General Instructions:
1. There are 17 questions in this question paper. All questions are compulsory. There is no overall choice. However, an internal choice has been provided.
2. This question paper has four sections: Section A, Section B, Section C and Section D.
3. Section A - Q. No. 1 to 5 are objective type questions and carry 1 mark each.
4. Section B - Q. No. 6 to 10 are short answer questions and carry 2 marks each.
5. Section C - Q. No. 11 to 15 are also short answer questions and carry 3 marks each.
6. Section D - Q. No. 16 and 17 are long answer questions and carry 5 marks.
7. Use log tables if necessary, use of calculators is not allowed.

SECTION A

1.   (1)
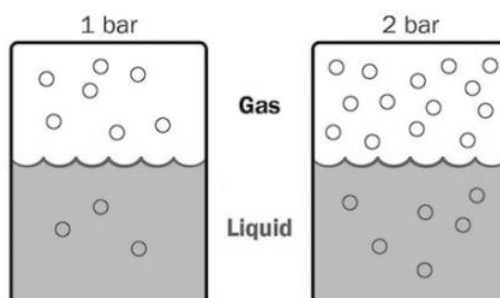
Consider the above picture representing Henry's law for the dissolution of gases in to liquid and select the appropriate option from the following:
(A) As pressure increases, solubility decreases
(B) As pressure decreases, mole fraction of gas in to liquid increases
(C) At constant temperature, higher is the pressure – higher is the value of K_H
(D) At constant temperature, the value of K_H remains constant irrespective of pressure

2.   Manveer is a student of class 12. To verify the colligative properties of a solution, he added a   (1)
      non – volatile solute in to volatile solvent (water). He finds _____
      (A) Solution boils at $0°C$ and freezes at $100 °C$
      (B) The boiling temperature of solution is above $100 °C$
      (C) The freezing temperature of solution is above $0 °C$
      (D) Solution boils at $100°C$ and freezes at $0 °C$

3.   The product that can be obtained by the electrolysis of molten sodium chloride but not of   (1)
      aqueous sodium chloride is _____
      (A) hydrogen gas   (B) chlorine gas   (C) metallic sodium   (D) oxygen gas

4.   State: Kohlrausch's law   (1)

5.   Define: Molar conductivity   (1)

SECTION B

6. (a) Give a statement of Henry's law. (2)
   (b) Draw a labelled diagram showing elevation in the boiling point of a solvent (ΔT_b) of a solution.

7. If the density of lake water is 1.25 g mL^{-1} and contains 92 g of Na$^+$ ions per kg of water, (2) calculate the molality of Na$^+$ ions in the lake. (At. Mass of Na = 23 u, H = 1 u, O = 16u)

   OR

   Determine the osmotic pressure of a solution prepared by dissolving 25 mg of K_2SO_4 in 2 litres of water at 25° C, assuming that it is completely dissociated. (At. Mass of K = 39 u, S = 32 u, O = 16u)

8. (a) Suggest the most important type of intermolecular attractive forces between I_2 and CCl_4. (2)
   (b) A and B liquids on mixing produce a warm solution. Which type of deviation from Raoult's law is there?

9. (a) State one difference between a primary battery and secondary battery. (2)
   (b) How will the E_{cell} value be affected when concentration of Zn^{2+} ions is increased in Daniel cell?

10. Calculate e.m.f. of the following cell at 298 K: (2)
$$Ni(s) / Ni^{2+} (0.01 \text{ M}) // Cu^{2+} (0.1M) / Cu (s)$$
   (Given $E^0 Ni^{2+}/ Ni = - 0.25$ V, $E^0 Cu^{2+}/Cu = + 0.34$ V)

SECTION C

11. H_2S, a toxic gas with rotten egg like smell, is used for the qualitative analysis. If the (3) solubility of H_2S in water at STP is 0.195 m, calculate Henry's law constant. (At. Mass of S = 32u)

12. (a) Give reason: Equimolar solutions of glucose and sodium chloride are not isotonic. (3)
   (b) When 1 mole of NaCl is added to 1 litre water the boiling point increases. When 1 mole of CH_3OH is added to 1 litre water, the boiling point decreases. Suggest reason.

13. The following figure represents variation of (Λ_m) vs $\sqrt{c}$ for an electrolyte. Here "Λ_m" is the (3) molar conductivity and "c" is the concentration of the electrolyte.
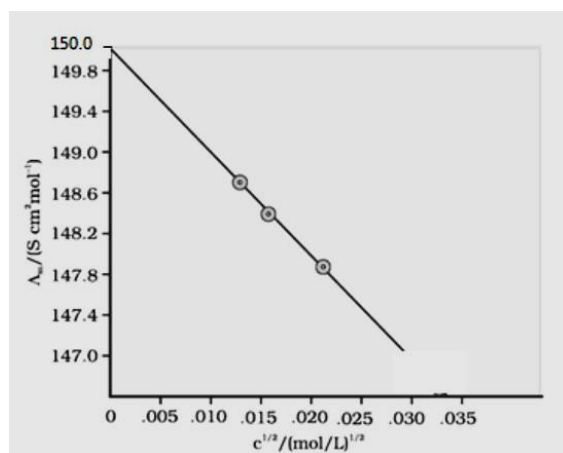
   (a) Identify the nature of electrolyte on the basis of the above plot.
   (b) What is the value of Λ_m^o for the electrolyte?
   (c) Why does the molar conductivity of a solution increase with dilution?

14. (a) Consider a cell given below: $\qquad$ (3)

$$Cu \mid Cu^{2+} \parallel Cl^- \mid Cl_2, Pt$$

Write the reactions that occur at anode and cathode.

(b) Value of standard electrode potential for oxidation of Cl^- ions is more positive than water, even then in electrolysis of NaCl, why is Cl^- oxidised at anode instead of water?

(c) Why concuctivity of the cell decreses with increse in volume/dilution?

15. (a) How much electricity in terms of Faraday is required to produce 20.0 g of Ca from molten $CaCl_2$? (At. Mass of Ca = 40 u, Cl = 35.5 u) (3)

(b) E° (reduction potential) of Cu and Zn are + 0.34 V and – 0.76 V respectively. Which of them is stronger reducing agent?

OR

(a) Λ^0m for NaCl, HCl and CH_3COONa are 126.4, 425.9, 91.0 S cm^2 mol^{-1} respectively. Calculate Λ^0_m for CH_3COOH.

(b) What will the effect on pH of soltion if the aqueous solution of NaCl is electrolysed?

SECTION D

16. (a) What will happen if we place blood cell in a hypertonic solution? (5)

(b) Why aquatic animals are more comfortable in cold water than warm water?

(c) Calculate the mass of a non-volatile solute (molar mass 40 g mol^{-1}) which should be dissolved in 114 g octane to reduce its vapour pressure to 80%.

OR

(a) What is the relation between relations in boiling points T_1 and T_2 respectively for equimolar solutions of $Ca(NO_3)_2$ and $Al(NO_3)_3$?

(b) Analyse the data given in the following table and arrange Helium, Nitrogen and Oxygen gas in the increasing their solubilities at 293 K temperature.

Gas	Temperature/K	K_H /kbar
He	293	144.97
H_2	293	69.16
N_2	293	76.48
N_2	303	88.84
O_2	293	34.86
O_2	303	46.82

(c) 18 g of glucose, $C_6H_{12}O_6$, is dissolved in 1 kg of water in a saucepan. At what temperature will water boil at 1.013 bar?

(K_b for water is 0.52 K kg mol^{-1}, At. Mass of C = 12u, H = 1u, O = 16u)

17. (a) What will the products of electrolysis when an aq. Solution of $CuSO_4$ is electrolysed using Cu electrode (5)

(b) Give the Reason: Unlike dry cell, the mercury cell has a constant cell potential throughout its useful life.

(c) Three electrolytic cells A,B,C containing solutions of $ZnSO_4$, $AgNO_3$ and $CuSO_4$, respectively are connected in series. A steady current of 1.5 amperes was passed through them until 1.45 g of silver deposited at the cathode of cell B.

(i) How long did the current flow?

(ii) What mass of coppe deposited?

(At. Mass of Zn = 65.3u, S = 32 u, O = 16u, Ag = 108u, N = 14u, Cu = 63.5u)