



Clothing is one of the basic needs and an important part of our life. Clothes protect us from heat, cold, dust, rain and insects. We wear different kinds of clothes according to the climate, weather and place. In winter we wear clothes that make us feel warm and in summer we wear clothes that make us feel cool.

**In this chapter, we will learn about :**

1. Natural fibers— Silk and wool.

## NATURAL FIBRES

Natural fibres, any hair like raw material directly obtainable from an animal, vegetable, or mineral source and convertible into non-woven fabrics such as felt or paper or, after spinning into yarns, into woven cloth. A natural fibre may be further defined as an agglomeration of cells in which the diameter is negligible in comparison with the length. Although nature abounds in fibrous materials, especially cellulosic types such as cotton, wood, grains and straw, only a small number can be used for textile products or other industrial purposes. Let us learn about how silk and wool are produced.



## SILK FIBRE

Silk is a protein fibre made by silkworms and is the only natural fibre that is a filament fiber. Silk is a filament spun by the caterpillars of various butterflies. Silk is a natural protein filament. Its filament density is 1.34 g/cm which makes it a medium weight fibre. Very light weight silk textile materials may be manufactured from silk filaments.



Originally, it was believed that an ancient Chinese princess was the first to discover the process for manufacturing silk fabric from the filament fibre produced by silkworms. Even though this was considered to be a legend, the first country to manufacture silk fabric was China. According to Kadolph, Langford, Hollen and Saddler (1993), China was the only country producing silk for approximately 3,000 years before spreading to other Asian countries. Japan is currently manufacturing more silk than any other country in the world.

Silk has set the standard in luxury fabrics for several millennia. The origin of silk dates back to ancient China. Legend is that a Chinese princess was sipping tea in her garden when a cocoon fell into her cup and the hot tea loosened the long strand of silk. Ancient literature, however, attributes the popularization of silk to the Chinese Empress Si-Ling, to around 2600 B.C. called the Goddess of the Silkworm; Si-Ling apparently raised silkworms and designed a loom for making silk fabrics.

## DIFFERENT TYPES OF SILK

### Wild or Tussah Silk

Wild or Tussah silk is a tan-coloured fibre from the cultivated silkworm which feeds on so rub oak. As the cocoons are always pierced, the fibres are shorter than reeled silk. It is different both physically and chemically from ordinary silk. It is brown in color, considerably stiffer and coarser. It is less reactive towards chemical. It is used in the shantung pongee.

### Thrown or Greg Silk

Thrown silk consists of two or more threads of raw silk reeled tighter and given a slight twist.

### Organize Silk

Organize silk is produced from best cocoons. It contains two or more strands each composed of number of greges twist together slightly. These threads are then doubled and re-twisted in the opposite direction to the original twist in the strands (Strand mean a number of flexible strings twisted together into a rope). Organize silk is used for warp threads when high tensile strength is required.

### Tram Silk

Tram silk is usually made from cocoons of lower grade, like organize. It is composed of two or more strands of thrown silk lightly twisted together and then doubled.

### Chappell Silk

When silk is still in the green is spun, the yarn is known as chappell.

## GROWTH

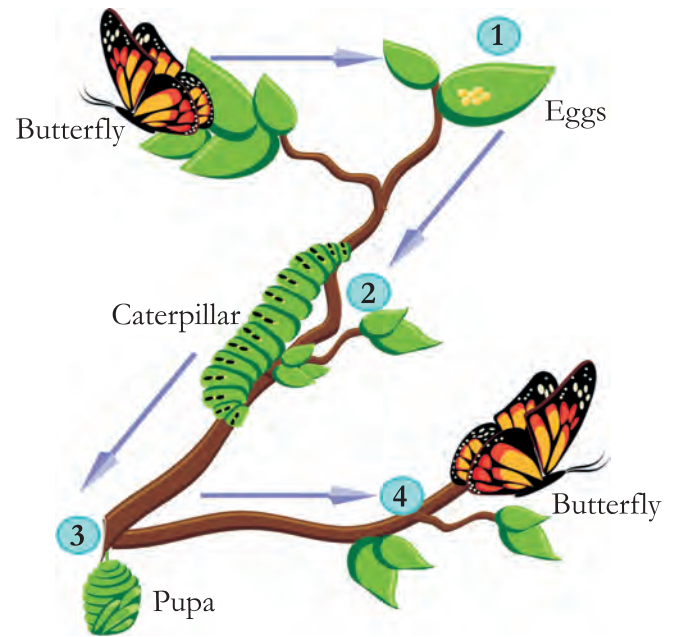
According to Chinese legend, around 2700 B.C. Empress Hsi Ling Shi [Sigh-Ling-She] sat under a mulberry tree drinking tea. She began playing with a silkworm cocoon and discovered it was made of a delicate thread. The Empress learned to spin the silk and to make luxurious fabric.

Archeological evidence indicates that silk production may have begun as early as 5000 BC that's more than seven thousand years ago. Sericulture is the raising of silkworms and the production of silk. The ancient Chinese kept the details of sericulture a secret, a secret coveted by the rest of the world. Today silk is produced mostly in China, India and Japan.

Silkworms, which are really caterpillars, are fed mulberry leaves, mulberry leaves and only mulberry leaves. They never stop eating. That means feeding every four hours.

## LIFE HISTORY OF SILK MOTH

The female silk moth lays eggs, from which hatch larvae which are called caterpillars or silkworms. They grow in size and when the caterpillar is ready to enter the next stage of its life history called pupa, it first weaves a net to hold itself. Then it swings its head from side to side in the form of the figure given. During these movements of the head, the caterpillar secretes fibre made of a protein which hardens on exposure to air and becomes silk fibre. Soon the caterpillar completely covers itself by silk fibres and turns into pupa. This covering is known as cocoon. The further development of the pupa into moth continues inside the cocoon.



## PRODUCTION OF SILK

### Harvesting

After 35 days of eating, the silkworm spins a cocoon of silk. It creates nearly a mile of filament! One can by hand, boil the cocoons, pick out the end of a silk filament and thread it onto a reel. This work may also be done in a manufacturing plant. Several filaments are combined and wrapped on a reel creating a yarn.

The commercial production of silk (or sericulture) is a long and complex process involving a variety of skilled people at different stages of its production. About 60 lakh people in India are engaged in various sericulture activities throughout the year. Here is an outline of the different steps involved in the production of mulberry silk and the people employed at each step.

**1. Silk Rearers :** The process starts with rearing the silkworm, *Bombyx mori*, in a controlled environment. The female silkworm lays eggs in a box which are incubated for a few days until the eggs hatch into larvae. They are now ready to be fed mulberry leaves.

**2. Silk Farmers :** Mulberry saplings are planted in nurseries and take about 6 months to grow. The leaves of the mulberry trees are then harvested to be fed to the silk larvae.



Caterpillars on Mulberry Leaves



Cocoons

**3. Silk Collectors :** The larvae are fed huge quantities of chopped mulberry leaves for about 6 weeks. During this time, they shed their skin 4 times and grow to about 4 inches long. Once it stops eating, the silkworm is now ready to spin silk. The worm is attached to a frame, where it rotates its body continuously, secreting saliva. The saliva hardens in contact with air, forming a pair of silk filaments. It also secretes a gummy fluid, sericin, which binds the filaments together for protection. Over the next 4 days, the silkworm

spins about 1 km of filament, constructing a cocoon and encloses itself completely within it, growing into a pupa. From every batch of cocoons, a small portion of the male and female pupae are kept aside until they grow into moths and are mated for producing the next generation of silkworms. The remaining cocoons are sent for processing into silk.

**4. Silk Reelers :** The cocoons are boiled in water, killing the pupae and softening the sericin. The silk filaments are unbound from the cocoon and carefully wound onto a reel. Filaments from several cocoons are wound together to create a single thread of raw silk. About 2500 silkworms are required to produce a pound of raw silk.



Reeling



Spinning Silk Yarn

**5. Silk Twisters :** The raw silk still contains the sericin gum. It is removed by washing it with soap and boiling water. The resulting silk is soft, light and lustrous and is twisted to produce the strands of silk yarn. Different methods of twisting are used to get the various types of silk yarn: crepe, organzine, singles, etc. The yarn is dyed at this stage in baths of dye colours.

### Interesting Fact

1 kg of raw silk is produced by about 5,500 silkworm.

**6. Silk Weavers :** In the final step, silk fabric is woven from the silk yarns using looms (handlooms and powerlooms). A variety of looms employ different ways of holding the warp and weft yarns in them and apply various weaving techniques to produce the diverse range of silk fabrics that we can find today.

## PROPERTIES AND USES

The length of the silk is important in creating high-quality fabric. Long fibers make long, smooth surfaces, which is why silk reflects light and has that special luster we value. But, short fibers and broken fibers may also be spun to create lower quality fabrics.

For all its delicacy, silk is as strong as the wire of equal thickness. However, it deteriorates over time. As silk ages, it becomes dry and brittle and will literally fall to pieces in one's hands. Much like shattered glass, silk will develop fissures, crumble and fall off in chunks. Feeding all those hungry caterpillars is expensive so silk fabric is expensive and used primarily in high-end apparel and furnishings.

### Interesting Fact

It is estimated that approximately 2000-3000 cocoons are needed to produce one pound of silk.

## CHARACTERISTICS OF SILK FIBERS AND PRODUCTS

- ❖ A protein fiber.
- ❖ Very long filament (up to a mile long).
- ❖ Spun by a caterpillar called a silkworm (but not actually a worm).

- ❖ Cultivated silk is from silkworms fed only mulberry leaves.
- ❖ Most valued for its “silky” feel.
- ❖ Stronger than cotton or linen.
- ❖ Rayon is a fibre that resembles silk. Rayon is prepared from cellulose obtained from wood pulp.
- ❖ Damaged by chlorine bleach.
- ❖ Sunlight can turn white silk yellow and weaken fibers.
- ❖ Absorbs moisture.
- ❖ Is resilient and elastic.
- ❖ Does build up static electricity.
- ❖ Dries quickly.
- ❖ Perspiration can deteriorate and discolour dyes.
- ❖ Requires delicate handling in cleaning.
- ❖ Expensive.

### Occupational Hazards of Silk Industry

Health risks factors in mulberry cultivation. The dicot weeds are controlled by use of 2, 4, D amine, it is reported that there is a connection between this weedicide and blood cancer. For control of monocot weeds, glyphosate is used, carcinogenic potential of this chemical has been reported. The Dichlorvos (DDVP) and Bavistin used for control of mulberry pests are known to induce neurophysiological and behavioural changes in human beings.

**Health Risks during Rearing :** (a) In winter season in villages, charcoal stoves are used to raise the room temperature during rearing, the carbon dioxide and carbon monoxide are silent killers which are produced in the ill ventilated rearing houses. If blocked from escaping or dangerous levels are reached, symptoms of toxicity noticed are headache, nausea and vomiting.

(b) Unhygienic conditions that prevail due to left over leaves and litter if unattended not only leads to silkworm mortality but also affects the rearers' health.

### Interesting Fact

Some insects such as may flies, silver fish, spiders and some beetles can also produce silk.

## WOOL

Wool comes from sheep, goat, yak and some other animals. These wool-yielding animals bear hair on their body. Do you know why these animals have a thick coat of hair? Hair trap a lot of air. Air is a poor conductor of heat, as you would learn in Chapter 4. So, hair keeps these animals warm. Wool is derived from these hairy fibres.

Like us, the hairy skin of the sheep has two types of fibres that form its fleece: (i) the coarse beard hair and (ii) the fine soft under-hair close to the skin. The fine hair provide the fibres for making wool. Some breeds of sheep possess only fine under-hair. Their parents are specially chosen to give birth to sheep which have only soft underhair. This process of selecting parents for obtaining special characters in their offspring, such as soft under-hair in sheep, is termed ‘selective breeding’.

## Animals That Yield Wool

Several breeds of sheep are found in different parts of our country. However, the fleece of sheep is not the only source of wool, though wool commonly available in the market is sheep wool. Yak wool is common in Tibet and Ladakh. Angora wool is obtained from angora goats, found in hilly regions such as Jammu and Kashmir.

Wool is also obtained from goat hair. The under fur of Kashmiri goat is soft. It is woven into fine shawls called Pashmina shawls. The fur (hair) on the body of camels is also used as wool. Llama and Alpaca, found in South America, also yield wool.

## Some Indian Breeds of Sheep

S.No.	Name of breed	Quality of wool	State where found
1.	Lohi	Good quality wool	Rajasthan, Punjab
2.	Rampur bushair	Brown fleece	Uttar Pradesh, Himachal Pradesh
3.	Nali	Carpet wool	Rajasthan, Haryana, Punjab
4.	Bakharwal	For woollen shawls	Jammu and Kashmir
5.	Marwari	Coarse wool	Gujarat
6.	Patanwadi	For hosiery	Gujarat

## From Fibres to Wool

For obtaining wool, sheep are reared. Their hair is cut and processed into wool. Let us learn about this process.

**Rearing and Breeding of Sheep :** If you travel to the hills in Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Arunachal Pradesh and Sikkim, or the plains of Haryana, Punjab, Rajasthan and Gujarat, you can see shepherds taking their herds of sheep for grazing. Sheep are herbivores and prefer grass and leaves. Apart from grazing, sheep rearers also feed them on a mixture of pulses, corn, jowar, oil cakes (material left after taking out oil from seeds) and minerals. In winter, sheep are kept indoors and fed on leaves, grain and dry fodder.

Sheep are reared in many parts of our country for wool. The table given above gives the names of some breeds of sheep reared in our country for producing wool. The quality and texture of the fibres obtained from them is also indicated in the table. Certain breeds of sheep have thick coat of hair on their body which yields good quality wool in large quantities. As mentioned earlier, these sheep are “selectively bred” with one parent being a sheep of good breed. Once the reared sheep have developed a thick growth of hair, hair is shaved off for getting wool.

## Manufacturing Process or Processing Fibres into Wool

The major steps necessary to process wool from the sheep to the fabric are: shearing, cleaning and scouring, grading and sorting, carding, spinning, weaving and finishing.

### Shearing

Sheep are sheared once a year—usually in the spring time. A veteran shearer can shear up to two

hundred sheep per day. The fleece recovered from a sheep can weigh between 6 and 18 pounds (2.7 and 8.1 kilograms); as much as possible, the fleece is kept in one piece. While most sheep are still sheared by hand, new technologies have been developed that use computers and sensitive, robot-controlled arms to do the clipping.

### Interesting Fact

A wool blind sheep is a type of sheep that is not able to see due to the large amount of wool around its eyes.



### Cleaning and Scouring

Wool taken directly from the sheep is called ‘raw’ or ‘grease wool’. It contains sand, dirt, grease and dried sweat (called suint); the weight of contaminants accounts for about 30 to 70 percent of the fleece’s total weight. To remove these contaminants, the wool is scoured in a series of alkaline baths containing water, soap and soda ash or a similar alkali. The byproducts from this process (such as lanolin) are saved and used in a variety of household products. Rollers in the scouring machines squeeze excess water from the fleece, but the fleece is not allowed to dry completely. Following this process, the wool is often treated with oil to give it increased manageability.



### Grading and Sorting

Grading is the breaking up of the fleece based on overall quality. In sorting, the wool is broken up into sections of different quality fibers, from different parts of the body. The best quality of wool comes from the shoulders and sides of the sheep and is used for clothing; the lesser quality comes from the lower legs and is used to make rugs. In wool grading, high quality does not always mean high durability.

### Carding

Next, the fibers are passed through a series of metal teeth that straighten and blend them into slivers. Carding also removes residual dirt and other matter left in the fibers. Carded wool intended for worsted yarn is put through gilling and combing, two procedures that remove short fibers and place the longer fibers parallel to each other. From there, the sleeker slivers are compacted and thinned through a process called drawing. Carded wool to be used for woollen yarn is sent directly for spinning.

### Spinning

After being carded, the wool fibers are spun into yarn. Thread is formed by spinning the fibers together to form one strand of yarn; the strand is spun with two, three, or four other strands. Since the fibers cling and stick to one another, it is fairly easy to join, extend and spin wool into yarn. Spinning for woollen yarns is typically done on a mule spinning machine, while worsted yarns can be spun on any number of spinning machines. After the yarn is spun, it is wrapped around bobbins, cones, or commercial drums.



## Weaving

Next, the wool yarn is woven into fabric. Wool manufacturers use two basic weaves: the plain weave and the twill. Woollen yarns are made into fabric using a plain weave (rarely a twill), which produces a fabric of a somewhat looser weave and a soft surface (due to napping) with little or no luster. The napping often conceals flaws in construction.

Worsted yarns can create fine fabrics with exquisite patterns using a twill weave. The result is a more tightly woven, smooth fabric. Better constructed, worsteds are more durable than woollens and therefore more costly.



## Finishing

After weaving, both worsteds and woollens undergo a series of finishing procedures including: fulling (immersing the fabric in water to make the fibers interlock); crabbing (permanently setting the interlock); decatizing (shrink-proofing); and occasionally dyeing. Although wool fibers can be dyed before the carding process, dyeing can also be done after the wool has been woven into fabric.

## DIFFERENT USES OF WOOL

### Clothing

The main use of wool is clothing ranging from knitwear such as jackets, sweaters, hats, socks, pants and jumpers to cloth which is found in suits and costumes.



### Carpets and Furniture

Carpets which are made from wool are known as being the best quality, whilst items in the furniture trade such as chair covers and table covers feature wool.



### Cleaning

Wool is an excellent fibre to use in pads to soak up oil following a spill.

### Bricks

Wool and seaweed are being combined to help strengthen bricks, this process is less toxic than traditional options, and stronger.



### Insulator

Wool in our walls keeps buildings both warm and quiet. Natural wool insulation is an environmentally-friendly sound and thermal option that is used across the world.



## Characteristics of Wool Fabrics

There are many factors, which affect the quality of wool fabric. The kind of sheep from which the wool is obtained, its physical condition, the part of the sheep from which the wool is obtained and the finishing processes are some of the factors, which affect the properties of wool fabric.



**Composition :** The chief constituent of these fibers is the protein substance called Keratin. Chemically these proteins contain 5 elements: carbon, hydrogen, oxygen, nitrogen and sulfur. This is the only animal fiber, which contains sulfur in its composition.

**Strength :** Wool is the weakest of all natural textile fibers. Wool fabric is strengthened by the use of ply yarns. A hard-twisted two-ply yarn may be regarded as an assurance of durability. Tightly twisted single yarns also make a strong fabric.

**Elasticity :** Each wool fibre is a molecular coil-spring making the fibre remarkably elastic. Depending upon the quality of wool, the fibre may be stretched from 25 or 30 per cent of its natural length before breaking. This characteristic reduces the danger of tearing under tension and contributes to free body movements. Wool fibers can be stretched up to 50% when wet and 30% when dry and still bounce back to their original shape when stress is released. To preserve this natural elasticity, wool garments should be hung properly after wearing and allowed to relax sufficiently to regain their shape.

**Resilience :** Wool fabrics resist wrinkles. Wool is the most resilient fiber because it has a natural crimp that helps it keep its shape. Wrinkles disappear when the garment or fabric is steamed. Good wool is very soft and resilient; poor wool is harsh. When buying a wool fabric, grasp a handful to determine its quality. If the fabric retains the wrinkles and feels stiff, this may indicate an inferior grade of recycled wool.

**Drapability :** Wool's excellent draping quality is aided by its pliability, elasticity and resiliency. Drapability is one of the competitive features of wool fabrics over many man-made fibres.

**Cleanliness and Washability :** The wool fabrics adheres dirt and requires to be thoroughly cleaned. Care should be taken while laundering as the fibre is softened by moisture and heat which results in shrinking and felting of the fabrics washed. Wool fabrics temporarily lose about 25 percent of their strength when wet. Thus wool fabrics should never be pulled or wrung while wet. They should be lifted and squeezed.

## OCCUPATIONAL HAZARDS OF WOOL INDUSTRY

### Anthrax

The industrial disease usually associated with wool textiles is anthrax or wool sorters' disease. It was at one time a great danger, particularly to wool sorters, but has been almost completely controlled in the wool textile industry as a result of:

- ❖ Improvements in production methods in exporting countries where anthrax is endemic.
- ❖ Disinfection of materials liable to be carrying anthrax spores.
- ❖ Improvements in handling the possibly infected material under exhaust ventilation in the preparatory processes.



- ❖ Microwaving the wool bale sufficiently long to a temperature that will kill any fungi. This treatment also assists in the recovery of lanolin associated with the wool.
- ❖ Significant advances in medical treatment, including immunization of workers in high-risk situations.
- ❖ Education and training of workers and the provision of washing facilities and when necessary, personal protective equipment.

Besides anthrax fungal spores, it is known that spores of the fungus *Coccidioides immitis* can be found in wool, especially from the southwestern United States. This fungus can cause the disease known as coccidioidomycosis, which, along with the respiratory disease from anthrax, usually has a poor prognosis. Anthrax has the added hazard of causing a malignant ulcer or carbuncle with a black centre when entering the body through a break in the skin barrier.

### Chemical Substances

Various chemicals are used—for example, for degreasing (diethylene dioxide, synthetic detergents, trichloroethylene and in the past, carbon tetrachloride), disinfection (formaldehyde), bleaching (sulphur dioxide, chlorine) and dyeing (potassium chlorate, anilines). The risks include gassing, poisoning, irritation of the eyes, mucous membranes and lungs and skin conditions. In general, prevention relies on :

- ❖ Substitution of a less dangerous chemical
- ❖ Local exhaust ventilation
- ❖ Care in labelling, storage and transport of corrosive or noxious liquids
- ❖ Personal protective equipment
- ❖ Good washing facilities (including shower baths where practicable)
- ❖ Strict personal hygiene

### Key Words

<b>Caterpillar</b>	:	The larva of an insect
<b>Fibre</b>	:	The basic unit of fabric
<b>Wool</b>	:	A fibre obtained from sheep, goats, yaks, etc.
<b>Scouring</b>	:	Washing of wool fibre
<b>Shearing</b>	:	Shaving off the sheep's fleece
<b>Carding</b>	:	Straightening of wool fibre
<b>Sorting</b>	:	Classifying wool in different categories



### Important Points

1. Silk comes from silkworms and wool is obtained from sheep, goat and yak. Hence silk and wool are animal fibres.
2. In India, mostly sheep are reared for getting wool.
3. The hair of camel, llama and alpaca are also processed to yield wool.
4. Silkworm are caterpillars of silk moth.
5. Silk fibres are made of a protein.



6. During their life cycle, the worms spin cocoons of silk fibres.
7. Silk fibres from cocoons are separated out and reeled into silk threads.
8. Sheep hair is sheared off from the body, scoured, sorted, dried, dyed, spun and woven to yield wool.
9. Weavers weave silk threads into silk cloth.

## Exercise

### Multiple Choice Questions (MCQs)

#### A. Tick (✓) the correct option :

1. The best quality of wool is obtained from :  
 (a) Camel  (b) Cow  (c) Merino sheep  (d) Goat
2. Anthrax is also called :  
 (a) Foot disease  (b) Bow leggedness  (c) Sorter's disease  (d) Kemp
3. Silk is obtained from :  
 (a) yak  (b) camel  (c) silk plant  (d) silkworm
4. Wool is obtained from :  
 (a) Goat  (b) Sheep  (c) Camel  (d) all of these
5. Pashmina wool is obtained from a kind of :  
 (a) goat  (b) camel  (c) sheep  (d) alpaca
6. Scouring is one of the steps of processing of :  
 (a) cotton  (b) jute  (c) silk  (d) wool

#### B. Fill in the blanks :

1. We wear woollen clothes in \_\_\_\_\_ season.
2. The process of removal of the fleece from an animal is called \_\_\_\_\_.
3. Silk is obtained from the \_\_\_\_\_ of silk moth.
4. Fibres manufactured in industries by humans are called \_\_\_\_\_ fibres.
5. \_\_\_\_\_ silk is the main variety of silk produced in India.
6. Two kinds of yarn that are made from wool for weaving and knitting are the \_\_\_\_\_ system and the \_\_\_\_\_ system.

#### C. Match the following :

##### Column A

1. Mulberry leaves
2. Cocoon
3. Scouring
4. Yak

##### Column B

- (a) Wool yielding animal
- (b) Reeling
- (c) Yields silk fibres
- (d) Food of silkworms

#### D. Very Short Answer Questions :

1. Name the process of shaving off a sheep's body to obtain fleece.
2. Name the state in India where sheep are reared.
3. Name the pupa stage in a moth's life cycle.



4. What is the process of washing wool called?
5. Name a disease which is commonly found in the workers of the wool industry.
6. How many cocoons are needed to produce one pound of silk?

#### E. Short Answer Questions :

1. What is fibre? Name two types of fibres.
2. Write the factors that determine the quality of wool.
3. What do you understand by woollen and worsted system?
4. Name the silk producing states in India.
5. What kinds of clothes do we wear in summer season?
6. Define moulting.
7. Mention the difference between wool and silk.

#### F. Long Answer Questions :

1. How do you classify fibres? Explain giving examples.
2. State the uses and occupational hazards of silk industry.
3. Describe the production of wool.
4. Explain the process to obtain silk from the cocoon.
5. Explain the life cycle of silkworm.
6. What are the health hazards of the workers of the wool and the silk industries?



## Assignments

### A. Read the passage and answer the following questions.

In the 1st century B.C., silk was brought west into the Roman Empire. At that time and for many hundreds of years, silk remained a fabric for royal use. The Chinese tried to keep information about the manufacture of silk cloth secret, but gradually traders brought the secrets to other countries. Around 550 A.D., it is said that monks from India told the Roman Emperor Justinian in Byzantium about the process of making silk. Eventually, these monks brought eggs back to the emperor and demonstrated how the silkworms produced the silk from the fibers spun for their cocoon after eating mulberry leaves. Although silk was the earliest product traded through this network of land and sea routes, many other products were brought along these paths. Grain, spices, metalwork, vegetables, fruits, animal hides, religious objects and jewels were just some of the goods introduced to other regions of the world this way.

1. When was the silk brought and used into the Roman Empire?
2. Which fabric remained a fabric for royal use?
3. Write the name of food for silkworms.
4. How the silkworm produced the silk from the fibres spun for the cocoon?

### Project

1. Find out about :
  - (a) The wool industry in India—the kind of sheep that are reared and the problem faced.
  - (b) The silk industry in India—the varieties of silkworms that are reared and the problems faced.
  - (c) Ahimsa silk—silk obtained after the insect has emerged out, without killing it.
  - (d) The types of wool known as ‘shahtoosh’ and why it is banned?
2. Collect threads of different materials like natural silk, artificial silk, natural wool and synthetic wool. Cut the threads into 10 cm long pieces. Burn each of the thread by holding it from one end with tongs and the other end over a candle flame. Observe the flame, smell and the residue formed in case of each thread. Note down the observation in a table.