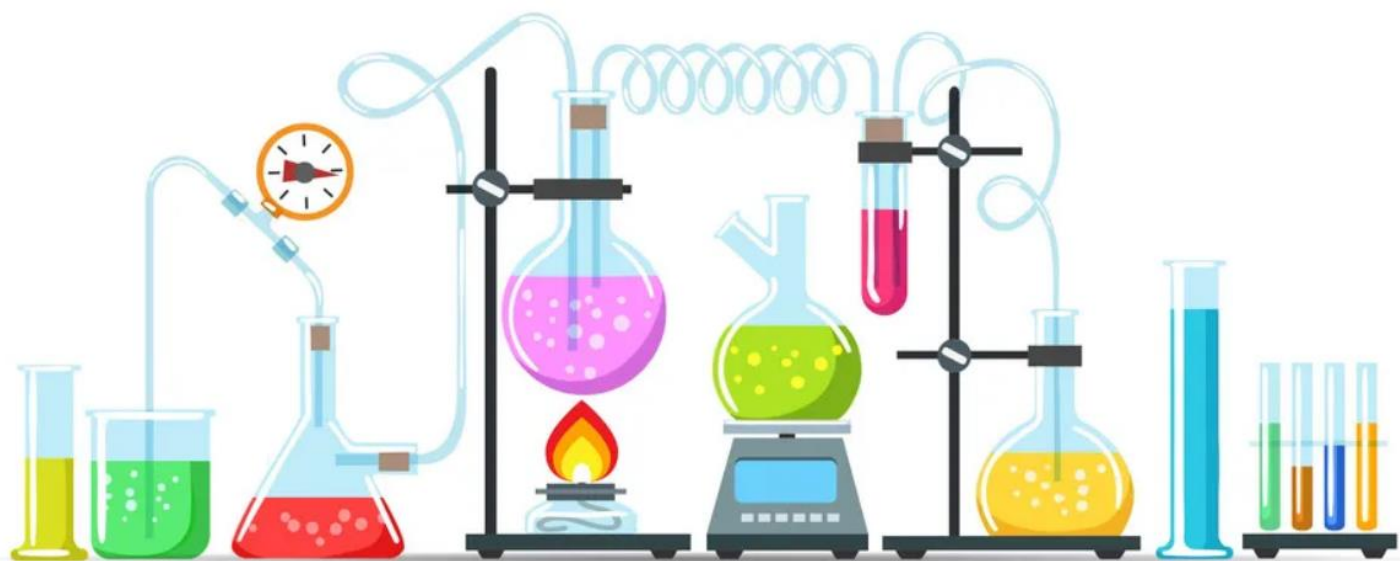


# SCIENCE

## CHAPTER 5: ACIDS BASES AND SALTS



## Acids, Bases and Salts

Chemicals can be broadly classified into three categories, acids, bases and salts.

### Acids

- Acids are substances which taste sour.
- They may be corrosive or non-corrosive.

#### Examples:

Hydrochloric acid and sulphuric acid are corrosive acids. Carbonic acid is a non-corrosive acid.

- Acids turn blue litmus red.
- There are two types of acids:  
Organic acids: Naturally occurring acids obtained from plants and animals. Mineral acids: They are obtained from minerals present in the Earth's crust.

### Bases

- Bases are substances which are bitter in taste and soapy to touch.

**Examples:** Calcium hydroxide and zinc hydroxide

- Water-soluble bases are called alkalis.
- **Example:** Sodium hydroxide
- Bases turn red litmus blue.

### Indicators

An indicator is a substance which illustrates the presence of a chemical substance by changing colour. Indicators can be natural or synthetic. For example, litmus, turmeric and China rose are naturally occurring indicators, while methyl orange and phenolphthalein are synthetically produced indicators.

#### Natural Indicators

##### Litmus Paper:

Acids turn blue litmus red and bases turn red litmus blue. The solutions which do not change the colour of either red or blue litmus are known as neutral solutions.

**Turmeric:**

It is yellow in an acidic medium and turns reddish brown in a basic medium.

**China Rose:**

It turns the colour of acidic solutions to dark pink (magenta) and that of basic solutions to green. Substances which do not change the colour of either red or blue litmus are known as **neutral substances**. These substances are neither acidic nor basic.

**Activity of Indicators**

Mix some water with lemon juice in a plastic cup/tumbler/test tube. Then Put a drop of the above solution on a strip of the red litmus paper with the help of a dropper. Is there any change in color? Repeat the same exercise with the blue litmus paper. Note down if there is any change in color. Perform the same activity with the following substances: Tap water, detergent solution, aerated drink, soap solution, shampoo, common salt solution, sugar solution, vinegar, baking soda solution, milk of magnesia, washing soda solution, lime water. If possible make solutions in distilled water. Record your observations and make a Table of your result, than check are there any substances on which litmus had no effect? Name those substances. The solutions which do not change the color of either red or blue litmus are known as neutral solutions. These substances are neither acidic nor basic.

**Synthetic Indicators****Phenolphthalein:**

It remains colourless in an acidic medium and turns pink in a basic medium.

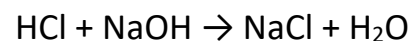
**Acid Rain**

- Rain which contains a higher level of acid than normal is called acid rain.
- Rain becomes acidic because carbon dioxide, sulphur dioxide and nitrogen dioxide (which are released into the air as pollutants) dissolve in the rain drops to form carbonic acid, sulphuric acid and nitric acid respectively.

**Salts**

Salts are produced by the neutralisation of acids with bases. During this process, water is also produced along with the evolution of heat.

Example: Hydrochloric acid on reaction with sodium hydroxide gives sodium chloride salt along with water.



## USES OF SALTS:

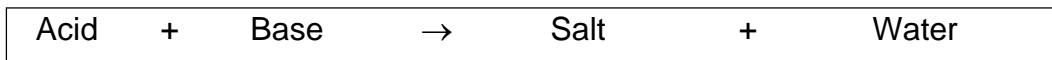
- As a table salt.
- In the manufacture of butter and cheese.
- In leather industry.
- In the manufacturing of washing soda and baking soda.
- For the preparation of sodium hydroxide by electrolysis of brine.
- In cold countries rock salt is spread on ice to melt it.

## USES OF SALTS IN DAILY LIFE

- **Common salt** : It is used in large amount as table salt. It is used for preservation of food in pickling. It is used to preserve raw hides. It is used in the manufacture of chemicals such as chlorine and caustic soda ( $\text{NaOH}$ ).
- **Baking soda** : It is used for making baking powder. It is used for preparing antacid tablets, for controlling acidity of stomach.
- **Washing soda** : It is used by washermen to wash clothes. It is used in manufacture of glass and caustic soda. It is used in fire extinguishers. It is used in the manufacture of detergents.
- **Chile saltpetre** : It is used in the manufacture of nitric acid, gun powder and fire works.
- **Nitre** : It is used as a fertiliser. It is also used in the manufacture of gun powder, fire works and nitric acid.
- **Smelling salt** : It provides relief from common cold.
- **Epsom salt** : It is used as a laxative by patients suffering from constipation.
- **Green vitriol** : It is used in making blue black inks and in curing leather.
- **Blue vitriol** : It is used as fungicide in agriculture. It is used in dyeing and printing industry. It is used in electroplating copper metal.
- **Plaster of Paris** : It is used for making statues. It is used for setting broken bones.
- **Potash alum** : It helps in rapid settling of suspended impurities in water. It is used for the purification of water.

## Neutralisation

The reaction in which an acid reacts with a base to form a salt and water is called a neutralisation reaction.



## Applications of neutralisation

People particularly of old age suffer from acidity problems in the stomach which is caused mainly due to release of excessive gastric juices containing HCl. The acidity is neutralised by antacid tablets which contain sodium hydrogen carbonate (baking soda), magnesium hydroxide etc.

The stings of bees and ants contain formic acid. Its corrosive and poisonous effect can be neutralised by rubbing soap which contains NaOH (an alkali).

The stings of wasps contain an alkali and its poisonous effect can be neutralised by an acid like acetic acid (present in vinegar).

Farmers generally neutralize the effect of acidity in the soil caused by acid rain by adding slaked lime (Calcium hydroxide) to the soil.

## Neutralisation in Everyday Life

### Indigestion

Our stomach contains hydrochloric acid. However, presence of a large quantity of acid in the stomach causes indigestion. To relieve this, we take an antacid such as milk of magnesia, which contains magnesium hydroxide base to neutralise the effect of excessive acid.

### Ant Bite

The sting of an ant contains formic acid. When an ant bites, the effect of the sting can be neutralised by rubbing a base like moist baking soda (sodium hydrogen carbonate) or calamine solution, which contains zinc carbonate.

### Soil Treatment

When soil is too acidic, it is treated with bases like quick lime (calcium oxide) or slaked lime (calcium hydroxide). If the soil is basic, organic matter is added to it. Organic matter releases acids which neutralise the basic nature of the soil.

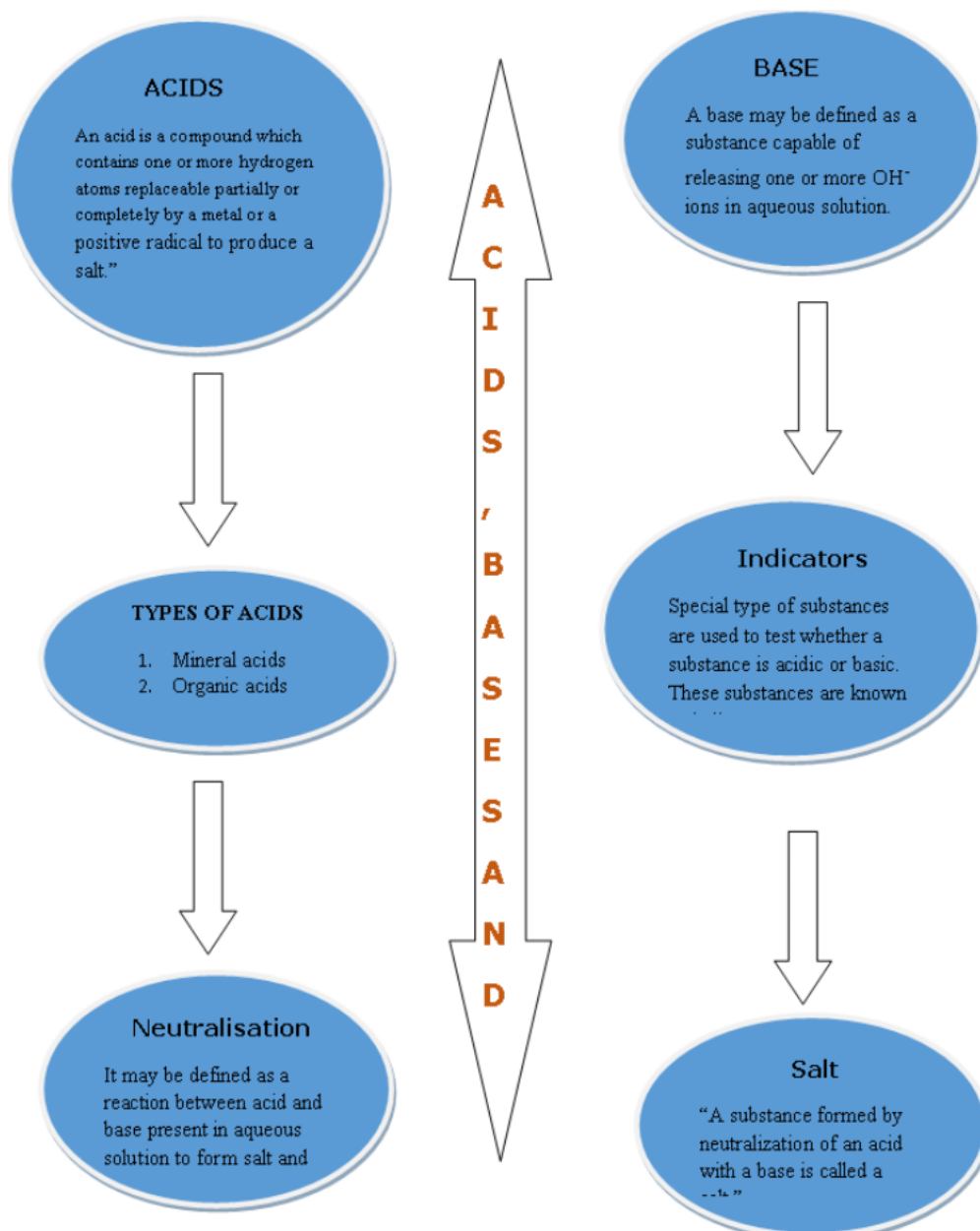
### Factory Wastes

- The wastes of many factories contain acids.
- If the waste is allowed to enter the water bodies, the acid will kill the fish and other aquatic

organisms.

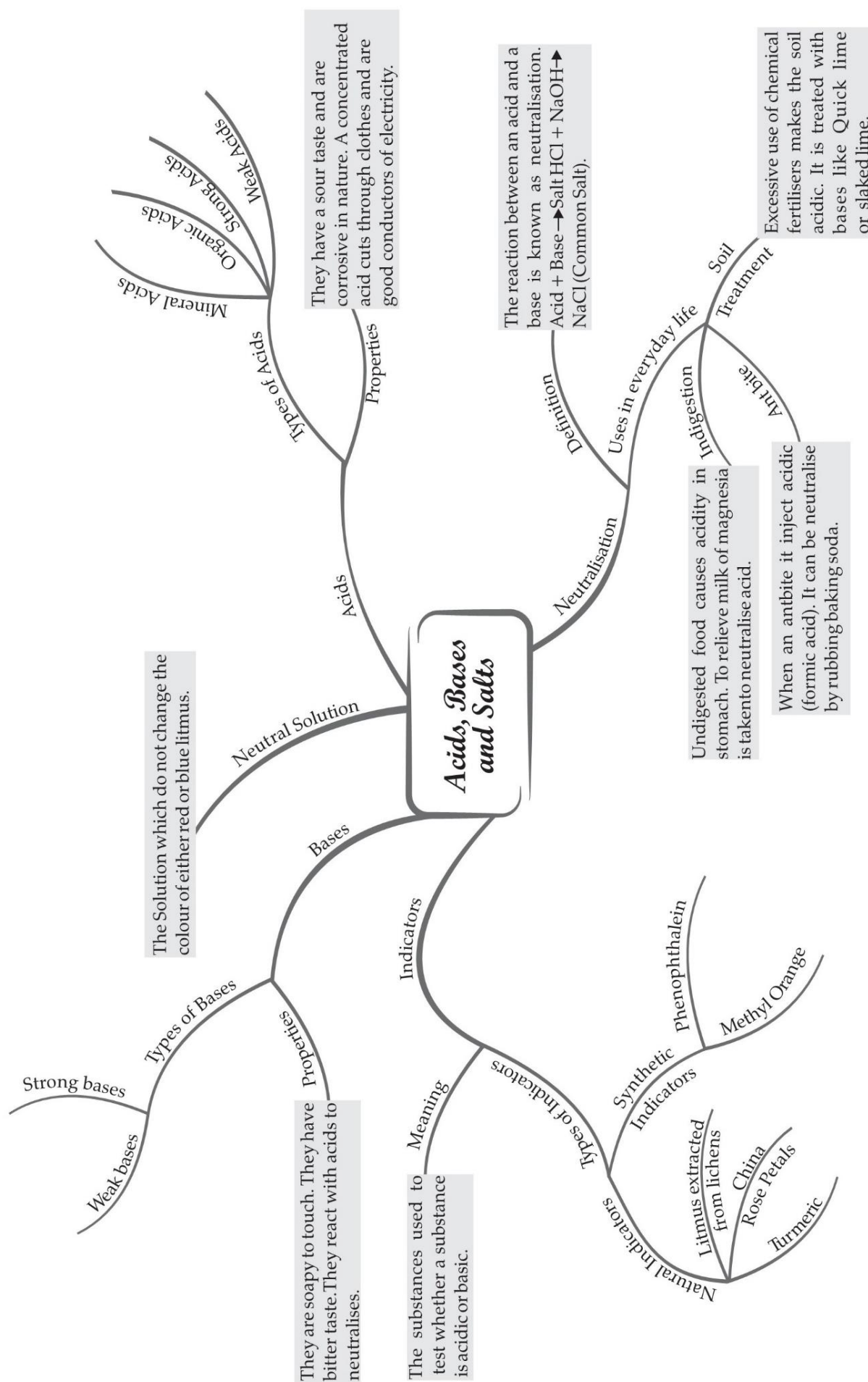
- So, factory wastes are neutralised with basic substances before releasing them into water bodies.

## MIND MAP



## MIND MAP : LEARNING MADE SIMPLE

## CHAPTER-5



## Important Questions

### ➤ Multiple Choice Questions:

Question 1. Acids taste

- (a) sour
- (b) sweet
- (c) bitter
- (d) salty

Question 2. Bases taste

- (a) sweet
- (b) sour
- (c) bitter
- (d) salty

Question 3. Colours of phenolphthalein indicator in acidic and basic medium, respectively are

- (a) pink and colourless
- (b) colourless and pink
- (c) blue and red
- (d) red and blue

Question 4. The nature of bases is

- (a) acidic
- (b) basic
- (c) neutral
- (d) all of these

Question 5. Which of the following feel soapy on touching?

- (a) Acid
- (b) Base
- (c) Salt
- (d) None of these

Question 6. Which of the following is a natural indicator?

- (a) China rose petal
- (b) Turmeric



- (c) Litmus
- (d) All of these

Question 7. The most commonly used natural indicator is

- (a) turmeric
- (b) beetroot
- (c) China rose petal
- (d) litmus

Question 8. The correct way of making a solution of acid in water is to

- (a) add water to acid
- (b) add acid to water
- (c) mix acid and water simultaneously
- (d) add water to acid in a shallow container

Question 9. Which of the following is basic in nature?

- (a) Lime water
- (b) Baking soda
- (c) Both (a) and (b)
- (d) Lemon juice

Question 10. Litmus is extracted from

- (a) curd
- (b) grapes
- (c) lichens
- (d) cabbage

Question 11. Calcium hydroxide is found in

- (a) window cleaner
- (b) lime water
- (c) soap
- (d) lime juice

Question 12. On adding phenolphthalein indicator to a colourless solution, no change is observed. The nature of the solution may be

- (a) acidic or basic
- (b) basic
- (c) acidic or neutral

(d) basic or neutral

Question 13. Neutralisation reaction is a

- (a) physical and reversible change
- (b) physical and irreversible change
- (c) chemical and reversible change
- (d) chemical and irreversible change

Question 14. When a drop of vinegar solution is put on the litmus paper, it turns

- (a) red
- (b) blue
- (c) green
- (d) yellow

Question 15. Tap water is

- (a) acidic
- (b) basic
- (c) neutral
- (d) depends on source

### ➤ Fill In the Blanks:

1. .... can cause damage to historical monuments, marble, statues, plants and animals.
2. .... helps to relieve indigestion.
3. Organic matters release .....
4. Salt may be ....., ..... or ..... in nature.
5. Plants do not grow well when the soil is either too ..... or too .....
6. When an ant bites, it injects ..... acid.

### ➤ True or False:

1. Curd is a base.
2. Lime juice tastes sour.
3. Turmeric is a man-made indicator.
4. China rose petal is a natural indicator.
5. Litmus is called a natural dye.
6. Lactic acid is found in lemons.

### ➤ Very Short Question:

1. Name the most commonly used indicator.
2. From where do we extract litmus to be used as indicator.
3. The reaction between an acid and a base is known as neutralisation.
4. Name the acid present in our stomach.
5. What role does HCL present in our stomach plays?
6. Name the acid present in sting of an ant.
7. State the nature of soap solution.
9. State the nature of lemon juice.
10. Why lemon juice and orange juice tastes sour?

### ➤ Short Questions:

1. Give examples of some acids and bases
2. Define indicators along with examples.
3. What is the use of litmus test?
4. Explain the nature of distilled water.
5. What do you mean by neutral substance, explain with examples?
6. Rena is trying to wash turmeric stain on her cloth with soap, she noticed the stain colour changed to red, explain why?
7. Red litmus paper is dipped in a solution; it remains red, what is the nature of the solution?
8. Explain the universal indicator.

### ➤ Long Questions:

1. State few properties of acids.
2. State few properties of bases.
3. What are the differences between acids and bases?
4. Write a short note about litmus paper.
5. Arnav is provided with three kinds of liquid of them one is sodium hydroxide; another is hydrochloric acid and third is a sugar solution. How will he identify them when he have only turmeric indicator.
6. Describe the process of neutralisation with the help of an example.

## ✓ Answer Key-

## ➤ Multiple Choice Answers:

1. (a) sour
2. (c) bitter
3. (b) colourless and pink
4. (b) basic
5. (b) Base
6. (d) All of these
7. (d) litmus
8. (b) add acid to water
9. (c) Both (a) and (b)
10. (c) lichens
11. (b) lime water
12. (c) acidic or neutral
13. (d) chemical and irreversible change
14. (a) red
15. (d) depends on source

## ➤ Fill In the Blanks:

1. Acid rain
2. Antacid
3. acids
4. acidic, basic, neutral
5. acidic, basic
6. formic

## ➤ True or False:

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

6. False

### ➤ Very Short Answers:

1. Answer: Litmus paper
2. Answer: Lichens
3. Answer: The reaction between an acid and a base is known as neutralization.
4. Answer: HCL
5. Answer: It helps in digestion of food
6. Answer: Formic acid
7. Answer: Basic
8. Answer: Basic
9. Answer: Acidic
10. Answer: Because they contain acids.

### ➤ Short Answer:

1. Answer: Curd, lemon juice, vinegar, orange juice etc. are acids and baking soda, lime water etc. are bases.
2. Answer: Indicators are special type of substance that are used to taste whether a substance is acidic or basic in nature. It change the colour of acidic or basis substances when added into it. Turmeric, litmus, etc. are some natural indicators.
3. Answer: To test the nature of a substance for an Acid or a base or a neutral, litmus test is performed in which the Acid turns blue litmus red, Bases turn red litmus blue and has no effect on neutral substance.
4. Answer: The Distilled water is neutral. It is neither sour (Acidic) nor bitter (Basic), to very its chemical nature, we can perform litmus test. It neither turns blue litmus red nor red litmus blue hence we can say, distilled water is a neutral substance.
5. Answer: The substances which are neither acidic, nor basic are called neutral substance. These substances neither turn blue litmus red nor red litmus blue, for example distilled water, sugar solution etc.
6. Answer: Turmeric is a natural indicator which when reacts with bases turns it into red colour; here soap solution is basic so it turns red.
7. Answer: Red litmus paper when dipped in a solution, if it remains red then the nature of the solution is neutral.
8. Answer: Universal indicator gives a range of colour that can be used to determine the level of acidity or basic of a solution, this level is called the pH value.

### ➤ Long Answer:

1. Answer:

- i. Acids are sour in taste
- ii. The chemical nature of such substances is acidic
- iii. Acid turns blue litmus red
- iv. It gives hydrogen ion when dissolves in water
- v. Do not give any colour with phenolphthalein indicator
- vi. Do not absorb carbon dioxide gas
- vii. Acids do not react with ammonium salt
- viii. Acids are generally found in Vinegar, Curd, Spinach, lemons, Citrus fruits, Amla, Tamarind, grapes, unripe mangoes, Citrus fruits such as oranges, etc.

2. Answer:

- i. Bases are bitter in taste and soapy to touch
- ii. Base turns red litmus blue
- iii. The nature of such substances is said to be basic
- iv. It gives hydroxide ions when dissolves in water
- v. It give pink colour with phenolphthalein indicator
- vi. Some bases like NaOH absorbs carbon dioxide gas
- vii. Bases are generally found in lime water, soap, window cleaner, Milk of Magnesia
- viii. Reacts with ammonium salt to give ammonia gas

3. Answer:

Acid	Bases
Acids are sour in taste.	Bases are bitter in taste and soapy to touch.
The chemical nature of such substances is acidic.	The nature of such substances is said to be basic.
Acid turns blue litmus red.	Bases turn red litmus blue
Acids are generally found in Vinegar, Curd, Spinach, Amla, Citrus fruits, Tamarind, grapes, unripe mangoes, Citrus fruits such as oranges, lemons, etc.	Bases are generally found in lime water, soap, window cleaner, Milk of Magnesia

Acids do not react with ammonium salt	Reacts with ammonium salt to give ammonia gas
Do not absorb carbon dioxide gas	Some bases like NaOH absorb carbon dioxide gas

4. Answer: Litmus is extracted from lichens. It is most commonly used as an indicator to determine the chemical nature of substance. It has mauve or purple colour in distilled water. When it is added to an acidic solution, it turns red and when added to a basic solution, it turns blue. It is available in the form of a solution, or in the form of strips of paper, known as litmus paper. Generally, it is available as red and blue litmus paper.
5. Answer: Turmeric is yellow in colour, when it is exposed to neutral (Sugar Solution) or acidic substances (Hydrochloric Acid) it will retain its yellow colouration. However, if turmeric is exposed to more alkaline substances (sodium hydroxide) it becomes a dark pink/red. So first we detect sodium hydroxide -a basic substance by a colour change from yellow to dark or red. Then will test for an acid or neutral substance with indication of no colour change. Now out of these two, we will mix one with already tested solution for basic substance -sodium hydroxide with dark or red colour, if on mixing the colour reverses back to yellow, the liquid is an acid and the remaining third liquid is neutral.
6. Answer: Neutralisation is a process in which an acid solution when mixed with base solution, react with each other to produce a salt and water along with generation of heat. Salt so produced, may be acidic, basic or neutral in nature. In this process the acidic nature of the acid and the basic nature of the base are destroyed.

Acid + base salt + water. (heat is evolved)

For example:  $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$ .