3 ▬▬▬ Fibre to Fabric

Lesson at a Glance

- Wool and silk are fibres which are obtained from animals.
- The wool yielding animals have a thick coat of hair. Hair trap a lot of air. Air is a poor conductor of heat. So, hair keeps these animals warm.

  Wool is derived from these hairy fibres.
- The skin of sheep has two types of hair (i) the coarse beard hair, and (ii) the fine soft under-hair close to the skin.
- The fine soft hair fibres are used for making wool.
- To obtain breeds of sheep that possess only fine under hair, their parents are carefully chosen. The process of selecting parents for obtaining special characters, such as fine soft under hair in sheep, is termed as 'selective breeding'.
- Wool commonly available in the market is sheep wool. Several breeds of sheep are found in different parts of our country.
- Some Indian breeds of sheep which provide wool are given in the table 3.1.

Table 3.1: 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

- Except the fleece of sheep, there are other sources of wool. Animals that provide wool are:
  - **(i) Yak:** Yak wool is common in Tibet and Ladakh.
  - **(ii) Angora Goats:** These goats are found in hilly region such as Jammu and Kashmir. They provide Angora wool.
  - **(iii) Kashmiri Goat:** The under fur of Kashmiri goat is very soft and is woven into fine shawls known as Pashmina shawls.
  - **(iv) Camels:** The hair of camel can be woven into light weight, durable fabric.
  - **(v) Alpaca:** They are found in the Andes Mountains of South America. They are domesticated by the natives of Peru to get their soft wool. The woolly hair varies in colour from white to red to dark brown to black.
  - **(vi) Llama:** They are found in mountains of South America. The male is used as a beast of burden. The female is highly valued for her milk, meat, hide and wool.
- Processing fibres into wool involves the following steps:

  Step I. The fleece of the sheep is removed by machines. This process is called shearing.

  Step II. The sheared hair is thoroughly washed in tanks to remove grease, dust and dirt. This process is called scouring.

  Step III. Clean hairy skin is sent to the factory where hair of different textures are sorted (separated). This is called sorting.

  Step IV. The small fluffy fibres, called burrs, are picked out from the hair.

  Step V. The natural fleece of sheep and goats is black, white or brown. So, the fibres are dyed in various colours.

  Step VI. The fibres are straightened, combed and rolled into yarn. The shorter fibres are spun and woven into woollen cloth. The longer fibres are made into wool for sweaters.
- **Silk:** Silk fibre is obtained from the cocoon of the silk moth. The insect producing silk is called silk moth. It lives on the

leaves of mulberry plants. There are four stages in the life-cycle of a silk moth—egg, larva, pupa and adult.

- **Sericulture:** The rearing of silk moth for obtaining silk is called *sericulture*. The silk yarn (thread) is obtained from the cocoon of the silk moth. There is a variety of silk moths which yield different types of silk yarn such as *tassar* silk, *mooga* silk, kosa silk, eri silk, mulberry silk.

- The most common silk moth is the *mulberry silk moth*. The mulberry silk fibre is soft, lustrous, elastic and can be dyed in beautiful colours.

- **Life Cycle of Silk Moth:** There are four stages in the development of silk moth—egg, larva, pupa and adult.

The silk moth lays eggs on mulberry leaves. The eggs are hatched into very small larvae within a week. The larvae eat vigorously and keep on feeding on mulberry leaves. The larva looks like a worm, that is why it is called *silkworm* or *caterpillar*. The silkworm grows to over three inches in length. When it reaches to the full size it enters the next stage of its life cycle called *pupa*. An adult silkworm, first weaves a net to hold itself. Then it swings its head from side to side in the form of the figure of eight (8). During these movement of the head, the silkworm secretes a sticky fluid from its silk glands through a common pore, called *spinneret*. The sticky fluid contains a protein that hardens on exposure to air and becomes *silk fibre*. Soon the caterpillar completely covers itself by silk fibres. This covering is called as cocoon.

The larva undergoes many changes inside the cocoon. The pupa changes to adult moth and comes out of the cocoon by cutting it open. The long silk thread of the cocoon gets cut into pieces when the adult comes out of it and the cut pieces of silk cannot be utilized by silk industry.

- **From Cocoon to Silk:** Obtaining silk for silk industry, silk moths are reared and their cocoons are collected to get silk thread.

- **Rearing silkworms:**

(i) The eggs of silkworms are sold to silkworm farmers.

(ii) Silkworm farmers keep eggs under hygienic condition. They warm them to a suitable temperature for the larvae to hatch from egg.

(iii) The larvae are kept in clean bamboo trays along with young and freshly chopped mulberry leaves. After 25-30 days, the silk worms stop eating and start spining the cocoons.

(iv) **Processing silk:** The cocoons are collected and boiled in water to kill the insect inside them. The resulting fibre is known as *raw silk*. The silk fibres separate out.

(v) **Reeling the silk:** The process of taking out fibres from the cocoon for use as silk is known as *reeling the silk*. Reeling is done in special machines.

(vi) Silk fibres are spun into silk threads, which are woven into silk cloth by weavers.

■ TEXTBOOK QUESTIONS SOLVED ■

Q.1. *You must be familiar with the following nursery rhymes:*

(i) *'Baa baa black sheep, have you any wool.'*

(ii) *'Mary had a little lamb, whose fleece was white as snow.'*

Answer the following:

(a) *Which parts of the black sheep have wool?*

(b) *What is meant by the white fleece of the lamb?*

Ans. (a) The hairy skin called fleece has wool in black sheep.

(b) White fleece of the lamb means the white coloured hairy skin.

Q.2. *The silkworm is (a) a caterpillar (b) a larva. Choose the correct option.*

(i) *(a)* (ii) *(b)* (iii) *both (a) and (b)*

(iv) *neither (a) nor (b)*

Ans. (iii) both (a) and (b).

Q.3. *Which of the following does not yield wool?*

(i) *Yak* (ii) *Camel* (iii) *Goat*

(iv) *Woolly dog*

Ans. (iv) Woolly dog

Q.4. *What is meant by the following terms?*

(i) *Rearing* (ii) *Shearing* (iii) *Sericulture*

Ans. (i) *Rearing:* The process of keeping, feeding, breeding and medical care of useful animals is called rearing of animals. These animals produce one or more useful products for human beings.

(ii) *Shearing:* The process of removing the fleece of the sheep alongwith thin layer of skin is called shearing.

(iii) Sericulture: The rearing of silkworms for obtaining silk is called sericulture.

Q.5. *Given below is a sequence of steps in the processing of wool. Which are the missing steps? Add them.*

Shearing, _____, sorting, _____, _____

Ans. Shearing, scouring, *sorting,* picking out of burrs, colouring, rolling.

Q.6. *Make sketches of the two stages in the life history of the silk moth which are directly related to the production of silk.*

Ans. | Silkworm | ⟶ | Cocoon with pupa |
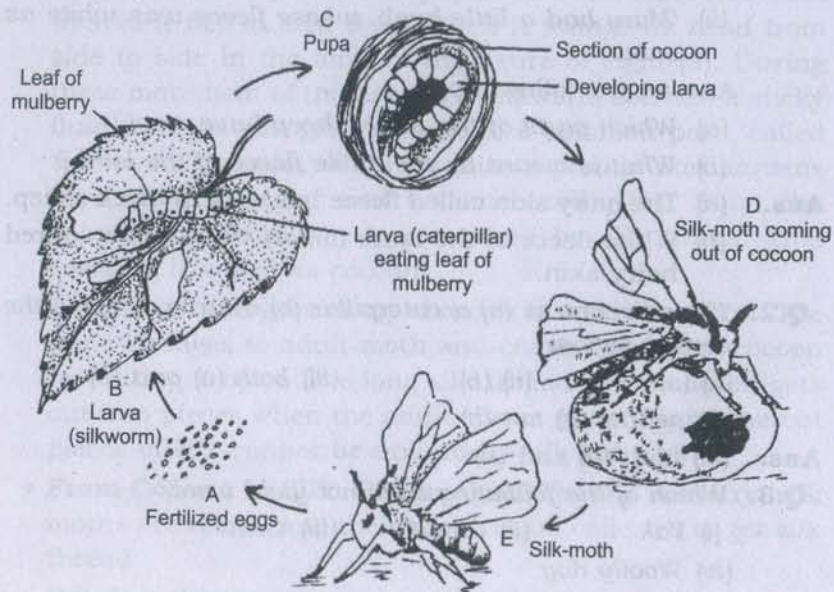
Fig. 3.1 Life-cycle of silk-moth.

Q.7. *Out of the following, which are the two terms related to silk production?*

Sericulture, floriculture, moriculture, apiculture and silviculture.

Hints:

(i) *Silk production involves cultivation of mulberry leaves and rearing silkworms.*

(ii) *Scientific name of mulberry is* **Morus alba.**

Ans. (i) Sericulture   (ii) Moriculture

Q.8. *Match the words of Column I with those given in Column II:*

Column I	Column II
1. Scouring	(a) Yields silk fibres
2. Mulberry leaves	(b) Wool yielding animal
3. Yak	(c) Food of silkworm
4. Cocoon	(d) Reeling
	(e) Cleaning sheared skin

Ans.

Column I	Column II
1. Scouring	(e) Cleaning sheared skin
2. Mulberry leaves	(c) Food of silkworm
3. Yak	(b) Wool yielding animal
4. Cocoon	(a) Yields silk fibres
	(d) Reeling

Q.9. *Given below is a crossword puzzle based on this lesson. Use hints to fill in the blank spaces with letters that complete the words.*
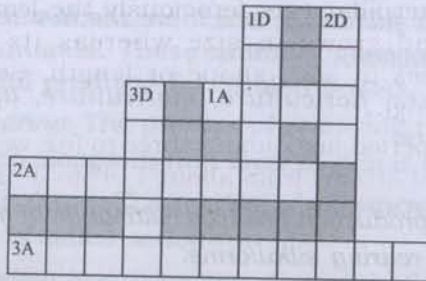
Down

(D) 1 : *Thorough washing*

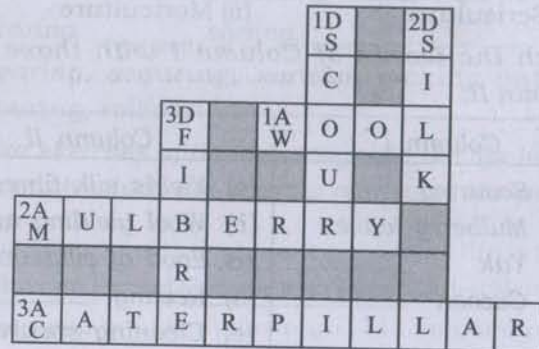2 : *Animal fibre*

3 : *Long thread like structure*

Across

(A) 1 : *Keeps warm*

2 : *Its leaves are eaten by silkworms*

3 : *Hatches from egg of moth*

Ans.

		1D		2D		
		S		S		
		C		I		
3D		1A		L		
F		W	O	O	L	
I				U		K
2A	U	L	B	E	R	R	Y
M						
		R				
3A	A	T	E	R	P	I	L	L	A	R
C						

EXTENDED LEARNING — ACTIVITIES AND PROJECTS

Q.1.

Paheli wants to know the maximum length of continuous silk thread that can be obtained from a cocoon.

Find out for her.

Ans. More than 1,000 feet (1,000 to 1,500 feet) continous in length.

Q.2.

Boojho wants to know why caterpillars need to shed their skin when they grow bigger but we humans do not.

Do you have any idea?

Ans. The caterpillar eats ferociously the leaves of mulberry tree and grows in size whereas its skin does not increases in size, shape or length. So, it sheds skin (moulting).

Larval period lasts about three to five weeks. During this period it attains from about 1/4″ to 3″ in length. During this period moulting occurs about four times.

Q.3.

Boojho wants to know why caterpillars should not be collected with bare hands.

Can you help him?

Ans. Caterpillar may cause irritation, skin allergy and transfer diseases.

Q.4. *Paheli wanted to buy a silk frock and went to the market with her mother. There they found that the artificial (synthetic) silk was much cheaper and wanted to know why. Do you know why? Find out.*

Ans. Artificial silk is synthetic and can be prepared at a large scale in factories/mills. So, it is cheap. For obtaining natural silk, we have to rear silk moth, their larvae to get pupa. To get silk thread, we have to dip cocoon in hot water to get silk thread which is wrapped over the cocoon. The pupa inside the cocoon dies. To obtain silk for commerial purposes a large number of cocoons (containing living pupa) are killed. For example, for about a pound of silk about 2,5000 cocoon are killed. As a result natural silk is costly.

Q.5. *Someone told Paheli that an animal called 'Vicuna' also gives wool. Can you tell her where this animal is found? Look for this in a dictionary or an encyclopaedia.*

Ans. Vicuna lives in the Andes from Ecuador to Chile, at an elevation of 12,000 to 18,000 feet.

Q.6. *When handloom and textile exhibitions are held, certain stalls display real moths of various varieties of silk and their life histories. Try and visit these stalls with elders or teachers and see these moths and stages of their life history.*

Ans. Do it yourself.

Q.7. *Look for eggs of any moth or butterfly in your garden or park or any other place full of plants. They look like any specks (dots) laid in a cluster on the leaves. Pull out the leaves containing eggs and place them in a cardboard box. Take some leaves of the same plant or another plant of the same variety, chop them and put them in the box. Eggs will hatch into caterpillars, which are busy eating day and night. Add leaves everyday for them to feed upon. Sometimes you may be able to collect the caterpillars. But be careful. Use a paper napkin or a paper to hold a caterpillar.*

Observe everyday. Note the (i) number of days taken for eggs to hatch, (ii) number of days taken to reach the cocoon stage and (iii) to complete life cycle. Record your observations in your notebook.

Ans. (i) **Number of days taken for eggs to hatch:** The hatching period varies from insect to insect. For example, in house flies, the eggs hatch out within 10 to 15 hours of copulation.

Eggs of the moth hatch in 10 to 12 days.

In Browntail moth, caterpillars hatch in 2–3 weeks.

Eggs of some butterflies, e.g. monarch butterfly hatch in less than a week.

(ii) **Number of days taken to reach cocoon state:** It also varies:

(a) In common mulberry silk moth, within 12 to 15 days, the caterpillar completely transforms into pupa.

(b) Some mothes (Browntail moth) takes 3 to 4 weeks to develop caterpillar into mature pupa.

(iii) **Number of days taken to complete life cycle:** Various insects take different time. It depends upon the insect moth or butterfly you are observing.

4 ▬▬▬ Heat

Lesson at a Glance

- **Heat:** Heat is a form of energy which causes the sensation of hotness and coldness. Heat energy can be used to do work. For example, on heating, water converts into steam which makes a steam engine move, and it pulls a train.

- On heating an object becomes hotter. If an object looses heat, it becomes cool.

- A reliable measure of the hotness of an object is its *temperature*. Temperature is measured by a device called *thermometer*. The temperature is a measure of the degree of hotness of an object.

- The thermometer that measures our body temperature is called a *clinical thermometer*.

- A clinical thermometer consists of a long narrow, uniform glass tube which has a capillary tube in which mercury runs. It has a bulb at one end and is connected with the capillary tube. The bulb contains mercury which can rise into capillary tube. There is a scale on the thermometer. The scale we use is the celsius scale indicated by °C.

In a clinical thermometer, the range of temperature is from 35°C to 42°C, and there is a small constriction or bend or a kink at the bottom of the capillary tube. Kink prevents mercury level from falling on its own.

Bulb ⎯⎯ Kink ⎯⎯ [35 36 37 38 39 40 41 42] ⎯⎯ Capillary
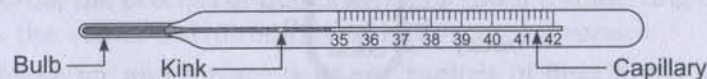
Fig. 4.1 A clinical thermometer.

In a *laboratory thermometer*, the range is from –10°C to 110°C and there is no kink.

- **Celsius Scale:** The *celsius scale* to measure temperature was designed by *Anders Celsius* (1701-1744). On this scale, temperature is described in degree celsius (°C). It is a metric