



CHAPTER

3

SYNTHETIC FIBRES AND PLASTICS

The clothes which we wear are made of fabrics. Fabrics are made from fibres obtained from natural or artificial sources. Can you name some natural fibres? Fibres are also used for making a large variety of household articles. Make a list of some common articles made from fibres. Try to separate them into those made from natural fibres and those made from artificial fibres. Make entries in Table 3.1.

Table 3.1 : Natural and artificial fibres

S. No.	Name of Article	Type of Fibre (Natural/artificial)

Why did you label some fibres as artificial?

You have read in your previous classes that natural fibres like cotton, wool, silk, etc., are obtained from plants or animals. The synthetic fibres, on the other hand, are made by human beings. That is why these are called **synthetic** or **man-made** fibres.

3.1 What are Synthetic Fibres?

Try to recall the uniform pattern found in a necklace of beads joined with the help of a thread [Fig. 3.1(a)]. Or, try to join a number of paper clips together to make a long chain, as in Fig. 3.1 (b). Is there any similarity between the two?

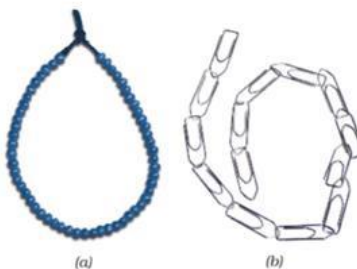


Fig. 3.1 : (a) Beads and (b) paper clips joined to form long chains

A synthetic fibre is also a chain of small units joined together. Each small unit is actually a chemical substance. Many such small units combine to form a large single unit called a **polymer**. The word 'polymer' comes from two Greek words: *poly* meaning *many* and *mer* meaning *part/unit*. So, a polymer is made of many repeating units.



Polymers occur in nature also. Cotton, for example, is a polymer called **cellulose**. Cellulose is made up of a large number of glucose units.

3.2 Types of Synthetic Fibres

A. Rayon

You have read in Class VII that silk fibre obtained from silkworm was discovered in China and was kept as a closely guarded secret for a long time. Fabric obtained from silk fibre was very costly. But its beautiful texture fascinated everybody. Attempts were made to make silk artificially. Towards the end of the nineteenth century, scientists were successful in obtaining a fibre having properties similar to that of silk. Such a fibre was obtained by chemical treatment of wood pulp. This fibre was called **rayon** or **artificial silk**. Although rayon is obtained from a natural source, wood pulp, yet it is a man-made fibre. It is cheaper than silk and can be woven like silk fibres. It can also be dyed in a wide variety of colours. Rayon is mixed with cotton to make bed sheets or mixed with wool to make carpets. (Fig. 3.2.)



Fig. 3.4: Use of Nylon Fibres

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B. Nylon

Nylon is another man-made fibre. In 1931, it was made without using any natural raw material (from plant or animal). It was prepared from coal, water and air. It was the first fully synthetic fibre.

Nylon fibre was strong, elastic and light. It was lustrous and easy to wash. So, it became very popular for making clothes.

We use many articles made from nylon, such as socks, ropes, tents, toothbrushes, car seat belts, sleeping bags, curtains etc. (Fig. 3.3). Nylon is



Fig. 3.3: Various Articles made from Nylon

Is nylon fibre really so strong that we can make nylon parachutes and ropes for rock climbing?



Fig. 3.4: Use of Nylon Fibres



Fig. 3.4: Use of Nylon Fibres

also used for making parachutes and ropes for rock climbing (Fig. 3.4). A nylon thread is actually stronger than a steel wire.

Let us find out.

Activity: 3.1

Take an iron stand with a clamp. Take a cotton thread of about 60 cm length. Tie it to the clamp so that it hangs freely from it as shown in Fig. 3.5. At the free end suspend



Fig. 3.5: An iron stand with a thread hanging from the clamp.

a pan so that weights can be placed in it. Add weights one by one till the thread breaks. Note down the total weight required to break the thread. This weight indicates the strength of the fibre. Repeat the same activity with threads of wool, polyester, silk and nylon. Tabulate the data as shown in Table 3.2. Arrange the threads in order of their increasing strength.

Observation Table 3.2

S. No.	Type of thread/fibre	Total weight required to break the thread
1.	Cotton	
2.	Wool	
3.	Silk	
4.	Nylon	

You may use a hook or a nail on the wall for hanging the fibres and a polythene bag at the other end. In place of weights you may use marbles (or pebbles) of similar size.

Precaution : Note that all threads should be of the same length and almost of the same thickness.

C. Polyester and Acrylic

Polyester is another synthetic fibre. Fabric made from this fibre does not get wrinkled easily. It remains crisp and is easy to wash. So, it is quite suitable for making dress material. You must have seen people wearing nice polyester shirts and other dresses. Terylene is a popular polyester. It can be drawn into very fine fibres that can be woven like any other yarn.

My mother always buys PET bottles and PET jars for storing rice and sugar. I wonder what PET is!



PET is a very familiar form of polyester. It is used for making bottles, utensils, films, wires and many other useful products.

Look around and make a list of things made of polyester.

Polyester (Poly+ester) is actually made up of the repeating units of a chemical called an ester. Esters are the chemicals which give fruits their smell. Fabrics are sold by names like polycot, polywool, terrycot etc. As the name suggests, these are made by mixing two types of fibres. Polycot is a mixture of polyester and cotton. Polywool is a mixture of polyester and wool.

We wear sweaters and use shawls or blankets in the winter. Many of these are actually not made from natural wool, though they appear to resemble wool. These are prepared from another type of synthetic fibre called **acrylic**. The wool obtained from natural sources is quite expensive, whereas clothes made from acrylic are relatively cheap. They are available in a variety of colours. Synthetic fibres are more durable and affordable which makes them more popular than natural fibres.

You have already performed an activity of burning natural and synthetic fibres (Activity 3.6 of Class VII). What

did you observe? When you burn synthetic fibres you find that their behaviour is different from that of the natural fibres. You must have noticed that synthetic fibres melt on heating. This is actually a disadvantage of synthetic fibres. If the clothes catch fire it can be disastrous. The fabric melts and sticks to the body of the person wearing it. We should, therefore, not wear synthetic clothes while working in the kitchen or in a laboratory.



Oh! Now I understand why my mother never wears polyester clothes while working in the kitchen.

All the synthetic fibres are prepared by a number of processes using raw materials of petroleum origin, called **petrochemicals**.

3.3 Characteristics of Synthetic Fibres

Imagine that it is a rainy day. What kind of umbrella would you use and why? Synthetic fibres possess unique characteristics which make them popular dress materials. They dry up quickly, are durable, less expensive, readily available and easy to maintain. Perform the following activity and learn for yourself.

Activity 3.2

Take two cloth pieces of the same size, roughly half a metre square each. One of these should be from natural fibre. The other could be a