

# Acids Bases and Salts

# EXERCISE

- **Multiple Choice Questions**
- **1.** Which one of the following will turn red litmus blue?
  - (a) Vinegar
  - (b) Baking soda solution
  - (c) Lemon juice
  - (d) Soft drinks
- **2.** Which one of the following will turn blue litmus red?
  - (a) Vinegar
  - (b) Lime water
  - (c) Baking soda solution
  - (d) Washing soda solution
- **3.** When zinc reacts with sodium hydroxide, the products formed are
  - (a) zinc hydroxide and sodium
  - (b) sodium zincate and water
  - (c) sodium zincate and hydrogen
  - (d) sodium zincate and oxygen
- **4.** pH of sodium carbonate ( $Na_2CO_3$ ) solution will be

(a) 7	(b) > 7
(c) < 7	(d) 1

- **5.** Change of  $Na_2CO_3.10H_2OtoNa_2CO_3.H_2O$  on exposure to air is called (a) efflorescence (b) effervescence (c) fluorescence (d) luminescence
- **6.** Which of the following is a strong base?
  - (a) Ammonium hydroxide
  - (b) Sodium hydroxide
  - (c) Magnesium hydroxide
  - (d) Copper hydroxide
- Which of the following is not a base?
  (a) KOH
  (b) ZnO
  (c) Al(OH)<sub>3</sub>
  (d) NaCI
- 8. Acetic acid is a weak acid because (a) its aqueous solution is acidic
  - (b) it is highly ionized
  - (c) it is weakly ionized
  - (d) it contains COOH group
- 9. Partial neutralization of a polybasic acid gives (a) acid salt (b) basic salt (c) normal salt (d) double salt

- **10.** Which of the following can form more than one acid salt?
  - (a)  $CH_3COOH$  (b)  $H_3PO_4$ (c)  $CH_3CH_2COOH$  (d) ZnO
- A solution turns blue litmus red. The pH of the solution is probably
  (a) 8
  (b) 10
  (c) 12
  (d) 6
- **12.** The type of medicine used to treat indigestion is (a) antihistamine (b) sulpha drug (c) antacid (d) antibiotic
- **13.**Washing soda has the formula<br/>(a)  $Na_2CO_3.7H_2O$ <br/>(b)  $Na_2CO_3.10H_2O$ <br/>(c)  $Na_2CO_3.H_2O$ <br/>(d)  $Na_2CO_3$
- 14.Which of the following acid is present in vinegar?(a) Lactic acid(b) Malic acid(c) Acetic acid(d) Tartaric acid
- 15. Basic salts are formed by neutralization of
  (a) strong acid and strong base
  (b) strong acid and weak base
  (c) weak acid and weak base
  (d) strong base and weak acid
- 16. When bitten by an ant, the sting causes irritation due to the presence of(a) a base in the sting(b) formic acid in the sting
  - (c) poisonous chemicals (d) both (a) and (b)
- 17. Plaster of Paris is obtained

  (a) by adding water to calcium sulphate
  (b) by adding sulphuric acid to calcium hydroxide
  (c) by heating gypsum to a very high temperature
  (d) by heating gypsum to 120° C

  18. Which of the following is 'quick lime'?
- 19. Which of these choices is considered to be a Bronsted-Lowry base?
  (a) Proton donor
  (b) Proton acceptor
  (c) Electron acceptor
  (d) None of these
- **20.** In the reaction,  $CO_3^{2-}H_2O \rightarrow HCO_3^{-} + OH^{-}$ water is a (a) Bronsted acid (b) Bronsted base (c) conjugate acid (d) conjugate base

**21.** A solution reacts with crushed egg-shells to give a gas that turns lime-water milky. The solution contains

(a) NaCI	(b) HCl
(c) Lid	(d) KCl

- 22. Which of the following statement is not correct?
  (a) Acids turn blue litmus solution to red.
  (b) Raw onion can be used as an olfactory indicator to check acid or base.
  (c) Bases are sour in taste.
  (d) Vanilla essence does not give odour in
- **23.** Baking powder contains sodium hydrogen carbonate and
  - (a) tartaric acid (b) washing soda
  - (c) calcium chloride (d) acetic acid
- $\begin{array}{ccc} \textbf{24.} & \mbox{Lime reacts with water to give} \\ (a) \ Ca(OH)_2 & (b) \ CaCI_2 \\ (c) \ CaOCI_2 & (d) \ CaO \end{array}$

strongly basic solution.

- **25.** Plaster of Paris hardens by
  - (a) giving off CO<sub>2</sub>
  - (b) changing into CaCO<sub>3</sub>
  - (c) combining with water
  - (d) giving out water
- **26.** The difference of water molecules in gypsum and Plaster of Paris is
  (a) 5/2
  (b) 2
  (c) 1/2
  (d) 3/2
- **28.** When water is added to quick lime, the reaction is

(a) explosive	(b) endothermic
(c) exothermic	(d) photochemical

- **29.** Bleaching powder gives smell of chlorine because it
  - (a) is unstable
  - (b) gives chlorine on exposure to atmosphere
  - (c) is a mixture of chlorine and slaked lime
  - (d) contains excess of chlorine
- Which of the following salts on dissolving in water will give a solution with pH less than 7 at 298 K?
  (a) KCN
  (b) CH<sub>3</sub>COONa
  (c) NaBr
  (d) NH<sub>4</sub>Cl

- Which of the following is incorrectly matched?
  (a) Tomato tartaric acid
  (b) Ant sting methanoic acid
  (c) Citrus fruit citric acid
  - (d) Curd lactic acid
- **32.** The solution with the lowest concentration of  $H^+$  ion is (a) pH = 7 (b) pH = 8.6 (c) pH = 2.0 (d) pH = 6.8
- **33.** The incorrect statement about acids is
  - (a) they give  $H^+$  ion in water
  - (b) they are sour in taste
  - (c) they turn blue litmus red
  - (d) they give pink colour with phenolphthalein
- **34.** If tartaric acid is not added in baking powder, the cake will taste bitter due to the presence of (a) sodium hydrogen carbonate
  - (b) sodium carbonate
  - (c) carbon dioxide
  - (d) some unreacted tartaric acid
- **35.** Soda-acid fire extinguisher extinguishes the fire by
  - (a) cutting the supply of air
  - (b) removing the combustible substance
  - (c) raising the ignition temperature
  - (d) none of these
- **36.** Acids like lactic acid, uric acid which are obtained usually from plants and animals (a) organic acid (b) inorganic acid (c) oxy acid (d) hydra acid
- 37. Choose one example of inorganic acid (minera acid) from the following.
  (a) Oxalic acid
  (b) Acetic acid
  (c) Nitric add
  (d) Formic acid
- 38. Which of the following statements is true regarding acids and bases?
  (a) Adds and bases don't react with each other.
  (b) Acids mixed with bases neutralize each other.
  (c) Acids mixed with bases make stronger acids.
  (d) Adds mixed with bases make weaker acids.
- **39.** Which gas is evolved when acids react with metal carbonates? (a)  $CO_2$  (b)  $H_2$ (c)  $NH_3$  (d)  $O_2$
- **40.**Which acid is used in flavoured drinks?(a) Boric acid(b) Carbonic acid(c) Sulphuric add(d) Oxalic acid

Sour milk contains	
(a) lactic acid	(b) acetic acid
(c) tartaric add	(d) citric add
	Sour milk contains (a) lactic acid (c) tartaric add

- 42. What will be the pH value of a solution if salt of a strong acid and weak base undergoes hydrolysis?
  (a) pH = 7
  (b) pH > 7
  (c) pH < 7</li>
  (d) pH = 1
- **43.** pH is a measure of ...... ions in a solution. (a) hydrogen (b) hydroxide (c) ammonium (d) carbonium
- **44.** On diluting solution of pH of 4, its pH will
  - (a) remain same
  - (b) increase
  - (c) decrease
  - (d) undergo a chemical change.
- **45.** The equation between an add and a base is  $XOH + HY \rightarrow XY + H_2O$  which of the following is the cation part of salt? (a) X (b) OH
  - (c) H (d) Y
- 46. Why should Plaster of Paris be stored in a moisture proof container?(a) On mixing with water it changes into a hard solid.
  - (b) On mixing with water it becomes diluted
  - (c) It evaporates in moisture
  - (d) It breaks into its component in water.
- **47.** If pH of solution is 13, it means that it is (a) weakly acidic (b) weakly basic (c) strongly acidic (d) strongly basic
- 48. Which of the following metals can displace hydrogen from the aqueous solution of sodium hydroxide?(a) Mg(b) Cu
  - (c) Al (d) Ag
- **49.** An aqueous solution with pH = zero is
  - (a) acidic(b) alkaline(c) neutral(d) amphoteric
- **50.** Two solutions A and B were found to have pH value of 6 and 8 respectively. The inference which can be drawn is that (a) the acid strength of the solution A is higher than that of B
  - (b) A is an add while B is a base  $% \left( A^{\prime}\right) =\left( A^{\prime}\right) \left( A^$
  - (c) both are add solutions
  - (d) both are base solutions.

- 51. Acetic add was added to a solid X kept in a test tube. A colourless and odourless gas was evolved. The gas was passed through lime water which turned milky. It was concluded that

  (a) solid X is sodium hydroxide and the.gas evolved is CO<sub>2</sub>
  (b) solid X is sodium bicarbonate and the gas evolved is CO<sub>2</sub>
  (c) solid X is sodium acetate and the gas evolved is CO<sub>2</sub>
  (d) solid X is sodium chloride and the gas evolved is CO<sub>2</sub>.
- **52.** 'Alum' is an example of (a) single salt (b) double salt (c) acids (d) none of these
- 54. Arrhenius acid gives
  (a) H<sup>+</sup> in water
  (b) OH<sup>-</sup> in water
  (c) both (a) and (b)
  (d) none of these
- 55. A blue litmus paper was first dipped in dil. HCl and then in dil. NaOH solution. It was observed that the colour of the litmus paper(a) changed to red(b) changed first to red and then to blue
  - (c) changed blue to colourless
  - (d) remained blue in both the solutions
- **56.**  $CuO+(X) \rightarrow CuSO_4 + H_2O$ . Here (X) is (a) CuSO<sub>4</sub> (b) HCl (c) H<sub>2</sub>SO<sub>4</sub> (d) HNO<sub>3</sub>
- 57. In a solution of pH = 5, more add is added in order to reduce the pH = 2. The increase in hydrogen ion concentration is
  (a) 100 times
  (b) 1000 times
  (c) 3 times
  (d) 5 times
- **58.** How many litres of water has evaporated on concentrating 10 litres of  $H_2SO_4$  such that its pH decreases from 6 to 5? (a) 9 (b) 7 (c) 5 (d) 10
- 59. Which of the following is an example of a basic buffer?
  (a) NH<sub>4</sub>OH + NH<sub>4</sub>Cl
  (b) CH<sub>3</sub>COOH + CH<sub>3</sub>COONa
  (c) CH COOH + CH<sub>3</sub>COOH
  - (c)  $CH_3COONH_4 + CH_3COOH$ (d)  $CH_3COONH_4 + NH_4OH$

- **60.** Which set of acids is solid in nature?
  - (a) Boric acid, oxalic add
  - (b) Acetic acid and boric acid
  - (c) Formic add and oxalic add  $% \left( {{\mathbf{r}}_{i}}\right) =\left( {{\mathbf{r}}_{i}}\right) \left( {{\mathbf{r}}_{i$
  - (d) Formic add and acetic acid
- 61. Which acids are highly corrosive in nature?(a) Acetic add and oxalic add
  - (b) Acetic add and sulphuric add
  - (c) Sulphuric add and nitric add
  - (d) Carbonic acid and acetic acid
- **62.** Which of the following does not give  $H^+$  ions in aqueous solution? (a)  $H_2CO_3$  (b)  $C_2H_5OH$ (c)  $CH_3COOH$  (d)  $H_3PO_4$
- **63.** For dilution of concentrated acid we should add (a) water into concentrated acid (b) concentrated add into water
  - (c) first water into acid and then more acid
  - (d) both (a) and (b) are correct
- 64. When sodium chloride reacts with sulphuric acid, a gas is evolved which gives dense white fumes with ammonia. Which is the gas evolved?
  (a) HCl
  (b) NH<sub>4</sub>Cl
  (c) NH<sub>4</sub>OH
  (d) (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>
- - (a) sodium sulphate, 2(b) sodium sulphite, 2(c) sodium sulphate, 1(d) sodium sulphite, 1
- **66.** Phenolphthalein is

(a) yellow in acidic medium, pink in basic medium(b) pink in acidic medium, colourless in basic

medium

(c) colourless in acidic medium, pink in basic medium  $% \left( {{\left( {{{\left( {{{\left( {{c}} \right)}} \right)_{i}}} \right)_{i}}} \right)_{i}} \right)$ 

(d) pink in acidic medium, yellow in basic medium

- **67.** The substances whose odour change in acidic and basic solutions are known as
  - (a) olfactory indicators
  - (b) add base indicators
  - (c) visual indicators
  - (d) all of these
- **68.** Which is not a dibasic acid?
  - (a) Carbonic add (H<sub>2</sub>CO<sub>3</sub>)
    - (b) Sulphurous add  $(H_2SO_3)$

(c) Formic acid (HCOOH)(d) Oxalic add [(COOH)<sub>2</sub>]

- 69. One molecule of Aluminium hydroxide will require how many molecules of dil HCl for complete neutralization?
  (a) 1
  (b) 2
  (c) 3
  (d) 4
- 71. Aqueous solution of copper sulphate reacts with aqueous ammonium hydroxide solution to give
  (a) brown ppt.
  (b) pale blue ppt.
  (c) white ppt.
  (d) green ppt
- **72.**Carbon tetrachloride is an example of<br/>(a) strong electrolyte(b) weak electrolyte(c) non electrolyte(d) electrolyte.
- **73.** 10 mL of a solution of NaOH is found to be completely neutralized by 8 mL of a given solution of HCl. If we take 20 mL of the same solution of NaOH, the amount of HCl required to neutralize it will be
  - (a) 4 mL
  - (b) 8 mL
  - (c) 12 mL (d) 16 mL
  - (a) 10 mL
- **74.** Which one of the following is a strong electrolyte?
  - (a) Carbon disulphide
  - (b) Ammonium hydroxide
  - (c) Sodium chloride
  - (d) Water
- **75.** Mark the correct statement.

(a) Both bases and alkalies are soluble in water.(b) Alkalies are soluble in water but all bases are not.

(c)  $C_2H_5OH$  is a base because it has OH group. (d) Bases are soluble in water but alkalies are not.

- **76.** The concentration of hydroxide  $[OH^-]$  in neutral water at 25°C in mol/L is
  - (a) 7
  - (b) 10<sup>-7</sup>
  - (c) 14
  - (d)  $10^{-14}$

77. The expression for the pH of a solution is given by

(a) 
$$pH = -\log \frac{1}{[H^+]}$$
 (b)  $pH = \log [H^+]$   
(c)  $\log \frac{1}{[H^+]}$  (d)  $pH = [H^+]$ 

- $10^{-6}$  M HCl is diluted to 100 times. Its pH is 78. (a) 6.0 (b) 8.0 (c) 6.95 (d) 9.5
- 79. Which salt can be classified as an acid salt (a)  $Na_2SO_4$ (b) BiOCl (c) Pb(OH)Cl(d)  $Na_2HPO_4$
- 80. pH of blood is maintained constant by mechanism of (a) common ion effect (b) buffer (d) all of these (c) solubility
- 81. The species among the following, which can act as an acid and a base is
  - (a)  $HSO_4^-$ (b)  $SO_4^{2-}$ (c)  $H_{3}O^{+}$ (d)  $Cl^{-}$
- 82. What is the term for the positive and negative ions of a compound breaking apart in solution? (a) Conglomeration
  - (b) Oxidation
  - (c) Dissociation
  - (d) None of the above
- 83. In the reaction

 $HNO_{3(aa)} + H_2O_{(l)} \rightarrow H3O^+ + NO_3^-$  the nitrate is the

- (a) Bronsted acid (b) Bronsted base (c) conjugate acid (d) conjugate base
- Plaster of Paris  $\left(CaSO_4, \frac{1}{2}H_2O\right)$  on mixing 84.

with water sets to form

- (a)  $CaSO_4.H_2O$  (b)  $CaSO_4.1\frac{1}{2}H_2O$ (c)  $CaSO_4.2H_2O$  (d)  $CaSO_4.2\frac{1}{2}H_2O$
- 85. The soil for healthy growth of plants should be (a) highly acidic
  - (b) highly alkaline
  - (c) neither alkaline nor highly acidic
  - (d) either acidic or highly alkaline

- 86. On electrolysis of brine solution, the products formed are (a) sodium and chlorine
  - (b) hydrogen, chlorine and oxygen
  - (c) hydrogen, chlorine and sodium hydroxide
  - (d) sodium hydroxide, chlorine and oxygen
- 87. When dilute hydrochloric acid is added to granulated zinc placed in a test tube, the observation made is that (a) the surface of the metal turns shining (b) the reaction mixture turns milky (c) odour of chlorine is observed (d) a colorless and odorless gas is evolved with bubbles
- 88. Moist sodium bicarbonate was placed on a strip of pH paper. The colour of the strip (a) turned blue
  - (b) did not change
  - (c) turned green (d) turned light pink
- 89. The colour of the pH strip turned red when it was dipped in a sample. The sample could be (a) dilute sodium bicarbonate solution (b) tap water (c) dilute sodium hydroxide solution

  - (d) dilute hydrochloric acid
- 90. Iron filings were added to solution of copper sulphate. After 10 minutes, it was observed that the blue colour of the solution changed and layer got deposited on iron filings. The colour of the solution and that of the layer would respectively be
  - (a) yellow and green
  - (b) brown and blue
  - (c) red and greenish blue
  - (d) green and reddish brown
- 91. Write the net ionic equation for the reaction of sodium hydroxide with hydrochloric acid.
  - (a)  $Na^+ + Cl^- \rightarrow NaCl$
  - (b)  $Na^+ + Cl^- + H^+ + OH^- \rightarrow NaCl + H_2O_{(1)}$
  - (c)  $H^+ + OH^- \rightarrow H_2 O_{(1)}$

(d) none of these

- 92. What is the term for a water molecule that gains an extra hydrogen ion?
  - (a) hydroxium ion (b) Hydronium ion (c) hydroxide ion
    - (d) none of the above
- 93. Which of the following compounds is neutral to litmus? (a) NaNO<sub>3</sub> (b) CuSO<sub>4</sub>.5H<sub>2</sub>O (c) NaHCO<sub>3</sub> (d)  $Ca(OH)_2$

- 94. A compound whose aqueous solution will have the highest pH is (a) NaCl (b) Na<sub>2</sub>CO<sub>3</sub> (c) NH<sub>4</sub>Cl (d) NaNO<sub>3</sub>
- **95.** pH + pOH equals (a) zero
  - (a) zero (b) fourteen (c) a negative number (d) infinity

## FILL IN THE BLANKS

- **1.** Plaster of Paris is obtained by heating ......
- **2.** Chemical formula of Plaster of Paris is.....
- **3.** Chemical formula of bleaching powder is ......
- **4.** Brine is a saturated solution of.....
- **5.** A salt is made when the ..... in an acid is replaced by a .....
- **6.** An acidic solution contains ..... ions while a basic solution contain ...... ions.
- **7.** The weaker is the acid, greater is the base strength of its ......
- **8.** When an acid react with a metal..... gas is evolved and a corresponding..... is formed.
- **9.** Anhydrous sodium carbonate is commonly known as ......
- **10.** Acid-base indicators are dyes or mixture of dyes which are used to indicate the presence of ....... and ......
- **11.** Strong acids are essentially ......% ionized in aqueous solution whereas weak acids are ......ionized.
- **12.** When ammonium chloride is heated with caustic soda, the gas evolved is ......
- **13.** A base which is not a metallic oxide or hydroxide is ......
- **14.** The colour of phenolphthalein in acidic medium is.....
- **15.** ENO salt contains..... and is..... in nature.
- **16.** An acid used in lead storage batteries is.....
- **17.** An alkali reacts with an ..... to give a .....
- **18.** All acids have a pH..... than 7.
- **19.** The strength of an acid or alkali can be tested by using a scale called the.....
- **20.** An acid that contains more than one acidic hydrogen atoms called a.....
- **21.** Chlorine produced from bleaching powder when it is treated with excess of hydrochloric acid, is called.....

## TRUE OR FALSE

- **1.** The hydronhun ion is the strongest acid that can exist in aqueous solution.
- **2.** Acidic and basic solutions in water conduct electricity because they produce hydrogen and hydroxide ions respectively.
- **3.** Living beings carry out their metabolic activities at a very high pH.
- **4.** Mixing concentrated acids or bases with water is a highly endothermic reaction.
- **5.** The colour of caustic soda turns pink when phenolphthalein is added to it.
- **6.** Bleaching powder cannot be used for disinfecting drinking water.
- **7.** An aqueous solution is one that has compound dissolved in water.
- **8.** Washing soda on reaction with dilute HCl liberates carbon dioxide in water.
- **9.** Dilution of an acid decreases  $H^+$  concentration.
- **10.** Calcium hydroxide is used to make soaps.
- **11.** Gastric juice contains hydrochloric acid.
- **12.** Vinegar contains citric acid.
- **13.** Carbonic acid is a weak acid.
- **14.** Basicity of acetic acid ( $CH_3COOH$ ) is four.
- **15.** Anhydrous sodium carbonate is known as washing soda.
- **16.** Formic acid is a weak acid.
- **17.** The solution of a weak acid and a strong base is alkaline.
- **18.** The pH of a solution is 10. It is likely to be acidic in nature.
- **19.** An antacid is used to treat indigestion.
- **20.** Nettle sting produces methanoic acid.

### Matrix Match Type

In this section, each question contains statements given in two columns which have to be matched. Statements (A, B, C, D) in Column-I have to be matched with statements (p, q, r, s) in Column-II. The answers to these questions have to be appropriately bubbled as illustrated

in the following example. If the correct matches are A-q, A-r, B-p, B-s, C-r, C-s and D-q, then the correctly bubbled matrix will look like as shown.



	Column I	Column II
	(A) HCl	(p) Strong acid
	(B) HCN	(q) Weak add
	(C) NaOH	(r) Weak base
	(D) NH₄OH	(s) Strong base.
2.	Column I	Column II
	(A) $KNO_3$	(p) Nitric acid, silver
		hydroxide
	(B) $AgNO_3$	(q) Hydrochloric acid,
		Magnesium hydroxide
	(C) $MgCl_2$	(r) Carbonic acid,
		Ammonium hydroxide
	(D) $(NH_4)_2 CO_3$	(s) Nitric acid,
		Potassium hydroxide
3.	Column I	Column II
	(A) Acid-base indicator	(p) $Na_2SO_4$
	(B) Acid used in soft	(q) Phenolphthalein
	(C) Salt formed by	(r) Carbonic acid
	neutralization of strong	(i) Caroonio aola
	acid and weak base	
	(D) Salt whose aqueous	(s) $CuSO_4$
	solution is neutral	
4.	Column I	Column II
	Solution	рН
	/ A \ <b>-</b>	
	(A) Vinegar	(p) 6.8
	(A) Vinegar (B) Milk	(p) 6.8 (q) 7.4
	<ul><li>(A) Vinegar</li><li>(B) Milk</li><li>(C) Human blood</li><li>(D) Line description</li></ul>	(p) 6.8 (q) 7.4 (r) 2.4 - 3.4
	<ul><li>(A) Vinegar</li><li>(B) Milk</li><li>(C) Human blood</li><li>(D) Lime water</li></ul>	(p) 6.8 (q) 7.4 (r) 2.4 - 3.4 (s) 10.5
5.	<ul> <li>(A) Vinegar</li> <li>(B) Milk</li> <li>(C) Human blood</li> <li>(D) Lime water</li> </ul> Column I	(p) 6.8 (q) 7.4 (r) 2.4 - 3.4 (s) 10.5 <b>Column II</b>
5.	<ul> <li>(A) Vinegar</li> <li>(B) Milk</li> <li>(C) Human blood</li> <li>(D) Lime water</li> </ul> Column I Anhydrous salt	(p) 6.8 (q) 7.4 (r) 2.4 - 3.4 (s) 10.5 <b>Column II</b> <b>Water of</b>
5.	<ul> <li>(A) Vinegar</li> <li>(B) Milk</li> <li>(C) Human blood</li> <li>(D) Lime water</li> </ul> Column I Anhydrous salt	(p) 6.8 (q) 7.4 (r) 2.4 - 3.4 (s) 10.5 Column II Water of Crystallization
5.	<ul> <li>(A) Vinegar</li> <li>(B) Milk</li> <li>(C) Human blood</li> <li>(D) Lime water</li> </ul> Column I Anhydrous salt (A) CuSO <sub>4</sub>	(p) 6.8 (q) 7.4 (r) 2.4 - 3.4 (s) 10.5 <b>Column II</b> <b>Water of</b> <b>Crystallization</b> (p) 5H <sub>2</sub> O
5.	<ul> <li>(A) Vinegar</li> <li>(B) Milk</li> <li>(C) Human blood</li> <li>(D) Lime water</li> </ul> Column I Anhydrous salt (A) CuSO <sub>4</sub> (B) CuSO <sub>4</sub>	(p) 6.8 (q) 7.4 (r) 2.4 - 3.4 (s) 10.5 <b>Column II</b> <b>Water of</b> <b>Crystallization</b> (p) 5H <sub>2</sub> O (q) 10H <sub>2</sub> O
5.	<ul> <li>(A) Vinegar</li> <li>(B) Milk</li> <li>(C) Human blood</li> <li>(D) Lime water</li> </ul> Column I Anhydrous salt (A) CuSO <sub>4</sub> (B) CuSO <sub>4</sub> (C) FeSO <sub>4</sub>	(p) 6.8 (q) 7.4 (r) 2.4 - 3.4 (s) 10.5 <b>Column II</b> <b>Water of</b> <b>Crystallization</b> (p) $5H_2O$ (q) $10H_2O$ (r) $2H_2O$
5.	<ul> <li>(A) Vinegar</li> <li>(B) Milk</li> <li>(C) Human blood</li> <li>(D) Lime water</li> </ul> Column I Anhydrous salt (A) CuSO <sub>4</sub> (B) CuSO <sub>4</sub> (C) FeSO <sub>4</sub> (D) Na <sub>2</sub> SO <sub>4</sub>	(p) 6.8 (q) 7.4 (r) 2.4 - 3.4 (s) 10.5 <b>Column II</b> <b>Water of</b> <b>Crystallization</b> (p) $5H_2O$ (q) $10H_2O$ (r) $2H_2O$ (s) $NaHCO_3$
5.	<ul> <li>(A) Vinegar</li> <li>(B) Milk</li> <li>(C) Human blood</li> <li>(D) Lime water</li> </ul> Column I Anhydrous salt (A) CuSO <sub>4</sub> (B) CuSO <sub>4</sub> (C) FeSO <sub>4</sub> (D) Na <sub>2</sub> SO <sub>4</sub> Column I	(p) 6.8 (q) 7.4 (r) 2.4 - 3.4 (s) 10.5 <b>Column II</b> <b>Water of</b> <b>Crystallization</b> (p) $5H_2O$ (q) $10H_2O$ (r) $2H_2O$ (s) $NaHCO_3$ <b>Column II</b>
5.	<ul> <li>(A) Vinegar</li> <li>(B) Milk</li> <li>(C) Human blood</li> <li>(D) Lime water</li> </ul> Column I Anhydrous salt <ul> <li>(A) CuSO<sub>4</sub></li> <li>(B) CuSO<sub>4</sub></li> <li>(C) FeSO<sub>4</sub></li> <li>(D) Na<sub>2</sub>SO<sub>4</sub></li> </ul> Column I <ul> <li>(A) Baking soda</li> </ul>	(p) 6.8 (q) 7.4 (r) 2.4 - 3.4 (s) 10.5 <b>Column II</b> <b>Water of</b> <b>Crystallization</b> (p) $5H_2O$ (q) $10H_2O$ (r) $2H_2O$ (s) $NaHCO_3$ <b>Column II</b> (p) $NaCl$
5.	(A) Vinegar (B) Milk (C) Human blood (D) Lime water Column I Anhydrous salt (A) $CuSO_4$ (B) $CuSO_4$ (C) $FeSO_4$ (D) $Na_2SO_4$ Column I (A) Baking soda (B) Washing soda	(p) 6.8 (q) 7.4 (r) 2.4 - 3.4 (s) 10.5 Column II Water of Crystallization (p) $5H_2O$ (q) $10H_2O$ (r) $2H_2O$ (s) $NaHCO_3$ Column II (p) $NaCl$ (q) $NaOH$

(D) Common salt (s)  $NaHCO_3$ 

7.	Column I	Column II
	(A) Simple buffer	(p) $CH_3COONa +$
		CH <sub>3</sub> COOH
	(B) Acidic buffer	(q) $NH_4OH + NH_4Cl$
	(C) Basic buffer	(r) $CH_3COONH_4$
	(D) Basic solution	(s) CH <sub>3</sub> COONa
8.	Column I	Column II
	(A) Mono basic	(p) KOH
	(B) Dibasic	(q) $Ca(OH)_2$
	(C) Diacidic	(r) $H_2SO_4$
	(D) Mono acidic	(s) HNO <sub>3</sub>
0	Column I	Column II
9.	Column 1	
9.	Salt solution	рН
9.	Salt solution (A) $Na_2SO_4$	<b>pH</b> (p) < 7
9.	Salt solution (A) $Na_2SO_4$ (B) $NH_4Cl$	<b>pH</b> (p) < 7 (q) 7
9.	Salt solution (A) $Na_2SO_4$ (B) $NH_4Cl$ (C) $Na_2CO_3$	<b>pH</b> (p) < 7 (q) 7 (r) = 7
9.	Salt solution (A) $Na_2SO_4$ (B) $NH_4Cl$ (C) $Na_2CO_3$ (D) $CH_3COONH_4$	<b>pH</b> (p) < 7 (q) 7 (r) = 7 (s) > 7
9. 10.	Salt solution (A) $Na_2SO_4$ (B) $NH_4Cl$ (C) $Na_2CO_3$ (D) $CH_3COONH_4$ Column I	pH (p) < 7 (q) 7 (r) = 7 (s) > 7 Column II
9. 10.	Salt solution (A) $Na_2SO_4$ (B) $NH_4Cl$ (C) $Na_2CO_3$ (D) $CH_3COONH_4$ Column I (A) Metal + acid	<b>pH</b> (p) < 7 (q) 7 (r) = 7 (s) > 7 <b>Column II</b> (p) Water
9. 10.	Salt solution (A) $Na_2SO_4$ (B) $NH_4Cl$ (C) $Na_2CO_3$ (D) $CH_3COONH_4$ Column I (A) Metal + acid (B) Acid + base	<pre>pH (p) &lt; 7 (q) 7 (q) 7 (r) = 7 (s) &gt; 7 Column II (p) Water (q) Hydronium ion</pre>
9. 10.	Salt solution (A) $Na_2SO_4$ (B) $NH_4Cl$ (C) $Na_2CO_3$ (D) $CH_3COONH_4$ Column I (A) Metal + acid (B) Acid + base (C) Metal carbonate + acid	pH (p) $< 7$ (q) 7 (r) $= 7$ (s) $> 7$ Column II (p) Water (q) Hydronium ion (r) Hydrogen gas
9. 10.	Salt solution (A) $Na_2SO_4$ (B) $NH_4Cl$ (C) $Na_2CO_3$ (D) $CH_3COONH_4$ Column I (A) Metal + acid (B) Acid + base (C) Metal carbonate + acid (D) Acid + water .	pH (p) $< 7$ (q) 7 (r) $= 7$ (s) $> 7$ Column II (p) Water (q) Hydronium ion (r) Hydrogen gas (s) Carbon dioxide.

# **ASSERTION & REASON QUESTIONS**

**Directions:** In each of the following questions, a statement of Assertion (A) is given followed by a corresponding statement of Reason (R) just below it. Of the statements, mark the correct answer as

(a) If both assertion and reason are true and reason is the correct explanation of assertion

(b) If both assertion and reason are true but reason is not the correct explanation of assertion

- (c) If assertion is true but reason is false
- (d) If assertion is false but reason is true.
- **1. Assertion:** Phenolphthalein is an acid-base indicator.

**Reason:** In acid-base titration, it is used as an indicator.

**2. Assertion:** pH of our body is about 7.4 and it remains almost constant inspite the variety of foods we eat.

**Reason:** Blood is a buffer.

**3. Assertion:** pH of ammonium nitrate solution is acidic.

**Reason:** Solution of a salt of weak base and strong acid is acidic.

- 4. **Assertion:** pH = 7 signifies pure water. **Reason:** At this Ph,  $[H^+] = [OH^-] = 10^{-7}$ .
- 5. Assertion: A solution of pH = 1 has hydrogen ion concentration 3 times than that of solution of pH = 3.

**Reason:** 
$$pH = log \frac{1}{[H_2O^+]}$$
.

**6. Assertion:** Strength of the acid or the base increases with dilution.

**Reason:** lionization of an acid or a base increases with dilution.

**7. Assertion:** When rain is accompanied by a thunderstorm, the collected rain water will have pH value slightly lower than that of rain water without thunderstorm.

**Reason:** Temperature increases due to thunderstorm and so  $[H^+]$  increases.

**8. Assertion:** A buffer solution controls the change in pH value on addition of small amount of acid or base to it.

**Reason:** pH value of buffer solution remains same on dilution or on keeping for long,

**9. Assertion:** Acetic acid does not act as an acid in benzene solution.

Reason: Benzene does not accept proton.

**10.** Assertion:  $H_3PO_4$  and  $H_2SO_4$  are known as polybasic acids.

**Reason:** They have two or more than two protons per molecule of the acid.

**11. Assertion:** pH of 10 M HCl aqueous solution is less than 1.

**Reason:** pH is negative logarithm of concentration.

**12. Assertion:** When a smaller amount of sodium acetate is added to a dilute solution of acetic acid, pH of the solution is not affected.

**Reason:** Buffer solutions have a definite pH.

- Assertion: Ammonia is a base.
   Reason: It does not contain OH<sup>-</sup> ions.
- 14. Assertion: Calcium sulphate semi hydrate,

 $CaSO_4 \cdot \frac{1}{2}H_2O$  is called plaster of Paris.

**Reason:** Plaster of Paris is used for producing moulds for pottery and ceramics and casts of statues and buses.

Assertion: Bleaching powder reacts with dilute acids to evolve chlorine.
 Reason: The chlorine liberated by the action of dilute acids on bleaching powder is called available chlorine.

#### **EXPLANATIONS**

#### **Multiple Choice Questions**

- **1.** (**b**): Baking soda ( $NaHCO_3$ ) is basic in nature.
- (a): Vinegar is a dilute solution of acetic acid (CH<sub>3</sub>COOH) hence turns blue litmus red.
- **3.** (c):  $Zn + 2NaOH \rightarrow Na_2ZnO_2 + H_2$ .
- 4. **(b)**:  $Na_2CO_32H_2O \rightarrow 2NaOH + H_2CO_3$ Strong base userk arid

Since it is a salt of weak acid and strong base, it is basic in nature with pH > 7.

- **5.** (a) : The process of loosing water of crystallisation when exposed to air is called efflorescence.
- **6.** (**b**): *Na*OH is a strong base.
- 7. (d): *NaCI* is a neutral salt.
- **8.** (c) :  $CH_3COOH$  is weakly ionised in water hence it is a weak acid.
- 9. (a): A polybasic acid contain more than one H atoms hence it remains acid salt. e.g.,  $H_2SO_4$  partially neutralised with *NaOH* to give *NaHSO*<sub>4</sub> which is acidic due to presence of one H atom which can be further replaced to give  $Na_2SO_4$ .
- **10.** (b):  $H_3PO_4$  is a polybasic acid while  $CH_3COOH$ ,

 $CH_3CH_2COOH$  are monobasic acids while ZnO is basic oxide.

11. (d): The solution turns blue litmus red, hence it is acidic and here pH between 1-7.

**12**. (c)

- **13.** (b) : Washing soda is sodium carbonate decahydrate.
- **14.** (c): Vinegar is a dilute solution of acetic acid.
- **15.** (d) : Salts of strong base and weak acid are basic in nature e.g.,  $Na_2CO_3$ .
- **16. (b)** : The sting of ant contains formic acid (HCOOH).
- **17.** (d) : Gypsum on heating upto 120°C gives Plaster of Paris.

 $CaSO_4.2H_2O \xrightarrow{120^{\circ}C} CaSO_4.\frac{1}{2}H_2O + 1\frac{1}{2}H_2O.$ 

18. (a)

**19. (b)**: According to Bronsted-Lowry concept an acid is a proton donor and a base is a proton acceptor, e.g.,

 $\underset{\textit{Base}}{NH_3} + \underset{\textit{Acid}}{H_2O} \longrightarrow \underset{\textit{Acid}}{NH_4^+} + \underset{\textit{BaseI}}{OH^-}$ 

- **20.** (a):  $CO_3^{2-} + H_2 \longrightarrow HCO_3^- + OH_{Base}^-$
- **21.** (**b**) : Egg shell contains  $CaCO_3$  which reacts with HCl to give  $CO_2$  that turns lime water milky.  $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$  $CO_2 + Ca(OH)_2 \rightarrow CaCO_3 + H_2O$ .
- **22.** (c): Bases are bitter in taste.
- **23.** (a): Baking powder contains  $NaHCO_3$  and tartaric acid which react in presence of water to give  $CO_2$ .

**24.** (a): 
$$CaO + H_2O \longrightarrow Co(OH)_2$$
  
Lime

- **25.** (c): Plaster of Paris is hardened by combining with water.
- **26.** (d): Gypsum is  $CaSO_4.2H_2O$  and Plaster of Paris is  $CaSO_4.\frac{1}{2}H_2O$  Difference in number of water molecules  $=\frac{3}{2}$  or  $1\frac{1}{2}$ .
- **27.** (c): pH of the solution  $pH = -Log[H^+] = 4$  $[H^+] = 10^{-4} M.$
- **28.** (c):  $CaSO + H_2O \rightarrow Ca(OH)_2$  + heat The reaction is highly exothermic in nature.
- **29.** (b) : Bleaching powder gives chlorine on exposure to air by reacting with  $CO_2$ .  $CaOCl_2 + CO_2 \rightarrow CaCO_3 + Cl_2$ .
- **30.** (d) : A salt of weak base and strong acid is acidic in nature hence the pH of the solution will be less than 7.  $NH_4OH + HCl \longrightarrow NH_4Cl + H_2O$  $_{Weak base} NH_4Cl + H_2O$
- **31.** (a):Tomato contains oxalic acid.
- **32.** (b) : The solution with pH more than 7 are basic in nature hence solution with pH 8.6 has less concentration of I-T and more of  $OH^-$ .
- **33.** (d) : Phenolphthalein gives pink colour only with bases and remains colour less in acidic solution.
- **34.** (b) : Sodium bicarbonate on heating gives sodium carbonate (base) which is neutralised by tartaric acid otherwise it will give a bitter taste.
- **35.** (a): Soda-acid fire extinguisher produces carbon dioxide which cuts off supply of air and extinguishes fire.
- **36.** (a) : Acids of living origin are called organic acids.
- **37.** (c): Nitric acid  $(HNO_3)$  is an inorganic acid.
- **38**. (b)

- **39.** (a) : Metal carbonates gives  $CO_2$  on reaction with acids.  $CaCO_3 + 2HCl \rightarrow CaCI_2 + H_2O + CO_2$
- **40.** (b): Carbonic acid is present in flavoured and aerated drinks.
- **41.** (a): Sour milk contains lactic acid.
- **42.** (c): Salt of a strong acid and weak base gives an acidic solution.
- **43.** (a):  $pH = -\log[H^+]$
- **44.** (b) : pH of the solution increases since the concentration of  $H^+$  decreases on dilution.
- (a) : Salt XY contains X<sup>+</sup> and Y<sup>-</sup>. X<sup>+</sup> (cation) comes from metal part of the base while Y<sup>-</sup> (anion) comes from non metal part of the acid.
- **46.** (a) : Plaster of Paris becomes a hard solid when mixed with water.
- **47.** (d): Solution with pH = 13, is strongly basic.
- **48.** (c) : Aluminium can displace hydrogen from sodium hydroxide solution.  $2Al + 2NaOH + 2H_2 \rightarrow 2NaAlO_2 + 3H_2$
- **49.** (a): pH = 0, then  $[H^+] = 1$ As the concentration of  $[H^+]$  ions is high, thus the solution will be highly acidic.
- **50.** (b): The solution with pH = 6 is an acid while pH = 8 is a base.
- 51. (b):  $NaHCO_3 + CH_3COOH$   $\rightarrow CH_3COONa + CO_2 + H_2O$ 52. (b): Alum is a double salt made by potassium
- and aluminium silicate.
- **53.** (b):  $Na_2CO_3$  is a basic salt because it is made by neutralisation of weak acid and strong base.
- 54. (a): Arrhenius acid gives  $H^+$  in the solution.  $HCl + H_2O \rightarrow H_3O^+ + Cl^-$ .

- **55.** (**b**): Acid changes blue litmus to red and then base changes it again to blue.
- **56.** (c):  $CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$ .
- **57. (b)**:  $[H^+]_I = 10^{-5}; [h^+]_{II} = 10^{-2}$ Thus increase is  $[H^+] = \frac{10^{-2}}{10^{-5}} = 1000$  times.

58. (a): Initial volume  $(V_1) = 10$  litre Initial  $[H^+] = 10^{-6}$  as pH = 6. Final  $[H^+] = 10^{-5}$  as pH = 5. As  $N_1V_1 = N_2V_2$  $10^{-6} \times 10 = 19^{-5} \times V_2$  $V_2 = \frac{10^{-6} \times 10}{10^{-5}} = 1$ 

So the final volume should be 1 litre and to make the volume 1 from 10, a litre should be evaporated.

**59.** (a):  $NH_4OH + NH_4Cl$ 

Composition of the buffer:  $NH_4OH + HCl \rightarrow NH_4Cl + H_2O$   $NH_4OH \rightarrow$  weak base  $HCl \rightarrow$  strong acid

As the buffer comprises of a weak base and the salt of the buffer is obtained from the reaction of a weak base ( $NH_4OH$ ) and a strong acid (HCl), it forms a basic buffer.

- **60.** (a): Both boric acid and oxalic acid are solids.
- **61. (c)** : Sulphuric acid and nitric acid are strong and highly corrosive acids.
- **62.** (b):  $C_2H_5OH$  is not an ionic compound.
- **63.** (**b**): A small amount of acid should be added into water since it is highly exothermic reaction.

64. (a): 
$$NaCl + H2SO_4 \rightarrow Na_2SO_4 + HCl$$
  
 $HCl + NH_3 \rightarrow NH_4Cl$   
(white furnes)  
65. (a):  $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$ .

66. (c)

- **67.** (a): Odour based indicators are called olfactory indicators.
- **68.** (c): *HCOOH* is a monobasic acid.
- **69.** (c):  $Al(OH)_3 + 3HCl \rightarrow AlCl_3 + 3H_2O$ .
- **70.** (b):  $Fe(OH)_2 + 2HCl \rightarrow FeCl_2 + H_2O$
- 71. **(b)**:  $CuSo_4 + 2NH_4OH \rightarrow Cu(OH)_2 + (NH_4)_2SO_4$ Blue ppt.
- **72.** (c):  $CCl_4$  is non electrolyte i.e., it does not dissociate into ions when dissolved in water.
- 73. (d) : If we take double the amount of same NaOH solution, the amount of the same HCl solution required to neutralise it is also double. Hence the correct option is (d).
- **74.** (c): Sodium chloride is a strong electrolyte and dissociates to give  $Na^+$  and  $Cl^-$ .
- **75.** (b): Water soluble bases are called alkalies.
- **76.** (**b**): For neutral  $H_2O$ ,  $[H^+] = [OH^-] = 10^{-7}$ .
- **77.** (c): pH of a solution =  $log \frac{1}{[H^+]}or log[H^+]$ .
- **78.** (c):  $10^{-6}MHCL = 10^{-8}[H^+]$  Also from  $H_2O$  $[H^+] = 10^{-7}M$ Total  $[H^+] = 10^{-7} + 10^{-8}$ Hence, pH = 7 - 0.0414 = 6.96.
- **79.** (d): Because it can furnish  $H^+$  ions in solutions,
- 80. (b): Blood is a buffer hence there is no change in pH by addition of small acid or base.
- **81.** (a) : The species which can accept as well as donate  $H^+$  can act both as an acid and a base.  $HSO_4^- + H^+ \Longrightarrow H_2SO_4$  $HSO_4^- \Longrightarrow SO_4^{2-} + H^+$

- 82. (c) : Acids and bases go through a process dissociation when they are dissolved in water. They break into positive and negative ions.
- 83. (d) : Nitrate is formed by nitric acid after loosing a H<sup>+</sup> ion. So nitrate is conjugate base.
  conjugate pair

$$HNO_{3} + H_{2}O \longrightarrow H_{3}O^{+} + NO_{3}^{-}$$
  
acid<sub>I</sub> base-II acid-II base<sub>I</sub>  
conjugate pair

**84.** (c): 
$$CaSO_4 \cdot \frac{1}{2}H_2O + 1\frac{1}{2}H_2O \rightarrow CaSO_4 \cdot 2H_2O$$

85. (c)

- 86. (c):  $NaCl \rightarrow Na^+ + Cl^ H_2O \rightarrow H^+ + OH^ 2Cl^-2e^- \rightarrow Cl_2$  (At anode)  $2H^+ + 2e^- \rightarrow H_2$  (At cathode)
- 87. (d) : A colour less, odour less gas is evolved with bubbles. The gas is hydrogen  $Zn + 2HCl \rightarrow ZnCI_2 + H_2 \uparrow$
- **88.** (a): The colour of strip changed to blue because sodium bicarbonate gives *NaOH* which is a strong base.
- **89.** (d): The sample is dilute HC1 (acidic solution).
- **90.** (d) :  $Fe + CuSO_4 \longrightarrow FeSO_4 + Cu_{Brown}$
- **91.** (c) :  $H^+ + OH^- \rightarrow H_2OO$  shows neutralization reaction.
- 92. (b): Water accepts a portion and is converted to hydronium ion.
   H<sub>2</sub>O+H<sup>+</sup> → H<sub>3</sub>O<sup>+</sup>
- **93.** (a):  $NaNO_3$  is a salt of strong acid and strong base.  $NaOH + HNO_3 \rightarrow NaNO_3 + Hp$ .

- 94. (b): Na<sub>2</sub>CO<sub>3</sub> when react with water form strong base and weak acid. So its aqueous solution is basic.
- **95.** (b): pH + pOH = 14.

#### Fill in the Blanks

1.	gypsum	2.	$CaSO_4 \cdot \frac{1}{2}H_2O$
3.	CaOCl <sub>2</sub>	4.	sodium chloride
5.	hydrogen, cation (or n	netal	ion)
6.	H <sub>3</sub> O <sup>+</sup> or H <sup>+</sup> , OH <sup>-</sup>	7.	Conjugate base
8.	Hydrogen, salt	9.	soda ash
10.	acids, bases	11.	100, partially
12.	ammonia	13.	ammonium
			hydroxide
14.	colourless	15.	NaHCO <sub>3</sub> , basic
16.	sulphuric acid	17.	acid, salt
18.	less	19.	pH scale
20.	polyprotic acid.	21.	available chlorine

I rue or False				
1.	True	2.	True	
3.	False	4.	False	
5.	True	6.	False	
7.	True	8.	True	
9.	True	10.	False	
11.	True	12.	False	
13.	True	14.	False	
15.	False	16.	True	
17.	True	18.	False	
19.	True	20.	True	

. .

#### Matrix Match Type

1.	А→р;	B→q;	C→s;	D→r
2.	A→s;	В→р;	C→q;	D→r
3.	A→q;	B→r;	C→s;	D→p
4.	A→r;	В→р;	C→q;	D→s
5.	A→r;	В→р;	C→s;	D→q
6.	A→s;	B→r;	C→q;	D→p
7.	A→r;	В→р;	C→q;	D→s
8.	A→s;	B→r;	C→q;	D→p
9.	A→q;	B→p;	C→s;	D→r
10.	A→r;	B→p;	C→s;	D→p

Assertion & Reason									
1.	В	2.	Α	3.	Α	4.	D	5.	D
6.	А	7.	А	8.	С	9.	А	10.	А
11.	В	12.	D	13.	В	14.	В	15.	В