



विद्या सर्वार्थ साधिका

ANANDALAYA
PERIODIC TEST -1
Class: XII

Subject: Chemistry (043)

Date : 14-07-2023

MM : 40

Time: 1 Hr. 30 min.

General Instructions:

1. There are 20 questions in all. All questions are compulsory.
2. This question paper has five sections: Section A, Section B, Section C, Section D and Section E. All the sections are compulsory.
3. Section A consists of twelve MCQs of 1 mark each, Section B consists of two questions of 2 marks each, Section C consists of two questions of 3 marks each, Section D consists of two long questions of 5 marks each and Section E consists of two case study-based questions of 4 marks each.
4. There is no overall choice. However, an internal choice has been provided in section D and E. You have to attempt only one of the choices in such questions.

SECTION A

1. Maximum amount of solid solute that can be dissolved in specified amount of given liquid (1)
solvent does not depend upon _____
(A) Temperature (B) Nature of solute (C) Pressure (D) Nature of solvent
2. Which of the following is incorrect for an ideal solution? (1)
(A) $\Delta H_{mix} = 0$
(B) $\Delta V_{mix} = 0$
(C) A – A, B – B is less than A – B interaction
(D) A – A, B – B, interaction is equal to A – B interaction
3. Which one of the following electrolytes has the same value of Van't Hoff factor (i) as that of (1)
 $Al_2(SO_4)_3$? (Assume that all are 100% ionized)
(A) K_2SO_4 (B) $K_3[Fe(CN)_6]$ (C) $Al(NO_3)_3$ (D) $K_4[Fe(CN)_6]$
4. The reaction in a galvanic cell is _____. (1)
(A) Spontaneous (B) Non-spontaneous (C) Disproportionation (D) Combination
5. Which cell will measure standard electrode potential of copper electrode? (1)
(A) $Pt(s) | H_2(g, 0.1 \text{ bar}) | H^+(aq., 1M) || Cu^{2+}(aq, 1M) | Cu$
(B) $Pt(s) | H_2(g, 1 \text{ bar}) | H^+(aq., 1M) || Cu^{2+}(aq, 2M) | Cu$
(C) $Pt(s) | H_2(g, 1 \text{ bar}) | H^+(aq., 1M) || Cu^{2+}(aq, 1M) | Cu$
(D) $Pt(s) | H_2(g, 0.1 \text{ bar}) | H^+(aq., 0.1M) || Cu^{2+}(aq, 1M) | Cu$
6. What amount of electric charge is required for the reduction of 1 mole of MnO_4^- into Mn^{+2} ? (1)
(A) 15F (B) 10F (C) 2F (D) 5F
7. Radha added a volatile liquid having its molecular formula C_2H_5OH in water for some (1)
experimental observation at room temperature and pressure. Which of the followings can be
her observation?
(A) Some amount of heat is released during the mixing of solutions
(B) The total volume remains same before and after the mixing
(C) The value of $\Delta H = 0$.
(D) The value of $\Delta V \neq 0$

8. In Nernst's equation 0.059 is the value of which given constant at 298 K? (1)
- (A) $\frac{RT}{F}$ (B) $\frac{RT}{nF}$ (C) $2.303 \frac{RT}{nF}$ (D) $2.303 \frac{RT}{F}$
9. Camphor in N₂ gas is an example of _____. (1)
- (A) Solid in gas solution (B) Gas in gas solution
(C) Solid in liquid solution (D) Liquid in gas solution
10. How many grams of sugar is required to prepare 10% w/v 4 litre solution? (1)
- (A) 100 (B) 200 (C) 300 (D) 400

For question numbers 11 and 12, two statements are given-one labelled Assertion and the other labelled Reason. Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

- (A) Both Assertion and Reason are true and Reason is the correct explanation of Assertion
(B) Both Assertion and Reason are true but Reason is NOT the correct explanation of Assertion.
(C) Assertion is true but Reason is false
(D) Assertion is false but Reason is true.
11. **Assertion (A):** When 100 ml 0.1 Molar solution of salt is added with 100 ml extra water, the molarity of solution becomes 5×10^{-2} molar. (1)
Reason (R): Molarity is directly proportional to volume of solution.
12. **Assertion (A):** Conductivity of solution does not depend upon the dilution process. (1)
Reason (R): Greater the dilution of an electrolyte lesser will be the conductivity of the solution.

SECTION B

13. (a) 10 mL of liquid A were mixed with 10 mL of liquid B. The volume of resulting solution was found to be 19.9 ml. What type of deviation from ideal behaviour does this represent? (2)
(b) Define the term "osmotic pressure".
14. The resistance of a conductivity cell containing 0.001 M KCl solution at 298 K is 1500 Ω. (2)
What is the cell constant if the conductivity of 0.001 M KCl solution at 298 K is 0.146×10^{-3} S cm⁻¹

SECTION C

15. Calculate the amount of KCl which must be added to 1 kg of water so that the freezing point is depressed by 2 Kelvin temperature. (K_f for water is 1.86 K Kg mol⁻¹m Molar mass = 74.5 g/mol) (3)
16. (a) Solution A = 1 mole of NaCl dissolved in 100 mL of the solution. (3)
Solution B = 1 mole of NaCl dissolved in 500 mL of the solution.
Which one of the above will have the greater molar conductivity and why?
(b) Write the anode and the cathode reactions occurring in the use of a lead storage?

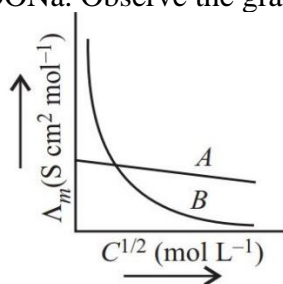
SECTION D

17. (a) If N₂ gas is bubbled through water at 293 K, how many millimoles of N₂ gas would dissolve in 1 litre of water? Assume that N₂ exerts a partial pressure of 0.987 bar. Given that Henry's law constant for N₂ at 293 K is 76.48 kbar. (5)
(b) Explain any one application of Henry's law of dissolution of gases in to liquids.
(c) Suggest the most important type of intermolecular attractive interaction in a mixture of I₂ and CCl₄ ?

OR

- (a) The freezing point of a solution composed of 5.85 g of NaCl in 100 g of water is $-3.348\text{ }^{\circ}\text{C}$. Calculate the van't Hoff factor 'i' for this solution. K_f (water) = $1.86\text{ K kg mol}^{-1}$.
- (b) When outer shell of two eggs are removed and one of the eggs is placed in pure water and the other is placed in saturated solution of NaCl, what will be observed and why?

18. (a) If a current of 0.5 ampere flows through a metallic wire for 2 hours, then how many electrons would flow through the wire? (5)
- (b) Suggest a way to determine the Λ°_m value of water.
- (c) Out of HCl and NaCl, which do you expect will have greater value for Λ_m and why?
- (d) The following is the graph of molar conductivity Vs concentration for two different electrolytes CH_3COOH and CH_3COONa . Observe the graph and answer the question.



Which one of above A or B, can be a graph of CH_3COOH ?

SECTION E

Questions 19 and 20 are Case Study Based questions and are compulsory. Each question carries 4 marks.

19. Boiling point or freezing point of liquid solution would be affected by the dissolved solids in the liquid phase. A soluble solid in solution has the effect of raising its boiling point and depressing its freezing point. The addition of non-volatile substances to a solvent decreases the vapor pressure and the added solute particles affect the formation of pure solvent crystals. According to many researches the decrease in freezing point directly correlated to the concentration of solutes dissolved in the solvent. This phenomenon is expressed as freezing point depression and it is useful for several applications such as freeze concentration of liquid food and to find the molar mass of an unknown solute in the solution. Freeze concentration is a high-quality liquid food concentration method where water is removed by forming ice crystals. This is done by cooling the liquid food below the freezing point of the solution. The freezing point depression is referred as a colligative property and it is proportional to the molar concentration of the solution (m), along with vapor pressure lowering, boiling point elevation, and osmotic pressure. These are physical characteristics of solutions that depend only on the identity of the solvent and the concentration of the solute. The characters are not depending on the solute's identity
- (i) Justify: When non-volatile solute is added to volatile solvent, its boiling temperature increases. (1)
- (ii) Assume three samples of juices A, B and C have glucose as the only sugar present in them. The concentration of sample A, B and C are 0.1M, 0.5M and 0.2 M respectively. Which of the above will have highest freezing point? (1)
- (iii) Define molal elevation constant or eullioscopic constant and write its unit. (2)

OR

(iii) Does toluene dissolve in water? Justify your answer.

20. The products of electrolysis depend on the type of electrolyte and electrode considered for the redox reaction in the cell. Only reactive electrodes take part in the chemical reaction. Inert electrodes do not take part in the chemical reaction. It only works as an electrode catalyst, i.e., platinum electrode. Strong electrolytes undergo faster electrolysis, whereas weak electrolytes

require an additional potential to start the chemical reaction. Oxidising and reducing agents also decide the products of electrolysis.

When an aqueous solution of an electrolyte is electrolysed, if the cation has higher reduction potential than water (-0.83 V), the cation is liberated at the cathode (e.g. in the electrolysis of copper and silver salts); otherwise, hydrogen gas is liberated due to the reduction of water (e.g. in the electrolysis of potassium, sodium, calcium salts, etc.). Similarly, if anion has a higher oxidation potential than water (-1.23 V), the anion is liberated at Anode (e.g. bromide ion); otherwise, oxygen gas is liberated due to oxidation of water (e.g. in the case of fluoride ion, an aqueous solution of sodium sulphate as oxidation potential of sulphate ion is -0.2 V).

- (i) When dil.H₂SO₄ solution is electrolysed, will the pH of the solution be affected? Justify your answer. (1)
- (ii) How much electricity in terms of Faraday is required to produce 20.0 g of Ca from molten CaCl₂? (1)
- (iii) Predict the products of electrolysis at cathode and anode when an aqueous solution of AgNO₃ is electrolysed with platinum electrodes. (2)

OR

- (iii) What do you mean by over-voltage?