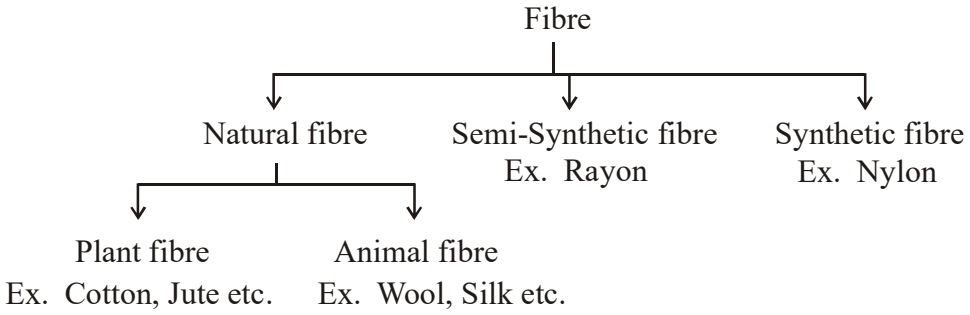
1 FIBRE TO FABRIC

THEORY

1.1 INTRODUCTION

Any fabric (cloth) is made up of yarns arranged together which are further made up of still thinner strands called fibres. Thread like part in animal and vegetable tissues is called fibres. They are the raw materials that are long, strong and enough to be spun into yarns and woven into fabrics.

1.2 CLASSIFICATION OF FIBRES



- **We all wear clothes to protect ourselves from heat, cold, dust, rain and insects.**

1.3 NATURAL FIBRES :

Fibres obtained from plants are called plant fibres and fibres obtained from animals are called animal fibres. Plant and animal fibres together are called natural fibres.

(i) Wool :

We wear sweaters in winter to protect ourselves from the cold. Wool is a fibre obtained from animal such as sheep, goat, yak and lamb. Animals from which we get wool bear a thick coat of hair on their bodies.

Wool fibres keep us warm the thick coat of hair traps a lot of air, thereby creating an insulating barrier.

Wool is a fibre obtained from the fleece (hairy growth) of these animals. Wool fibre is made up of protein. It is usually white in colour, although, it can also be brown or grey. Wool is mainly derived from sheep.

Wool comes from sheep, llama, alpaca, guanaco and vicuna.

Remember

- **Difference between fleece and hair**

Fleece : Thick covering of wool on a sheep, used to make a piece of clothing

Hair : The mass of thin thread like structure that grows out of the skin

(a) Wool from Sheep

A sheep's hairy coat has two types of fibres :

(i) the coarse beard hair and (ii) the soft under-hair, found close to the skin. It is the soft under-hair that is used to make wool. Scientists have developed certain breeds of sheep that only have the soft under-hair.

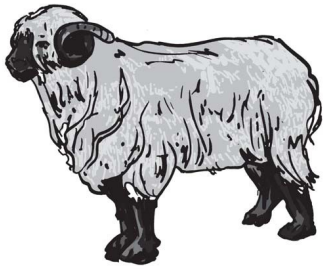
The wool from different varieties of sheep differes in fineness, shine, length, and strength. The finest wool is obtained from the Merino, a breed of sheep originally from Spain. Their wool is very soft and light, and is therefore used in making the finest woollen clothes.

(b) Rearing of Sheep

In India, sheep are reared in the hilly regions of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Arunachal Pradesh, Sikkim, Punjab, Haryana, Rajasthan, and Gujarat.

Remember

- **Breed : A particular type of animal developed for certain desirable characteristics**
- **Rearing : Keeping animals and caring for them to obtain useful products**



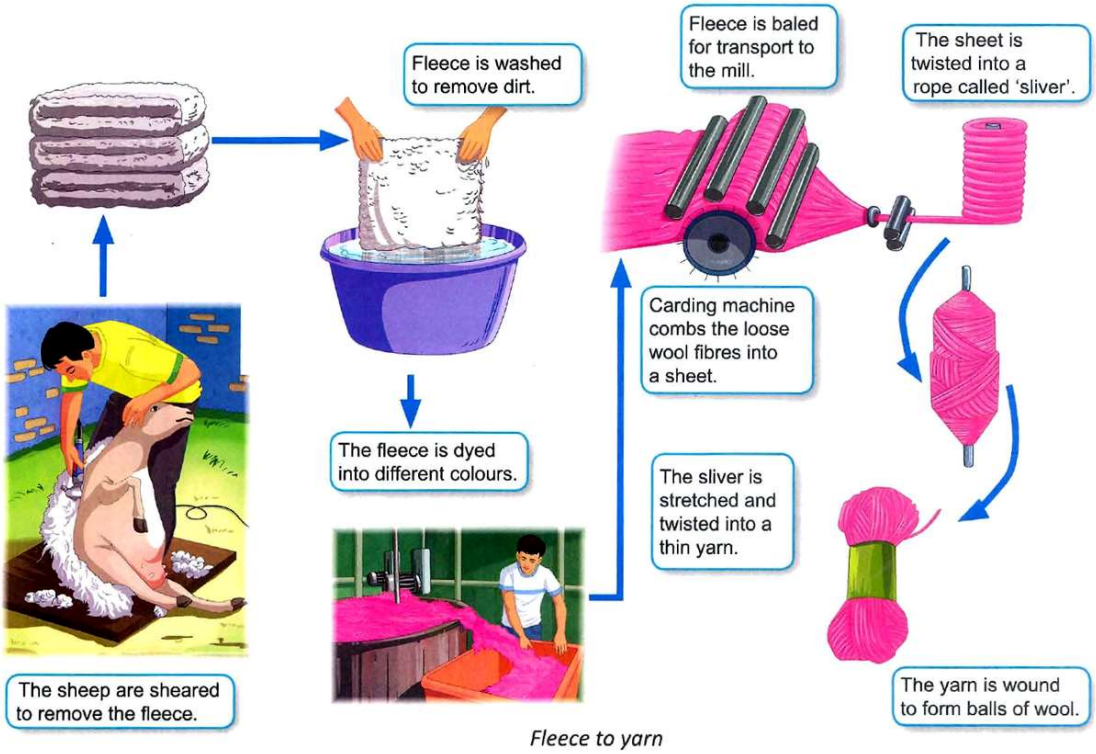
Sheep with thick growth of hair

(c) Wool Production

Sheep hair is sheared off from the body, scoured, graded or sorted, dried, dyed, spun and woven to yield wool.

- **Shearing :** The fleece of the sheep along with a thin layer of skin is removed from its body. This is called shearing.
  Sheep are usually shorn annually in the spring/summer months.
  Just as a haircut does not hurt us, shearing does not hurt the sheep, it actually helps them by removing the heavy woollen coat that they do not require in summer.
- **Scouring :**The sheared skin with hair is thoroughly washed in tanks to remove grease, dust and dirt. This is called scouring.
  It is done with the help of machines.
- **Grading or Sorting :** In this process, the wool is sorted on the basis of length, colour, texture, and the ease with which it can be dyed (coloured).

- **Dyeing :** As the natural colour of fleece is white,brown or black, the sheared wool is dyed in different colours.
- **Drying :** In this process, containers of wool are put through rollers to squeeze out as much water as possible. Then the wool is weighed and packed into bales. The bales are transported to the mills where they are processed further.
- **Making of Yarn :**
  Figure explains how the fleece is woven into yarn.



Fleece to yarn

(d) Health Hazards in the wool industry :

- While sorting wool, workers (sorters) get infected by bacteria, anthrax, which causes fatal blood disease called sorter's disease. Such risks faced by workers in any industry are called occupational hazards.
  Nowadays, this disease occurs rarely because of the use of vaccines for prevention.

(e) Wool from other Animals

- Angora wools is obtained from angora goats, which are found in hilly areas like Jammu and Kashmir.
- Yak wool is commonly found in areas like Laddakh and Tibet.
- Wool obtained from Kashmir goat is soft and is used to weave fine quality shawls called Pashmina shawls.
- Wool is also obtained from fur (hair) on the body of camels. It is used in making carpets etc.
- Llama and Alpaca, found in South America, also yield wool.
- Wool is used for making coats, suits, shawls, scarves, gloves and carpets. It traps air and so it has insulating properties.

Bactrian camel

Alpaca (belongs to the camel family)

Llama (belongs to the camel family)

Cashmere goat

Angora goat

Some Indian breeds of sheep

Name of the breed	Products made from the wool
Lohi	Carpets (good quality wool)
Nali	Carpets (good quality wool)
Bakharwal	Woollen shawls
Marwari	Carpets (coarse quality wool)
patanwadi	Hosiery such as socks and stockings

(ii) Silk :

Silk is an animal fibre derived from silkworms. Silk is produced by a moth (species) known as silk moth. The scientific name of silk moth is **"Bombyx mori"**.

The breeding of these silk moths for production of silk is known as **"sericulture"**.

(a) Production of Silk :

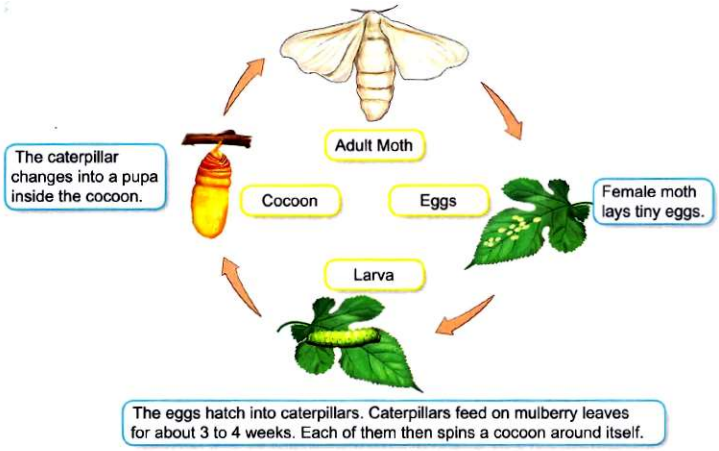
The female species of silk moth lays eggs on leaves. After 20 days, eggs hatch into larvae. these hatched larvae are known as Silkworms or Caterpillars.

(i) The silkworms are fed on mulberry leaves for about 6 weeks. As a result, they grow in size and enter their next life cycle called Pupa. Pupa holds itself by weaving a net around its body by swinging its head in figure of eight (8). While swinging their head, silkworm secretes a wet sticky substance. This substance is made up of protein, which hardens on exposure to air and becomes silk fibre. This way silkworm covers itself completely in the covering known as Cocoon. By the time of completion, cocoon pupa, develops into Adult Moth.

(ii) After complete development of silkworm, the cocoons are gathered and kept under the sun or boiled or exposed to steam, Boiling releases the silk fibres from cocoon. The silk fibres from many cocoons are brought together to form a single silken thread. This process is known as Reeling of silk. Reeling is done in special machines which unwind the fibres of silk from the cocoons.

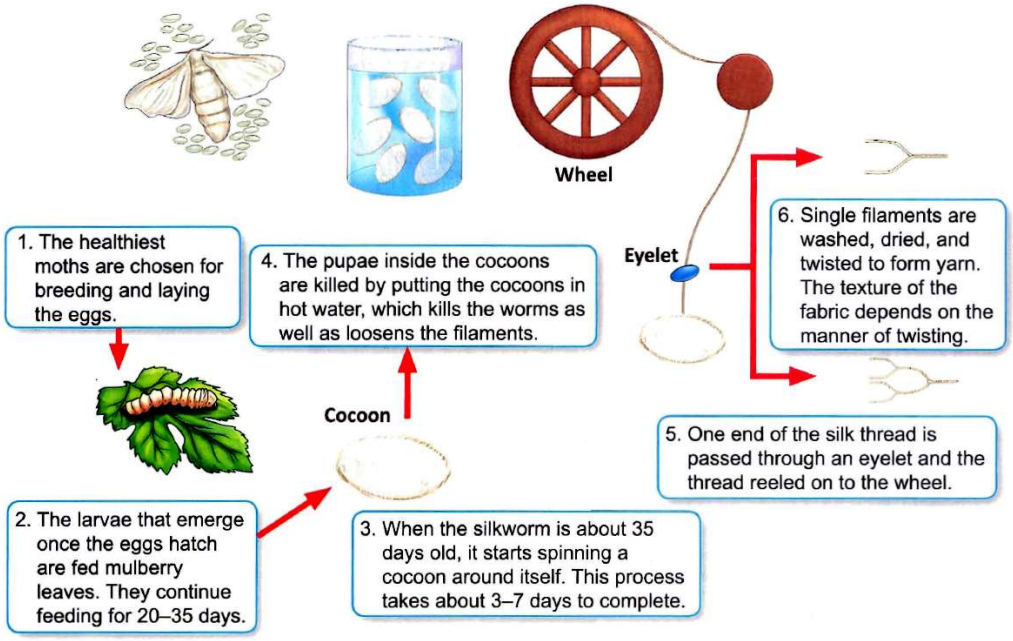
(iii) Broadly, 3 grades of silk is obtained from a cocoon. The unwound fibres form the finest quality silk called the reeled silk. It is dazzling white in colour. Silk that remains after the reeling process from the damaged or waste cocoon is carded and combed. It constitutes an inferior quality of silk called the spun silk. It is slightly honey-coloured. After carding or combing, the short fibres which are left behind constitute an even inferior quality of silk called the Nail Silk. It has rough texture as compared to reeled and spun silk.

(iv) Throwing is the process by which the obtained silk fibres are twisted into a strand for weaving to prevent silk yarn from splitting into individual fibres. These strands are industry ready to be turned into clothes.



Life cycle of the silk moth

(b) Summary of sericulture



Summary of the process of sericulture

- **Silk is considered the queen of fibres. It is used for making dress materials, saris, scarves, jackets, gloves and carpets.**
- **Silk fibre is mainly made of two proteins : sericine and fibroin**
- **Pheromones : These are chemical secreted by an insect to attract the attention of other members of its species.**

(c) Varieties of Silk

- The damaged or waste cocoons are used to produce an inferior quality of silk called **spun silk**.
- **Crepe** is a kind of silk thread made by twisting individual threads of raw silk, then doubling two or more of these together and twisting them again.
- **Tram** is the type of silk thread made by twisting two or more silk threads together in only one direction.
- **Thrown singles** is the type of silk, in which individual threads are twisted in only one direction.
- **Organizing** is the type of silk thread made by twisting a thread in one direction bringing two or more such threads together and twisting them in the opposite direction.
- **mulberry silk** is produced by Bombyx mori worms. These worms are fed on the leaves of mulberry trees.
- **Eri Silk** is produced by Philosomia ricin worms. These worms are fed on leaves of oaster trees leaves.
- **Tusser silk** and Muga silk are produced by Anheraea Mylitta worms.

- **Semi-synthetic fibres :**
  These are obtained from naturally occurring fibres by chemical modifications. For example, cellulose on reaction with acetic anhydride in the presence of concentrated sulphuric acid gives cellulose diacetate, which is used for making threads of acetate and other materials like films and glasses.
- **Synthetic (artificial) fibres :**
  Synthetic fibres are manufactured by man in the laboratories. For example: nylon, acrylic and polyester.

1.4 BURNING CHARACTERISTICS OF VARIOUS FIBRES

S. No.	Fibre	Texture (soft/coarse)	lustre (shiny/dull)	lustre (shiny/dull)
1.	Cotton	Burns steadily and gives out light smoke.	Burning paper	Fine ash is produced, which crumbles on touching.
2.	Nylon	Melts, shrinks and drops of melted nylon falls on the ground	Burning plastic	Dry hard beads are produced that can be moulded when hot and are hard when cold.
3.	Silk	Burns slowly (Fire extinguishing)	Burning hair	Silver beads which crush easily to powder.
4.	Wool	Burns slowly, stops burning when removed from the source	Burning hair	First turns brown, then shiny hollow beads are produced, which crumble on pressing.

CONCEPT APPLICATION LEVEL - I [NCERT Questions]

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 as fleece, has wool in black sheep.
(b) White fleece means the hairy skin which is white in colour.

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 term ?
(i) Rearing (ii) Shearing (iii) Sericulture

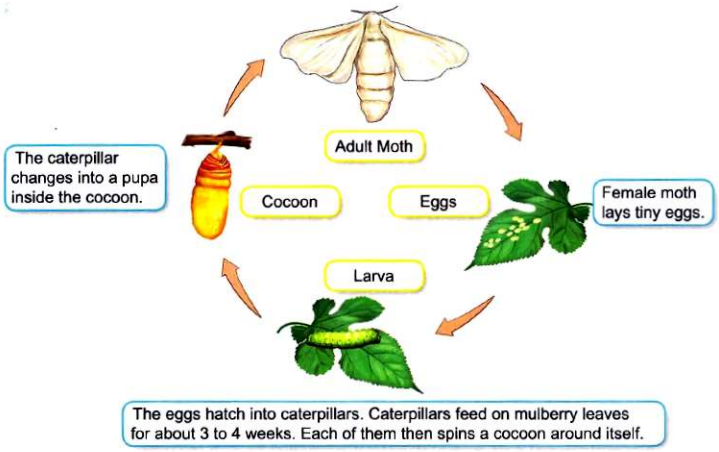
Ans. (i) **Rearing :** Keeping animals and caring for them to obtain useful products
(ii) **Shearing :** The fleece of the sheep along with a thin layer of skin is removed from its body. This is called shearing.
(iii) **Sericulture :** The breeding of these silk moths for production of silk is known as sericulture.

Q.5 Give 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 burrs, colouring, rolling.

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

Ans.



Life cycle of the 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. Sericulture, 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

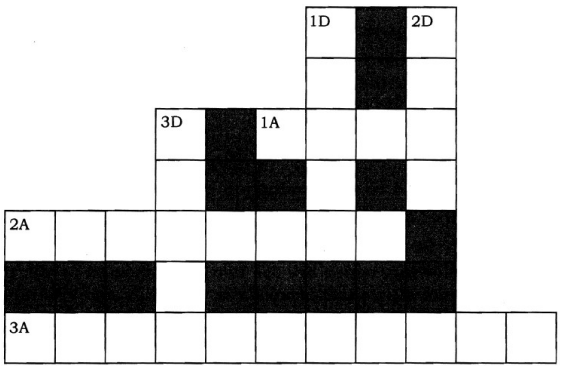
Ans.

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

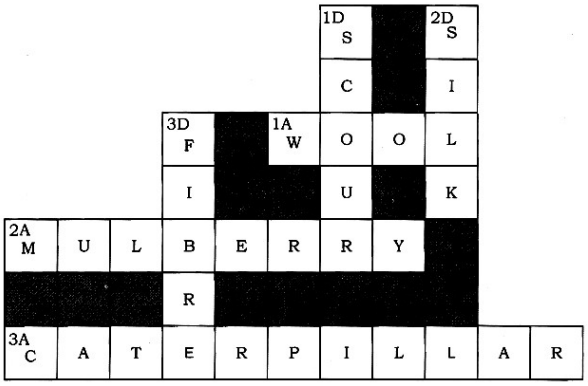
Q.9 Given below is a crossword puzzle based on this lesson. **Use hints to fill in the blank spaces with letters that complete the words.**

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.



CONCEPT APPLICATION LEVEL - II

VERY SHORT ANSWER TYPE QUESTION :

Q.1 From which body part of sheep, wool is obtained?
Ans. Fleece (hair).

Q.2 Name any two animal fibres.
Ans. Wool and silk.

Q.3 Name some animals which yield wool.
Ans. Sheep, goat, yak, camel, alpaca and llama.

Q.4 In its life cycle in which stage the silk moth spin the silk fibre?
Ans. Caterpillar.

Q.5 To which class of organic substances does silk fibre belong?
Ans. Protein.

Q.6 From which animal, the silk is obtained?
Ans. Silk moth.

SHORT ANSWER TYPE QUESTION :

Q.7 How many types of fibres can be obtained from sheep?
Ans. The hairy skin of 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 provides the fibres for making wool.

Q.8 What is 'selective breeding?
Ans. The process of selecting parents for obtaining desired characters in their offsprings, such as soft under hair in sheep, is termed as 'selective breeding'.

Q.9 Describe various sources of wool. What kind of animals in different regions are reared for obtaining wool?
Ans. Though wool commonly available wool in the market is sheep wool, the fleece of sheep is not the only source of wool. For example,
(i) Yak wool is common in Tibet and Ladakh.
(ii) Angora wool is obtained from angora goats, found in hilly regions such as Jammu and Kashmir.
(iii) The under fur of Kashmiri goats is soft. It is woven into fine shawls called Pashmina shawls.
(iv) The fur on the body of camels is also used as wool.
(v) Llama and Alpaca found in South America also yield wool.

Q.10 Explain how the caterpillar makes silk thread.
Ans. Caterpillars grow in size and when it is ready to enter the next stage of its life called pupa, it first weaves a net to hold itself. Then it swings its head from side to side and 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. This covering is known as cocoon.

Q.11 Why is silk obtained by mulberry silk moth most popular?
Ans. The most common silk moth is the mulberry silk moth. The silk fibre obtained from the cocoon of this moth is soft, lusturous and elastic and can be dyed in beautiful colours. Thus it is most popular.

LONG ANSWER TYPE QUESTION :

Q.12 Explain various steps involved in the process of making wool.

Ans. The wool which is used for knitting sweaters, weaving shawls, etc., is the final product of a long process which completes in following steps:

Step I-Shearing: The fleece of the sheep along with a thin layer of skin is removed from its body. This process is called shearing. Machines similar to those used by barbers are used to shave off hair. Usually hair is removed during the hot weather.

Step II-Scouring: The sheared skin with hair is thoroughly washed in tanks to remove grease, dust and dirt. This is called scouring.

Step III-Sorting: The hairy skin is sent to a factory where hair of different textures are separated or sorted.

Step IV-The small fluffy fibres, called burrs are picked out from the hair. The fibres are scoured again and again and dried.

Step V-The fibres can be dyed in various colours.

Step VI-The fibres are straightened, combed and rolled into yarn. The long fibres are woven into wool for sweaters and the shorter fibres are made spun and woven into woollen clothes.

Q.13 How are silkworms reared? Explain in brief.

Ans. After mating with male, the fertilized female silk moth lays hundreds of eggs. These eggs are stored on cloth or paper strips, and kept under hygienic and suitable conditions of temperature and humidity. The eggs are warmed at certain temperature. The eggs hatch into larvae. These larvae feed mulberry leaves and grows in size. The worms are kept in bamboo trays with freshly chopped mulberry leaves. After 25-30 days, the caterpillars stop eating and move to tiny chambers of bamboo in the tray and spin cocoons.

Q.14 Write a short note on the discovery of silk.

Ans. One cannot say certainly how long before the silk was discovered. It was perhaps discovered when the Chinese emperor Huang-ti asked the empress Si-lung-Chi to find the cause of the damaged leaves of mulberry trees growing in their garden. Si-lung-Chi found that white worms were eating mulberry leaves. She also found that the worms were spinning. shiny cocoons around them. Accidentally a cocoon dropped into her cup of tea and a tangle of delicate threads separated from the cocoon.

CONCEPT APPLICATION LEVEL - III

SECTION–A

FILL IN THE BLANKS :

Q.1 The scientific name of silk moth is _____ .

Q.2 The low grade silk is obtained from the filaments of _____ cocoons.

Q.3 Wool is obtained from the _____ of domesticated sheep.

Q.4 Silk and _____ are animal fibres.

Q.5 Silk fibres are made of _____.

TRUE (T) OR FALSE (F) :

Q.6 Silk moths spin the silk fibres. [ ]

Q.7 Silk was first discovered in china. [ ]

Q.8 The most common silk moth is the mulberry silk moths [ ]

Q.9 Wool is also obtained from fur (hair) on the body of camels. [ ]

Q.10 Nylon, acrylic and polyester are semi synthetic fibres. [ ]

MATCH THE GIVEN COLUMNS :

Q.11

	Column-A		**Column-B**
1.	Selective breeding	a.	Process of taking out threads from cocoon
2.	Shearing	b.	Selecting parents for obtaining special characters in their offspring
3.	Scouring	c.	Removing fleece from sheep
4.	Reeling	d.	Washing of hair removed from sheep

SECTION–B

MULTIPLE CHOICE QUESTIONS :

Q.1 Wool is a / an -
(A) fibre obtained from cocoon. (B) artificial fibre.
(C) plant fibre. (D) animal fibre.

Q.2 Which fibres are used to make clothes ?
(A) Natural (B) Synthetic (C) Both (D) None of these

Q.3 Which of these is not a plant fibre ?
(A) Seed fibre (B) Fruit fibre (C) Avian fibre (D) None of these

Q.4 _____ is a cellulose fibre.
(A) Cotton (B) Wool (C) Silk (D) None of these

Q.5 Which of the following is made from coconut fibres ?
(A) Sweaters (B) Shoes (C) Mattresses (D) Sarees

Q.6 Wool is graded according to its -
(A) length & texture (B) dyeing capacity (C) Both (A) & (B) (D) None of these

Q.7 Eri is a type of -
(A) silk (B) wool (C) cotton (D) None of these

Q.8 Which fibre burns with a yellow flame ?
(A) Silk (B) Nylon (C) Rayon (D) None of these

Q.9 Removing the wool from a sheep is called
(A) sericulture (B) shearing (C) spinning (D) ginning

Q.10 Removing of silk fibre from cocoons is -
(A) shearing (B) reeling (C) sericulture (D) None of these

Q.11 Silk is a natural animal fibre obtained from silkworms named -
(A) Bombyx mori (B) Earthworm (C) Morus alba (D) None of these

Q.12 The fibre obtained from Angora goat is -
(A) Mohair (B) Alpaca (C) Llama (D) None of these

Q.13 Cotton is obtained from -
(A) larva of silkworm (B) hairs of sheep (C) balls of flowers (D) patsun

Q.14 The wool of Arabian camels is used to make _____.
(A) sweaters (B) carpets (C) shawls (D) None of these

Q.15 Which disease is most common among the workers of sericulture industry ?
(A) Cancer & Skin (B) Respiratory & Skin (C) Cancer & T.B. (D) None of these

Q.16 Silk thread woven by silkworm around its larva is made up of -
(A) carbohydrates (B) proteins (C) fat (D) None of these

Q.17 Jute is obtained from which part of patsun ?
(A) Leaves (B) Root (C) Stem (D) Both leaves and stem.

Q.18 Wool burns with smell of burning hairs -
(A) as it is obtained from hairs of sheep and goat.
(B) because it is a natural fibre.
(C) because it is synthetic fibre.
(D) None of these

Q.19 Caterpillars spin their cocoons at which stage ?
(A) Pupa Stage (B) Larva Stage (C) Both (A) & (B) (D) None of these

Q.20 Pashmina shawls are obtained from the skin of which animal ?
(A) Kashmiri Goat (B) Camel (C) Yak (D) None of these

Q.21 Which materials were used for clothes in ancient times ?
(A) Animal skins (B) Grass (C) Vines (D) All of these

Q.22 Which among these bodies or organisations produce high quality wool ?
(A) International wool supply (B) International wool secretariat
(C) Indian wool status (D) None of these

Q.23 Which of the following animals does not yield wool ?
(A) Camel (B) Yak (C) Dog (D) Goat

Q.24 Wool can be dissolve in -
(A) acid (B) base (C) Both (A) and (B) (D) None of these

Q.25 Flax is a kind of -
(A) animal skin (B) synthetic fibre (C) plant (D) None of these

ANSWER KEY

CONCEPT APPLICATION LEVEL - III

SECTION–A

FILL IN THE BLANKS :

Q.1 bombyx mori Q.2 Damaged Q.3 Hairs Q.4 Wool Q.5 Protein

TRUE (T) OR FALSE (F) :

Q.6 T Q.7 T Q.8 T Q.9 T Q.10 F

MATCH THE GIVEN COLUMNS :

Q.11 (1) $\rightarrow$ b, (2) $\rightarrow$ c, (3) $\rightarrow$ d, (4) $\rightarrow$ a

SECTION–B

MULTIPLE CHOICE QUESTIONS :

Q.1	D	Q.2	C	Q.3	C	Q.4	A	Q.5	C	Q.6	C	Q.7	A
Q.8	C	Q.9	B	Q.10	B	Q.11	A	Q.12	A	Q.13	C	Q.14	B
Q.15	B	Q.16	B	Q.17	C	Q.18	A	Q.19	A	Q.20	A	Q.21	D
Q.22	B	Q.23	C	Q.24	C	Q.25	C						