Acids, Bases and Salts

Acids

- The word acid has been derived from a Latin word *'acidus'* which means *'sour'*.
- Acids are those chemical substances which have a sour taste and turns blue litmus solution red.
- Acids react with metal to liberate hydrogen gas.
  Acid + Metal $\longrightarrow$ Salt + Hydrogen gas
- On the basis of sources, acids are of two types-organic acids and mineral acids.

Organic acids

These are obtained from plant and animal sources. These are prepared in laboratories as well. Sources and uses of some important organic acids are tabulated below.

Name of acid	Found in	Uses
Acetic acid	Vinegar	in preservation of pickle and chinese foods.
Formic acid	Ant's sting	leather industry, in making insecticides.
Citric acid	Citrus fruits such as oranges, lemons, etc.	in cloth industry, in washing metals.
Lactic acid	Curd	in setting of milk to curd.
Oxalic acid	Spinach	in removing ink, photography.
Ascorbic acid (Vitamin C)	Amla, citrus fruits	in prevention of scurvy.

Mineral acids

These are formed up on reactions between two or more minerals (i.e non-living sources). These are prepared in laboratories and have many industrial applications.

Few minerals acids and their uses are listed below.

(i) **Nitric acid** (HNO_3) is used for making fertilisers, dyes, plastics, medicines, explosives (TNT), aqua regia, etc. It is also used in photography and as a laboratory reagent.

(ii) **Sulphuric acid** (H_2SO_4) is used in the manufacture of fertilisers, plastics, paints, explosives, dyes, detergents, batteries, etc. It is also used in petroleum exploration.

(iii) **Hydrochloric acid** (HCl) is used for making plastics (PVC), medicines, cosmetics, dyes, textile, aqua regia, etc. It is also used in leather industry and as a laboratory reagent.

Bases

- Bases are those chemical substances which is soapy to touch and turns red litmus to blue.
- It is bitter in tarte.
- Bases also reacts with some metals to liberate hydrogen gas.

  e.g. $Zn + 2NaOH \longrightarrow Na_2ZnO_2 + H$

Name of base	Found in	Uses
Calcium hydroxide	Lime water	manufacturing of bleaching powder
Sodium hydroxide/ Potassium hydroxide	Soap	manufacture of hard soaps and drugs, paper and textile industry, petroleum refining
Magnesium hydroxide	Milk of magnesia	as antacid, in sugar industries

pH Value

It is a measure of acidity or basicity of a solution. It represents the estimation hydrogen ion concentration in a solution.

It is 7 for neutral solution, greater than 7 for basic solution and less then 7 for acidic solution.

pH of some common substances are

Substance	pH	Substance	pH
Gastric juice	1.0-3.0	Rain water	6.0
soft drinks	2.0-4-0	Tears	7.4
Lemon	2.2-2.4	Sea water	8.5
Vineger	2.4-3.4	Milk of magnesia	10.5
Urine (human)	4.8-8.4	Milk (cow)	6.3-6.6
Saliva (Human)	6.5-7.5	Blood plasma (human)	7.30-7.42

Indicators

These are the substances which give different colours in acidic and basic solutions.

Some indicators and their colour in acidic and basic medium are

Indicators	Colour	
	In acid	In base
Phenolphthalein	Colourless	Pink
Methyl orange	Orange	Yellow
Methyl red	Red	Yellow
Phenol red	Yellow	Red

Some Natural Indicators Litmus-A Natural Dye

A naturally occurring indicator, i.e. litmus is obtained from certain lichens (small plants) and used as a dilute solution.

Litmus have mauve (purple) colour in water. In an acidic solution, it turns red. When it is added to basic solution, it turns blue. Usually, it is available as red and blue litmus paper.

Turmeric : Another Natural Indicator

Turmeric (Haldi) is a bright yellow powder obtained from a plant.

Turmeric turns red in basic solution. It is used as indicator in form of turmeric paper.

Salts (Neutralisation reaction)

Salt is the product of neutralisation reaction between an acid and a base.

Acid + Base $\longrightarrow$ Salt + Water (Heat is evolved)

Sodium chloride (common salt), caustic soda (sodium hydroxide), bleaching powder (calcium oxy chloride), baking soda (sodium bicarbonate), etc., are the examples of salts.

Neutralisations in Everyday Life Indigestion

- Due to indigestion, sometimes a person feels pain in the stomach and irritation. To relive indigestion, we take an antacid such as milk of magnesia.
- Milk of magnesia contains a base called magnesium hydroxide.
- Magnesium hydroxide neutralises the excess acid present in the stomach and cures indigestion.

Ant Bite

- *When an ant bites, it injects formic acid into are skin which causes burning pain.*
- *The effect of the acid can be neutralised by rubbing a mild base like baking soda solution (sodium hydrogen carbonate) or calamine solution.*

Practice Exercise

1. Which of the following about acid is true?
(a) It has sweet taste
(b) It liberates hydrogen gas with metals
(c) It turns red litmus blue
(d) All of the above.

2. Curd is sour due to the presence of
(a) tartaric acid (b) lactic acid
(c) acetic acid (d) oxalic acid

3. Which of the following sets of substances contains acids?
(a) Grapes, lime water
(b) Vinegar, soap
(c) Curd, milk of magnesia
(d) Curd, vinegar

4. Which of the following is used to remove rust stains on cloth?
(a) Kerosene (b) Lime
(c) Oxalic acid solution (d) Petrol

5. Which of the following is not an mineral acid?
(a) Hydrochloric acid (b) Nitric acid
(c) Acetic acid (d) Sulphuric acid

6. The acid used in lead storage cells is
(a) phosphoric acid
(b) hydrochloric acid
(c) nitric acid
(d) sulphuric acid

7. Which of the following is/are used as antacid prescribed for stomach acidity?
(a) sodium hydroxide
(b) potassium hydroxide
(c) magnesium hydroxide
(d) All of the above

8. Base changes the colour of red litmus to
(a) black (b) green
(c) blue (d) pink

9. Rain water has pH around 6.0. It is
(a) acidic (b) basic
(c) neutral (d) can't be said

10. Which of the following most acidic
(a) lemon juice (b) rain water
(c) milk (d) tears

11. It is not safe to taste every substance to find out its ..... There are some special substances that have different ..... in acidic and basic mediums.
These substances are known as ..... These substances change their colour when added to a solution containing an acidic or a basic substances.
Choose the correct order to fill the blanks
(a) neutrality, colours, indicators
(b) acidity, colours, indicators
(c) basicity, tastes, salts
(d) acidity, tastes, salts

12. Which of the following is an acid base indicator?
(a) Vinegar (b) Lime water
(c) Turmeric (d) Banking soda

13. Which of the following is/are natural indicator(s)?
(a) Litmus (b) Turmeric
(c) China rose (d) All of these

14. Phenolphthalein is a synthetic indicator and its colours in acidic and basic solutions respectively are
(a) red and blue
(b) blue and red
(c) pink and colourless
(d) colurless and pink

15. Neutralisation reaction is a
(a) physical and reversible change
(b) physical change that cannot be reversed
(c) chemical and reversible change
(d) chemical change that cannot be reversed

16. Products of a neutralisation reaction 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

17. Which of the following solutions will not change the colour of blue litmus paper of red?
1. Acid solution
2. Base solution
3. Common salt solution
Select the correct answer using the codes given below.
(a) 1 and 3 (b) 2 and 3
(c) 1 only (d) 2 only

18. The substance most commonly used as a food preservative is
(a) sodium carbonate
(b) tartaric acid
(c) acetic acid
(d) sodium salt of benzoic acid

19. Chemically, baking soda is
(a) calcium phosphate
(b) sodium bicarbonate
(c) sodium chloride
(d) baker's yeast

20. When an ant bites we use
(a) salt (b) base
(c) acid (d) neutral solution

Answers

1	*(b)*	2	*(b)*	3	*(d)*	4	*(c)*	5	*(c)*	6	*(d)*	7	*(c)*	8	*(c)*	9	*(a)*	10	*(a)*
11	*(b)*	12	*(c)*	13	*(d)*	14	*(d)*	15	*(d)*	16	*(c)*	17	*(b)*	18	*(d)*	19	*(b)*	20	*(b)*