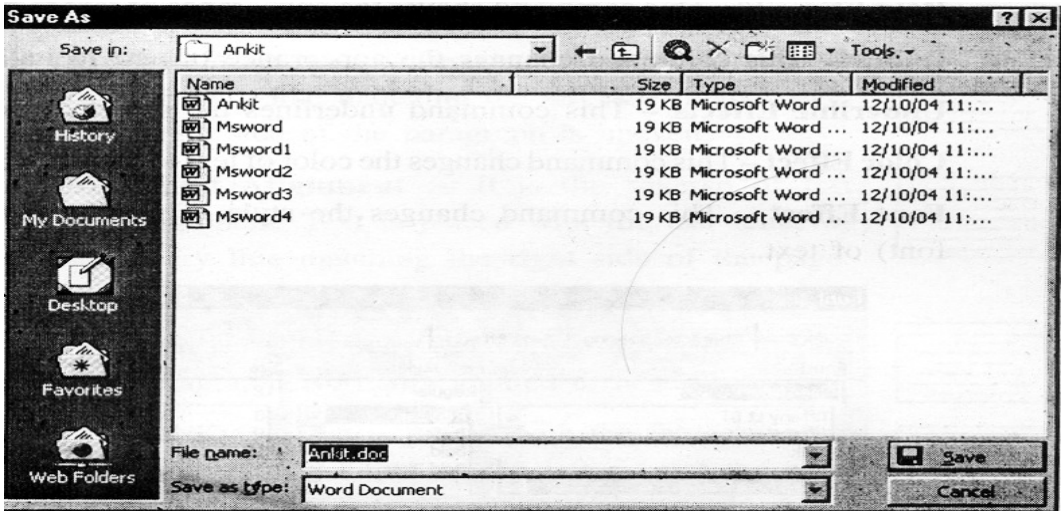
2. Select the Blank document icon.
3. Click on the document radio button in the create new box
4. Click on the OK button.



In order to preserve the document for future use, it needs to be saved on the disk :

The steps are :

1. Select same option from the file menu.
2. Save dialog box is displayed.



3. Type a file same in the file Name Text box

4. Click on the save button

19.4.2. Formating a Document :-

There are 2 types of formats in word.

(a) **Character Formats :** are applicable to selected text.

(b) **Paragraph Formats :** are automatically applicable to entire paragraph.

Character Formatting:

Most character format commands are available in the formatting toolbar. Alternatively these commands are available in the font option of the format menu.

The following options are available :-

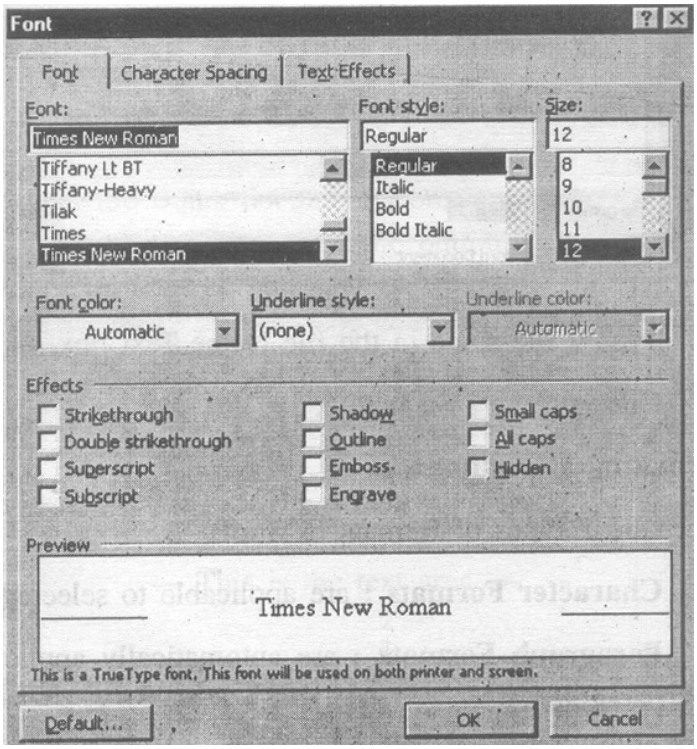
Bold Effect B This command changes the appearance of text to bold.

Italics -This command changes the appearance of text to italics.

Underline Effects -This command underlines the selected text.

Colour Effect -This command changes the colour of text to selected colour.

Font Effect -This command changes the style of writing (called font) of text.



Size Effect -This command changes the size of text.

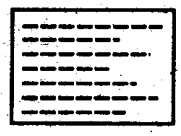
Use the drop down font and size lists on the second toolbar.

Alignment

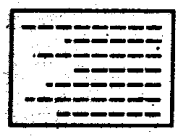
Word allows 4 different alignments- left, right, center and justify.

The alignment commands are also available in the formatting toolbar.

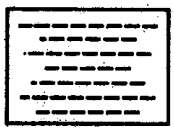
(a) **Left Alignment :-** Text is placed with first letter of every line matching the left side of the page. Right side of the paragraph is uneven.



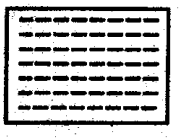
(b) **Right Alignment :-** It is the reverse of left alignment Text is placed with the last letter of every line matching the right side of the page. Left side of the paragraph is uneven.



(c) **Centre Alignment** :- Centres every line of the paragraph. Normally applied to headings.



(d) **Justify:**- Text is placed with the first character of every line matching the left side of the page and the last character of every line matching the right side of the page. Both the sides are smooth



19.5 LESSON END EXERCISE

1. What is MS Word?
2. What are the steps of creating a document in MS Word?
3. Write down the steps of formatting of a document?

MS - WORD II

20.1 INTRODUCTION

In this lesson, you will study more about MS-Word.

20.2. OBJECTIVES:

The chapter aims at helping students learn how to change fonts styles and size. You will also know how to page set and print word documents.

20.3. CHANGING FONTS AND POINT SIZE

In Microsoft Word, a user can change the properties of any text including font type, size, color, as well as making it bold, italic or underlined. The following picture is a graphic illustration of the Microsoft Format bar, as well as a description of each of the tools contained within it.

Tip: In Word 2003 or earlier, if you do not see this bar when you open Word, click **View**, then **Toolbars**, and make sure **Formatting** has a check next to it.

Changing font type

To change the font type within a Microsoft Word document, follow the steps below.

1. Highlight the text you want to change.
2. Click the down arrow next to the font field on the format bar. (If you want to change the font to bold, italic, or underlined, click on the B, I, or U on the format bar.)
3. After clicking the down arrow for the font, you should be able to select from each of the installed fonts on your computer. Click the font you want to use and the highlighted text will change.

Note: If you do not highlight any text, the font type will change as soon as you type new text.

Changing font size

To change the font size within Microsoft Word, follow the steps below.

1. Highlight the text you want to change.
2. Click the down arrow next to the size box on the format bar. Often, the default size is 12, as shown in the above example.
3. After clicking the down arrow for the size, you should have a selection of different sizes to choose. Some fonts may not scale properly, so they may have limited size options.

Note: **If you do not highlight any text, the font size will change as soon as you type new text.**

Changing font color

To change the font color, follow the steps below.

1. Highlight the text you want to change.
2. Click the down arrow next to the color icon. It is usually displayed as the letter "A" with a red underline, as shown in the example above.
3. After clicking the down arrow for the color, select the color you want to make the text.

Note: If you do not highlight any text, the font color will change as soon as you type new text.

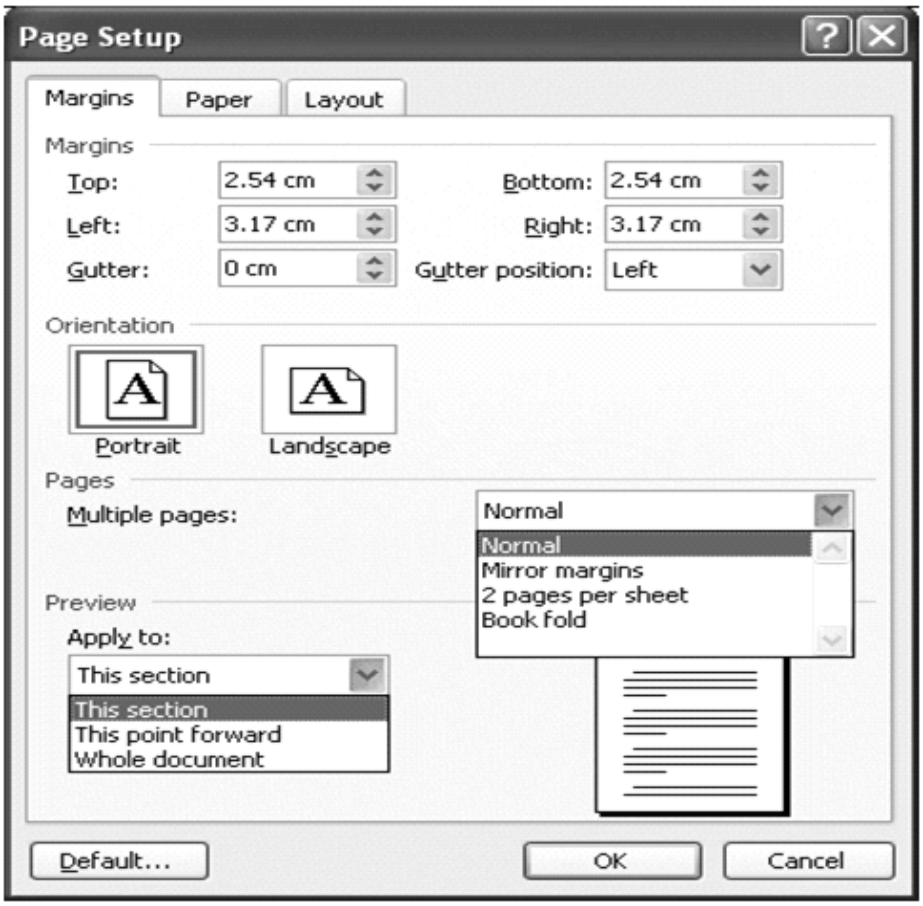
20.4. PAGE SETUP, PRINT PREVIEW AND PRINTING A DOCUMENT

Page setup

Word offers you several options to change the presentation of the text such as to put the text in bold, in italic or in underlined. It's also possible to change the font as well as cut its letters and its colors from the others. The pagination allows you to control the options of presentation of your document on paper. You can change the margins, the size(format) of the paper, the orientation of the paper and the other options that will be explained below on this page.

- From the **File** menu, select the option **Page setup** option.

Click on the **Margins** tab.

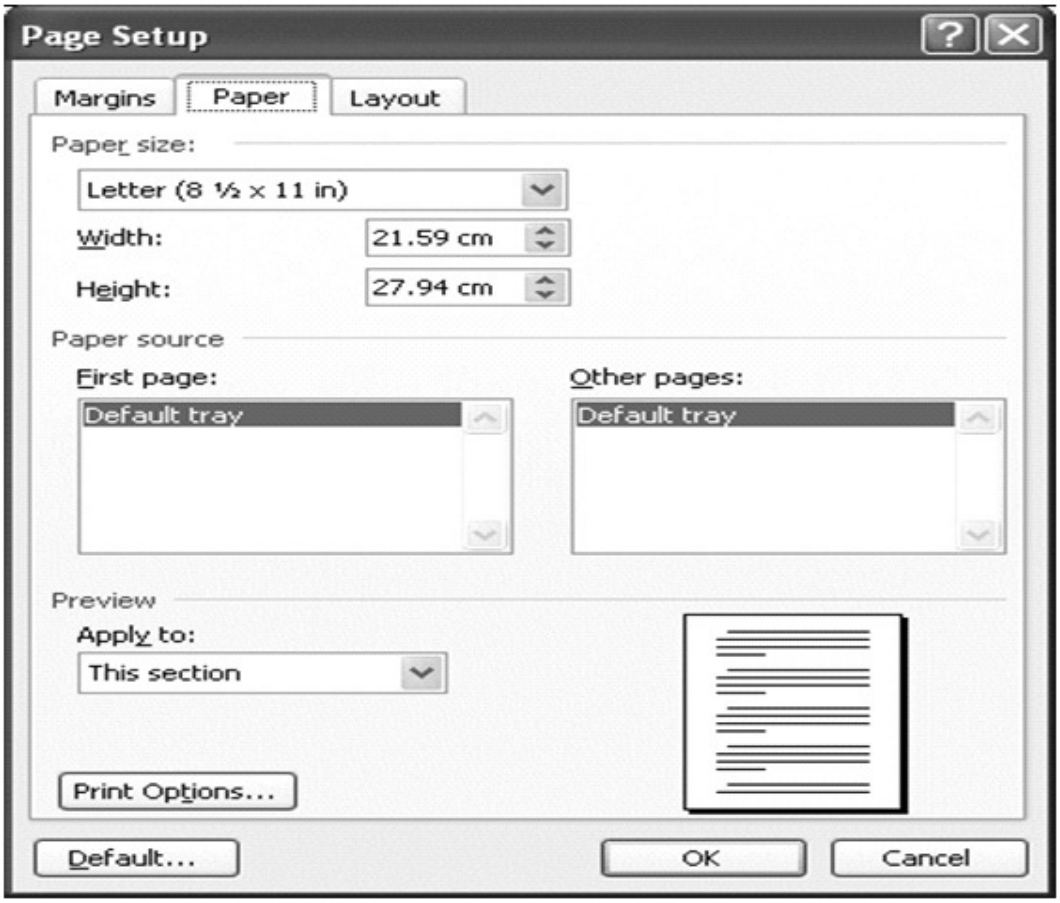


Under this tab, you can control the margins of the document as well as the place of the heading and the foot of page inside the superior margins and subordinates. The option of binding is to add a supplementary space of the left-hand side to be able to connect the document.

In the left lower corner, the option " Pages in towards " can be very important. This option controls the margins for impressions(printings) " first side reverse " or for the impressions(printings) on both sides of a sheet. The right and left margins are transformed into internal margins and outsides.

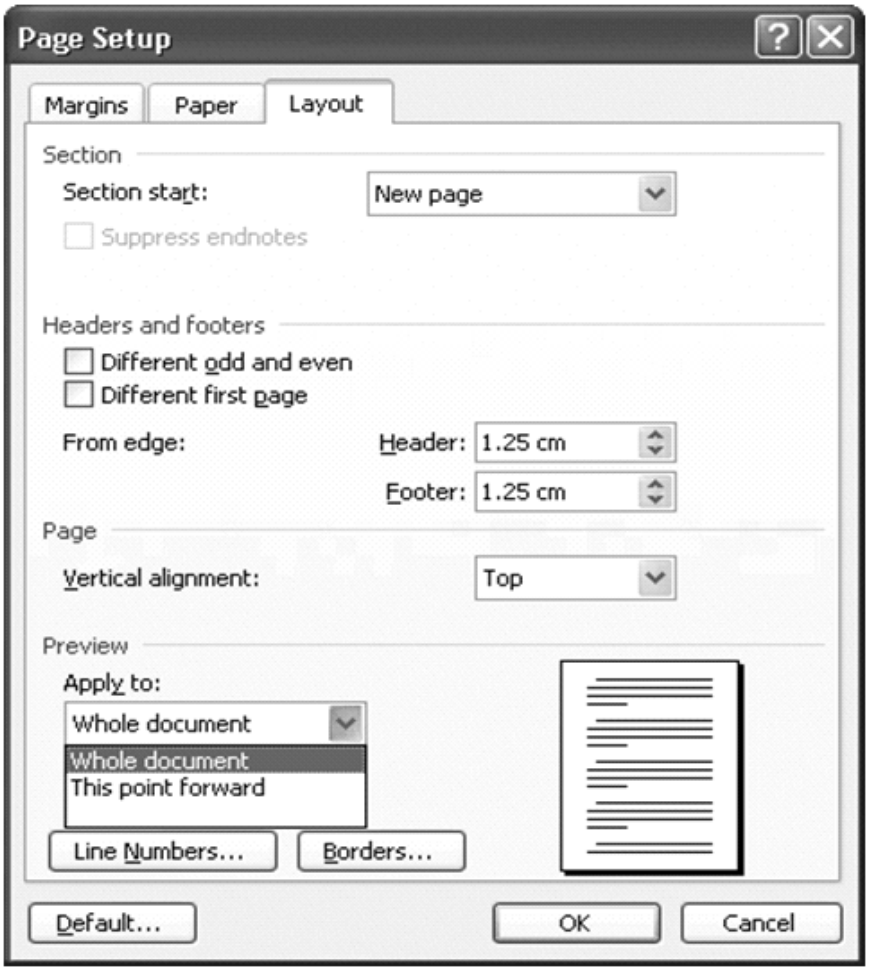
The option To apply is important too. It's from this option that you apply the changes that you brought to the margins or to the other options for all the document or only from the place where is the cursor at this moment. If you use the option " From this point ", it forces the addition of a jump of section.

- Click on the **Paper** tab.



From this window, you can change the size(format) of the paper as well as its orientation. It's especially necessary to pay attention to the size(format) of the paper. Some notice too late that they have the bad size(format) of paper. Generally, the size(format) of the paper is in " A4 " when it should be for the size(format) " US Letter ". The size(format) A4 is the one that is used in Europe and not in North America. make sure to have the right size(format) before continuing or even beginning a new document. Otherwise, you'll not only have to change the size(format) of the paper but also the presentation of your document.

- Click on the **Layout** tab.



You can control the food of the paper in the printer. You can decide to let the computer take charge automatically of the food or to change it if your printer has several tubs of papers or for an printing on some special paper. Unless a special need, leave the options with " Tub by default ".

Under this tab, there are several options to control the arrangement of the text on the page. From these, there is a place of the debuts of section. I don't see the advantage of this option because you may insert a jump of section any time and the necessary type from the **Insert** menu.

The options in the category of Headers and the feet of page are more interesting. They are used when you print first side reverse. For example, the place of the numbering of pages can be different on an even page that on an odd page. With the option " different Front page", the heading of the front page of your document can have supplementary elements such as the corporate logo and the address of the company. This heading will not be on the other pages of the document. You can put the another heading for the rest of the document.

The option of vertical adaptation brings the advantage of power to centre vertically the contents of the page. It's now useless to try to centre manually. This is very advantageous for the page an picture, but not titles of the document or for a page with a table or for a common page. The option "Height" is generally used for the rest of the document.

To end, there is an option for the numbering of rows. It's rarely used, unless being paid among rows of text.

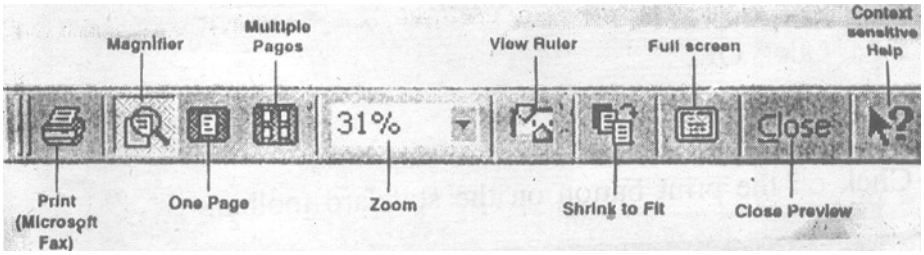
Preview

Previewing A Document

Print preview displays the document exactly the way it will appear after printing. Always preview before Printing to spot mistakes and avoid reprinting.

To preview click the Print Preview button on the Print Preview standard Toolbar. You can also select the Print Preview command from the file menu.

The print preview, shows the entire page in one screen and the print preview toolbar.



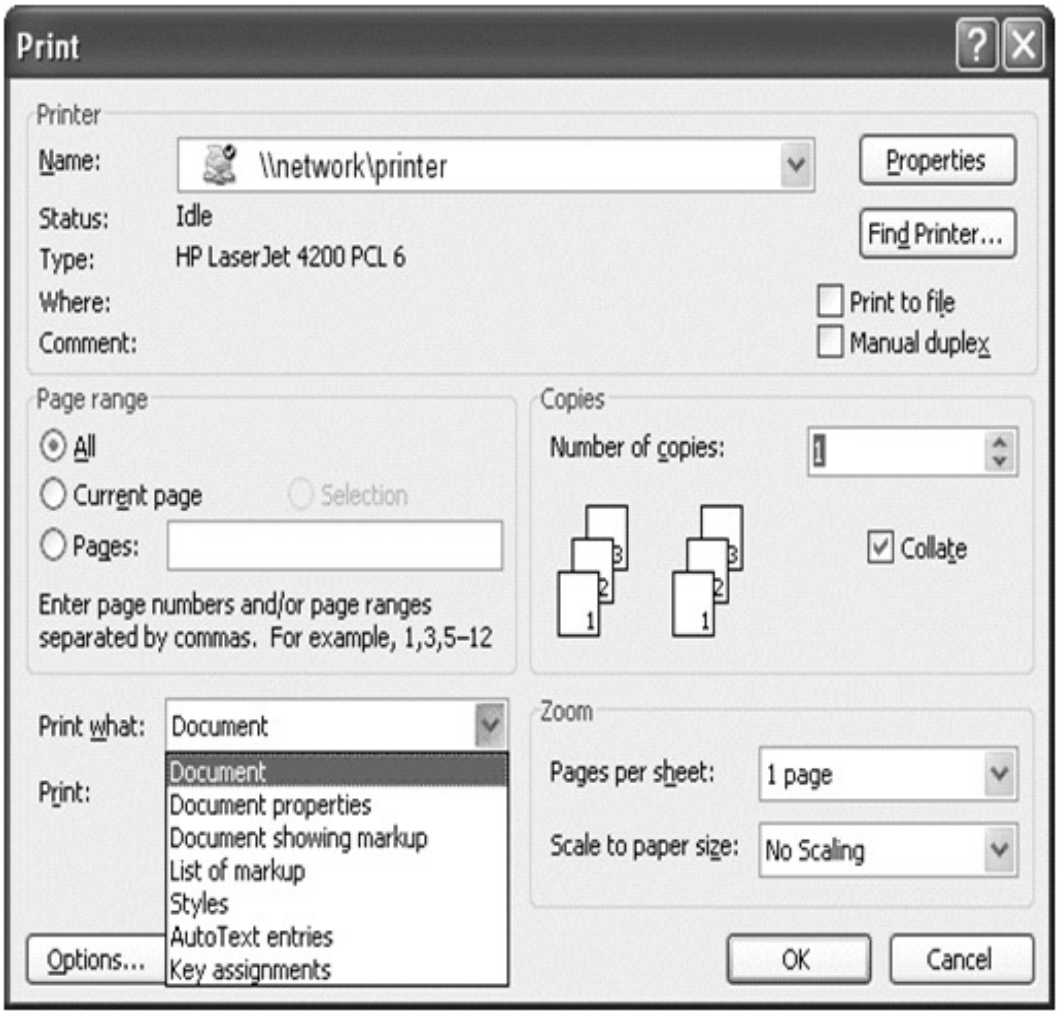
Printing a Word Document

You can print all your document by pressing on the button. However, Word offers you also several options for the printing.

- From the **File** menu, select the **Print** option.

You can first select the printer of your choice. This is practical if you have access to several printers from your workstation. It's however necessary to pay attention. The presentation of your document changes according to the printer that you chose. It's necessary to select the good printer and to make a preview before printing to make sure to have the good result in the printing.

You can also control the vast of your printing. You can print all the document, the page where is the cursor at this moment, the block of text that you selected or certain pages in your choice.


Print
Printer
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Properties
Status:
Idle
Find Printer...
Type:
HP LaserJet 4200 PCL 6
Where:
Print to file
Comment:
Manual duplex
Page range
All
Current page
Selection
Pages:
Enter page numbers and/or page ranges separated by commas. For example, 1,3,5–12
Copies
Number of copies:
1
Collate
Print what:
Document
Document
Document properties
Document showing markup
List of markup
Styles
AutoText entries
Key assignments
Print:
Zoom
Pages per sheet:
1 page
Scale to paper size:
No Scaling
Options...
OK
Cancel

Sometime, you don't want to print a document completely but only a couple of pages. The last option of the section on the area offers you this possibility. It's necessary just to know that you must put a semicolon **(;)** between every page or block of page. It's necessary to put a hyphen **(-)** between the first and the back page of a series of pages to be printed. There is a small example at the foot of the window. In this example, you could print pages 1 , 3 , 5 - 12 up to and including as well as page 14 of your document (1; 3; 5-12; 14).

You have also the control on the number of copies that will be printed. This is practical if you have to print a document for several persons for a report, a committee or a meeting. leave the option with " assembled Copies ". Otherwise, you should replace in order all the pages of your copies.

Most of the time, you'll want to print the document. But you can take advantage of the other possibilities such as the printing of the properties of the document or the comments.

The last option allows you to print all the pages or the pages odd peers or pages. One of the advantages of this option is to be able to print manually a document in first side reverse. Here are the stages.

- Select the option of printing of pages indiscretions and print all the document.
- Invert the paper and put back it in the tub of the printer.
- Select the option of printing of pages peers.
- Press the **Options** button in the left lower corner of the Print window.

20.5. LESSON END EXERCISE

1. Describe the process of creating and formatting a word document.
2. Explain the steps involved in changing the font style and size in word document.
3. Explain the process of printing a document.

MS-POWERPOINT I

21.1 INTRODUCTION

In this lesson, you will learn/understand more about MS Powerpoint.

21.2. OBJECTIVE:

The main objective is to enable students to learn about MS Powerpoint. They will be equipped to learn how to make power point presentations and use them for various purposes. The students should also know about the auto content option and usage of clip art and word art gallery.

21.3 MS-POWERPOINT I

MS PowerPoint is a powerful tool which helps us to communicate our views and ideas effectively using diagrams, photos, clip arts, sounds, designs and animated special effects.

21.4. STARTING POWERPOINT

This section describes how to start PowerPoint, what you will see when you first open the program, and how to start creating a presentation from scratch.

Step 1: To start PowerPoint, go to the Start menu and select Programs ->Microsoft Office ->Power Point.

Step 2: PowerPoint opens in " Normal" view. In normal view, you will see the following:

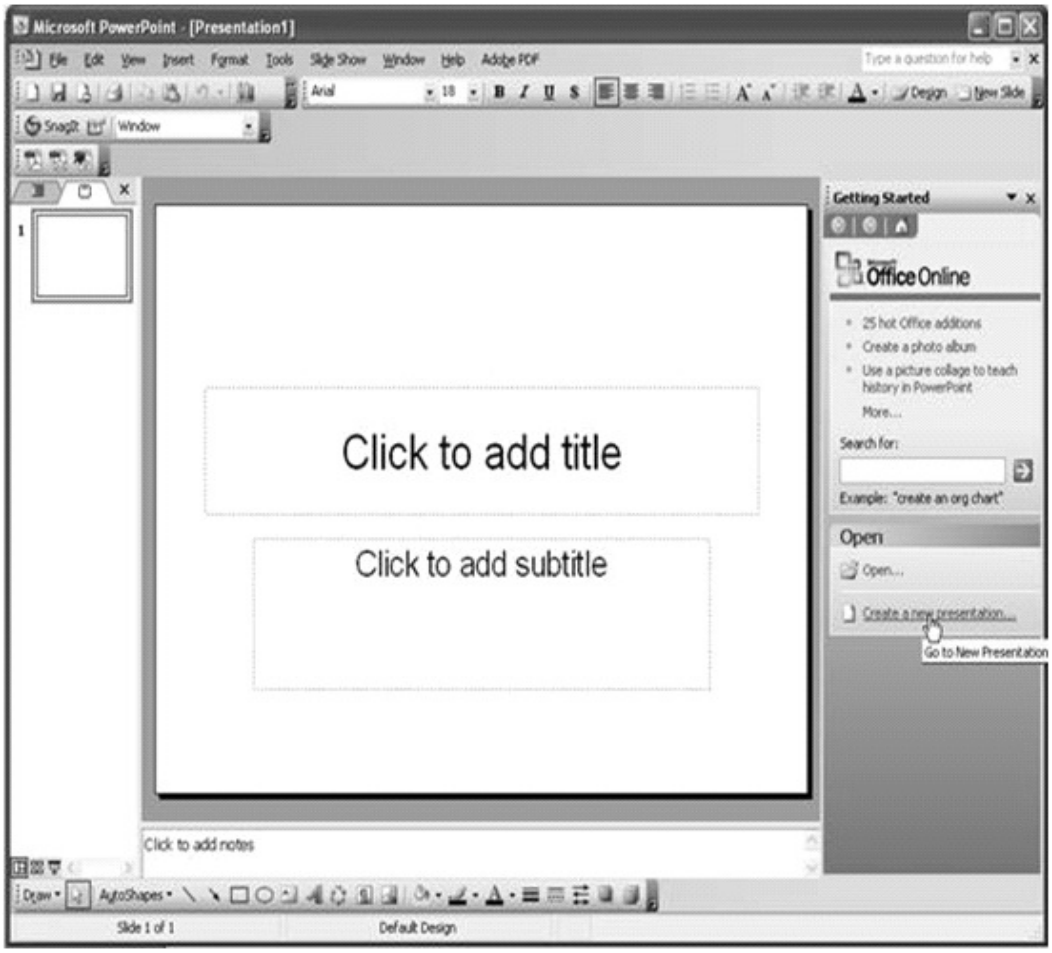
• A blank slide in the center of the window.

• Off to the left, a "Slides" pane that will display a thumbnail sketch of all the slides in your presentation, in sequence.

• Off to the right, a "Task" pane that will display the following options for getting started:

i. "Open," to open a pre-existing presentation.

ii. "Create a new presentation," to start a new presentation.



Step 3: Click "Create a new presentation" to start a new presentation.

Step 4: Click "Blank presentation" to create a presentation from scratch. Your other options here are "From design template," "From AutoContent wizard" and "From existing presentation."

Step 5: Click on a desired layout from the choices that appear in the task pane. A discussion of layouts follows in the next section.

Layouts, Text and Slides

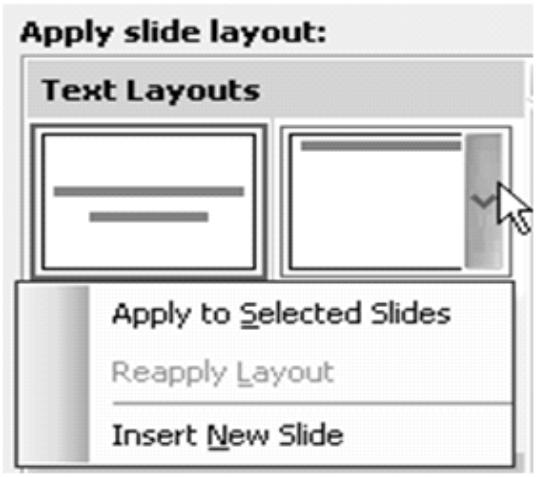
This section describes how to apply a layout; insert, format, and delete text; and insert and delete slides.

To apply a layout to your new slide:

Step 1: Scroll through the available layouts in the "Slide Layout" task pane off to the right.

Step 2: Click on the layout you would like to apply to your slides.

NOTE: You may change the layout of all or some of your slides at any point while working on your presentation. To apply a layout to only certain slides, select the slides you want in the slide pane on the left, and then go to the task pane on the right. Click the downward arrow button on the right side of the layout you want in the task pane on the right. You will get a menu that lets you choose "apply to selected slides".



To insert and format text in a slide:

Step 1: Click inside a placeholder.

Step 2: Enter text. You may use the formatting toolbar at the top of the PowerPoint window to apply various formats to your selected text. You may notice this toolbar is identical to the one used in Microsoft Word.

Step 3: When you are finished entering text, click outside the placeholder on some "empty space."

To delete text :

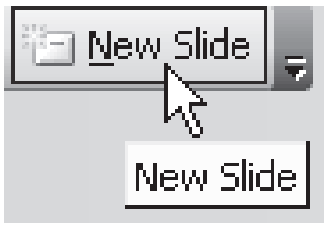
Option #1: Highlight the text you want to delete by dragging the cursor over the letters, and press the delete key.

Option #2: Click on the selection rectangle around the text so that its border changes from hatch marks to dots, and then press the delete key.

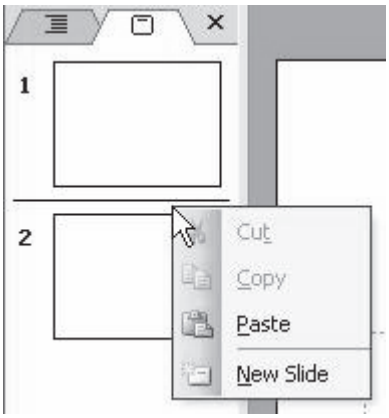
To insert a new slide:

Option #1: Go to Insert->New Slide. A blank slide will appear in the workspace, positioned after the selected slide or slide you were viewing.

Option #2: Click on the "New Slide" button on the formatting toolbar at the top of the PowerPoint window.



Option #3: On the Slides pane (off to the left), position your cursor to the point in the presentation where you would like the new slide to appear (i.e. between slides, at the beginning of the presentation, or at the end of the presentation). Right click, and choose "New slide" from the menu that appears.



To delete a slide :

Option #1: Go to Edit->Delete Slide. The current slide will disappear from the workspace.

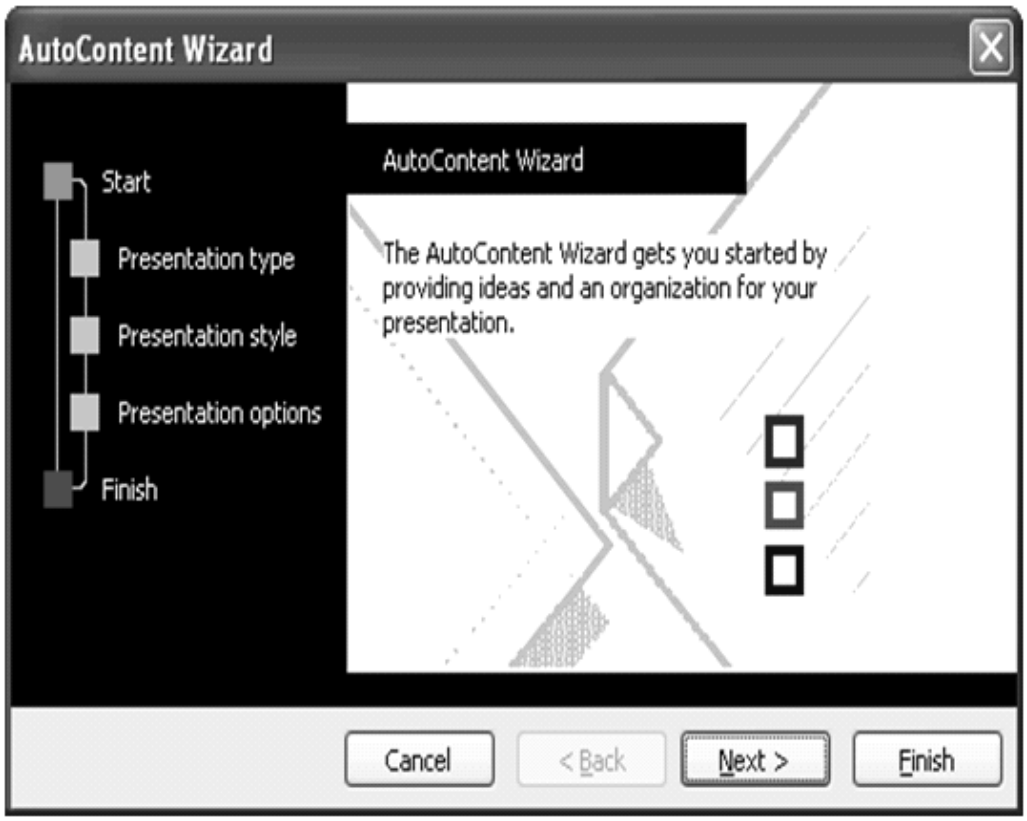
Option #2: On the Slides pane (off to the left), click on the slide you would like to delete, and then hit the <Delete> key.

21.5. AUTO WIZARD, CREATING A PRESENTATION USING AUTO CONTENT WIZARD

PowerPoint has an AutoContent Wizard to help you create a presentation. The wizard provides several slides with different content guides. Presentation guides are available in several areas, including general, corporate, and sales and marketing.

To use the AutoContent Wizard:

- In the **task pane** under **New Presentation**, choose **From AutoContent Wizard**.

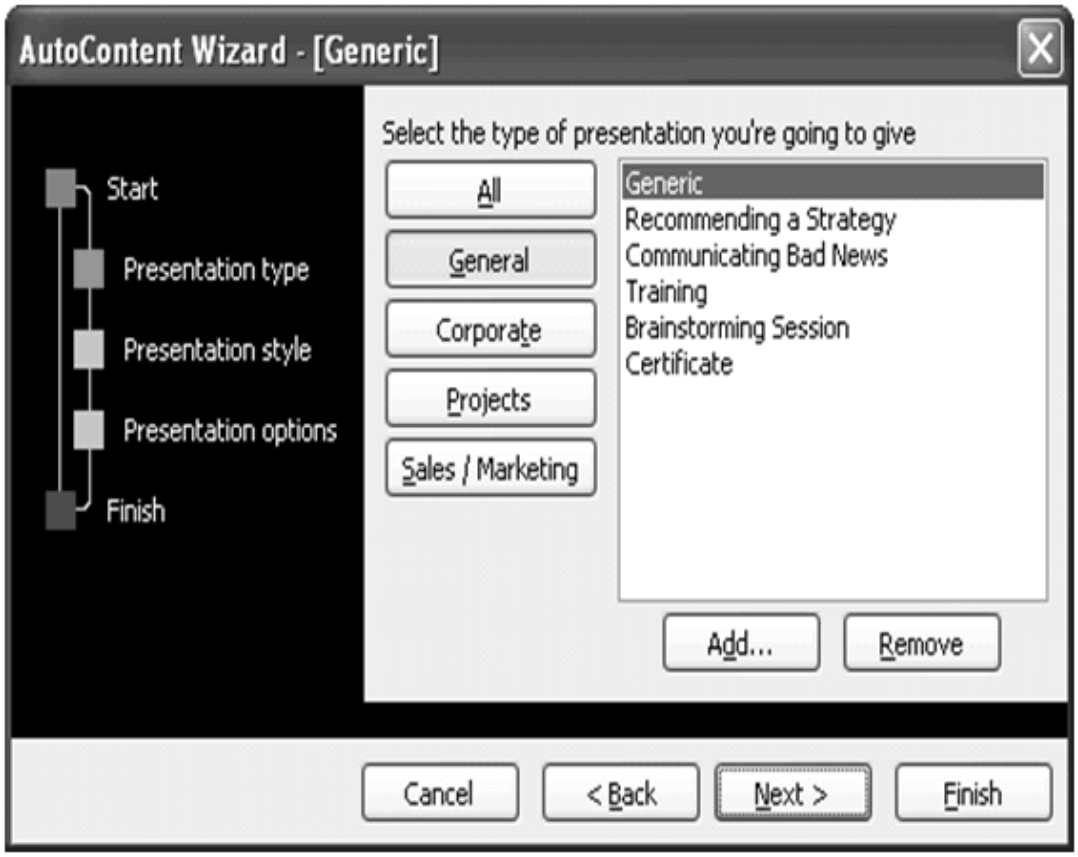


- Click **Next** to see the different presentation options that are available.

Choosing a presentation type

As you continue working in the wizard, think about what you presentation best fits your needs. If you're not sure which choice to make, try **General - Generic**.

- Click **Next** after you have chosen a presentation type.

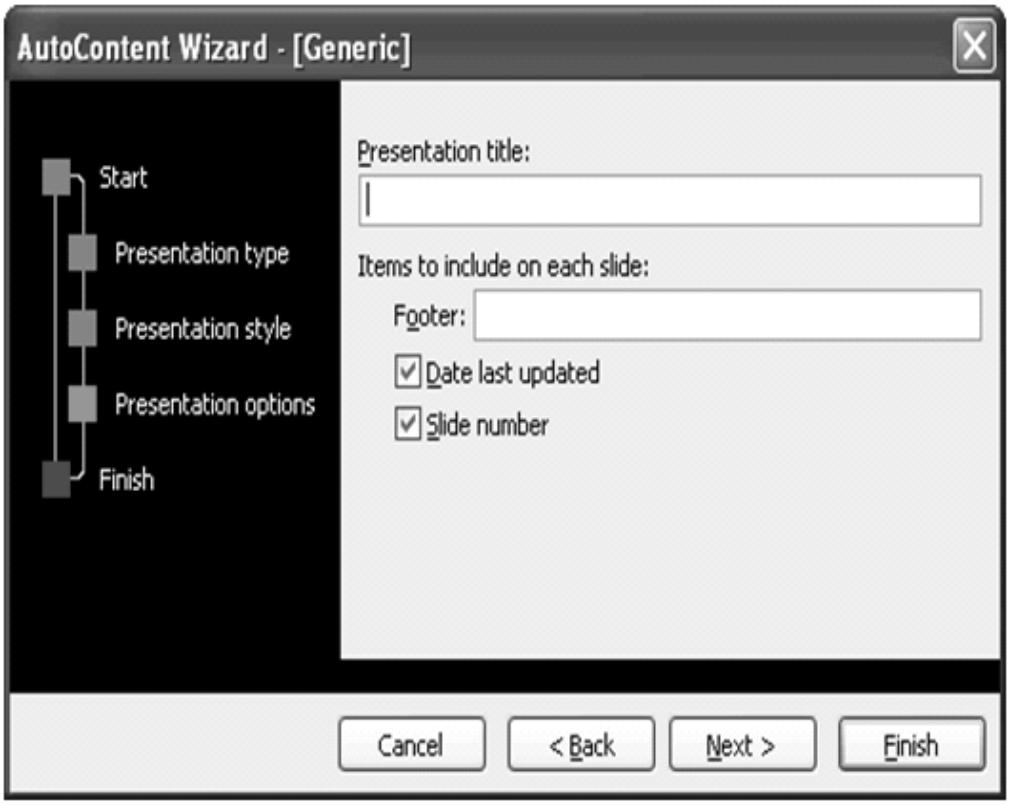


Type of output

The next screen asks, **What type of output will you use?**

- Because you will likely be doing an **On-screen presentation**, click inside the circle next to On-screen presentation. Or, if you are not, feel free to choose another presentation type.
- Click **Next**.

On the next screen, you can type in your **Presentation Title**. Add a footer if necessary.



* Click **Next**.

- The last AutoContent Wizard dialog box appears.
- **Click Finish**.

Your slides will appear, and you can go through each one and make changes to the content. Edit the slides in **Outline View** in the left pane, or type directly into the slides in the center pane.

Making changes to content

When you use the AutoContent Wizard, the slides that result are a guide for your actual content. Make the changes necessary to fit your presentation.

For example, if you are working on a **General - Generic** presentation about your organization and how it helps the community, your first slide might look like this:

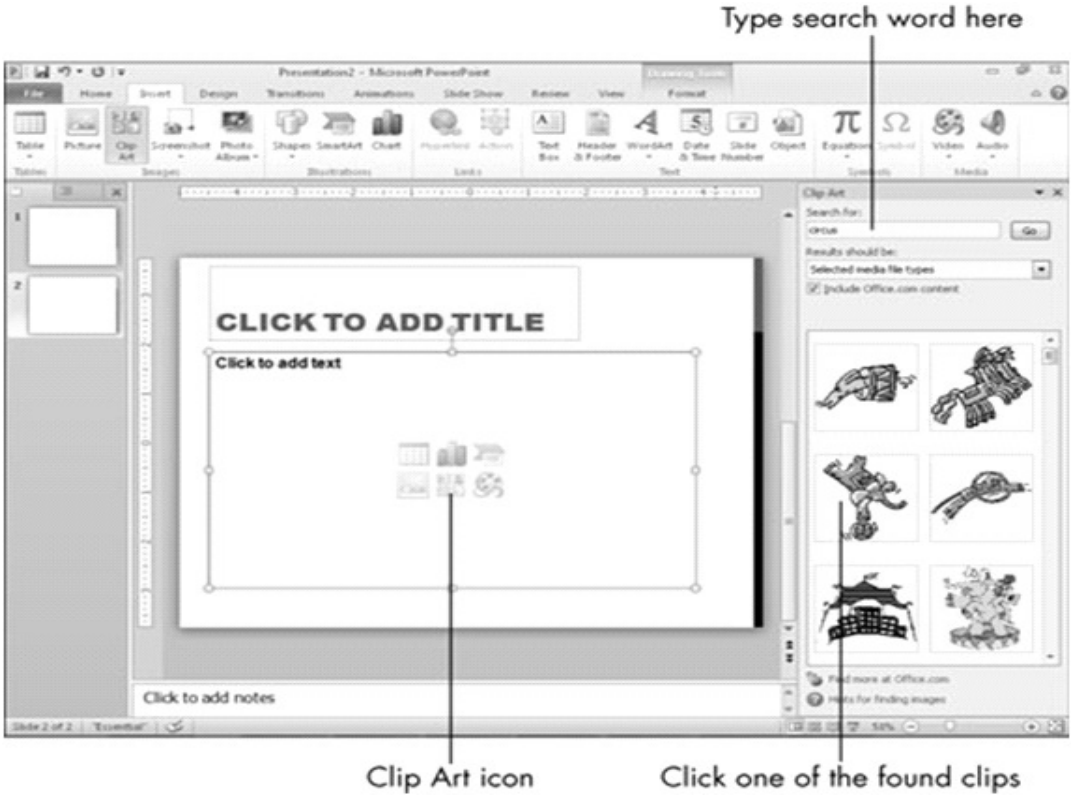
21.6. USING CLIP ART, WORD ART GALLERY

Clip Art: Microsoft Clip Art encompasses the illustrations, photos, and images provided with each Office program. Clip Art can be used in PowerPoint presentations to illustrate the slides and make more of an impact on the audience. There is a wide variety of different Clip Art images that can be used, in a variety of categories.

Clip art is pre drawn generic artwork, and Microsoft provides many clip art files for free with its Office products. We can insert clip art into the PowerPoint slide layout.

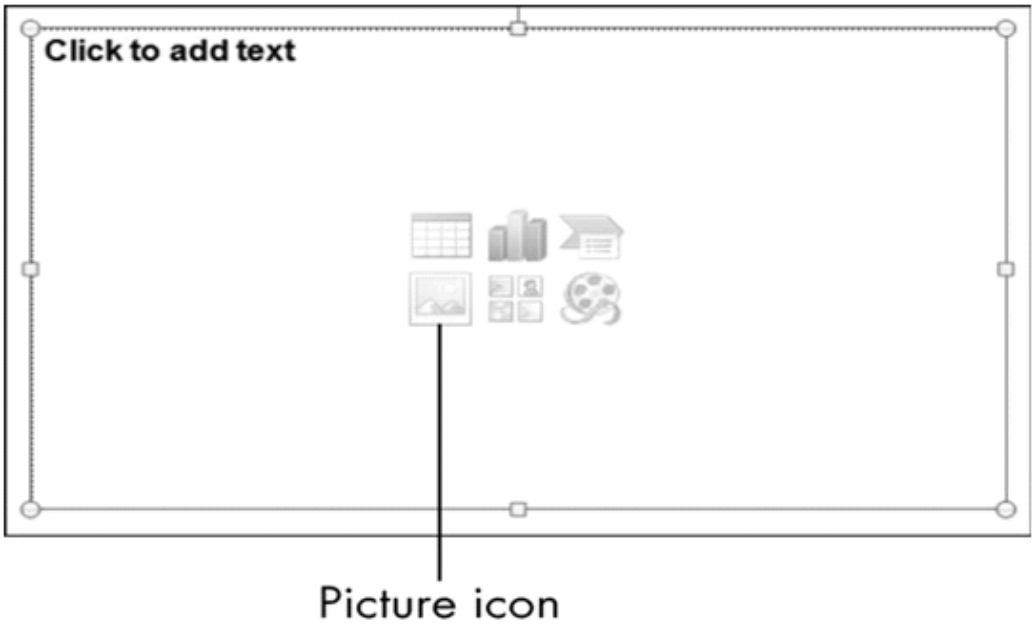
The easiest way to insert clip art is by using one of the placeholders on a slide layout:

1. Display a slide that contains a Clip Art icon on one of its placeholders.



If the current layout doesn't contain a Clip Art icon as a placeholder, switch to a different layout or delete the existing content from the Content placeholder so that the Clip Art icon is available in it.

1. Click the Clip Art icon to open the Clip Art task pane.



In the Search For box, type a word that describes the artwork you want; then click the Go button.

Samples of the available clips appear. If your Internet connection is active, PowerPoint also includes clips from the Internet in the search results.

1. Click the clip you want.

   It's inserted in the placeholder.

2. (Optional) Move or resize the image as desired.

   To move the image, drag it by its center. To resize the image, drag a selection handle around the edge.

You can also insert clip art as independent objects on slides, separate from the layout placeholders. To do so, do *not* select a placeholder on the slide. Instead, just display the slide and then choose Insert - Clip Art to open the Clip Art task pane and go from there.

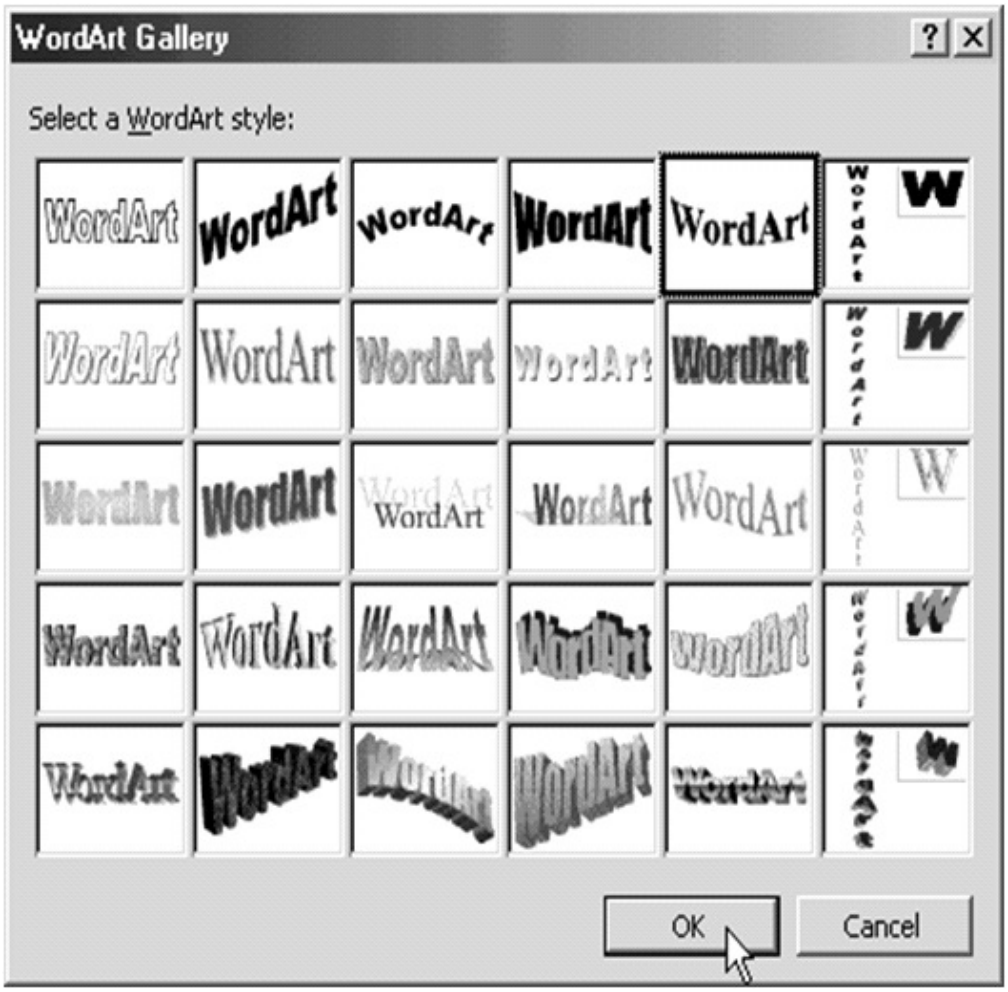
Word Art Gallery: WordArt is colorful, artful text that is available in a variety of styles. It allows us to create interesting titles, logos, and text in the presentation.

Browse the WordArt Gallery, and choose the various designs to add a different look to the text in your slides.

To insert WordArt:

Click the **WordArt button** on the **Drawing toolbar**.

The **WordArt Gallery** appears.



- Choose the **WordArt** that best fits your slide presentation.
- Click OK.
- The **WordArt** appears in your slide. You can drag it wherever you want it to appear on your slide.
- Type any text you want to display. This type will display instead of the web address.
- Click OK.

You can also add Clip Art, AutoShapes, hyperlinks, and charts to your presentation.

COMPUTER BASICS

MS-POWERPOINT- II

22.1 INTRODUCTION

In this lesson, you will understand about applications of MS Powerpoint, how to work on MS Powerpoint.

22.2. OBJECTIVE

The main objective is to enable students to learn about some essentials of working on MS Power point. They should learn about addition of transitions and animations in a power point presentation. The students should also know about preparation of note pages, audience handouts and printing of presentation documents

22.3. ADDING TRANSITIONS AND ANIMATION EFFECTS

Animations control how objects move onto, off on and around your slides. Transitions control how your presentation moves from one slide to the next. This section teaches you how to create animations and transitions.

Add Animations: You can animate the objects on your PowerPoint slides. PowerPoint provides four types of animations: Entrance, Emphasis, Exit, and Motion Paths.

An Entrance animation determines the manner in which an object appears on a slide; for example, an object can move onto a slide.

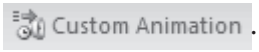
An Emphasis animation does something to draw attention to an object; for example, the object can become larger. An Exit animation determines the manner in which an object leaves a slide; for example, an object can move off a slide. A Motion Paths animation determines how an object moves around a slide; for example, an object can move from left to right.

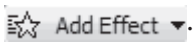
After you add an animation, you can use the Custom Animation pane to modify it by choosing an effect. Choosing an effect enables you to define what starts the animation, its properties (such the direction from which an object moves onto the slide), and control the speed of the animation. In addition, you can have an animation start when you click the mouse, start along with the previous animation, or start at a specified time after the previous animation.

If the Auto Preview box is checked on the Custom Animation pane, PowerPoint provides you with preview of your animation after you create it and each time you modify it. You can also use the Play button 

on the Custom Animation pane to preview an animation.

To choose an effect:

1. Select the object you want to animate.
2. Choose the Animations tab.
3. Click the Custom Animation button 

. The Custom Animation pane appears.
4. Click the Add Effect button 

. A menu appears.
5. Choose the type of effect you want. A submenu appears.
6. Click the effect you want. PowerPoint applies the effect.

To modify an effect:

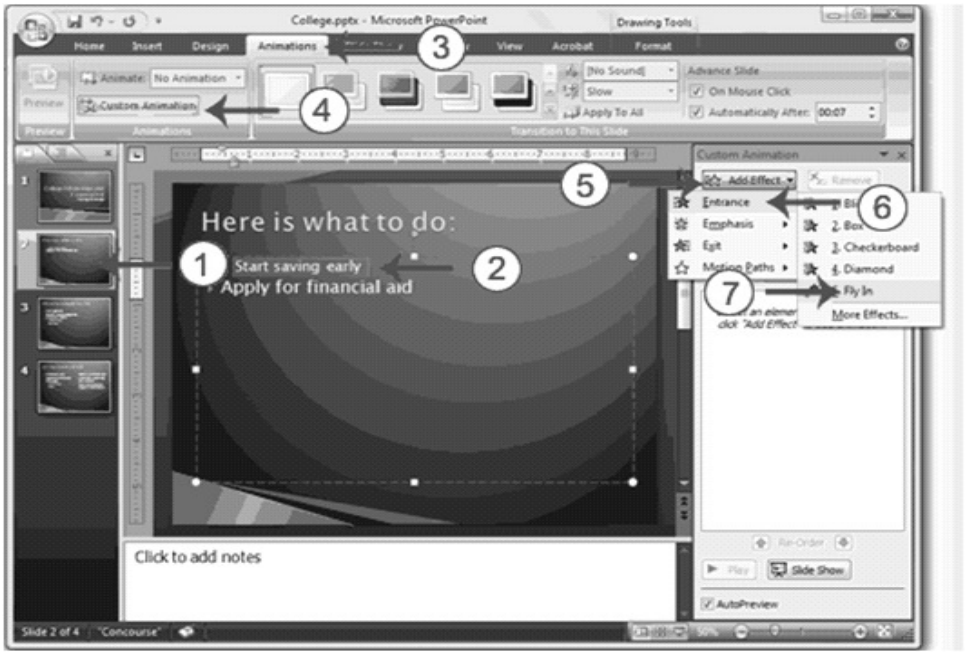
1. Click the down arrow next to the Start field on the Custom Animations pane and then select the start method you want.

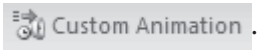
2. Click the down arrow next to the Property field on the Custom Animations pane and the select the property you want. The Property field might be labeled Direction, Size, or some other property.

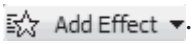
3. Click the down arrow next to the Speed field on the Custom Animations pane and then select the speed you want to apply to your animation.

To preview the animation, click the Play button ▶ Play on the Custom Animations pane.

Exercise: Add an Animation to a Slide



1. Click Slide 2 on the Slides tab.
2. Select "Start saving early."
3. Choose the Animations tab.
4. Click the Custom Animation button 

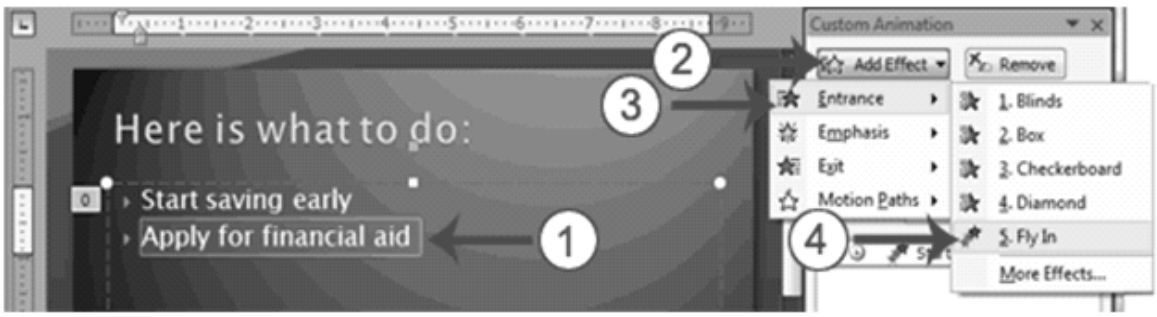
. The Custom Animation pane appears.
5. Click the Add Effect button 

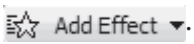
. A menu appears.
6. Choose Entrance. A submenu appears.
7. Click Fly In. PowerPoint applies the effect. If the Auto preview box is checked, PowerPoint automatically provides you with a preview of the animation.

Modify the Effect

1. Click the down arrow next to the Start field and then select After Previous.
2. Click the down arrow next to the Direction field and then select From Bottom.
3. Click the down arrow next to the Speed field and then select Medium.

Add Another Animation



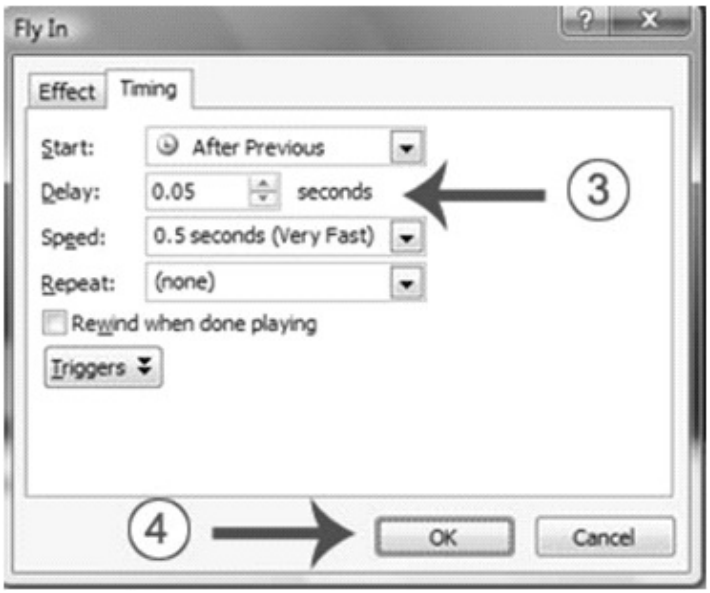
1. Select "Apply for financial aid."
2. Click the Add Effect button 

. A menu appears.

1. Choose Entrance. A submenu appears.
2. Click Fly In. PowerPoint applies the effect. If the Auto preview box is checked, PowerPoint automatically provides you with a preview of the animation.

Modify the Animation

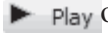
1. Click the down arrow next to the Start field and then select After Previous. The Apply for Financial Aid field appears in the center of the Custom Animation pane.
2. Click the down arrow next to the Apply for Financial Aid field and then click Timing. The Fly In dialog box appears.



3. Type **0.05** in the Delay text box.

4. Click OK.

5. Click the down arrow next to the Direction field and then select From Bottom.

6. Click the down arrow next to the Speed field and then select Medium. If the Auto preview box is checked, PowerPoint automatically provides you with a preview of the animation. You can click the Play button 

on the Custom Animation pane at anytime to preview an animation.

Add Transitions

Transitions determine how your presentations move from one slide to the next. For example, a slide can move up onto the screen and replace the previous slide. PowerPoint provides several transition methods. You can add sound to a transition and you can control its speed. You can apply a transition to selected slides or to all of the slides in your presentation.

A transition can occur when the presenter clicks the mouse or after the amount of time you specify.

To apply a transition to selected slides:

1. On the Slides tab, hold down the Ctrl key and then click the slides to which you want to apply the transition.

2. Choose the Animations tab.

3. Click the More button  in the Transition to this Slide group. A menu of transitions appears.

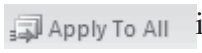
4. Click the transition you want to apply. PowerPoint applies the transition. As you roll your pointer over each transition, PowerPoint provides you with a live preview of the transition.

To apply a transition to all slides:

1. Choose the Animations tab.

2. Click the More button  in the Transition to this Slide group. A menu of transitions appears.

1. Click the transition you want to apply. As you roll your pointer over each transition, PowerPoint provides you with a live preview of the transition.

2. Click the Apply to All button 

in the Transition to This Slide group.

To add a sound to a transition:

1. Choose the Animations tab.

2. Click the down arrow next to the Transition Sound field and then click the sound you want. As you roll your pointer over each sound, PowerPoint plays the sound.

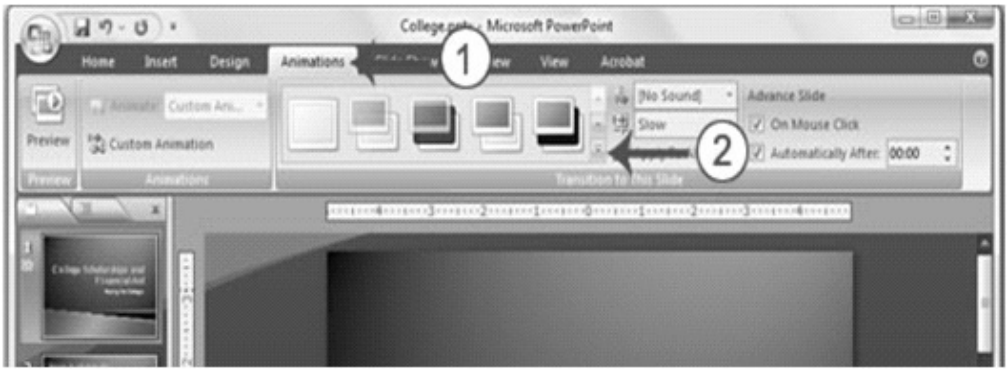
To set the speed of a transition:

1. Choose the Animations tab.

2. Click the down arrow next to the Transition Speed field and then click the speed you want.

If you want the transition to occur after the presenter clicks the mouse, check the On Mouse Click check box. If you want a transition to occur after a specified period of time, check the Automatically After check box and then specify the amount of time you want to elapse before the transition occurs. The On Mouse Click check box and the Automatically After check box are both located on the Animations tab in the Transition to This Slide group.

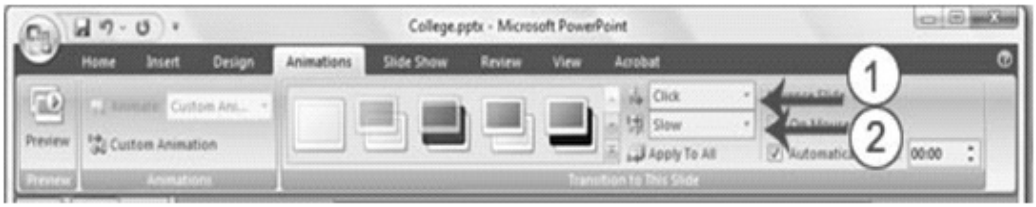
EXERCISE: Add Transitions



1. Choose the Animations tab.
2. Click the More button in the Transition to this Slide group. A menu of transitions appears.

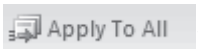
3. Click the Push Up transition. As you roll your pointer over each transition, PowerPoint provides you with a live preview of the transition.

Add Sound and Set the Speed



1. Click the down arrow next to the Transition Sound field and then click Click.
2. Click the down arrow next to the Transition Speed field and then click Slow.

Advance Slide

1. Check the On Mouse Click check box.
2. Click the Automatically After check box.
3. Type **00:07** in the Automatically After text box.
4. Click the Apply to All button 

. PowerPoint applies all of your changes to all of the slides.
5. Click Slide 1 on the Slides tab.
6. Type **00:03** in the Automatically After text box. PowerPoint changes the timing for Slide 1.

22.4. OTHER OPTIONS FOR SETTING THE TIMING OF SLIDE SHOW

If you would like to have some slides show for longer periods of time to give the viewers a chance to read text or to examine a complicated diagram, then you will need to set the timing for each slide separately. It is best to do this when you are in the slide sorter view where you can see thumbnails (miniatures) of each slide.

1. From slide sorter view.

    - To set the timing for one or more selected slides, select the slide (or slides —> hold the shift key so you can select more than one slide at a time) —> then click on the slide transition icon next to where it says **no transition** or where it says the name of the transition you selected (e.g. box in) above the row of slides —> this causes the **Slide Transition** dialog box appears and you can enter in the number of seconds you want the slide(s) to appear on the screen (as you did above) or you can use the Rehearse Timings option (see below).

2. Rehearse timings. This allows you to set the timings for each individual slide.

    - From the **Slide Show** menu bar —> select **Rehearse Timings**

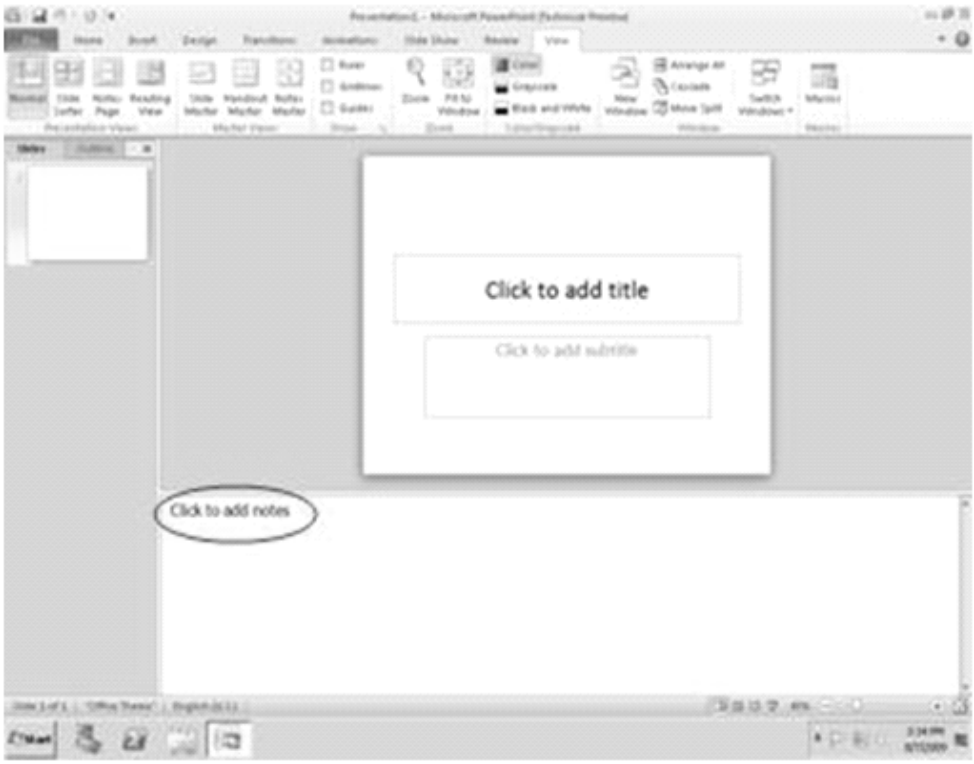
    - As soon as you select rehearse timings first slide will appear along with a timer counting seconds (in the bottom right corner of the screen). The counter will continue to count until you click the right arrow, space bar, or mouse. Once you click, it moves to the next slide and starts the counter for the next slide.

When you finish creating the settings for each slide, a box pops up and lets you choose to accept the timings or start again.

- Record narration: This allows you to set the timings for each slide and at the same time record any comments you want to make to go along with the slide (be sure to check that you microphone is working and that it is selected in the Control Panel under "sound.").

22.5. PREPARING NOTES PAGES

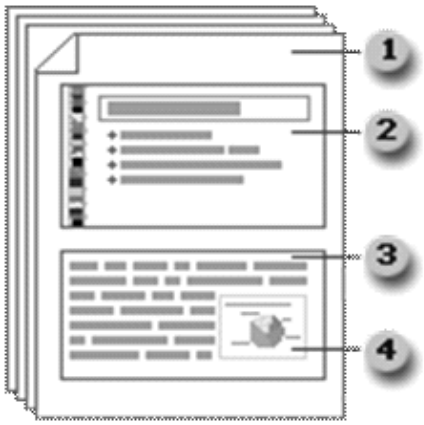
Use the notes pane in Normal view to write notes about your slides. To get to Normal view, on the View tab, in the Presentation Views group, click Normal.



The Notes pane (circled portion) in Normal view

You can type and format your notes as you work in Normal view, but to see how your notes pages will print and to see the full effect of any text formatting, such as font colors, switch to Notes Page view. You can also check and change the headers and footers of your notes in Notes Page view.

Each notes page shows a slide thumbnail, together with the notes that accompany that slide. In Notes Page view, you can embellish your notes with charts, pictures, tables, or other illustrations.



(The following numbers correspond to the numbers in the illustration.)

1. Notes pages include your notes and each slide in the presentation.
2. Each slide prints on its own notes page.
3. Your notes accompany the slide.
4. You can add data, such as charts or pictures, to your notes pages.

As you add notes, keep the following in mind:

- The changes, additions, and deletions that you make on a notes page apply only to that notes page and to the note text in Normal view.
- If you want to enlarge, reposition, or format the slide image area or notes area, make your changes in Notes Page view.
- You can't draw or put pictures in the notes pane in Normal view. Switch to Notes Page view and draw or add the picture there.
- Pictures and objects that you add in Notes Page view appear on your printed notes page, but not on your screen in Normal view.

22.6. PREPARING AUDIENCE HANDOUT

1. Click the Microsoft Office button. A menu appears.
2. Choose Print.
3. Click Print Preview. The Print Preview tab appears.
4. Click the down arrow next to the Print What field in the Page Setup group and then select Handouts (4 slides per page).
5. Click the Print button  . The Print dialog box appears.
6. Click the down arrow next to the Color/Grayscale field to select whether you want your slides to print in color, grayscale, or black and white. If you are using a black and white printer, choose black and white. You will use less ink or toner.
7. Set the other print settings.
8. Click OK. Your handouts print.

22.7. PRINTING PRESENTATION DOCUMENT

To print your presentation:

NOTE: You should always preview before printing, so that you don't waste paper or pay for printouts you did not want.

Step 1:

Go to File->Print Preview. You will be shown a preview of how your printed document will look like.

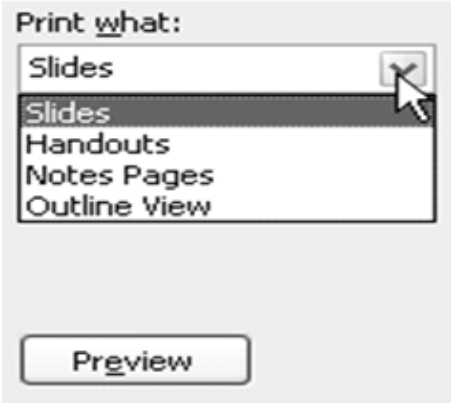
Step 2:

If you are satisfied with the appearance of your document, click on the "Print" button at the top left of the preview window. Otherwise, click on the "Close" button and make any necessary changes.

Choosing Options in the Print dialog box :

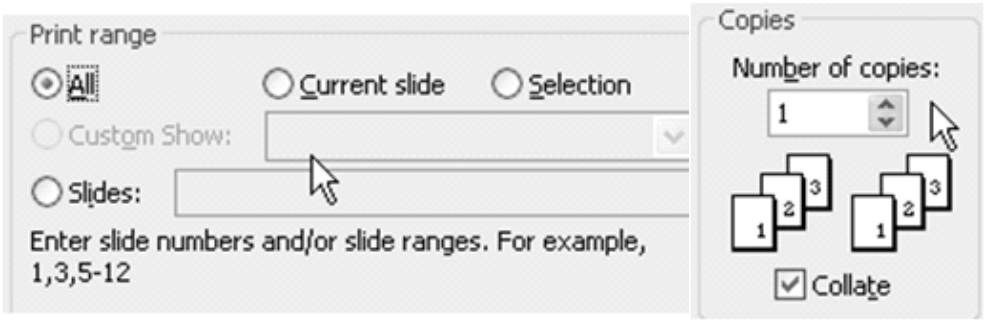
Step 1:

In the Print dialog box, you will see a "drop-down" menu labeled "Print what:" You can choose from Slides, Handouts, Notes Pages, and Outline View. You can preview what each one of these looks like by clicking the <Preview> button in the lower left corner of the Print dialog box.



Step 2:

You also have the ability to choose which slides to print in the Range section of the dialog box, and how many copies in the Copies section of the dialog box.



Step 3: Click the <OK> button to print.

22.8 QUESTIONS FOR REVIEW

1. Describe the steps involved in starting Powerpoint.
2. What is the role of auto wizard in Ms Powerpoint?
3. Describe the process of adding transition and animation effects in powerpoint.
4. How can notes be added in powerpoint?