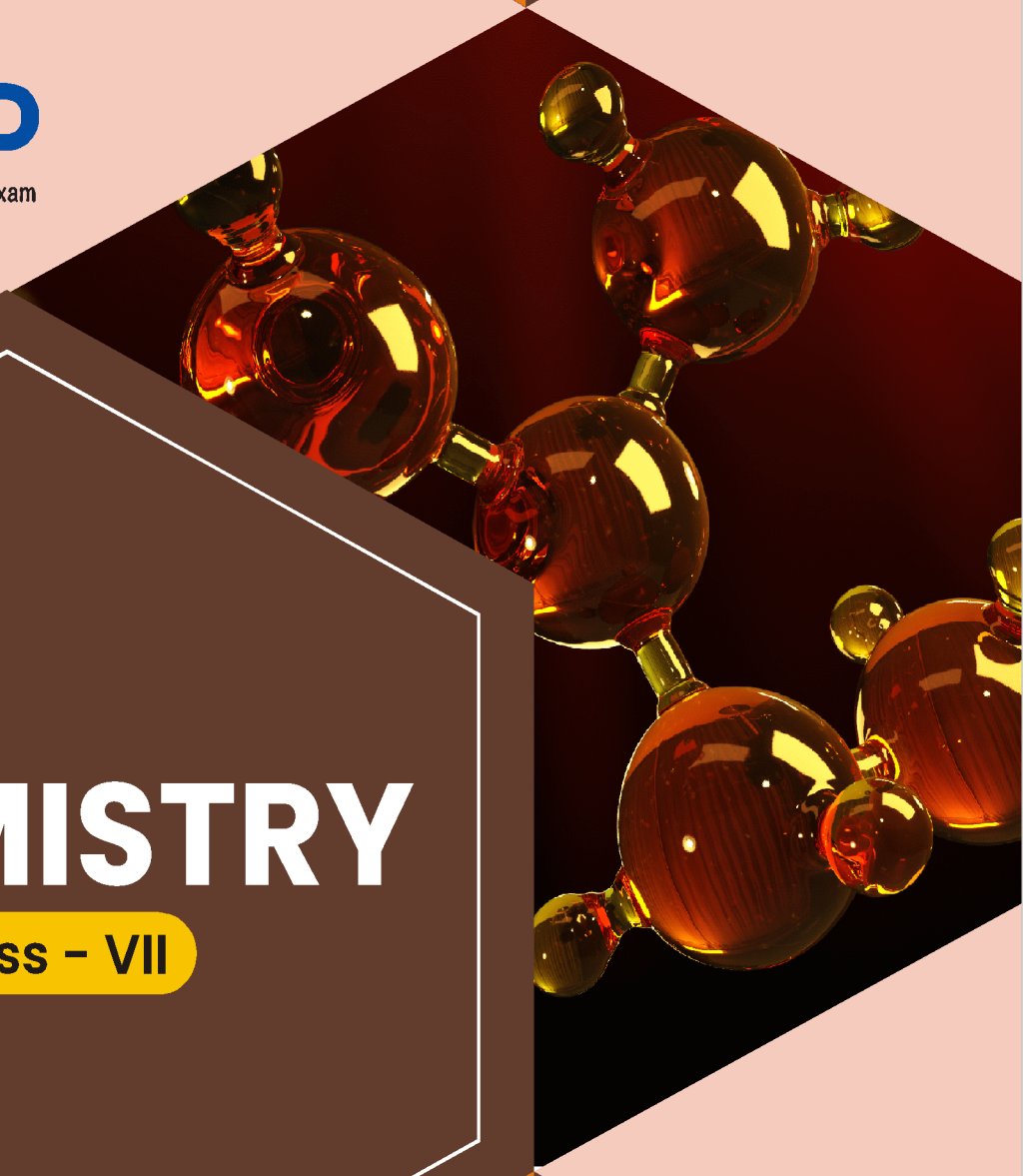
MATRIX OLYMPIAD

The Most Innovative Talent Recognition Exam



CHEMISTRY

Class - VII

MATRIX

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Few words for the Readers

Dear Reader,

"*Matrix Olympiad is established to encourage school students to go a step further than their regular studies, and get a chance and exposure to competition on a wide scale. It also helps students enhance their learning of basic cognitive skills and deeper knowledge of subjects like Science, Mathematics, English, Mental Ability, Social Studies.“Matrix Olympiad helps students nurture their minds for higher targets of tomorrow and enables them to study School for JEE, NEET, CLAT, NDA, Olympiads , NSEJS, NTSE , STSE etc.*"

The above thought has been our guiding principle while designing and collating the study material for **Matrix Olympiad** . And hence, we hope that this particular material will be helpful towards your preparation for **Matrix Olympiad**.

Our team at **MATRIX** has put in their best efforts for making this particular module interesting and relevant for you. Additional efforts have been made to ensure that the content is easy to understand and error free to the extent possible. However, there might remain some inadvertent errors in answer keys and theoretical portion and we would welcome your valuable feedback regarding the same.
If there are any suggestions for corrections, please write to us at **smd@matrixacademy.co.in** and we would be highly grateful.

Finally, we would like to end this message by a famous quote by Ernest Hemingway - "*There is no friend as loyal as a book*." So, please give your study material the time and attention it deserves, and it will surely help you reach newer heights in your fight with competition examinations.

With love and best wishes !
Team MATRIX

CONTENTS

ACIDS, BASES & SALTS

1

Concepts

INTRODUCTION

The chemicals which we come across are usually categorised as acids, bases and salts.

Earlier this classification was based on different taste of chemicals.

Acids were first recognized as substances that taste sour. Vinegar tastes sour because it is a dilute solution of acetic acid. Citric acid is responsible for the sour taste of a lemon.

Bases, sometimes called alkalis, are characterised by their bitter taste and they are soapy to feel. Most hand soaps and commercial preparation for unclogging drains are highly basic.

Substances having taste similar to that of common salt are called salts.

However, some substances have very unpleasant taste and even may be poisonous. Usually salts are prepared by chemical reaction between acids and bases.

Now, the question arises – how to test that the given substance is an acid or a base without tasting it ?

In this chapter, we shall discuss the common characteristics of acid and bases and their chemical nature.

1. ACIDS

- The substances which taste sour contain acids in them and are called acidic substances or acid.
- Some of the acids are naturally occuring acids which are generally present in food items. Lemon juice, orange juice, vinegar, curd, tamarind etc. are sour in taste due to presence of acids.
- Acids are corrosive in nature and soluble in water.

1.1 CLASSIFICATION OF ACIDS

Classification of acids can be done in different ways as given below :

(A) Classification of acids on the basis of their Source

(B) Classification on the basis of their concentration

(C) Classification on the basis of their strength

(A) Classification of acids on the basis of their Source

On the basis of their source, acids can be classified in two categories :

(i) Organic acids **(ii)** Inorganic acids

(i) Organic acids :

The acids which are usually obtained from organisms are known as organic acids. Oxalic acid [$(COOH)_2$], acetic acid (CH_3COOH) etc. are very common examples of organic acids. Some other organic acids with their natural sources are given in the following Table.

Some Organic Acids with Their Natural Sources

S.No.	Organic acid	Natural sources
1.	Acetic acid	Micro-organism (bacteria)
2.	Citric acid	Citrus fruits (like orange and lemon)
3.	Butyric acid	Rancid butter
4.	Formic acid	Sting of bees and ants
5.	Lactic acid	Sour milk
6.	Malic acid	Apples
7.	Oleic acid	Olive oil
8.	Stearic acid	Fats
9.	Amino acid	Proteins
10.	Uric acid	Urine
11.	Tartaric acid	Tamarind
12.	Oxalic acid	Tomatoes

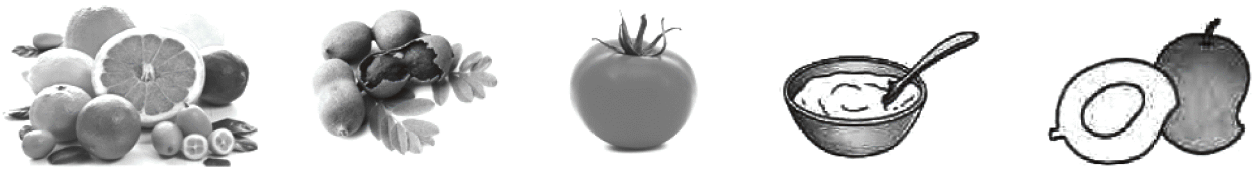


Figure : Substance that contains Acid

(ii) Inorganic Acids.

The acids which are usually obtained from minerals are known as inorganic acids. Since the acids are obtained from minerals, therefore, these acids are also called mineral acids.

Some common examples of inorganic acids are :

Hydrochloric acid HCl

Sulphuric acid H_2SO_4

Nitric acid HNO_3

Phosphoric acid H_3PO_4

Carbonic acid H_2CO_3

(B) Classification on the basis of Concentration of the Acid :

By the term concentration, we mean the amount of water present in the given sample of acid solution in water.

(i) Concentrated Acid :

The sample of an acid which contains very small or no amount of water is called a concentrated acid.

(ii) Dilute Acid :

The sample of an acid which contains very large amount of water is called a dilute acid.

(C) Classification of acids on the basis of their strength :

(i) Strong Acids :

The acids which dissociate completely in water to give a large number of hydrogen ions (H^+) are known as strong acid.

Examples of strong acids :

Some examples of strong acids are :

(i) Hydrochloric acid (HCl) (ii) Sulphuric acid (H_2SO_4) (iii) Nitric acid (HNO_3)

All these three mineral acids are considered to be strong acids because they ionise almost completely in their dilute aqueous solutions.

(ii) Weak Acids :

The acids which do not dissociate completely in water and give a small number of hydrogen ions (H^+) are known as weak acid.

Examples of weak acids :

Some examples of weak acids are :

(i) Acetic acid (CH_3COOH) (ii) Formic acid (HCOOH)

(iii) Oxalic acid [$(COOH)_2$] (iv) Carbonic acid (H_2CO_3)

(v) Sulphurous acid (H_2SO_3) (vi) Hydrogen sulphide (H_2S)

(vii) Hydrocyanic acid (HCN)

Focus Point

- **According to Arrhenius: "**The substances which give hydrogen ions (H^+) in water are known as acids. For example, HCl is an example of acid because it gives H^+ ion in water.

$$HCl \rightarrow H^+ + Cl^-$$

- Generally mineral acids are strong acids while organic acids are weak acids.

2. BASES

- The substances which are bitter in taste and are soapy to touch contain bases in them and are called basic substance or bases.
- All bases are not soluble in water. The bases which are soluble in water are known as alkalis.
- Following table shows examples of a few bases with their chemical names:

Some Common bases

Common Name	Chemical Name
Caustic soda	Sodium hydroxide
Washing soda	Sodium carbonate
Milk of magnesia	Magnesium hydroxide
Slaked lime	Calcium hydroxide
Baking soda	Sodium bicarbonate (Sodium hydrogen carbonate)

2.1 CLASSIFICATION OF BASES

Classification of bases or alkalis can be done in different ways as given below :

(A) Classification on the basis of their concentration

(B) Classification on the basis of their strength

(A) Classification of Bases or Alkalis on the Basis of their Concentration :

By the term concentration, we mean the amount of water present in the given sample of alkali solution in water. On the basis of concentration, the alkalis can be classified as under :

(i) Concentrated alkali :

A solution of alkali having a relatively high percentage of alkali in its aqueous solution is known as concentrated alkali.

(ii) Dilute alkali :

A solution of alkali having a relatively low percentage of alkali in its aqueous solution is known as a dilute alkali.

(B) Classification of the Bases or Alkalis on the Basis of their Strength

(i) Strong alkalis or bases :

The alkalis or bases which undergo almost complete ionisation in aqueous solution to produce high concentration of hydroxyl (OH^-) ions are known as strong alkalis or strong bases.

Example of strong alkalis or bases :

Some example of strong alkalis or bases are : Sodium hydroxide (NaOH), Potassium hydroxide (KOH) and Barium hydroxide [$Ba(OH)_2$] etc.

$NaOH(aq) \longrightarrow Na^{+}(aq) + OH^{-}(aq)$
$KOH(aq) \longrightarrow K^{+}(aq) + OH^{-}(aq)$
$Ba(OH)_2(aq) \longrightarrow Ba^{2+}(aq) + 2OH^{-}(aq)$
} (Almost completely ionised)

(ii) Weak alkalis or bases :

The alkalis or bases which undergo only partial ionisation in aqueous solution to produce a relatively low concentration of hydroxyl (OH^-) ions are known as weak alkalis or weak bases.

Some examples of weak alkalis or bases are :

Ammonium hydroxide (NH_4OH), Calcium hydroxide [$Ca(OH)_2$], Magnesium hydroxide [$Mg(OH)_2$] etc

Focus Point

- **According to Arrhenius:** "The substances which give hydroxyl ions (OH^-) in water are known as bases. For example, NaOH is an example of base because it gives OH^- ion in water.
  $NaOH \rightarrow Na^{+} + OH^{-}$
- **Alkalis:** The bases which are soluble in water are known as alkalis.
  For example, NaOH, KOH etc are also known as alkalis because they are soluble in water.

3. INDICATORS

• An indicator is a substance which changes colour when added to an acid or a base. The change in colour indicates whether the substance is acidic or basic. If there is no change in the colour of the indicator, the substance is called a neutral substance.

• Indicators can be natural dyes extracted from plants or chemical compounds.

3.1 NATURAL INDICATORS

The indicators which are obtained from natural resources known as natural indicators. Some examples of natural indicators are given below :

(A) Litmus :

• Litmus is a natural dye which is extracted from lichens. Litmus solution is prepared from this extract. It is also used in the form of litmus paper which is prepared by absorbing litmus solution on filter paper.

• Litmus is available in the form of blue litmus paper and red litmus paper.

• Acidic substances change blue litmus paper to red while basic substances change red litmus paper to blue.

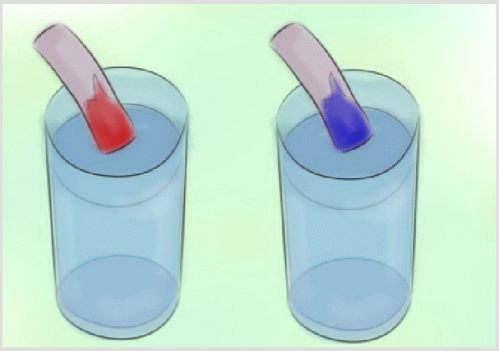
• Substances which do not change the colour of the litmus paper are known as neutral substances.

Action of litmus on acidic or basic solutions can be understood by following activity.

LAB TIME
Let's Do & Learn

- **Object : To identify the given substances as acidic or basic in nature.**
- **Materials required**: Vinegar, lemon juice, soap solution, soda water, curd, limewater, window cleaner, orange juice, aerated soft drink, sugar solution, salt solution, red litmus paper, blue litmus paper, dropper.
- **Procedure :**

(i) Take a drop of the sample solution and put it on the blue litmus paper. Note the change in colour.
(ii) Now put a drop of the same solution on red litmus paper and note the change in colour.



Acid Base

- **Observations :**

Sample	Change in colour with blue litmus paper	Change in colour with red litmus paper
Vinegar	Red	No change
Lemon juice	Red	No change
Soap solution	No change	Blue
Soda water	Red	No change
Curd	Red	No change
Limewater	No change	Blue
Window cleaner	No change	Blue
Orange juice	Red	No change
Aerated soft drink	Red	No change
Sugar solution	No change	No change
Salt solution	No change	No change

• **Conclusion**: Substances which change blue litmus paper to red are acidic substances. Substances which change red litmus paper to blue are basic substances and substances which do not change the colour of litmus paper are neutral substances.

(B) China rose:

- China rose makes another natural indicator which is prepared by soaking the petals of the flower in water.
- Acidic substances change China rose indicator into dark pink or magenta while basic substances turn China rose indicator into green.
- Substances which do not change the colour of China rose indicator are neutral in nature.

LAB TIME
Let's Do & Learn

- **Object : To test the samples by China rose indicator for identification of acidic or basic nature.**
- **Materials required :** Vinegar, lemon juice, soap solution, soda water, curd, limewater, window cleaner, orange juice, aerated soft drink, sugar solution, salt solution, China rose, warm water, dropper.

•Procedure :

(i) Take some warm water in a beaker and put few China rose petals in it. Keep the petals dipped for some time till the water becomes coloured.

(ii) Take the coloured water and use it as an indicator by putting few drops in the sample solution.

(iii) Observe the change in colour of the China rose solution with each sample.

- **Observations:**

Sample	**Change in colour of China rose indicator**
Vinegar	Magenta
Lemon juice	Magenta
Soap solution	Green
Soda water	Magenta
Curd	Magenta
Limewater	Green
Window cleaner	Green
Orange juice	Magenta
Aerated soft drink	Magenta
Sugar solution	No change
Salt solution	No change

- **Conclusion :**

(i) Samples which turn China rose indicator to magenta (dark pink) are acidic in nature.

(ii) Samples which turn China rose indicator to green are basic in nature.

(iii) Sugar and salt solutions which do not show any colour change in the indicator are neutral.

(C) Turmeric :

• Turmeric or haldi powder is another natural indicator.

• Turmeric paste made by adding water to turmeric powder is used as an indicator for making turmeric paper.

• With acidic or neutral substances turmeric paper remains yellow. Turmeric paper changes to red colour in basic solutions.

Let's discuss an activity to understand action of turmeric on acidic or basic solution.

• **Object : To test acidic or basic solutions using turmeric powder as indicator.**

• **Materials required :** Vinegar, lemon juice, soap solution, soda water, curd, limewater, window cleaner, orange juice, aerated soft drink, sugar solution, salt solution, turmeric powder, water, blotting paper.

• **Procedure :**

(i) Take one teaspoon of turmeric powder. Add a small amount of water to it to make a paste.

(ii) Apply this paste on a blotting paper and let it dry. Cut the dried paper into thin strips.

(iii) Dip the strip into each sample solution and note down the change in colour.

• **Observations :**

Sample	**Change in colour of turmeric paper**
Vinegar	No change
Lemon juice	No change
Soap solution	Red
Soda water	No change
Curd	No change
Limewater	Red
Window cleaner	Red
Orange juice	No change
Aerated soft drink	No change
Sugar solution	No change
Salt solution	No change

• **Conclusion:**

With basic samples like soap solution, limewater and window cleaner turmeric paper changes from yellow to red.

(D) Red Cabbage :

- Red cabbage can also be used for making a natural indicator to test acids and bases.
- Red cabbage indicator can be prepared by boiling chopped red cabbage in water.
- Acidic solutions change purple colour of red cabbage indicator to red while basic solutions change purple colour of red cabbage to green.
- Neutral substances do not change the colour of red cabbage indicator.

Let's discuss an activity to understand action of red cabbage on acidic or basic solution.

LAB TIME
Let's Do & Learn

- **Object : To identify acidic, basic and neutral substances by using red cabbage indicator.**
- **Materials required :** Vinegar, lemon juice, soap solution, soda water, curd, limewater, window cleaner, orange juice, aerated soft drink, sugar solution, salt solution, red cabbage, water.
- **Procedure :**

(i) Add chopped red cabbage to warm water and keep it dipped for some time.

(ii) Strain the solution and use this purple coloured solution as indicator and test the given samples to note any change in colour.

- **Observations:**

Sample	Change in colour of red cabbage indicator
Vinegar	Red
Lemon juice	Red
Soap solution	Green
Soda water	Red
Curd	Red
Limewater	Green
Window cleaner	Green
Orange juice	Red
Aerated soft drink	Red
Sugar solution	No change
Salt solution	No change

- **Conclusion :**

(i) The samples which turn purple colour of red cabbage indicator to red are acidic in nature.

(ii) The samples which turn purple colour of red cabbage indicator to green are basic in nature.

(iii) Solutions which do not change the colour of red cabbage indicator are neutral.

3.2 SYNTHETIC INDICATORS

- Some chemical compounds which are prepared in laboratory can also be used as indicators to identify bases and acids.
- Methyl orange and phenolphthalein are two common indicators used to test acids and bases.

(A) Phenolphthalein :

It is also an organic dye and acidic in nature. In neutral or acidic solution, it remains colourless while in the basic solution, the colour of indicator changes to pink.

(B) Methyl Orange :

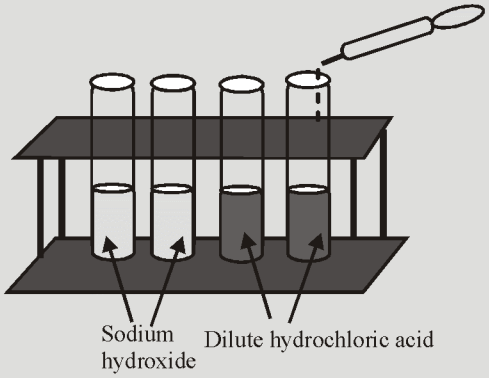
Methyl orange is an orange coloured dye and basic in nature. In the acidic medium the colour of indicator becomes red and in the basic medium, colour of indicator becomes yellow and in neutral medium, its colour remains unchanged.

LAB TIME
Let's Do & Learn

- **Object : To identify the given samples of acid and base by using phenolphthalein and methyl orange as indicators.**
- **Materials required :** Dilute hydrochloric acid, sodium hydroxide solution, phenolphthalein, methyl orange, dropper, test tubes.
- **Procedure :**

  (i)Take a small amount of given solution in a test tubes and add two drops of phenolphthalein.

  (ii) Repeat the experiment with methyl orange and record the observations.



- **Observations :**

Sample	Indicator	Colour
Sodium hydroxide	Phenolphthalein	Pink
Sodium hydroxide	Methyl orange	Yellow
Dilute hydrochloric acid	Phenolphthalein	Colourless
Dilute hydrochloric acid	Methyl orange	Red

- **Conclusion :**

  Phenolphthalein remains colourless in hydrochloric acid while turns pink with sodium hydroxide.

  Methyl orange remains yellow with sodium hydroxide while turns red with hydrochloric acid.

Action of various indicators on acidic, basic or neutral solutions

Indicator	Acid solution	Basic solution	Neutral
Methyl orange	Red	Yellow	Orange
Phenolphthalein	Colourless	Pink	Colourless
Blue litmus solution	Red	No colour change	No change
Red litmus solution	No change	Blue	No change
Red cabbage Juice	Red or pink	Green	Purple
Turmeric juice	Yellow	Reddish	Yellow
China Rose	Dark pink or Magenta	Green	Pink

Focus Point

- **Olfactory indicator:**

The indicators which change their smell in acidic or basic solution known as Olfactory indicator.

For exmaple : Clove oil, Chopped onion etc.

4. USES OF ACIDS AND BASES

4.1 USES OF ACIDS

- Sulphuric acid is used for manufacturing fertilisers, drugs, plastics, paints. It is also used in making batteries for vehicles and used in paper, textile and leather industries.
- Nitric acid is used for manufacturing explosives and fertilisers.
- Hydrochloric acid is used as a cleaner, to remove scales or deposits in the boilers.

4.2 USES OF BASES

- Bases are used as common reagents in various industries.
- Calcium hydroxide is used for white washing of buildings.
- Sodium hydroxide is used for manufacturing soap. It is also used for manufacturing paper, rayon, textiles, etc.
- Ammonium hydroxide is used for manufacturing, fertilisers, plastics, dyes, etc.

Focus Point

pH of acidic, basic and neutral solution

• The strength of an acid and a base is measured by a scale called pH scale. pH value of solution indicates the concentration of hydrogen ions in the solution. Pure water which is nautral has a pH value 7. A pH paper is used to find out pH of a solution by matching the change in colour with a universal indicator paper.

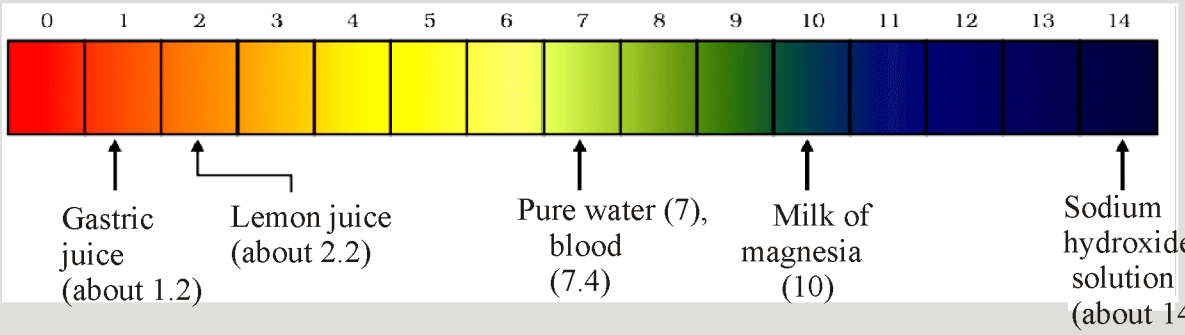
• In general, lesser the pH of a solution, more will be its acidic strength. Similarly, higher the pH of a solution, more will be its acidic strength. Similarly, higher the pH of a solution, more will be its basic strength.

A neutral salt solution has pH = 7.

An acidic salt solution has pH < 7.

A basic salt solution has pH > 7.

• pH plays vital role in our daily life because most of the biochemical reactions take place at specific pH values. pH of our blood is in the range of 7.36 – 7.42. Our body becomes prone to disease when pH of blood alters due to some reason.



5. NEUTRALISATION

When an acid and a base are mixed, they react and form a new compound called salt. Water is formed during the reaction and heat is evolved. The reaction between an acid and a base is called neutralisation.

Acid + Base ⟶ Salt + Water + Heat

LAB TIME
Let's Do & Learn

• **Object : To study the reaction between an acid and a base (neutralisation reaction).**

• **Materials required :** Dilute hydrochloric acid, dilute sodium hydroxide solution, phenolphthalein, test tubes, dropper.

• **Procedure :**

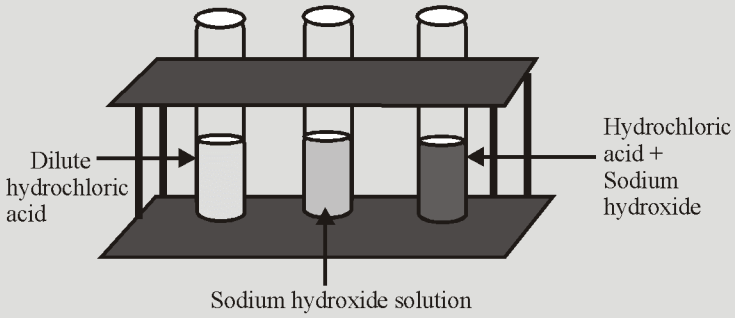
(i) Take a test tube and add some dilute hydrochloric acid to it.

(ii) Add few drops of phenolphthalein. Observe if there is any change in colour.

(iii) Now add sodium hydroxide solution slowly. Keep shaking the test tube and observe change in colour.

(iv) Keep adding sodium hydroxide till the solution becomes pink. Add one more drop of sodium hydroxide and observe the colour of the solution.

(v) Touch the test tube and observe the temperature.



• **Observations :** When phenolphthalein is added to dilute hydrochloric acid, the solution is colourless. As we keep adding sodium hydroxide to it there is appearance of pink colour which disappears on shaking. When the acid and base neutralise each other, the resulting solution is neutral hence the solution is colourless. When an extra drop of sodium hydroxide is added, the solution turns pink. When we touch the test tube it feels warm.

• **Conclusion :**

(i) When a base and an acid are mixed in just right amount, neutralisation reaction takes place. When there is extra base in the solution, it turns phenolphthalein pink. Heat is evolved during neutralisation.

(ii) In the above reaction dilute hydrochloric acid (HC1) and sodium hydroxide (NaOH) react to form sodium chloride (NaCl) and water (H_2O). Sodium chloride is also known as common salt.

Hydrochloric acid + Sodium hydroxide $\rightarrow$ Sodium chloride + Water

HC1 + NaOH $\rightarrow$ NaCl + H_2O

Focus Point

Universal indicator:

An indicator is a substance that changes colour in different pH environments. It is the brown coloured solution containing a mixture of indicator that can be added to any substance to determine its pH.

For low pH Red colour

For neutral Green colour

For high pH Blue or violet

6. IMPORTANCE OF NEUTRALISATION REACTIONS IN EVERYDAY LIFE

- **Treatment of Acidity and Indigestion :**

In our stomach hydrochloric acid helps in digestion. But excess of Acid in the stomach causes acidity and indigestion. It can be treated by neutralising the acid with a mild base. These bases are called antacids. Milk of magnesia is an antacid which contains a mild base, i.e, magnesium hydroxide.

- **Treatment of Acidity of Soil:**

Due to use of excess of fertilisers in the soil, the nature of the soil becomes acidic. Acidic soil is not good for plants. To neutralise the acidity of the soil some bases like slaked lime (calcium hydroxide) or quick lime (calcium oxide) is added to the soil.

- **Treatment of Ant sting :**

The sting of an ant contains formic acid which causes pain and inflammation. To get relief from ant sting the acid is neutralised by bases like sodium bicarbonate (baking soda) or zinc carbonate (calamine solution).

- **Treatment of Factory Waste :**

When acidic waste from factories is disposed off in rivers, the water becomes acidic and is harmful for aquatic life. To avoid pollution of rivers the factory waste is first neutralised by bases and then thrown in water.

- **Prevention of Tooth Decay :**

The bacteria present in mouth produce acids which lead to tooth decay. Tooth decay is prevented by brushing the teeth with tooth paste which contains bases, resulting in neutralisation of the acid thus preventing cavities.

7. ACIDIC, BASIC OR NEUTRAL SOLUTIONS OF SALTS

- Salts formed by a strong acid and a strong base are called neutral salts. Neutral salts produce neutral solutions when dissolved in water, e.g., sodium chloride (salt of HCl and NaOH).

- Salts formed by neutralisation of a strong acid and a weak base give acidic solution e.g., ammonium chloride (salt of HCl and NH_4OH).
- Salts formed by neutralisation of a strong base and a weak acid give basic solution e.g., sodium acetate (salt of NaOH and CH_3COOH).

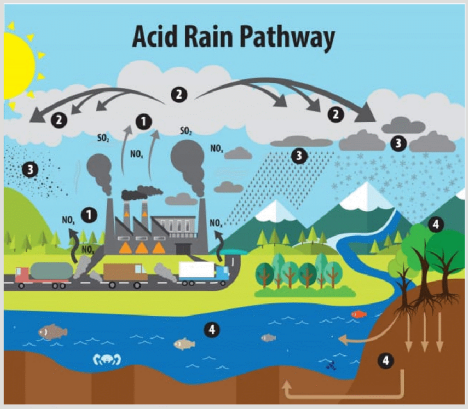
8. USES OF SALTS

- Sodium chloride (common salt) is an important part of our food and vital to health. It is used as a preservative, in making soaps and preparing many chemicals.
- Sodium carbontate (washing soda) is an important part of detergents. It is also used in making glass.
- Sodium bicarbonate (baking soda) is used in baking cakes and bread. It is also used in extinguishers.
- Copper sulphate (blue vitriol) is used as a fungicide and in electroplating.

Focus Point

Acid rain

- The rain which contains excess of acids dissolved in it, is called acid rain.
- The acidic oxides present in the air like carbon dioxide, sulphur, dioxide and nitrogen dioxide are dissolved in rain water to form acids like carbonic acid, sulphuric acid and nitric acid.
- Acid rain causes damage to crops, soil and buildings made up of marbles.



Water of Crystallisation

- The fixed number of water molecules which remains with the crystalline salts is known as a water of crystallisation, e.g. $FeSO_4.7H_2O$, $CuSO_4.5H_2O$, $Na_2CO_3.10H_2O$.

SOLVED EXAMPLES

SE. 1

Baking soda is used to treat bee sting while vinegar is used to treat wasp sting. Based on the information what is the difference in chemical nature of wasp sting and bee sting?

Ans. Since baking soda is used to treat bee sting it means bee sting contains acid which is neutralised by baking soda. Since vinegar is used to treat wasp sting it indicates that wasp sting contains some base which is neutralised by vinegar.

SE. 2

Name three acids obtained from natural sources.

Ans. (i) Citric acid from oranges
(ii) Lactic acid from curd
(iii) Oxalic acid from tomatoes

SE. 3

Why does a milkman usually add a very small amount of baking soda to fresh milk during summer season?

Ans. Baking soda is basic in nature. It neutralises the lactic acid present in milk and prevents it from turning sour.

SE. 4

What is a neutralisation reaction? Give one examples.

Ans. The reaction of an acid and a base to form salt and water is known as neutralisation reactio
Example: Sodium hydroxide (NaOH) + Hydrochloric acid (HCl) $\rightarrow$ Sodium chloride (NaCl) + Water (H_2O)

SE. 5

Can we dilute concentrated sulphuric acid by adding water to it? Explain.

Ans. No, water should never be added to acid since a large amount of heat is evolved which results boiling of acid. Acid is diluted by adding concentrated acid to water since the heat evolved gets absorbed in water.

SE. 6

What will you observe when
(i) methyl orange is added to dilute hydrochloric acid?
(ii) a drop of phenolphthalein is added to limewater?

Ans. (i) Methyl orange will change to red in acidic solution.
(ii) The colour of phenolphthalein will become pink in basic solution.

SE. 7

Why should a farmer add quick lime to the soil if he thinks his crop is not growing well?

Ans. The farmer should add quick lime to the soil if the soil condition is more acidic than the required conditions. Quick lime will neutralise the excess of acid present in soil.

SE. 8

Why are factory wastes treated with bases before discharging?

Ans. The factory waste contains harmful acids which if flown to rivers causes lot of damage to aquatic plants and animals. Hence, these acids are first neutralised by bases.

SE. 9

Name the base used in manufacture of soap.

Ans. Sodium hydroxide is used to manufacture soap. Soaps are sodium salts of fatty acids.

EXERCISE – I

ONLY ONE CORRECT TYPE

1. A boy was given two test tubes one containing water and other containing sodium hydroxide. To identify the solutions which of the following indicators can be used by him?
   (i) Blue litmus
   (ii) Turmeric indicator
   (iii) Phenolphthalein
   (iv) Red litmus
   (A) (i) and (iv) (B) (ii), (iii) and (iv)
   (C) only (iv) (D) only (iii)
2. Which of the following will turn blue litmus red?
   (A) Limewater (B) Lemon water
   (C) Sugar solution (D) Salty water
3. Which of the following acids is present in sour milk?
   (A) Lactic acid (B) Formic acid
   (C) Acetic acid (D) Citric acid
4. Vinegar is
   (A) Bitter in taste (B) Sour in taste
   (C) Sweet in taste (D) Tasteless
5. The acid present in the stomach which helps in digestion is
   (A) Sulphuric acid (B) Citric acid
   (C) Lactic acid (D) Hydrochloric acid
6. Hydrochloric acid can be neutralised by
   (A) Sodium hydroxide
   (B) Calcium hydroxide
   (C) Sodium carbonate
   (D) All of these.
7. Acidic soil can be neutralised by
   (A) Vinegar (B) Quick lime
   (C) Orange juice (D) Tamarind juice
8. When added to acids, phenolphthalein
   (A) Changes to pink
   (B) Changes to green
   (C) Remains colourless
   (D) Changes to orange
9. When an acid and a base react, salt (X) and another product (Y) are formed. (Y) is
   (A) An acid (B) A base
   (C) Water (D) Hydrogen
10. A substance that changes colour in acidic and basic solutions is called
    (A) an indicator (B) a weak base
    (C) a weak acid (D) a neutral salt
11. Neutralisation is used in the treatment of
    (A) Tooth decay (B) Indigestion
    (C) Soil treatment (D) All of these.
12. Lemon juice and coffee
    (A) Are both acidic
    (B) Are both basic
    (C) Lemon juice is acidic, coffee is basic
    (D) Lemon juice is basic, coffee is acidic.
13. Citric acid is present in
    (A) Curd (B) Milk
    (C) Lemon (D) Spinach
14. Which of the following is a mineral acid?
    (A) Lactic acid (B) Formic acid
    (C) Tartaric acid (D) Nitric acid
15. Which of the following explains the properties corrosive, sour, water soluble, present in citrus fruits?
    (A) Acid (B) Base
    (C) Salt (D) Alkali

16. Which of the following is not an inorganic acid?
(A) Hydrochloric acid (B) Nitric acid
(C) Sulphuric acid (D) Acetic acid

17. Which of the following types of medicines is used for treating indigestion?
(A) Antibiotic (B) Antacid
(C) Antiseptic (D) Antipyretic

18. Which of the following statements is not correct?
(A) Acids turn blue litmus red.
(B) Bases are bitter in taste.
(C) Neutralisation reaction gives salt and water.
(D) All the indicators change colour in acids and bases.

19. The common salt is
(A) Sodium carbonate
(B) Sodium bicarbonate
(C) Sodium chloride
(D) Sodium nitrate

20. Which of the following is a strong acid?
(A) Hydrochloric acid (B) Carbonic acid
(C) Acetic acid (D) Lactic acid

21. What is the colour of turmeric indicator in a basic solution?
(A) Green (B) Red
(C) Yellow (D) Pink

22. Lemon juice will turn
(A) Phenolphthalein pink
(B) Red litmus blue
(C) Turmeric indicator red
(D) Methyl orange red

23. Common name of sodium bicarbonate is
(A) Common salt (B) Baking soda
(C) Washing soda (D) Quick lime

24. Which of the following is not the property of an alkali?
(A) They have bitter taste.
(B) They turn red litmus blue.
(C) They are insoluble in water.
(D) They give pink colour with phenolphthalein.

25. The acidic waste of factories, before disposing off in the river is treated with
(A) Hydrochloric acid (B) Bleaching powder
(C) Bases (D) Salts

PARAGRAPH TYPE

PARAGRAPH # 1

Neutralisation is a process in which an acid reacts with a base to produce salt and water. Take some dilute hydrochloric acid in a test tube and add 2-3 drops of phenolphthalein. The solution will remain colourless. Add to this acidic solution, sodium hydroxide solution with the help of a dropper and shake the test tube after adding each drop. The pink colour which appears keeps disappearing on shaking. Stop adding sodium hydroxide drop when the pink colour does not disappear. This is the point where neutralisation reaction has taken place. After this, if you keep on adding sodium hydroxide the solution will remain pink since it is basic in nature. pH of a neutral solution is 7.

1. Products of a neutralisation reactions are always-
(A) An acid and a base
(B) An acid and a salt
(C) A salt and water
(D) A salt and a base

2. Name the solution which do not change the colour of either red or blue litmus ?
(A) Base solution
(B) Acid solution
(C) Neutral solution
(D) Indicator

3. What is p^H of a neutral solution ?
(A) 8 (B) 6
(C) 7 (D) 4

PARAGRAPH # 2

Acid rain, or acid deposition is a broad term that includes any form of precipitation with acidic components, such as sulphuric or nitric acid that fall to the ground from the atmosphere in wet or dry forms. The acidic oxides present in air like carbon dioxide, sulphur dioxide and nitrogen dioxides are dissolved in rain water to form acids like carbonic acid, sulphric acid and nitric acid.

Typical acid rain has pH value of 4. A decrease in pH values from 5 to 4 means that the acidity is 10 times greater.

1. Which of the following gases are main contributors to acid rain ?
(A) CO_2 & CO (B) SO_2 & CO_2
(C) SO_2 & NO_2 (C) SO_2 & N_2O

2. Liquids with a p^H less than _____ are acidic.
(A) 10 (B) 9
(C) 8 (D) 7

3. Who discovered the phenomenon of acid rain ?
(A) George brown
(B) James T. stewart
(C) Robert Angus Smith
(D) Charles David

MATCH THE COLUMN TYPE

In this section, each question has two matching lists. Choices for the correct combination of elements from List-I and List-II are given as options (a), (B), (C) and (D) out of which one is correct.

1.

List-I	List-II
(P) Quicklime	1.Sodium hydroxide
(Q) Caustic soda	2. Magnesium hydroxide
(R) Washing soda	3. Calcium oxide
(S) Milk of magnesia	4. Sodium carbonate

Code :

	P	Q	R	S
(A)	1	2	3	4
(B)	3	1	4	2
(C)	2	3	4	1
(D)	4	2	1	3

2.

List-I	List-II
(P) Citric acid	1. Tamarind
(Q) Lactic acid	2. Tomatoes
(R) Oxalic acid	3. Orange
(S) Tartaric acid	4. Sour milk

Code :

	P	Q	R	S
(A)	3	4	2	1
(B)	4	3	2	1
(C)	1	3	4	2
(D)	2	1	3	4

EXERCISE – II

VERY SHORT ANSWER TYPE

1. Name the acid present in vinegar.
2. Give names of any two natural indicators.
3. What is a neutral salt?
4. What is the colour of phenolphthalein in basic solution?
5. Write the chemical name and formula of baking soda.
6. Name two synthetic acid-base indicators.
7. Name the acid present in tomatoes.
8. What is the reaction between an acid and a base called?
9. Which acid is present in sour milk?
10. What is the reaction between an acid and a base called ?

SHORT ANSWER TYPE

1. What is an indicator?
2. How will you prepare China rose indicator?
3. What are strong and weak bases? Give two examples of each.
4. What is the difference between an ant sting and a wasp sting?
5. Why do antacid tablets relieve the uneasiness due to indigestion?

FILL IN THE BLANKS TYPE

1. Bases which are soluble in water are called.....
2. Substances used for testing acids and bases are called..... .
3. Bases react with acids to form.....and.....
4. Acids turn..... litmus to ..... while bases turn ..... litmus to ..... .
5. The colour of phenolphthalein is ..... in acidic and ..... in basic solutions.

TRUE OR FALSE TYPE

1. Litmus is an indicator prepared by dissolving litmus salt in water.
2. Antacids neutralise the bases present in the stomach.
3. When an acid reacts with a base, neutralisation reaction takes place to give salt and water.
4. Acids have a sour taste and they are soapy to touch.
5. All bases are alkalis but all alkalis are not bases.

LONG ANSWER TYPE

1. Four solutions A, B, C and D are taken in four test tubes. They were tested with four indicators— methyl orange, phenolphthalein, China rose and blue litmus. The observations are recorded below. Identify A, B, C and D as acids, bases or neutral salts.

Soln.	Methyl orange	Phenol-phthalein	China rose	Blue litmus
A	Orange	Colourless	Pink	Blue
B	Yellow	Pink	Green	Blue
C	Red	Colourless	Magenta	Red
D	Yellow	Pink	Green	Blue

2. Demonstrate a neutralisation reaction between sodium hydroxide and dil. hydrochloric acid using phenolphthalein as indicator. Explain the changes in colour of the indicator during the reaction.
3. Give few important applications of neutralisation reactions.
4. How will you prepare turmeric indicator? Using this indicator give tests for limewater, salt solution and soap solution.
5. Complete the following table :

Indicator	Colour in acidic medium	Colour in basic medium	Colour neutral medium
Blue litmus	_____	_____	_____
Red litmus	_____	_____	_____
China rose	_____	_____	_____
Turmeric	_____	_____	_____
Methyl orange	_____	_____	_____
Phenolphthalein	_____	_____	_____

EXERCISE I ANSWER KEY

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

MATCH THE COLUMN

1. B 2. A

PARAGRAPH TYPE # 1

1. C 2. C 3. C

PARAGRAPH TYPE # 2

1. C 2. D 3. C

EXERCISE II

FILL IN THE BLANKS

1. Alkalis 2. Indicators 3. Salt, water
4. Blue, Red, Red, Blue 5. Colourless, pink

TRUE OR FALSE

1. F 2. F 3. T 4. F 5. F

SELF PROGRESS ASSESSMENT FRAMEWORK

(CHAPTER : ACIDS, BASES AND SALTS)

CONTENT	STATUS	DATE OF COMPLETION	SELF SIGNATURE
Theory			
In-Text Examples			
Solved Examples			
Exercise I			
Exercise II			
Short Note-1			
Revision - 1			
Revision - 2			
Revision - 3			
Remark			

NOTES :

1. In the status, put "completed" only when you have thoroughly worked through this particular section.
2. Always remember to put down the date of completion correctly. It will help you in future at the time of revision.

Space for Notes :

FIBRE TO FABRIC 2

Concepts

Introduction

1. *Types of Fibres*
2. *Natural Fibre*
   - *2.1 Plant Fibre*
3. *Animal Fibres*
   - *3.1 Wool*
   - *3.2 Silk*
4. *Other useful plant Fibres*
   - *4.1 Coir*
   - *4.2 Silk Cotton*
   - *4.3 Kapok*
   - *4.4 Hemp*
   - *4.5 Flax*

Solved Examples

Exercise – I (SCQ Type)

Exercise – II (Board Pattern Type)

Answer Key

INTRODUCTION

You all know that food, clothing, shelter are the three basic needs of life. You eat food to survive and protect yourself from diseases, you need a house to live in. Why do you wear clothes ? You wear clothes for protection against climate, for modesty and beauty, and also to show status. The material that you use for clothing is called fabric. These fabrics are made up of fibres. Fibre is a hair-like strand of material. It is flexible and can be spun or twisted for weaving and knitting to make desired products.

Fibres can be obtained in natural form, from plants and animals as well as in synthetic form. Man-made or synthetic fibres are either made up of chemicals or by processing natural fibres to create new fibre structures or properties.

LAB TIME
Let's Do & Learn

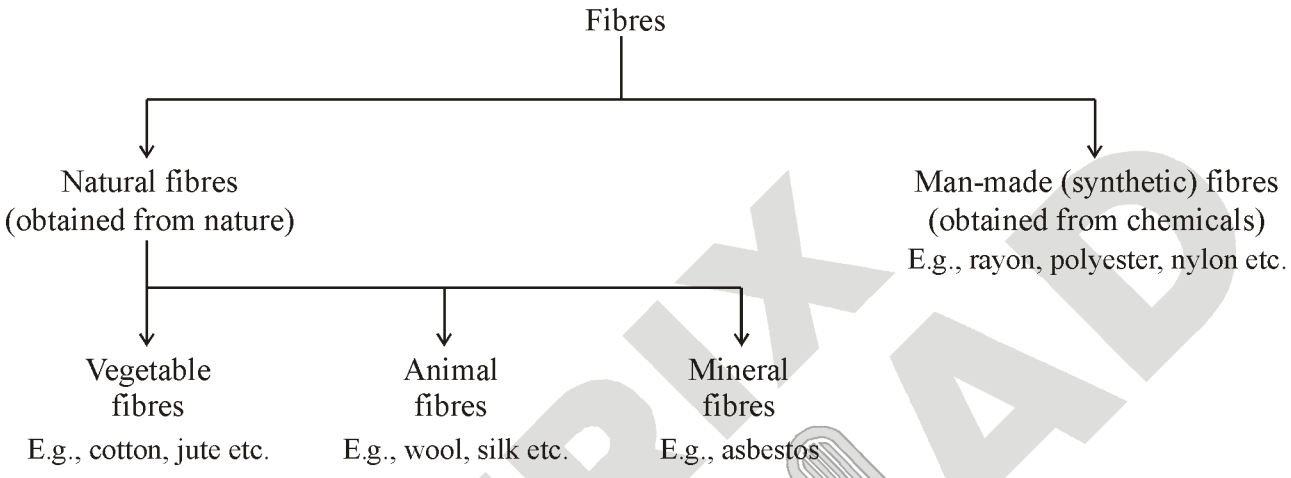
Object : To understand the meaning of fibre and yarn.

Procedure :

- Take a cloth and pull out a thread. Untwist to loosen this thread.
- You will see that it is made up of smaller threads of hair like strands. Pull out one of these strands. This single hair like strand is called a fibre. A fibre is a thin hair like strand from which all the fabrics are made.
- The thread which you pulled earlier from the cloth is called as yarn. Thus, a yarn is made up of a number-of fibres twisted together.
- Fibres are thin and small, and cannot be made into a fabric directly. So, they are first converted into yarns which are longer, thicker and stronger. These yarns are then used to make fabrics. A yarn is a continuous strand made up of a number of fibres which are twisted together. The process of making yarns from fibres is called spinning.

1. TYPES OF FIBRES

Fibres obtained from different sources possess different properties. On the basis of sources, we can divide fibres in following two categories:-



2. NATURAL FIBRE

2.1 PLANT FIBRE

(A) Cotton:- It is cultivated where warm and sunny weather stays for at least half of the year. Cotton plants require warm temperature ranging between 21° C to 27° C with sunny and dry weather. By the time of harvesting rainfall between 50 cm to 80 cm is another conducive for its growth. Black soil, which has the ability to retain moisture is best suited for cotton cultivation. When cotton crop grows to maturity, the seeds with their fibres are harvested. Fibres are separated from the seeds and raw cotton is then shipped to textile factories.

Figure : Cotton

♦ **Uses :**

(i) Cotton is used in the manufacture of fish nets, coffee filters, tents and in book binding.

(ii) The cotton seed, which remains after the cotton is separated from its seeds or ginned, is used to produce cotton seed oil, which after refining can be consumed like any other vegetable oil.

(iii) The cotton seed meal (khal) that is left is generally fed to livestock.

(B) Jute:

(i) It is a long, soft, shiny plant and is one of the cheapest natural fibres. Jute fibres are composed of cellulose and lignin.

(ii) Jute is a rainy season crop, grown best in warm, humid climate. Jute plant requires temperature ranging from 17°C to 40°C and rain fall from 120 mm to 150 mm.

(iii) Jute is said to have more than a thousand uses. It is the second most important vegetable fibre after cotton; not only for its wider cultivation, but also for its uses.

(iv) Jute is used to make cloth for wrapping bales of raw cotton, and to make sacks and coarse cloth. Jute fibres are also woven into curtains, chair coverings, bags, carpets, hessian cloth, etc.

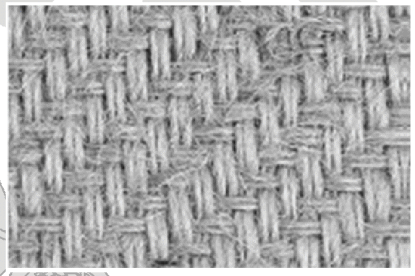


Figure : Jute

Focus Point

- You can try spinning and making a yarn by yourself. Take some cotton and start pulling out a few fibres. While pulling, also twist the fibres. You will see that a yarn is formed.
- The spinning process brings the fibres together and makes the yarns strong, smooth and fine.
- Spinning can be done with a takli, a charkha (both are hand operated), or a spinning machine. After spinning, yarns are used to make fabrics by the processes such as weaving and knitting.

3. ANIMAL FIBRES

Fibres obtained from animals are called animal fibres.

3.1 WOOL

It is a fibre obtained from animals like sheep, lambs and goats. It is a form of hair, with a wavy structure characteristic of the breed of sheep. In India, mostly sheep are reared (to bring up) for getting wool. Sheep hair is sheared off from the body, scoured, sorted, dried, dyed, spun and woven to yield wool.

♦ **Wool bearing animals:**

(i) Wool, spun from the fleece of sheep, is versatile, durable and elastic.

(ii) Angora wools is obtained from angora rabbit, which are found in hilly areas like jammu and kashmir.

(iii) Yak wool is commonly found in areas like Laddakh and Tibet.

(iv) Wool obtained from Kashmir goat is soft and is used to weave fine quality shawls called Pashmina shawls.

(v) Wool is also obtained from fur (hair) on the body of camels. It is used making carpet etc.

(vi) Llama and Alpaca, found in South America, also yield wool.

Alpaca Angora rabbit Camel Goat

Figure : Wool bearing animals

Focus Point

• **Angora wool** obtained from Angora rabbit is one of the softest and most expensive wools of the world. In 2013, several clothing retailers suspended the sourcing of products containing Angora wool after video evidence surfaced of live rabbits with their paws tied being plucked raw in Chinese fur farms.

• **'Mohair'** (obtained from Angora goat) is composed mostly of keratin, a protein found in the hair, horns and skin of all mammals. Mohair does not feel as wool does, but it is very durable and resilient. Due to its high lustre and sheen, it has been nicknamed as the **"Diamond Fibre"**.

• The word **'Cashmere'** is an old spelling of Kashmir. **Pashmina** refers to a type of fine Cashmere wool and the textiles made from it. It was first woven in India. The wool comes from **Changthangi** or **Pashmina goat**, which is a special breed of goat indigenous to high altitudes of the Himalayas in India, Nepal and Pakistan. Pashmina shawls are hand spun, woven and embroidered in Nepal and Kashmir, and made from fine Cashmere fibre.

• **Woolmark** is a symbol of quality to assure that the woolen cloth is made from pure wool. This logo is assigned by International Wool Secretariat (IWS) established in North Yorkshire, United Kingdom.

Woolmark symbol

• **Bioclip** is a new method of shearing, invented by Australian scientists. It is a chemical method of shearing. In bioclip, a protein made chemical is injected into sheep which causes its fleece to drop off on its own. It saves time and effort as compared to traditional shearing process which is labour as well as time intensive.

♦ **Properties of wool :**

(i) **Natural and renewable-** Wool is grown not made, every year sheep grow a new fleece. Wool products also use less energy than man-made fibres during manufacture.

(ii) **Flame retardant-** Wool fibre has a higher ignition threshold than many other fibres and is flame retardant up to 600°C. It also produces less toxic fumes in a fire.

(iii) **Biodegradable-** When disposed of, natural wool fibre takes only a few years to decompose, and with a high nitrogen content, wool can even act as a fertilizer.

(iv) **Breathable**- Wool's natural structure allows it to absorb and release water vapour into the atmosphere, keeping you warm in winter and cool in summer.

(v) **Non allergenic**- Wool is not known to cause allergy and does not promote the growth of bacteria. With microscopic scales, wool fibres can trap dust in the top layers until vacuumed away.

(vi) **Durable and elastic**- Wool fibre can be bent 20,000 times without breaking and still have the power to recover and return to its natural shape. Quality wool garments look good for longer.

(vii) **Easy care**- Modern wool can be machine-washed; retaining a small amount of natural oil. Wool fibre resists dirt and grease.

(viii) **Multi-Climatic**- Wool acclimatizes to its surroundings.

(ix) **Naturally insulating**- Wool can insulate the home providing and retaining warmth, and reducing energy costs.

(x) **Sunsafe**-Wool has naturally high UV protection.

♦ **Rearing and breeding of sheep:**

Rearing of sheep means to look after the sheep. The person who look after the sheep are called Shepherds. Sheep don't require high-end or expensive housing. They are happy, as long as you fulfill their basic housing needs. Even you can raise them with other livestock animals, in small scale production. But for commercial production, you have to make a separate and suitable house for them. Their house must have to be suitable enough to keep them safe from adverse weather and harmful predators. Usually an adult sheep requires about 20 squire feet floor space.

Following table shows some of the common breeds of sheep reared in different states and the quality of wool obtained from them

Different types of wool obtained from different breeds of sheep :-

Name of breed	State where reared	Quality and Uses of wool
Bakharwal	Jammu and Kashmir	Fine quality (for woollen shawls)
Rampur Bushair	Uttar Pradesh, Himachal Pradesh	Brown wool (for woollen blankets)
Nali	Rajasthan, Punjab, Haryana	Used for making carpets
Lohi	Rajasthan, Punjab	Good quality (for making woollen fabrics
Marwari	Gujarat	Coarse wool (for blankets)
Patanwadi	Gujarat	Good quality (for hosiery)

♦ **Processing of fleece 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.

(i) **Shearing :** Sheep are sheared once a year-usually in the springtime. 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.

Figure : Shearing of sheep

(ii) **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). 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 by-products 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.

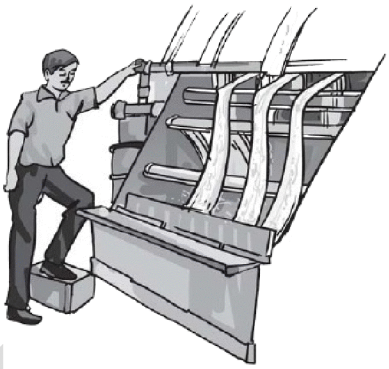
(iii) **Grading and sorting :** Grading is the breaking up of the fleece based on overall quality. In sorting, the wool is broken up into sections of different quality fibres, from different parts of the body. The best quality of wool comes from the shoulders and sides of the sheep and is used for clothing, 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.

(iv) **Removing burr :** Burrs are the small fluffy fibres present in hair. These are the same fibres which sometimes appear on your sweaters. These burrs are picked out from the hair.

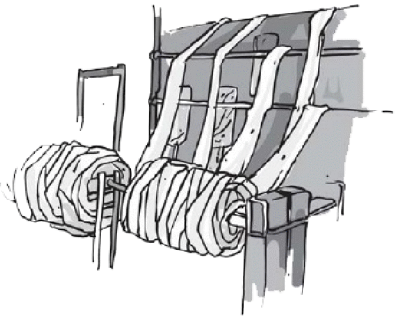
Sheep with thick growth of hair

Shearing a sheep

Scouring in tanks



Scouring by machines



Rolling into yarn

Figure : Processing of fleece into wool

(v) Carding: The fibres are passes 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 ginning and combing, two procedures that remove short fibres and place the longer fibres parallel to each other. From there, the sleeker slivers are compacted and thinned through a process called drawing. Carded wool to be used for woolen yarn is sent directly for spinning.

(vi) Dyeing : The natural fleece of sheep and goats is white, brown or black. The slivers are dyed to get wool fibres of various colours.

(vii) Spinning: Thread is formed by spinning the fibres together to form one strand of yarn, the strand is spun with two, three or four other strands. Since the fibres cling and stick to one another,it is fairly easy to join, extend, and spin wool into yarn. Spinning for woolen 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 bobins, cones, or commercial drums.

(viii) Weaving: The wool yarn is woven into fabric. Wool manufacturers use two basic weaves: The plain weave and the twill. Woolen yarns are made into fabric using a plain weave. which produces a fabric of a somewhat looser weave and a soft surface with little or no lustre.

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 woolens and therefore more costly.

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

♦ **Uses of wool :**

(i) Wool is used for making fabrics, shawls, blankets, carpets, felt (compressed wool) and upholstery.

(ii) Wool belt is used to cover piano hammers. It is also used to absorb noise in heavy machinery and stereo speakers.

(iii) **Shoddy** is made from the used wool. To make shoddy, the existing wool fabric is cut into small pieces and then carded. The carded wool is then respun into yarn. Such a yarn is inferior to the fresh wool and is used for making cheap woollen garments and blankets.

♦ **Occupational hazards of wool production :**

Sorter's disease: Wool industry is an important means of livelihood for many people in our country. But sorter's job is risky as sometimes they get infected by a bacterium, anthrax, which causes a fatal blood disease called sorter's disease.

LAB TIME
Let's Do & Learn

Objects : To debate amongst your classmates whether it is fair on the part of humans to rear sheep and other animals, and then chop off their hair for getting wool.

Procedure :

- Wool production from sheep and other animals has its own positive and negative aspects. Wool has tremendous importance to human beings for clothing requirements. Also, it is a very important industry for the economy of a country. Shearing of sheep for producing wool is fair on the part of humans as long as the safety of the animal is taken into consideration. The sheep should not be harmed or given pain and should be taken care of.
- The animals which are wild and rare, e.g., Angora rabbit, Vicuna, etc. should not be exploited to obtain wool merely for human benefits. Due to over exploitation, population of these animals has declined over the time, which is certainly not fair on part of humans.

3.2 SILK

Silk is a natural protein fibre. Silk is an animal fibre produced by the silkworm. Silk fibre are soft and lustrous.

♦ **Life cycle of silkmoth :**

Silk production, formally called **Sericulture**, is a very complex and lengthy process. It needs a lot of skill too. Since it is a delicate fibre and needs careful handling. The newly born silkworm only eats mulberry leaves. Within three to four weeks it becomes an adult and then begins to seek a place to prepare its cocoon.

The silkworm secretes a very fine filament from two glands on its head which solidifies upon coming in contact with air. Through figure-of-eight movements of the head, the silkworm deposits filaments in layers forming the cocoon. The female silkmoth lays eggs, from which larvae hatch which are called caterpillars or silkworm. The sillkworm takes three to seven days to prepare the cocoon. It is formed of about 20 to 39 concentric layers made up of a single thread. Inside the cocoon the silkworm transforms itself into a chrysalis (called the pupa stage in a moth's life cycle) and then into a moth. The moth eventually leaves the cocoon, which can then be unraveled.

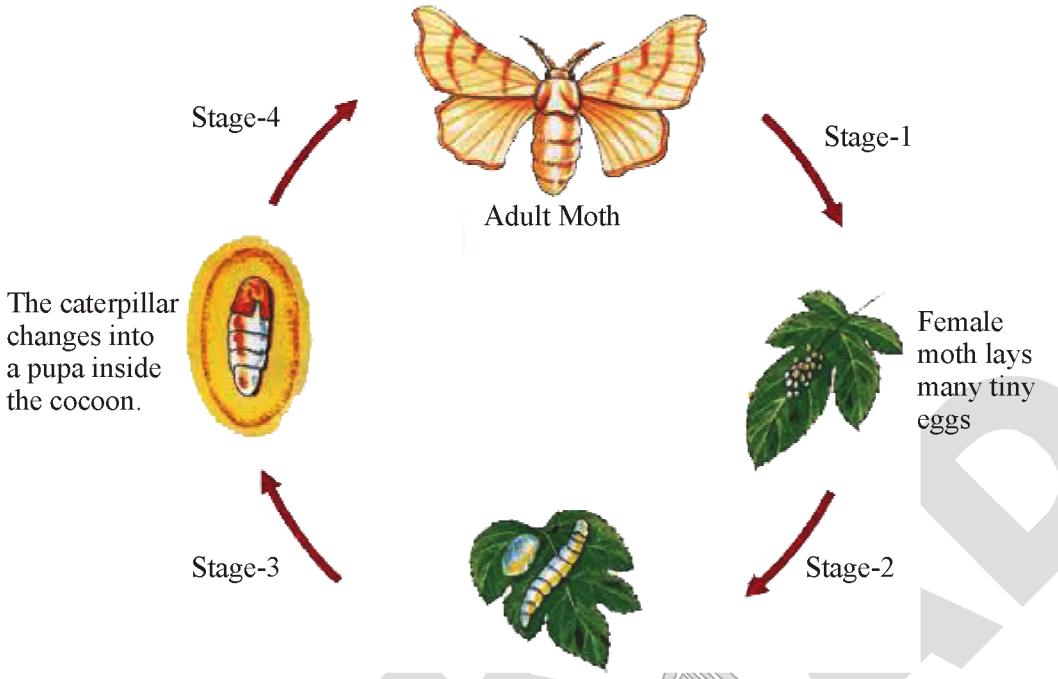


Figure : Life cycle of silkmoth

♦ **Production of silk :**

Silk fibre is produced from a silkworm or silk moth known as Bombyx mori, which feeds on mulberry leaves. Female moth lays eggs, which hatch larvae after 20 days. The larvae make their cocoons by using the wet sticky substance produced by the silk glands. The cocoon is spun using two threads from the two glands, in a figure of eight. around itself and changes into a pupa. The cocoons are either roasted or dropped in boiling water to kill the pupa. This releases the silk threads from the cocoon, which are then spun into a reel.

♦ **Rearing of silk to obtain cocoons :**

A female silk moth lays hundreds of eggs at a time. The eggs of silk moth are stored carefully on paper strips and sold to silkworm farmers. The farmers keep these eggs at suitable temperature and humidity under hygienic conditions. The eggs are then warmed to a suitable temperature for hatching. When the eggs hatch silkworm come out of eggs.

The silkworms are fed cut-up mulberry leaves. The silkworm eat day and night and grow big in size. After about 25 to 30 days, the silkworm stop eating and get ready to spin cocoons. The silkworm climb the twigs placed near them and spin cocoons of silk fibre. The silkworms enclose themselves completely inside the silken cocoon in two or three days.

♦ **Processing of cocoons to obtain silk fibre :**

Once the complete cocoons are formed, they are gathered. The initial step in the harvesting of silk fibre is to kill the insect in inside the cocoon. For killing, the cocoons are boiled in water. The boiling hot water not only kills the insect within the cocoons, but dissolve a gummy substance that holds the cocoon filament in place. The cocoons are then dried and brushed to remove coarse outer portion which consist of coarse filaments.

After brushing, filaments from four to eight cocoons are joined and twisted. They are then combined with a number of other similarly twisted filament, to make a thread is wound on a reel. The threads is called raw silk. It usually consist of 48 individual silk fibres. When each cocoon is unknown, it is replaced by another cocoon. Unlike are thread spun from other natural fibres, such as cotton or wool, the silk thread is made of extremely long fibres. About 5,500 cocoons are required to produce 1 kg of raw silk.

♦ **Converting silk fibre to silk cloth :**

(i) The science related to silk production is called sericulture.

(ii) Silk is considered the queen of fibres. It is used for making dress materials, sarees, scarves, jackets, gloves and carpets.

(iii) The damaged or waste cocoons are used to produce an inferior quality of silk called spun silk.

(iv) 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.

(v) Tram is the type of silk thread made by twisting two or more silk threads together in only one direction.

(vi) Thrown singles is the type of silk, in which individual threads are twisted in only one direction.

(vii) 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.

(viii) Mulberry silk is produced by Bombyx mori worms. These worms are fed on the leaves of mulberry trees.

(ix) Eri Silk is produced by Philosomia ricin worms. These worms are fed on leaves of oaster trees leaves.

(x) Tussar silk and Muga silk are produced by Anheraea Mylitta worms.

LAB TIME
Let's Do & Learn

Object : To identify different types of silk .

Procedure :

- Collect pieces of silk cloth of various types and paste them in your scrap book. You can get the pieces of silk cloth in a tailor's shop among the heap of waste cut pieces. Take help of your mother, aunt or teacher and identify the types of silk such as mulberry silk, tussar silk, eri silk, mooga silk, etc.
- Compare the texture of these silks with that of the artificial silk pieces, which xiontain synthetic fibres.

Try and collect pictures of different moths whose caterpillars provide the various types of silk.

4. OTHER USEFUL PLANT FIBRES

There are other important plants fibres as well.

4.1 COIR

Coir is the fibre obtained from the outer covering of the fruit of the coconut palm.

Usually coconuts are left in water for a few months. The husk is them separated from the nut beaten with wooden mallets to get the fibre. The fibre thus obtained is then spun and dyed and is ready for weaving. There are various qualities of coir. Coir is used to make several household products like ropes and floor coverings. Some varieties are used as a stuffing in matteresses and pillows.

Figure : Coir

4.2 SILK COTTON

There is another plant fibre that is commonly used as a stuffing in pillows, sleeping bags, and life jackets. This fibre is known as silk cotton which is obtained from the silk cotton tree, also called kapok.

Figure : Silk cotton

4.3 KAPOK

The fruits of the kapok tree contain fibres that are light open, releasing the fibres. Bursting of the fruit also helps the tree in dispersing its seeds.

Figure : Kapok

4.4 HEMP

Hemp fibres are obtained from the stem of the hemp plant. Hemp plants grow best in loamy soil. Hemp fibres are used in the production of ropes, carpets, nets, clothes, and paper.

Figure : Hemp

4.5 FLAX

Fibres obtained from the stem of the flax plant are wove to make a fabric called linen. Flax fibre are also used in the production of ropes and high quality paper.

Figure : Flax

Focus Point

- **Cocoon** - The fibre cover spun by the silk larva around its body on changing into pupa stage.
- **Fleece** - The hair on the skin of sheep, yak, etc., from which wool can be obtained
- **Reeling** - Unwinding of silk fibre from the silk cocoon on a reel.
- **Sericulture**- The science of raising silkworms so as to obtain silk cocoons.
- **Shearing**- The process of removing fleece from the sheep.
- **Scouring** - The process of removing yolk and suint from the raw wool with soap or detergent.
- **Sorting**- The process of separating wool and hair from the fleece.
- **Shoddy** - The fabrics made from the used wool by carding, spinning and weaving.
- **Silk moth**- A moth whose larva spins silk fibres to form a cocoon.
- **Silkworm**- A caterpillar, which hatches from the eggs of the silk moth.
- **Silk** - A natural protein fibre having a triangular prism-like structure, spun by the mulberry silk larva around its body, while changing into pupa stage.
- **Suint** - The dried perspiration of sheep found in the raw wool.
- **Throwing** - The process of twisting one or more silk threads to make sufficiently strong silk strand, fit for weaving or knitting.
- **Web**- A thin film of wool emerging out of the rollers of a carding machine.
- **Yolk** - The oily substance (lanolin) found in the raw wool.

SOLVED EXAMPLES

SE. 1

Read the following statements with 1-2 blanks in each one of them.

(a) Each silk moth lays about ..... number of eggs and then dies.

(b) A yarn is a continuous strand made up of a number of ..... which are twisted together.

(c) The quality and quantity of wool depends upon the ..... of the sheep.

(d) Mohair fibre is obtained from ..... .

(e) ..... trapped between wool fibres creates insulation against cold.

Ans. (a) 400-500 (b) fibres (c) breed
(d) Angora goat (e) Air

SE. 2

What is selective breeding ?

Ans. The process of selecting parents in order to obtain desirable characteristics in their offspring is called selective breeding.

SE. 3

Study the table showing the characteristics of different kinds of fibres.

Fibres	Source	Air spaces	Absorption of water
I	Plant	Less air spaces	High
II	Animal	More air spaces	High
III	Artificial	Minimum air space	Minimum

Fabric made from which fibre should be used to make clothes for

(a) summer (b) winter

Ans. Fabric made up of the fibres that have more air spaces will keep the body warmer because air trapped inside the fibres is a bad conductor of heat and would not allow the body heat to escape. Fabric made up of fibres that have less air spaces will keep the body cool because it will allow more body heat to escape. Fibre I has less air spaces whereas fibre II has more air spaces.

Both the fibres I and II absorb high amount of water. Comparing these two characteristics (air spaces and absorption of water), it can be concluded that both fibres I and II can absorb the heat of our body but fibre I will keep the body cool while fibre II will keep it warm. So fabric made of fibre I would be more suitable for summer clothing and the fabric made of fibre II would be more suitable for winter clothing.

Fabric made of fibre III can neither absorb body sweat (due to minimum absorption of water) nor can keep it cool or warm (due to minimum air spaces).

SE. 4

The process of converting fleece of sheep into wool fibres is a long process. Briefly explain the different steps involved in this process.

Ans. The process of converting fleece of sheep into wool fibres involves the following steps :

1. Shearing 2. Scouring 3. Sorting
4. Removing burr 5. Carding 6. Dyeing
7. Spinning

1. **Shearing**- Shearing is the process in which fleece, along with a thin layer of skin, is removed from the body of the animal. It can be done by using shearing machine or by using large razor.
2. **Scouring**- The sheared skin with hair is thoroughly washed in tanks filled with soapy water to remove grease, dust and dirt. This is called scouring. Now-a-days scouring is done by machines. The hair are then passed through a series of rollers and driers.
3. **Sorting** - During this process, hair of different textures are separated out depending on their fineness, length, crimps, colour etc.

4. **Removing burrs** - The small fluffy fibres called burrs are picked out from the hair.
5. **Carding** - During the process of carding, the clean selected wool fibres are passed through rollers that have thin wired teeth. The teeth untangle the fibres and arrange them into a flat sheet called a web. The web is then formed into narrow untwisted fibres known as slivers.
6. **Dyeing**- The natural fleece of sheep and goats is white, brown or black. The slivers are dyed to get wool fibres of various colours.
7. **Spinning**- The fibres are straightened, combed and rolled into yarn. The process of making yarn from fibres is called spinning.

SE. 5

Why does it hurt when someone pulls our hair but it does not hurt when we get our hair cut ?

Ans. Hair are produced from hair follicles. When our hair are pulled, stress is being put on the root of hair, which causes pain because the root is pulled out of the hair follicles. Moreover, there are skin receptors that feel the pain and send signals of pain to our nervous system so that we feel pain and respond to it.

On the other hand, when we get a hair cut, we do not feel any pain. This is because hair are made up of dead cells and keratin protein, which do not have any muscles or receptors or nerve supply of their own. Thus, cutting or breaking of dead part does not hurt us.

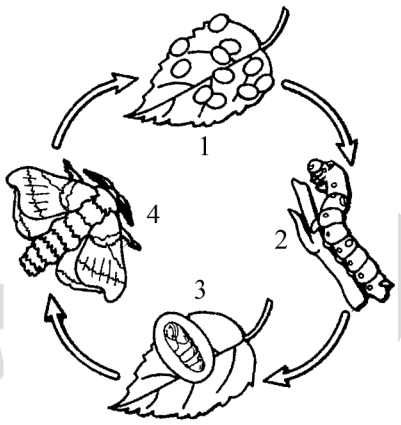
SE. 6

Is it safe to collect caterpillars of insects with bare hands ?

Ans. No, it is not safe to collect caterpillars with bare hands. This is because the caterpillars possess certain hair over their bodies. These hair may cause skin irritation and allergy.

SE. 7

Given is the diagrammatic representation of life cycle of silk moth.



(a) Write down the correct terms for the different stages labelled as 1, 2, 3 and 4.

(b) At which of these stages, commercial silk fibre is obtained ?

(c) At which of these stages, four moultings occur ?

Ans. (a) 1-Eggs, 2-Larva, 3-Pupa, 4-Adult moth.

(b) Silk fibre is obtained from pupal stage(labelled as 3) of life cycle of silk moth.

(c) Four moultings occur at larval stage(labelled as 2).

SE. 8

Why is it necessary to kill the pupae by boiling cocoons in water at the right time ?

Ans. If the pupae are not killed by boiling the cocoons in water, they would grow, break the cocoon and thereby reduce the length of the continuous silk filament obtained from it. More is the length of this filament, more is it prized for better quality. Thus, to obtain the silk filament of longer length, it becomes important to kill the pupae at the right time.

SE. 9

What are the two types of fibres obtained from the fleece of sheep ? Which out of these fibres is used to make wool ?

Ans. The two types of fibres obtained from the fleece of sheep are :

(i) The coarse beard hair and

(ii) The fine soft under-hair close to skin.

Out of these, the second ones i.e. the fine soft under -hair are used to make wool.

SE. 10

Besides sheep, name other wool yielding animals.

Ans. Goat, rabbit, camel, alpaca, llama, yak etc. are the other wool yielding animals besides sheep.

SE. 11

Define the following :

(a) Carding **(b) Reeling**

Ans. **(a) Carding:** The clean selected wool fibres are passed through rollers that have thin wired teeth. The teeth untangle the fibres and arrange them into a flat sheet called a web. The web is then formed into narrow untwisted fibres known as slivers. This processing is called carding.

(b) Reeling: The process of unwinding the silk filaments from the cocoon and combining them together to made a thread of raw silk is called reeling.

SE. 12

The workers of sericulure industry often develop asthma, chronic bronchitis and other respiratory ailments. Why ?

Ans. Workers of sericulture industry often develop respiratory diseases such as asthma, bronchitis etc. because of inhalation of vapours arising from cocoons when being steamed, boiled and reeled.

SE. 13

(a) Where are Angora goats found in India ?

(b) From which animal the wool is obtained for making pashmina shawls. Name the regions where this animal is found in India.

Ans. (a) Angora goats are found in hilly regions of India such as Jammu and kashmir.

(b) Wool used to make pashmina shawls is obtained from Kashmiri goat, which is found in Kashmir and Ladakh regions of India. The under fur of kashmiri goat gives wool for fine pashmina shawls.

SE. 14

What is bioclip ? How is it different from shearing?

Ans. Bioclip is a new method invented by Australian scientists. It is a chemical method of shearing. In bioclip, a protein made chemical is injected into sheep which causes its fleece to drop off on its own . It saves time and effort as compared to traditional shearing process which is labour as well as time intensive.

SE. 15

Why is shearing usually done in early summers ?

Ans. Sheep are usually found in hilly and cold regions. Shearing is done in early summers because it relieves the sheep of warm covering over its body and the sheep can survive without its protective coat of hair during hot weather.

EXERCISE – I

ONLY ONE CORRECT TYPE

1. Select the option which contains animal fibres only.
(A) Cotton, jute, hemp (B) Jute, wool, silk
(C) Wool, silk (D) Wool, silk, hemp

2. Match Column-I with Column-II and select the correct option.

Column-I	Column-II
A. Fibre	(i) The material made by weaving or knitting
B. Fabric	(ii) A coarse, hand-woven cloth made from cotton
C. Khadi	(iii) Woolen fabric made from hair of Kashmiri goat
D. Pashmina	(iv) Thin hair like strand used to make fabric

(A) A-(iv), B-(i), C-(ii), D-(iii)
(B) A-(iv), B-(i), C-(iii), D-(ii)
(C) A-(iv), B-(iii), C-(i), D-(ii)
(D) A-(iii), B-(ii), C-(iv), D-(i)

3. Which of the following statements is correct regarding fibres ?
(A)Wool and silk are animal fibres.
(B)Cotton and jute are vegetable fibres.
(C)The animal fibres are largely made up of proteins.
(D)All of these

4. Which of the following options does not represent a property of wool ?
(A) Wool is an elastic
(B) Wool can absorb moisture.
(C) Wool is a poor conductor of heat.
(D) While burning wool gives the smell of burning paper.

5. Which of the following properties of wool helps us to feel warm after wearing woolen garments ?
(A) Trapping of air between woolen garments
(B) Resistance of wool to fire
(C) Burning properties of wool
(D) Good water absorbency of wool

6. Which one of the following statements is not ture ?
(A) Climate of a place determines the type of clothes we wear.
(B) Hair present on body of wool-yielding animals trap a lot of air.
(C) Wool is obtained from the fleece of sheep or goat.
(D) None of these

7. Which of the following can be used to protect woolen and silk clothes ?
(A) Acids (B) Salt solution
(C) Benzene solution (D) Naphthalene balls

8. Given below are two groups of materials used to make some products.

Group I	Group II
Jute	Leather
Cotton	Wool
Flax	Silk

What is the basis of grouping of these materials.
(A) Group I are natural and Group II are synthetic materials
(B) Group I are plant products and Group II are animal products
(C) Group I are synthetic and Group II are natural materials
(D) Both (A) and (B) are correct

9. We do not get hurt when we get a hair cut because
(A) Hair are made up of dead cells
(B) Hair possess their own blood supply
(C) Uppermost layer of skin is made up of living cells
(D) All of these

10. Select the option that contains only wool yielding animals.
(A) Sheep, Camel, Deer
(B) Camel, Llama, Goat
(C) Sheep, Goat, Bear
(D) Deer, Camel, Antilope

11. Select the correct statement out of the following .
(A) Rearers feed the sheep on a mixture of pulses, corn, jowar, oil cakes etc.
(B) In winters, sheep are kept indoors and fed on leaves, grain and dry fodder.
(C) Sheep are herbivores and prefer to eat grass and leaves.
(D) All of these

12. Select the incorrect statement.
(A) Fabrics are made from yarns, which in turn are made from fibres.
(B) Wool has a high absorbency and it can absorb a large quantity of water.
(C) Silk is a bad conductor of heat
(D) While burning, artificial fibres give a smell of burning paper.

13. The eggs are laid by a female silk moth in
(A) Units (B) Tens
(C) Hundreds (D) Thousands

14. The process of arranging two sets of yarn together to make a fabric is called
(A) Knitting (B) Weaving
(C) Spinning (D) None of these

15. The process of making yarn from fibres is called
(A) Knitting (B) Weaving
(C) Spinning (D) Ginning

16. Fabric from yarn is made by
(A) Sheaving
(B) Spinning
(C) Weaving and Knitting
(D) Combing.

17. Selective breeding involves the selection of
(A) Good quality fibres from sheep
(B) Parents with desired characteristics
(C) Offspring with desired characteristics
(D) Vegetable fibres from natural fibres.

18. Match Column-I with Column-II and select the correct option.

Column-I	**Column-II**
a. Shearing	(i) Separation of hair of different textures
b. Scouring	(ii) Removal of fleece from sheep
c. Carding	(iii) Washing of fleece to remove dust, dirt and grease
d. Sorting	(iv) Formation of slivers

(A) a-(ii), b-(iii), c-(iv), d- (i)
(B) a-(ii), b-(iv), c-(iii), d- (i)
(C) a-(i), b-(iv), c-(ii), d- (iii)
(D) a-(iii), b-(ii), c-(i), d- (iv)

19. Read the following statemens and select the corect ones.
(A) Sheep are sheared at the end of winter when they do not need their fleece to keep themselves warm.
(B) Weaving uses two sets of yarn whereas knitting involves only one yarn.
(C) The hair/fur of sheep act as insulator and keep the body of sheep warm.
(D) All of these

20. The rearing and management of silkworms for the production of silk is referred to as
(A) Moriculture (B) Silviculture
(C) Sericulture (D) Floriculture.

21. Angora wool is obtained from
(A) Angora goat (B) Yak
(C) Kashmere goat (D) Angora rabbit

22. In India, yak wool is commonly found in
(A) Tibet and Ladakh (B) jammu and Kashmir
(C) Punjab and haryana (D) Gujarat and Rajasthan

23. Mohair, which is one of the expensive wools is got from
(A) Angora goat (B) Angora rabbit
(C) Kashmere goat (D) Merino sheep

24. The silkworm which produces eri silk feeds upon leaves of which of the following plants ?
(A) Mulberry (B) Soalu
(C) Castor (D) Arjun

25. Which of the following countries are leading producers of silk and wool respectively ?
(A) Australia and China (B) Australia for both
(C) India and Australia (D) China and Australia

MATCH THE COLUMN TYPE

1. Match Column-I containing type of wool with the respective animals from which it is obtained given in Column-II and select the correct option.

	Column-I	Column-II
P.	Mohair	(i) Angora goat
Q.	Merino	(ii)Kashmiri goat
R.	Angora wool	(iii) Merino sheep
S.	Cashmere	(iv) Angora rabbit

(A) (P)-(iv), (Q)-(iii), (R)-(ii), (S)-(i)
(B) (P)-(i), (Q)-(iii), (R)-(iv), (S)-(ii)
(C) (P)-(ii), (Q)-(iii), (R)-(i), (S)-(iv)
(D) (P)-(i), (Q)-(ii), (R)-(iii), (S)-(iv)

2. Match Column-I with Column-II and select the correct option.

Column-I	Column-II
P. Mineral fibre	(i) Polyester
Q. Vegetable fibre	(ii) Wool
R. Animal fibre	(iii) Asbestos
S. Synthetic fibre	(iv) Jute

(A) (P)-(iv), (Q)-(iii), (R)-(ii), (S)-(i)
(B) (P)-(i), (Q)-(iii), (R)-(iv), (S)-(ii)
(C) (P)-(iii), (Q)-(iv), (R)-(ii), (S)-(i)
(D) (P)-(i), (Q)-(ii), (R)-(iii), (S)-(iv)

EXERCISE – II

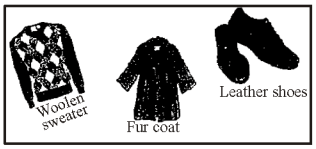
VERY SHORT ANSWER TYPE

1. Name the wool yielding animals which belong to camel family.
2. Name the major wool producing countries of the world.
3. Define shearing.
4. Does shearing hurt the sheep ?
5. Give two examples each of vegetable fibres and animal fibres.
6. Name the most commonly reared silk moth all over the world. Which plant does its larva feed upon ?
7. What is the scientific name (or botanical name) of the tree on the leaves of which the larva of *Bombyx mori* feeds ?
8. What do you mean by reeling of silk filament ?
9. What is a cocoon ?
10. Define sericulture.

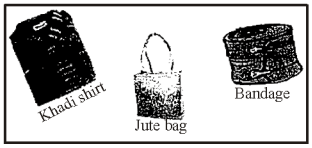
SHORT ANSWER TYPE

1. Make a flow chart showing the processes involved in the conversion of hair of sheep into woolen fabric.
2. (a) What is the basis to decide the quality of wool obtained from sheep ?

   (b) Study the two groups of items shown below. On what basis the given items have been grouped separately ?



Group-I



Group-II

3. Why do many people believe that it is ethically not right to use silk ?
4. Distinguish between animal fibres and vegetable fibres with examples.
5. Enlish five important characteristics of wool.
6. Why is shearing of sheep not done during cold season ?
7. Name the two types of fibres obtained from the fleece of sheep ? Which ones are used to make wool ?
8. (a) Explain the process of sorting of wool fibres ?

   (b) Define carding.
9. What is done during the process of softening of sericin in sericulture ?
10. Complete the following table by filling the blanks A, B and C.

Types of silk	Plants on the leaves of which the silkworms feed
Mulberry	Mulberry
Mooga	A
Eri	B
Tassar	C

11. (a) Which property of silk makes it so attractive and a highly priced fibre ?

    (b) What do you understand by sorter's disease ?
12. (a) At what stage in the life cycle of a silk moth is it killed to get the silk fibre ? About how many have to be killed to get one kilogram (1kg) of silk ?

    (b) What do you understand by the term raw silk ?
13. Write down the buring properties of silk fibre.

FILL IN THE BLANKS TYPE

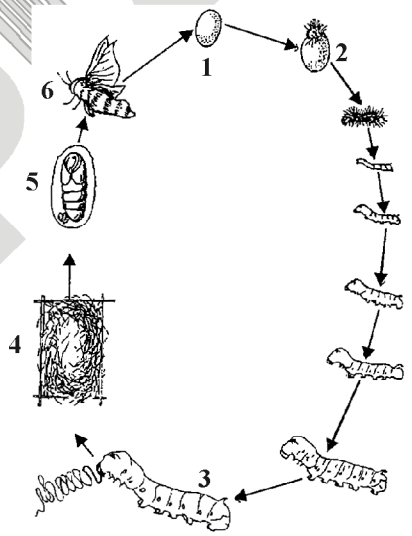
1. ..... fibre has a unique shimmering quality.
2. Wool is a ..... fibre whereas nylon is a ..... fibre.
3. During the production of silk, ... are immersed in hot water which loosens the silk filament.
4. The larvae of silkmoth feed day and night, and undergo moulting ..... times.
5. The thick coat of hair present on a wool-yielding animal's body is called ..... .

TRUE / FALSE TYPE

1. Wool is a vegetable fibre.
2. Fabrics made from synthetic fibres help to absorb sweat from body during summers.
3. Most Australian wool comes from Merino breed of sheep.
4. Angora goat yields Angora wool.
5. Woolen fabric dries slower than the cotton fabric.

LONG ANSWER TYPE

1. (a) How fibres are classified on the basis of their origin ? Briefly explain with examples.
   (b) List some important characteristics of silk.
2. (a) The climate of a place determines the type of clothes we wear. Justify this statement.
   (b) Write a short note on the health problems of workers in the wool industry.
3. (a) Show the complete life history of the silk moth using diagrammatic representation.
   (b) Write a brief note on rearing of sheep in India.
4. (a) Crossbreeding of sheep is necessary in India. Commet.
   (b) Name three exotic breeds with which crossbreeding is done in our country.
   (c) Write a note on Cashmere wool.
5. (a) Write a brief note on wool production in the world.
   (b) Silk industry originated in which country ?
   (c) Write down the occupational health hazards related with silk industry.
6. Summarize the steps involved in the production of silk cloth.
7. Study the given life cycle of silk moth and answer the accompanying questions.



   (a) Identify the labels 1, 2, 3, 4, 5 and 6.
   (b) At which stage does the silk moth feed on the plant leaves ?
   (c) How many eggs are laid by the female silk moth ?
   (d) How is the structure labelled as 4 formed ?
   (e) What happens to the caterpillar inside the cocoon ?

EXERCISE I ANSWER KEY

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

MATCH THE COLUMN TYPE

1. B 2. C

EXERCISE II

FILL IN THE BLANKS

1. Silk **2**. Natural, Synthetic **3**. Cocoons **4**. Four **5**. Fleece

TRUE / FALSE TYPE

1. False **2**. False **3**. True **4**. False **5**. False

SELF PROGRESS ASSESSMENT FRAMEWORK

(CHAPTER : FIBRE TO FABRIC)

CONTENT	STATUS	DATE OF COMPLETION	SELF SIGNATURE
Theory			
In-Text Examples			
Solved Examples			
Exercise I			
Exercise II			
Short Note-1			
Revision - 1			
Revision - 2			
Revision - 3			
Remark			

NOTES :

1. In the status, put "completed" only when you have thoroughly worked through this particular section.
2. Always remember to put down the date of completion correctly. It will help you in future at the time of revision.

Space for Notes :

MATRIX

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