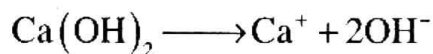


(vii) **0.55 M Ca(OH)₂**



Ca(OH)₂ releases two (OH⁻) ions as

$$[\text{OH}^-] = 2 \times 0.055\text{M}$$

$$[\text{OH}^-] = 0.11 \text{ or } 11 \times 10^{-2} \text{ M}$$

$$\text{pOH} = -\log (11 \times 10^{-2})$$

$$\text{pOH} = 0.96$$

$$\text{pH} + \text{pOH} = 14$$

$$\text{pH} = 14 - \text{pOH}$$

$$\text{pH} = 14 - 0.96$$

$$= 14 - 0.96$$

$$\text{pH} = 13.04$$

Solution	[H ⁺]	[OH ⁻]	pH	pOH
(i) 0.15 M HI	15×10^{-2}	—	0.82	13.12
(ii) 0.040 M KOH	—	4×10^{-2}	12.6	1.4
(iii) 0.020 M Ba(OH) ₂	—	4×10^{-2}	12.6	1.4
(iv) 0.00030 M HClO ₄	3×10^{-4}	—	3.52	10.48
(v) 0.55 M NaOH	—	55×10^{-2}	13.74	0.26
(vi) 0.055 M HCl	55×10^{-3}	—	1.26	12.74
(vii) 0.055 M Ca(OH) ₂	—	11×10^{-2}	13.04	0.96

Short Answer Questions

Q.1 What is meant by Acid?

Ans. The acid is derived from the Latin word “Acidius” meaning sour. Acid is a substance which has sour taste and turns blue litmus red.

Q.2 Write down characteristic properties of Acids and bases

Ans. Properties of acids and bases

Acids	Bases
1) Acids have sour taste for example unripe citrus fruits or lemon Juice.	1) Bases have bitter taste and feel slippery for example soap is slippery to touch.
2) They turn blue litmus red.	2) They turn red litmus blue.

3) They are corrosive in concentrated form.	3) They are non corrosive except concentrated forms of NaOH and KOH.
4) Their aqueous solutions conduct electric current.	4) Their aqueous solutions conduct electric current.

Q.3 Define Arrhenius acid. Give example?

Ans. According to Arrhenius concept acid is a substance which dissociates in aqueous solution to give hydrogen ions. For example HCl is an acid because it ionizes in aqueous solution to provide H^+ ions.

Q.4 Define Arrhenius base. Give example.

Ans. According to Arrhenius concept base is a substance which dissociates in aqueous solution to give hydroxide ions. For example the substance NaOH is a base because it ionizes in aqueous solution to provide OH^- ions.

Q.5 Define Bronsted and Lowry acid.

Ans. An acid is a substance (molecule or ion) that can donate a proton (H^+) to another substance. e.g HCl and CH_3COOH

Q.6 Define Bronsted Lowry base.

Ans. A base is a substance that can accept a proton (H^+) from another substance. e.g H_2O and NH_3 .

Q.7 Define conjugate acid and base.

Ans. Conjugate acid

A conjugate acid is a specie formed by accepting a proton by a base. e.g., H_3O^+

Conjugate base

A conjugate base is a specie formed by donating a proton by an acid. e.g., Cl^-

Q.8 Define amphoteric.

Ans. A substance that can behave as an acid as well as a base is called amphoteric. For example water is an amphoteric compound.

Q.9 Write down limitations of Bronsted Lowry concept.

Ans. It has been observed that there are certain substances which behave as acids though they do not have the ability to donate a proton e.g SO_3 . Similarly CaO behaves as a base but

it cannot accept a proton. These observations prove the limitations of Bronsted Lowry concept of acids and bases.

Q.10 Define Lewis-base. Give example.

Ans. A base is substance (molecule or ion) which can donate a pair of electrons. e.g NH_3 .

Q.11 Define Lewis acids. Give example.

Ans. An acid is a substance (molecule or ion) which can accept a pair of electrons. e.g AlCl_3 and BF_3 .

Q.12 Define Adduct.

Ans. The product of any Lewis acid-base reaction is a single specie called an adduct

Q.13 Write down the names of three mineral acids.

Ans. Following acids are called mineral acids. Hydrochloric acid (HCl)
Sulphuric acid (H_2SO_4) and nitric acid (HNO_3).

Q.14 Write down uses of sulphuric acid.

Ans. It is used to manufacture fertilizers, ammonium sulphate, calcium super phosphate, explosives, paints, dyes and drugs. It is also used as an electrolyte in lead storage batteries.

Q.15 Write down uses of nitric acid.

Ans. It is used in manufacturing of fertilizer (ammonium nitrate), explosives, paints, drugs and etching designs on copper plates.

Q.16 Write down uses of hydrochloric acid.

Ans. It is used for cleaning metals, tanning and in printing industries.

Q.17 Write down uses of benzoic acid.

Ans. It is used for food preservation

Q.18 Write down uses of sodium hydroxide.

Ans. It is used for manufacturing of soap, artificial silk, as laboratory reagent in textile and paper industries.

Q.19 Write down uses of calcium hydroxide.

Ans. It is used for manufacturing of bleaching powder, softening of hard water and neutralizing acidic soil and lakes due to acid rain.

Q.20 Write down uses of potassium hydroxide.

Ans. It is used in alkaline batteries.

Q.21 Write down uses of magnesium hydroxide.

Ans. It is used as a base to neutralize acidity in the stomach. It is also used for treatment of bee stings.

Q.22 Write down uses of Aluminium hydroxide.

Ans. It is used as a foaming agent in fire extinguishers.

Q.23 Write down uses of ammonium hydroxide.

Ans. It is used to remove grease stains from clothes.

Q.24 Define pH. Write down its formula.

Ans. pH is the negative logarithm of molar concentration of the hydrogen ions

$$\text{pH} = -\log [\text{H}^+]$$

Q.25 Write down uses of pH.

Ans. i) It is used to determine acidic or basic nature of a solution

ii) It is used to produce medicines, culture at a microbiological particular concentration of H^+ ion.

iii) It is used to prepare solutions of required concentrations necessary for certain biological reactions.

Q.26 What are indicators. Give example?

Ans. Indicators are the organic compounds. They have different colours in acidic and alkaline solutions. Litmus is a common indicator. It is red in acid and blue in alkaline solutions.

Q.27 What are universal indicators?

Ans. Some indicators are used as mixtures. The mixture indicators give different colours at different pH values. Hence it is used to measure the pH of a solution. Such a mixed indicator is called a universal indicator.

Q.28 Who are analytical chemists?

Ans. Analytical chemists examine substances qualitatively and quantitatively. They identify substances and evaluate their properties.

Q.29 Define salts.

Ans. Salts are inorganic compounds generally formed by neutralization of an acid with a base. e.g., sodium chloride (NaCl)

Q.30 What is acid and basic radical?

Ans. Salts are made up of positive ions (cations) and negative ions (Anions). A cation is metallic and derived from a base therefore it is called **basic radical**. While anion is derived from acids therefore it is called **acid radical**.

Q.31 Write down any two characteristics of salts.

Ans. salts are ionic compounds found in crystalline form. They have high melting and boiling points.

Q.32 Define normal or neutral salts.

Ans. A salt formed by the total replacement of ionizable H^+ ions of an acid by a positive metal ion or NH_4^+ ions is called normal or neutral salt. e.g NaCl

Q.33 Define Acidic salt.

Ans. These salts are formed by partial replacement of H^+ ions of an acid by a positive metal ion. e.g $KHSO_4$

Q.34 Define basic salt.

Ans. Basic salts are formed by the incomplete neutralization of a polyhydroxy base by an acid. e.g $Al(OH)_3 Cl$

Q.35 Define double salt. Give example.

Ans. Double salts are formed by two normal salts when they are crystallized from a mixture of equimolar saturated solutions. The individual salt components retain their properties. For example Mohr's salt $FeSO_4 \cdot (NH_4)_2 SO_4 \cdot 6H_2O$.

Q.36 Define Mixed salt. Give example.

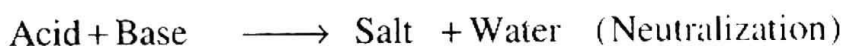
Ans. Mixed salts contain more than one basic or acid radicals. Bleaching powder $Ca(OCl)Cl$, is an example of mixed salts.

Q.37 Define Complex salt. Give example?

Ans. Complex salt on dissociation provides a simple cation and a complex anion or vice versa. Only simple ions yields the characteristics test for cation or anion. E.g., potassium ferrocyanide $K_4 [Fe(CN)_6]$

Q.38 Define neutralization reaction. Give example

Ans. A reaction between an acid and a base is called a neutralization reaction. It produces a salt and water.



Q.39 Name three common household substances having

a) pH values greater than 7

- 1) Soap
- 2) Detergent
- 3) Shampoo

b) pH values less than 7

- 1) vinegar
- 2) Citrus fruits
- 3) Butter

c) pH values equal to 7

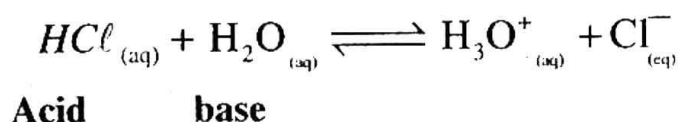
- 1) Water
- 2) NaCl
- 3) Sugar

Q.40 Define a base and explain all alkalis are bases, but all bases are not alkalis.

Ans. A base is a substance which turn red litmus to blue and having pH value greater than 7. Water soluble base is called alkali but some bases are not soluble in water, so all alkalis are bases but all bases are not alkalis.

Q.41 Define Bronsted-Lowery base and explain with an example that water is Bronsted-lowery base.

Ans. Bronsted-Lowery base is a substance (molecule or ion) which can accept a proton (H^+) from another substance. For example, when HCl dissolves in water, HCl acts, as an acid and H_2O act as a base because it accepts a proton.



Q.42 How can you justify that Bronsted –Lowry concept of acid and base is applicable to non aqueous solutions?

Ans. According to Bronsted-Lowry concept:

“An acid is a compound which donates a proton (H^+).”

“A base is a compound which accepts a proton (H^+).”

So, the compounds which have H^+ ions also act as acids in addition to water e.g., CH_3COOH while the compounds which have not OH^- ions also act as base e.g., NH_3 .

Q.43 Which kind a bond forms between Lewis acid and base?

Ans. Coordinate covalent bond forms between Lewis acid and base.

Q.44 Why H^+ ion acts as a Lewis acid?

Ans. Because it has an empty orbital that can accommodate a pair of electrons.

Q.45 Name two acids used in the manufacture of fertilizers.

Ans. Sulphuric acid and nitric acid both are used in the manufacture of fertilizers.

Q.46 Define pH. What is the pH of pure water?

Ans. pH is the negative logarithm of molar concentration of the hydrogen ions. that is,
 $pH = -\log [H^+]$. The pH value of pure water is 7.

Q.47 How many times a solution of pH 1 will be stronger than that of a solution having pH 2?

Ans. Because the pH scale is logarithmic, a solution of pH 1 has 10 times higher concentration of $[H^+]$ than that of a solution of pH2.

Q.48 Na_2SO_4 is a neutral salt while $NaHSO_4$ is an acidic salt justify.

Ans. Because in Na_2SO_4 there is total replacement of ionizable H^+ ions. While in $NaHSO_4$ the partial replacement of a replaceable H^+ ions of an acid takes place by a positive metal ion. It turns red litmus to blue.

Q.49 Give few characteristics of salts.

Ans. There are following characteristics of salt.

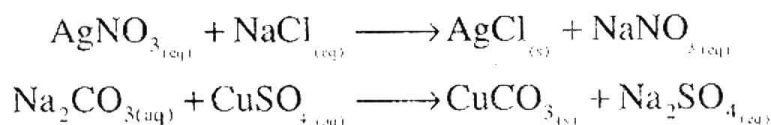
- 1) Salts are ionic compounds found in crystalline form.
- 2) They have high melting and boiling point.

Q.50 How the soluble salts are recovered from water?

Ans. Soluble salts are recovered by evaporation or crystallization.

Q.51 How the insoluble salts are prepared?

Ans. In this method, usually solutions of soluble salts are mixed. During the reaction exchange of ionic radicals (i.e. metallic radicals exchange with acidic radicals) takes place to produce two new salts. One of the salt is insoluble and other is soluble. The insoluble salt precipitates (solidify in solution) e.g.,

**Q.52 Why a salt is neutral, explain with an example?**

Ans. A salt is formed by the total replacement of ionizable H^+ ions of an acid by a positive metal ion or NH_4^+ ions is called normal or neutral salt. These salts are neutral to litmus.

**Q.53 Name an acid used in the preservation of food.**

Ans. Benzoic acid is used for food preservation.

Q.54 Name the acids present in.

Ans.

1) Vinegar:

Acetic acid

2) Ant sting

Formic acid

3) Citrus fruit

Citric acid

4) Sour milk

Lactic acid

Q.55 How can you justify that Pb(OH)NO_3 is a basic salt?

Ans. Pb(OH)NO_3 is a basic salt because it is formed by the incomplete neutralization of a poly hydroxyl base by an acid.



It can react with acids to form normal salts. $\text{Pb(OH)NO}_3 + \text{HNO}_3 \longrightarrow \text{Pb(NO}_3)_2 + \text{H}_2\text{O}$

Q.56 You are in a need of an acidic salt. How can you prepare it?

Ans. An acidic salt is formed by the partial replacement of a replaceable H^+ ions of an acid by a positive metal ion.



Q.57 Which salt is used to prepare plaster of paris?

Ans. Calcium sulphate($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) is used to prepare plaster of Paris.

Q.58 What is the difference between Arrhenius base and Bronsted-lowry base?

Ans. Difference between Arrhenius base and Bronsted-Lowry base

Arrhenius base:

A base is a substance which dissociates in aqueous solution to give hydroxide ion. (OH^-) e.g., NaOH

Bronsted-Lowry base:

Bronsted-Lowry base is a substance which can accept a proton (H^+) from another substance e.g., NH_3

Q.59 What do you mean by neutralization reaction according to Arrhenius acid base concept?

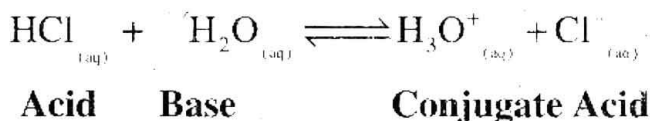
Ans. A neutralization reaction according to Arrhenius concept acid gives H^+ ions and bases gives OH^- ions.



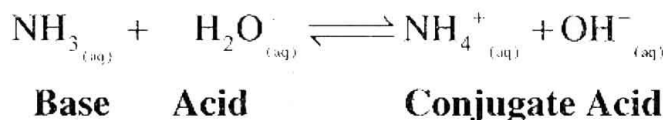
Q.60 Prove that water is an amphoteric specie.

Ans. Water is an amphoteric specie because it acts as acid as well as base.

As a base:



As a acid:



Q.61 How can you justify that NH_3 is Bronsted-Lowry base but not Arrhenius base?

Ans. Ammonia(NH_3) is Bronsted-Lowry base because it has the ability to accept a proton(H^+)but not Arrhenius base because it does not produce hydroxide ion (OH^-)in aqueous solution.

Q.62 State and explain the neutralization reaction according to Lewis concept.

Ans. A neutralization reaction according to Lewis concept is donation and acceptance of an electron pair to form a coordinate covalent bond in an adduct.

Q.63 Define and Give the characteristics of Lewis acid.

Ans. There are following characteristics of Lewis acids.

- i. Lewis acids, are molecules, in which the central atom has incomplete octet e.g. BF_3 , AlCl_3
- ii. Simple cations can act as Lewis acids. since they are deficient in electrons e.g. Na^+ , Ca^{2+}

Q.64 Why BF_3 behaves as a Lewis acid?

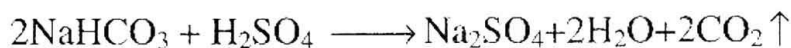
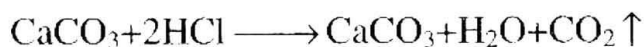
Ans. BF_3 acts as Lewis acid because it accepts a pair of electrons, the central atom has only six electrons around it, therefore, it accepts an electron pair.

Q.65 Water is an amphoteric species= according to Bronsted-Lowry concept. What is the nature of water according to Lewis concept?

Ans. According to Lewis concept water acts as Lewis base because it has the ability to donate electron pair.

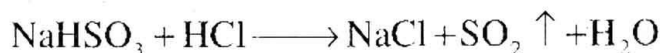
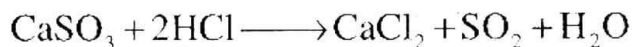
Q.66 When acid reacts with carbonates and bicarbonates, which gas evolves out?

Ans. When acid reacts with carbonates and bicarbonates carbon dioxide(CO_2) gas evolves it.



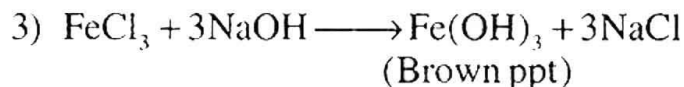
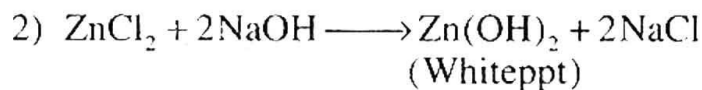
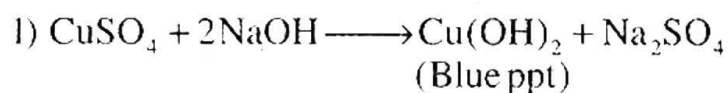
Q.67 Which type of salts produce SO_2 gas on reacting with acids?

Ans. Acids react with sulphites and bisulphate to form salts with liberation of sulphur dioxide (SO_2) gas.



Q.68 Write down colours of the precipitates formed by reaction of aqueous caustic soda with solutions of copper, zinc and ferric salts.

Ans.



Q.69 Why pure water is not a strong electrolytes?

Ans. Because water has smaller value of degree of ionization due to presence of strong forces i-e Hydrogen bonding.

Q.70 HCl and H₂SO₄ are strong acids while their solutions are equimolar, they have different PH values. Why they have different PH values?

Ans. Because H₂SO₄ is a dibasic acid. It produces two hydrogen ions while HCl is monobasic acid it produces only one hydrogen ion. That is why both acids have different pH values with their equimolar solutions.

Q.71 Difference between 'P' and Ph value.

Ans.

P

'P' scale is the conversion of very small figures into positive figure by taking the common logarithm of the small figure and multiplying it with -1

pH

pH is the negative logarithm of molar concentration of the hydrogen ions, that is
 $\text{PH} = -\log[\text{H}^+]$

Q.72 How the salts are named?

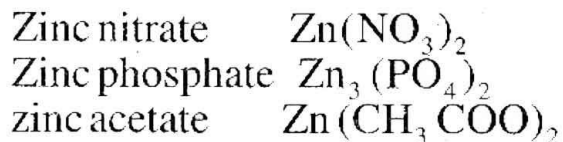
Ans. A salt gets its name from the names of the metal and the acid e.g

Metal	Acid	Salt Name
Sodium(Na)	Hydrochloric Acid (HCl)	Sodium Chloride (NaCl)

Q.73 Name the salts which are formed when Zn metal reacts with following acids.

- a. Nitric Acid
- b. Phosphoric Acid
- c. Acetic Acid

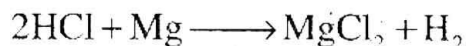
Ans.



Q.74 Name the type of reaction that takes place between an acid and a metal. Which gas would evolve in the reaction? Explain with an example.

Ans. When acid reacts with metal, salt and hydrogen gas are produced. This type of reaction is called direct displacement method.

Acid Metal Salt Hydrogen gas



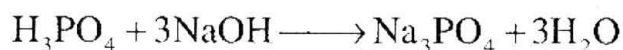
Q.75 Names the types of salts.

Ans. There are following types of salts.

- | | |
|------------------|-------------------|
| i. Normal Salts | iv. Double Salts |
| ii. Acidic Salts | v. Mixed Salts |
| iii. Basic Salts | vi. Complex Salts |

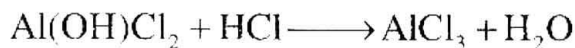
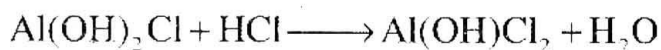
Q.76 H_3PO_4 is weak acid but its salt(Na_3PO_4)with strong base NaOH is neutral. Explain it.

Ans. It is normal or neutral salt which is formed by the total replacement of ionization of H^+ ions of an acid by a positive metal ion or NH_4^+ ions is called normal or neutral salt.



Q.77 How the basic salts turns into normal salts. Explain with an example.

Ans. When basic salts react with acids it produces normal salts.



Normal Salt

Q.78 Define acid rain

Ans. Acid rain is formed by dissolving acidic air pollutants like oxides of sulphur and nitrogen by rain water. As a result pH of the rain it damages animals, Plants, buildings, water bodies and even soil.