CLASS 10TH MID TERM

SCORE BOOSTER

CHEMISTRY

ACIDS, BASES & SALTS

ONESHOT

What is an Acid ?

An acid is a hydrogen containing substance that is capable of donating a proton (hydrogen ion) to another substance.
Acidic solution turns blue litmus paper into red.
Examples - HCl and HNO_3

Blue → Red

Apart from the strong acid in our stomach, human bodies are known to produce lactic acid while exercising.

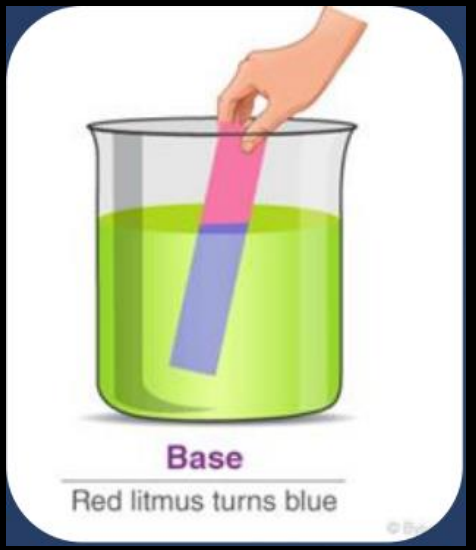
What is a Base ?

Bases are the chemical substances which have a bitter taste, are soapy to touch and turn red litmus blue. It dissolves in water to produce hydroxide ions (OH-) in solutions.

Red → Blue.

Alkalies $NaOH$, $Ca(OH)_2$

Bases → soluble in H_2O



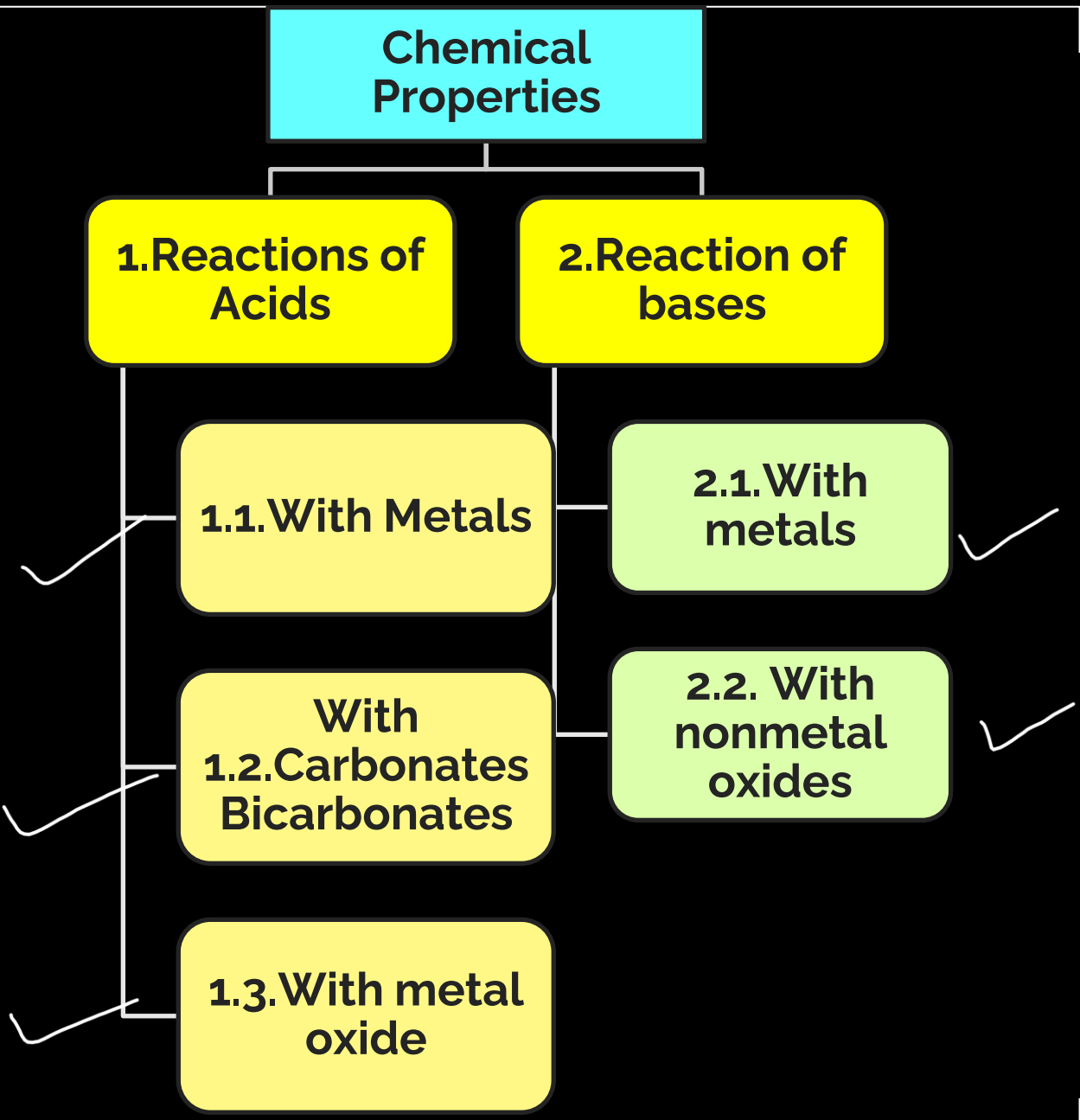
Basic solution turns red litmus paper into blue.

Examples - $NaOH \rightarrow Na(aq) + OH^-$

What are Salts ?

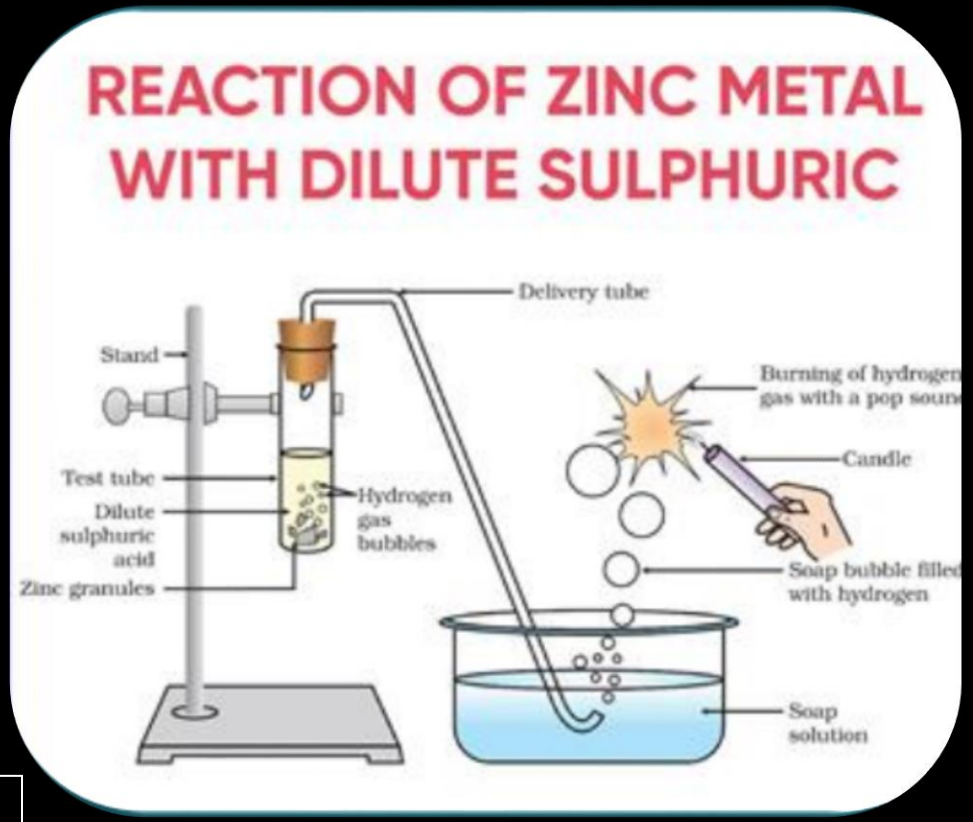
Salts are produced due to the reaction between acids and bases.

$NaOH + HCl \rightarrow NaCl + H_2O$


Chemical Properties
1.Reactions of Acids
2.Reaction of bases
1.1.With Metals
With 1.2.Carbonates Bicarbonates
1.3.With metal oxide
2.1.With metals
2.2. With nonmetal oxides

1.1. Reaction of Acid with metals

Acid + Metal → Salt + Hydrogen gas



EXAMPLES

Colourless.

$Zn(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)$

Salt

Burning matching → pop sound.

1.2. Reaction of Metal carbonates and hydrogen carbonates with acids

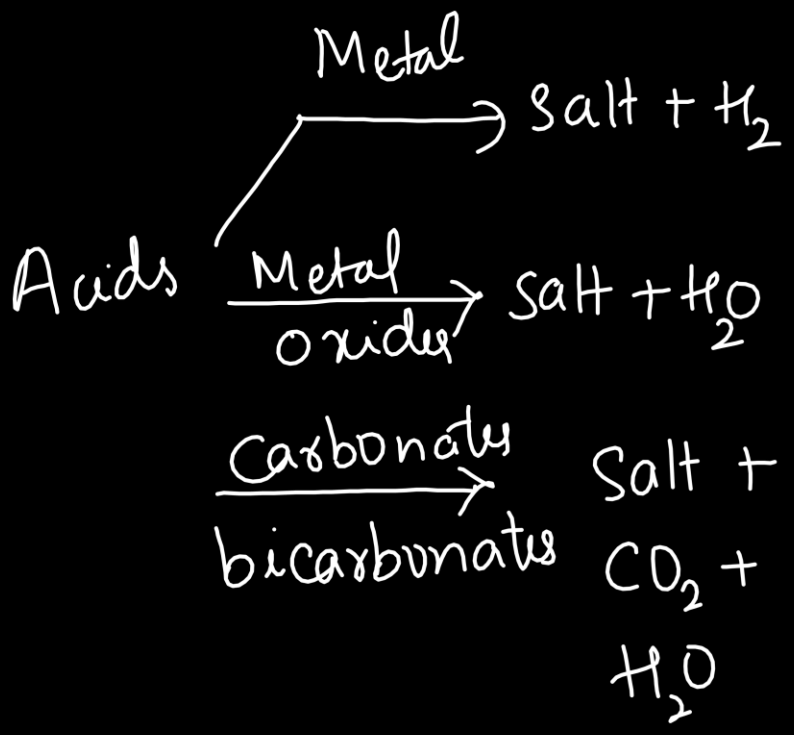
Acid + Metal Carbonate → Salt + H_2O + CO_2

EXAMPLES

$Na_2CO_3(s) + 2HCl(l) \rightarrow 2NaCl\ (aq) + H_2O + CO_2$

$NaHCO_3\ (s) + HCl(l) \rightarrow NaCl\ (aq) + H_2O + CO_2$

1.3. Reaction of Metal oxides with Acids



Acid + Metal Oxide → Salt + H2O

EXAMPLES

CuO + 2HCl → CuCl2 + H2O

M.O

Salt

2.1. Reaction of Base with metals

Base + Metal → Salt + Hydrogen gas

EXAMPLES

$NaOH(aq) + Zn(s) \rightarrow Na_2ZnO_2(aq) + H_2(g)$

Sodium zincate

2.2. Reaction of Base with nonmetalic oxide

Base + Nonmetal oxide → Salt + H2O

Base → Metals → Salt + H_2

Base → non-metal Oxides → Salt + H_2O

EXAMPLES

Ca(OH)2 (aq) + CO2 (g) → CaCO3 (s) + H2O(l)

3. Do acids and bases have something in common?

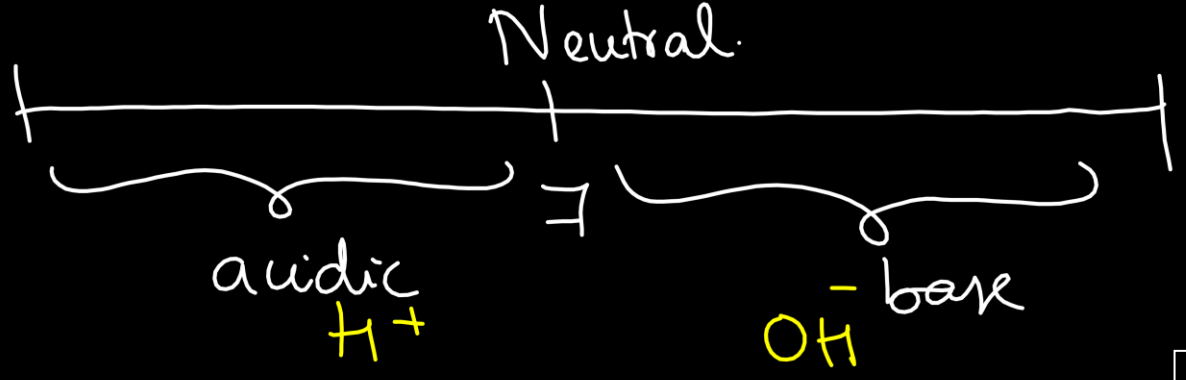
Both acids and bases are electrolytes which means that they are good conductors of electricity. Acids and bases both produce ions in water solution.

Acids release hydrogen ions (H^+) whereas Bases release hydroxide ions (OH^-).

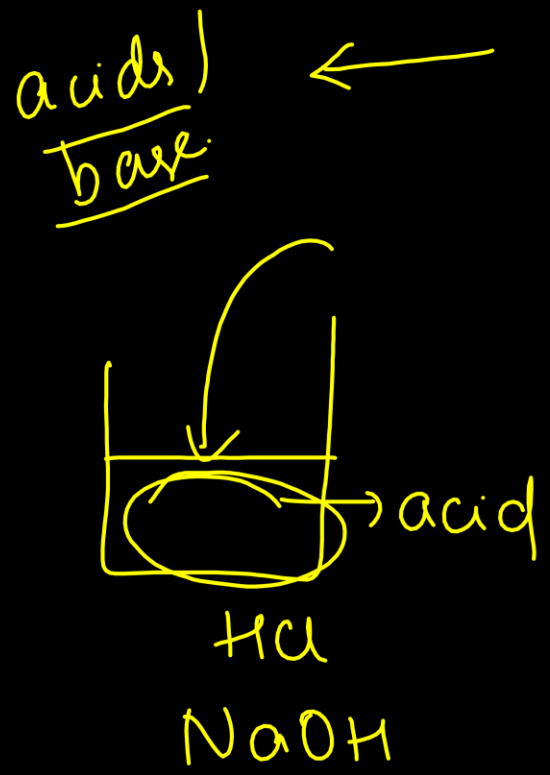
The process of mixing acid or base in water is an exothermic one. (heat is liberated) Δ

4. STRENGTH

The solution is considered acidic if the pH of the solution is less than 7 ;
the solution is neutral if the pH is around 7 ;
if the pH is greater than 7, the solution is called basic.
The abundance of hydrogen ions in an acidic solution, then, is greater than that of hydroxide ions



5. INDICATORS



Those chemical substances which help to detect nature of other chemicals.

Indicators	Acids	Bases
Red litmus	Remains red	Turns blue
Blue litmus	Turns red	Remains blue
Turmeric	No changes	Red
Phenolphthalein	Colorless	Pink
Methyl orange	Red	Yellow

5. INDICATORS

Olfactory indicators

Those substances whose odour changes in acidic or basic medium are called olfactory indicators.

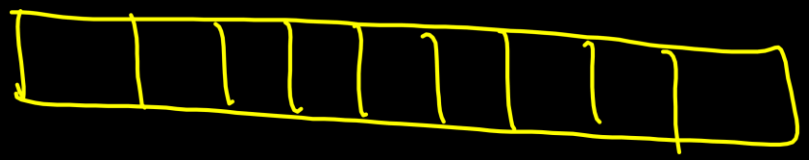
Example - Vanilla, onion clove (smell of onion and vanilla diminishes in a base and remains as it it in an acid).

5. INDICATORS

Universal indicators

Those substances which not only detect nature of other chemicals, but also determine their acidic or basic strengths.

Example - pH paper



6. NEUTRALIZATION REACTION

A + B

Strong Acid + Strong Base → Neutral Salt + H2O

$NaOH + HCl \rightarrow NaCl + H_2O$

Strong Acid + Weak Base → Acidic Salt + H2O

HCl

$NH_4OH \rightarrow NH_4Cl + H_2O$

Weak Acid + Strong Base → Basic Salt + H2O

$CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$

Basic

7. SOME IMPORTANT SALT

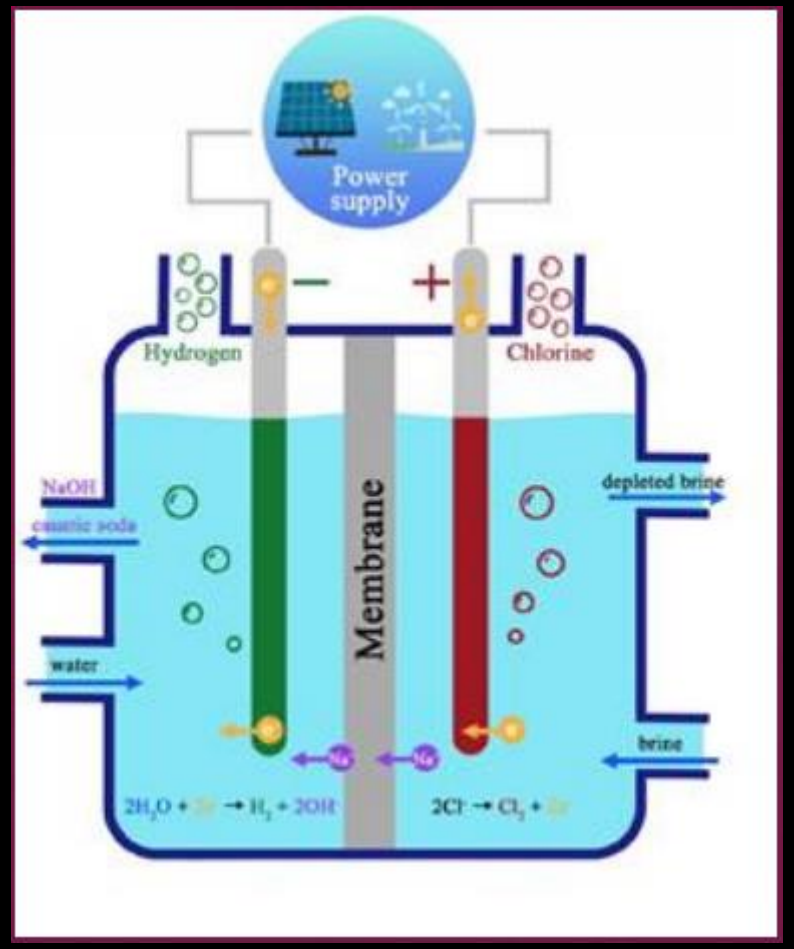
7.1. Common Salt

7.2. Bleaching Powder

7.3. Baking Soda

7.4. Washing Soda

7.5. Plaster of Paris



7.1. COMMON SALT

When electricity is passed through an aqueous solution of sodium chloride (called brine), it decomposes to form Sodium hydroxide.
The process is called the chlor-alkali process.

$$2NaCl(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + Cl_2 + H_2$$

Uses:

NaOH

- Preparation of soaps and detergents.
- Paper making.
- Used in artificial fibres.

H_2

- Used as fuel.
- Used in margarine.
- Ammonia for fertilizers.

Cl_2

- Used in water treatment.
- Swimming pools.
- PVC, Disinfectants, CFCs, Pesticides

7.2. BLEACHING POWDER ($CaOCl_2$)

The chemical nature of bleaching powder is calcium oxychloride.

$$Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2(aq) + H_2$$

Uses: Bleaching powder.

- It is used for bleaching cotton.
- It is used as an oxidizing agent in chemical industries.
- It can be used for disinfection of water.

7.3. BAKING SODA ($NaHCO_3$)

The chemical nature of baking soda is **sodium bicarbonate**.

It is produced on a large scale by treating cold and concentrated solution of sodium chloride with ammonia and carbon dioxide.

$$NaCl + H_2O + CO_2 + NH_3 \rightarrow NH_4Cl + NaHCO_3$$

Baking Soda

$$NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$$

Rxn of Basic Soda

Uses:

- Used as an antacid to treat acidity in stomach.
- Used to make baking powder, which is used in preparation of cakes, breads etc.

7.4. Washing Soda - ($Na_2CO_3.10H_2O$)

The chemical nature of bleaching powder is **sodium carbonate.** Washing Soda

Uses

- Used in glass, soap and paper industries.
- Employed in the manufacture of sodium compounds such as borax.
- Used to remove permanent hardness of water.

· Cleaning agent.

7.5. Plaster of Paris - ($CaSO_4.1/2H_2O$)

- The chemical nature of POP is Calcium sulphate hemihydrate.
- POP is prepared by heating gypsum at 373 K.
- On heating, it loses water molecules and becomes calcium sulphate hemihydrate.

$CaSO_4 \cdot 2H_2O$

(PoP)

Uses

- It is used to fix gaps in the walls/roofs of buildings/houses.
- Used in making casting for several ornaments as well as decorative material.
- ● Used in designing products for fire protection system

• Medical.

MCQs (1 Marks)

Q1. Which of the following is a basic salt ?

a. CH_3COONa
b. K_2SO_4
c. Na_2SO_4
d. KCl

Stoongbase + weak acid

MCQs (1 Marks)

Q2) Which of the following is a strong acid?

A. HCl
B. Lemon juice
C. Milk
D. CH_3COOH

Short Answer Questions (2 Marks)

Q3) Which gas is usually liberated when an acid reacts with a metal? Illustrate with an example. How will you test for the presence of this gas?

(i) H_2 gas is liberated.

Ex: $Zn + HCl \rightarrow ZnCl_2 + H_2$

(ii) When a burning matchstick is brought near then, it burns with a pop sound.

Short Answer Questions (2 Marks)

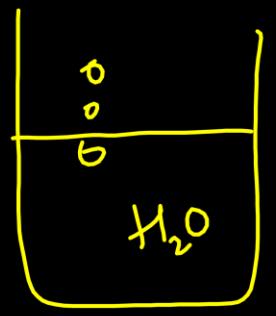
Q4. Why does an aqueous solution of an acid conduct electricity?

(i) $HCl + H_2O \longrightarrow H_3O^+ + Cl^-$

When acid is mixed with water, it produces ions which can conduct electricity.

Short Answer Questions (2 Marks)

Q5) While diluting an acid, why is it recommended that the acid should be added to water and not water to the acid?



→ When acid is added to H_2O, a large amt of heat is generated which is absorbed by the H_2O (1)

→ But if H_2O is added (1) to acid, the heat gen. can't be absorbed & causes exp.

Short Answer Questions (2 Marks)

Q6) Under what soil condition, do you think a farmer would treat the soil of his fields with quick lime (calcium oxide) or slaked lime (calcium hydroxide) or chalk (calcium carbonate)?

Metals

Soil is acidic

Short Answer Questions (2 Marks)

Q7) What happens when nitric acid is added to eggshell?

(i) $HNO_3 + CaCO_3 \rightarrow Ca(NO_3)_2 + CO_2 + H_2O$ [1]

acid — carbonate

(ii) egg shell dissolves in HNO_3. [1]

Short Answer Questions (2 Marks)

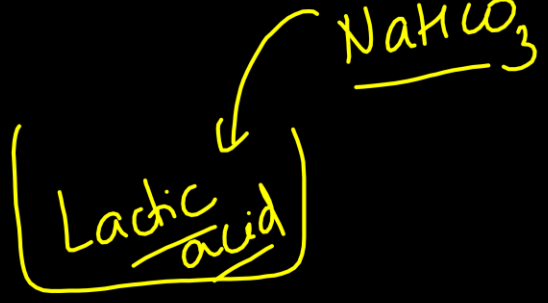
Q8) What happens when acetic acid reacts with caustic soda ?

$CH_3COOH + NaOH \longrightarrow CH_3COONa + H_2O$

(WA) (SB) ↳ 1

A basic salt is produced. ↳ 1

Short Answer Questions (3 Marks)



Q9) A milkman adds a very small amount of baking soda to fresh milk.

NaHCO3

(a) Why does he shift the pH of the fresh milk from 6 to slightly alkaline?

(b) Why does this milk take a long time to set as curd?

→ to prevent the formation of curd.

→ the $NaHCO_3$ added neutralises the lactic acid.

Short Answer Questions (3 Marks)

Q10) Name the acid present in ant sting and give its chemical formula. Also, give the common method to get relief from the discomfort caused by the ant sting.

→ Formic acid ½

→ $HCOOH$ ½

→ Applying baking soda ($NaHCO_3$)

Short Answer Questions (3 Marks)

Q11) You have two solutions, A and B. The pH of solution A is 6 and pH of solution B is 8. Which solution has more hydrogen ion concentration? Which of this is acidic and which one is basic?

(i) pH = 6

(ii) pH = 6 → Acidic

pH = 8 ⇒ Basic

Short Answer Questions (3 Marks)

$Acid + H_2O \rightarrow H^+$

Q12) Why do HCl HNO3 etc. show acidic character in aqueous solutions while solutions of compounds like C2H5OH and glucose do not show acidic character?

(i) When HCl / HNO_3 is dissolved in H_2O, it produces H^+.

(ii) When C_2H_5OH / Glu, H_2O ds does not produce H^+ because they do not diss.

Short Answer Questions (3 Marks)

Q13) Give 3 uses of washing soda ?

→ cleaning

→ removal of hardness

→ borax formation.

Short Answer Questions (3 Marks)

Q14) On heating gypsum at 373 K, it loses water molecules and becomes calcium sulphate hemihydrate ($CaSO_4\ H_2O$). This is called Plaster of Paris. Plaster of Paris is a white powder and on mixing with water, it changes to gypsum once again giving a hard solid mass.

i) What is the molecular formula of gypsum? $CaSO_4 \cdot 2H_2O$
ii) What are the uses of Plaster of Paris ? deco, fill gaps.
iii) Crystals of a substance changed their colour on heating in a closed test tube but regained it after some time when they were allowed to cool down. Name the substance and write its formula and explain the phenomenon involved.

Eg $(CuSO_4 \cdot 5H_2O)$ (Blue vitriol) Water of crystallization

Long Answer Questions (5 Marks)

Q15)A compound X is bitter in taste. It is a component of washing powder and reacts with dil. HCl to produce brisk effervescence due to colourless odourless gas Y which turns lime water milky due to formation of Z. When excess of CO2 is passed milkiness disappears due to formation of P Identify X Y Z and P.

$CaCO_3 + H_2O + CO_2 \longrightarrow Ca(HCO_3)_2$

(soluble)

(P)

$X = Na_2CO_3$

$Y = CO_2$

$Z = CaCO_3$

$P = Ca(HCO_3)_2$

$Na_2CO_3 + HCl \rightarrow NaCl + CO_2 + H_2O$

(X) (Y)

$Ca(OH)_2 + CO_2 \longrightarrow (CaCO_3) + H_2O$

(2) (ppt) (milky)

Long Answer Questions (5 Marks)

(Acid) B → R

(Base) R → B

Q16) What will be the action of the following substances on litmus paper? Dry HCl gas, Moistened NH_4 gas, Lemon juice, Carbonated soft drink, Curd, Soap

a) Dry HCl ⟶ no change

(b) NH_4OH ⟶ Red → Blue

(c) Lemon ⟶ Blue → Red.

(d) Carbonated ⟶ Blue → Red.

(e) Curd ⟶ " "

(f) Soap ⟶ R → B.

Short Answer (2 Marks)

Q17) What is observed when carbon dioxide gas is passed through lime water
(i) for a short duration?
(ii) for a long duration? Also write the chemical equations for the reactions involved.

(i) $CO_2 + Ca(OH)_2 \longrightarrow CaCO_3 + H_2O$

i.e. milky

(ii) $CaCO_3 + H_2O + CO_2 \longrightarrow Ca(HCO_3)_2$

milkiness Soluble diss.

Short Answer (3 Marks)

Q18) Complete and balance the following chemical equations :

(i) NaOH(aq) + Zn(s) →

(ii) CaCO3(s) + H2O(l) + CO2(g) →

(iii) HCl(aq) + H2O(l) →

(i) $2NaOH + Zn \rightarrow Na_2ZnO_2 + H_2$

(ii) $CaCO_3 + H_2O + CO_2 \rightarrow Ca(HCO_3)_2$

(iii) $HCl + H_2O \rightarrow H_3O^+ + Cl^-$

Short Answer (3 Marks)

Acid B → R.

dry → no change

wet → red

Q19) Sugandha prepares HCl gas in her school laboratory using certain chemicals. She puts both dry and wet blue litmus papers in contact with the gas.

(i) Name the reagents used by Sugandha to prepare HCl gas.

(ii) State the colour changes observed with the dry and wet blue litmus papers.

(iii) Show the formation of ions when HCl gas combines with water.

$HCl + H_2O \longrightarrow H_3O^+ + Cl^-$

$2NaCl + H_2SO_4 \rightarrow Na_2SO_4 + 2HCl$

Short Answer (3 Marks)

Q20) Write the names of the product formed when zinc reacts with NaOH. Also write the balanced chemical equation for the reaction involved. Write a test to confirm the presence of the gas evolved during this reaction.

3: 1 (i) Sodium Zincate

1 (ii) $2NaOH + Zn \rightarrow Na_2ZnO_2 + H_2$

1 (iii) pop sound.

Test Yourself

Q1. A white coloured powder is used by doctors for supporting fractured bones.
(a) Write chemical name and formula of the powder.
(b) When this white powder is mixed with water a hard solid mass is obtained. Write balanced chemical equation for the change.

Q2. Explain the action of dilute hydrochloric acid on the following with chemical equation:
(i) Magnesium ribbon (ii) Sodium hydroxide (iii) Crushed egg shells

Test Yourself

Q3) State reason for the following statements:

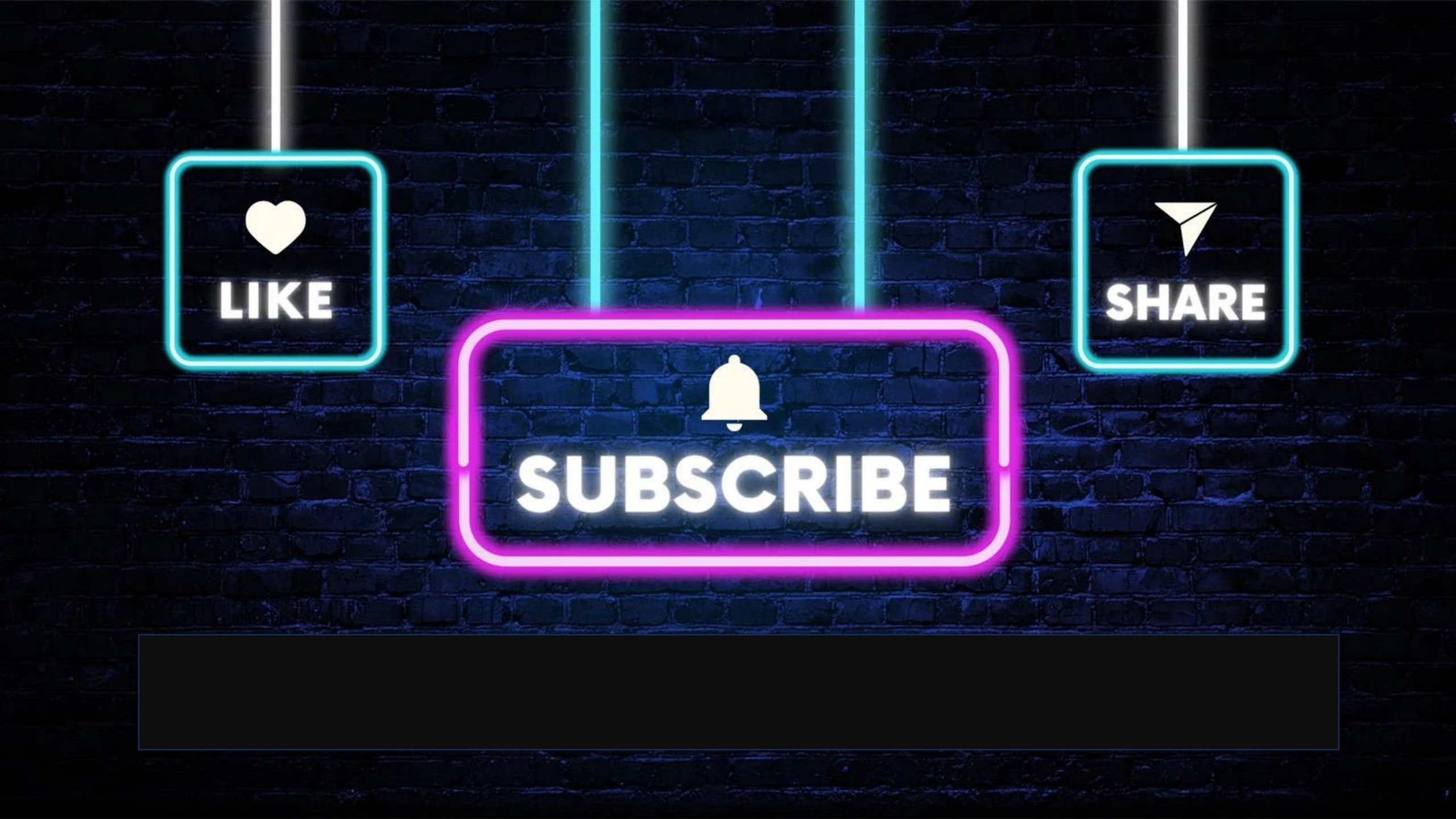
(i) Tap water conducts electricity whereas distilled water does not.

(ii) Dry hydrogen chloride gas does not turn blue litmus red whereas dilute hydrochloric acid does.

(iii) During summer season, a milk man usually adds a very small amount of baking soda to fresh milk.

(iv) For a dilution of acid, acid is added into water and not water into acid.

(v) Ammonia is a base but does not contain hydroxyl group.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