

## SEMESTER—ONE

# CHEMISTRY

Class XI

## Sample Paper—1

Max. Marks: 50

Time Allowed: 90 minutes

### General Instructions:

- (i) This question paper consists of 40 questions in 4 sections.
- (ii) Section A consists of 10 Objective type questions carrying 1 mark each.
- (iii) Section B consists of 10 Fill in the blanks type questions carrying 1 mark each.
- (iv) Section C consists of 10 True or False statement type questions carrying 1 mark each.
- (v) Section D consists of 10 Short answer and Numerical type questions carrying 2 marks each.

### Section A

Select and write one most appropriate option out of the four options given for each of the questions 1–10.

1. Which of the following aqueous solutions should have the highest boiling point?
  - (a) 1.0 M KOH
  - (b) 1.0 M  $K_2SO_4$
  - (c) 1.0 M  $NH_4NO_3$
  - (d) 1.0 M  $KNO_3$ .
2. Which of the following statements is incorrect?
  - (a) The osmotic pressure of a solution is given by the equation  $\pi = CRT$  (where C is the molarity of the solution).
  - (b) Two different solutions of sucrose of same molarity prepared in different solvents will have the same depression in freezing point.
  - (c) Decreasing order of osmotic pressure for 0.01 M aqueous solutions of calcium chloride, sodium chloride, acetic acid and urea is  $CaCl_2 > NaCl > CH_3COOH > (NH_2)_2 CO$ .

- (d) According to Raoult's law, the vapour pressure exerted by a volatile component of a solution is directly proportional to its mole fraction in the solution.
3. While relating concentration of solution to its vapour pressure? Which mode of concentration is useful?
- (a) molality (b) parts per million  
(c) mass percentage (d) mole fraction
4. Which of the following statements is false?
- (a) Atmospheric pressure and osmotic pressure are expressed in the same units.  
(b) In reverse osmosis, solvent molecules move through a semipermeable membrane from a region of lower concentration of solute to a region of higher concentration.  
(c) The value of molal depression constant depends on nature of solvent.  
(d) Relative lowering of vapour pressure, is a dimensionless quantity.
5. The average K.E. of an ideal gas per molecule in S.I. units at  $25^{\circ}\text{C}$  will be
- (a)  $61.7 \times 10^{-21} \text{ J}$  (b)  $6.17 \times 10^{-21} \text{ J}$   
(c)  $6.17 \times 10^{-20} \text{ J}$  (d)  $7.16 \times 10^{-20} \text{ J}$
6. Which of the following is not an assumption of the kinetic theory of gases?
- (a) Gas particles have negligible volume  
(b) Collisions of gas particles are perfectly elastic  
(c) At high pressure, gas particles are difficult to compress  
(d) A gas consists of many identical particles which are in continual motion.
7. When does a gas deviate the most from its ideal behaviour?
- (a) At low pressure and low temperature  
(b) At low pressure and high temperature  
(c) At high pressure and high temperature  
(d) At high pressure and low temperature
8. The pH of 0.1 M solution of the following compounds increases in the order:
- (a)  $\text{NaCl} < \text{NH}_4\text{Cl} < \text{NaCN} < \text{HCl}$   
(b)  $\text{HCl} < \text{NH}_4\text{Cl} < \text{NaCl} < \text{NaCN}$   
(c)  $\text{NaCN} < \text{NH}_4\text{Cl} < \text{NaCl} < \text{HCl}$   
(d)  $\text{HCl} < \text{NaCl} < \text{NaCN} < \text{NH}_4\text{Cl}$ .

9. Among the following, the weakest Bronsted base is  
(a)  $F^-$  (b)  $Cl^-$   
(c)  $Br^-$  (d)  $I^-$ .
10. Buffer solutions have constant acidity and alkalinity because:  
(a) acids and alkalies in these solutions are shielded from attack by other ions  
(b) they have large excess of  $H^+$  or  $OH^-$  ions  
(c) they have fixed value of pH  
(d) these give unionised acid or base on reaction with added acid or alkali.

### Section B

Fill in the blanks with a suitable word for each of the questions 11–20.

11. If molarity of oxalic acid solution is  $M/2$  then its normality will be .....
12. The amount of solute in grams present per  $dm^3$  of solution is known as .....
13. The solubility of a gas in a liquid ..... with the increase in temperature.
14. The law describing relationship between pressure and volume of ideal gas at constant temperature is called .....
15. The instrument used for measuring gas pressure is called .....
16. Vapour pressure of a liquid decreases with increase in .....
17. pH of blood is around .....
18. A solution which resists the change in its pH value on addition of a small amount of acid or a base is called .....
19. At 298 K, the sum of pH and pOH is equal to .....
20. In the reaction  $I^- + I_2 \rightarrow I_3^-$ , the Lewis acid is .....

### Section C

State whether the following statements are true or false for each of the questions 21–30.

21. The rate of diffusion of a gas is inversely proportional to its density.
22. van der Waals constants have same values for all the gases.
23. A mixture of ideal gases on cooling to  $-250^\circ C$  form an ideal liquid solution.
24. The observed pressure of real gas is more than the ideal pressure.
25. pH of pure water is always 7.
26. Aqueous solution of  $NH_4Cl$  has pH less than 7 at 298 K.
27. NaOH is Lewis base.

28.  $\text{pH} + \text{pOH} = 14$  is valid at all temperatures.
29.  $\text{Cl}^-$  ion can act as Lewis base but it cannot act as Arrhenious base.
30. pH of water increases with increase in temperature.

### Section D

Answer each of the questions 31–40.

31. Which out of 1 molar and 1 molal aqueous solution is more concentrated and why?
32. What is the difference between effusion and diffusion?
33. What is the composition of air in stratosphere?
34. Which is more acidic, a solution having a pH of 4 or one having pH of 3?
35. Classify the following species into Lewis acids and Lewis bases and show how these act as such:
- |                    |                     |
|--------------------|---------------------|
| (i) $\text{HO}^-$  | (ii) $\text{F}^-$   |
| (iii) $\text{H}^+$ | (iv) $\text{BCl}_3$ |
36. 5.00 g of a substance with molar mass  $200 \text{ g mol}^{-1}$  have been dissolved in 50 g of a solvent with molar mass  $60 \text{ g mol}^{-1}$  and vapour pressure 400 m bar. Find the vapour pressure of the solutions.
37. Reading of mercury level in closed end arm of a manometer is 100 mm and in the arm attached to the system is 70 mm. What is the pressure of system?
38. Calculate the pressure exerted by 56 g of an ideal gas (with molar mass  $80 \text{ g mol}^{-1}$ ) enclosed in a vessel of volume  $0.1 \text{ m}^3$  at 300 k. ( $R = 8.314 \text{ Nm mol}^{-1} \text{ k}^{-1}$ )
39. Boiling point of water at 750 mm Hg is  $99.63^\circ\text{C}$ . How much sucrose is to be added to 500 g of water such that it boils at  $100^\circ\text{C}$ ?  $K_b$  for water is  $0.52 \text{ K kg mol}^{-1}$ .
40. Calculate the  $[\text{H}_3\text{O}^+]$  of a solution having a pH of 10.6.