SECOND YEAR HIGHER SECONDARY
FIRST TERMINAL EXAMINATION – 2024

Part – III Time: 2 Hours

CHEMISTRY

Cool-off time: 15 Minutes

Maximum: 60 scores

SECTION A

Answer *any four* questions from 1 to 5. Each carry 1 score. (4 × 1 = 4)

1. Which of the following is not a colligative property?
   (A) Osmotic pressure (B) Elevation of boiling point (C) Vapour pressure (D) Depression of freezing point
2. The unit of rate constant for a first order chemical reaction is ……
3. The cell potential of mercury cell is nearly ……..
   (A) 1.50 V (B) 1.35 V (C) 1.91 V (D) 1.10 V
4. Among the following oxides of vanadium, which is amphoteric in nature?
   (A) V_2O_3 (B) V_2O_4 (C) V_2O_5 (D) None of these
5. The product formed at the cathode during the electrolysis of aqueous solution of NaCl is …….

SECTION B

Answer *any eight* questions from 6 to 15. Each carry 2 scores. (8 × 2 = 16)

6. State Henry's Law. Write any one application of this law.
7. The vapour pressure of pure liquids A and B are 600 mm of Hg and 800 mm of Hg respectively. Calculate vapour pressure of the solution in which mole fraction of B is 0.6.
8. What is abnormal molar mass? How can it be corrected?
9. Write the anode and cathode reactions occur during the discharging of a lead storage battery.
10. a) Represent the galvanic cell based on the cell reaction given below:
    $Cu_{(s)} + 2Ag^+_{(aq)} \text{ —} \quad Cu^{2+}_{(aq)} + 2Ag_{(s)}$ (1)
    b) Write the half-cell reactions of the above cell. (1)
11. Calculate the time required for the 90% completion of a first order reaction ($k = 0.2303\ s^{-1}$).
12. Write any two differences between molecularity and order of a reaction.
13. What is a zero order reaction? Write the integrated rate equation for a zero order reaction.
14. Transition elements show various oxidation states. Give reason for variability of oxidation state.
15. Calculate the 'spin only' magnetic moment of $M^{2+}_{(aq)}$ ion (Z = 25).

SECTION C

Answer *any eight* questions from 16 to 26. Each carry 3 scores. (8 × 3 = 24)

16. (i) What are Ideal solutions? (1)
    (ii) Mixture of two liquids A and B form an ideal solution. Draw the vapour pressure – composition graph for this solution. (2)
17. (i) What are azeotropes? (1)
    (ii) What is reverse osmosis? Mention any one of its applications. (2)
18. (i) What are fuel cells? (1)
    (ii) Write any two advantages of fuel cells. (1)
    (iii) Write the net reaction taking place in a $H_2 – O_2$ fuel cell. (1)

19. (i) Define molar conductivity. (1)
(ii) Explain the variation of molar conductivity with concentration for strong and weak electrolytes. (2)
20. (i) State Faraday's first law of electrolysis. (1)
(ii) A solution of $Ni(NO_3)_2$ is electrolysed between platinum electrodes using a current of 5 amperes for 20 minutes. What mass of Ni is deposited at the cathode? (Atomic mass of Ni = 58.7 g mol^{-1}) (2)
21. (i) What do you mean by rate of a chemical reaction? (1)
(ii) The initial concentration of the first order reaction, $N_2O_{5(g)} \longrightarrow 2\ NO_{2(g)} + ½\ O_{2(g)}$, was 1.24 x 10^{-2} mol L^{-1} at 300 K. The concentration of N_2O_5 after 1 hour was 0.20 x 10^{-2} mol L^{-1}. Calculate the rate constant of the reaction at 300 K. (2)
22. (i) Write Arrhenius equation. (1)
(ii) The rate constant for a first order reaction becomes 4 times, when the temperature is raised from 350 K to 370 K. Calculate the activation energy for the reaction (R = 8.314 J $K^{-1}mol^{-1}$). (2)
23. (i) Define half-life period ($t_{½}$) of a reaction. (1)
(ii) By deriving the equation for $t_{½}$ of a first order reaction, prove that $t_{½}$ is independent initial concentration of reacting species. (2)
24. How do you prepare $K_2Cr_2O_7$ from chromite ore?
25. (i) Zn (atomic number = 30) is not a transition element, though it is a d block element. Why? (1)
(ii) Which is more paramagnetic, Fe^{2+} or Fe^{3+}? Why? (2)
26. (i) E^0 (std. electrode potential) values generally become less negative as we move across a transition series, but in first row transition series elements, E^0 values of Ni^{2+}/Ni and Zn^{2+}/Zn are more negative than expected. Why? (2)
(ii) Name the first row transition series element which has a positive E^0 value. (1)

SECTION D

Answer *any four* questions from 27 to 31. Each carry 4 scores. (4 × 4 = 16)

27. (i) What do you mean by colligative properties? (1)
(ii) For determining the molecular mass of polymers, osmotic pressure is preferred to other colligative properties. Why? (1)
(iii) For intravenous injections only solutions with osmotic pressure equal to that of 0.9% NaCl solution is used. Why? (2)
28. (i) State Raoult's law. (1)
(ii) Boiling point of water at 750 mm Hg is 99.63^0C. How much sucrose ($C_{12}H_{22}O_{11}$) is to be added to 500g of water such that it boils at 100^0C ? (For water, K_b = 0.52 K kg mol^{-1}) (3)
29. Consider the pseudo-order reaction, $CH_3COOC_2H_5 + H_2O \xrightarrow{H^+} CH_3COOH + C_2H_5OH$
(i) Identify the order and molecularity of the above reaction. (2)
(ii) Give the rate law expression for the above reaction. (1)
(iii) What happens to the rate of the above reaction when the concentration of $CH_3COOC_2H_5$ is doubled? (1)
30. (i) State Kohlrausch law of independent migration of ions. (1)
(ii) The molar conductivity (Λ_m) of 0.001 M acetic acid is 4.95 x 10^{-5} S cm^2 mol^{-1}. Calculate the degree of dissociation (α) at this concentration, if the limiting molar conductivity (λ^0_m) for H^+ is 340 x 10^{-5} S cm^2 mol^{-1} and for CH_3COO^- is 50.5 x 10^{-5} Scm^2 mol^{-1}. (3)
31. (i) What is meant by lanthanoid contraction? (1)
(ii) What is the cause of Lanthanoid contraction? (1)
(iii) Write any two consequences of Lanthanoid contraction. (2)