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Roll No. :

HALF YEARLY EXAM. (2022-23)

SUBJECT : CHEMISTRY

CLASS : XII

Time : 3hrs

MM:70

Read the following Instructions carefully.

1. The Question Paper contains five sections.
2. Section A: Q No: 1 to 20 are very short questions/ objective type and carry 1 marks each. Q No: 1 to 6 are very short questions, Q No: 7 to 11 are MCQs, Q No: 12 to 16 are assertion and reasoning type questions and Q No: 17 to 20 are case based objective questions.
3. Section B: Q No: 21 to 25 are short answer questions and carry 2 marks each.
4. Section C: Q No: 26 to 32 are short answer questions and carry 3 marks each.
5. Section D: Q No: 33 to 35 are long answer questions and carry 5 marks each.
6. Section E: Q No 36 to 37 is case based question carrying 4 marks.
7. All questions are compulsory.
8. There is no overall choice. However an internal choice has been provided in two questions of two marks, two questions of three marks and all the three questions of five marks weightage. You have to attempt only one of the choices in such questions.

9. Use Log tables if necessary, use of calculators are not allowed.

Q1. Which element of the first transition series has highest enthalpy of atomization and why?

Q2. Why does p-dichlorobenzene have a higher m.p. than its o- and m-isomers?

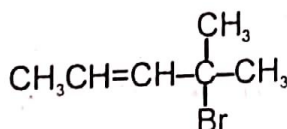
Q3. Which of the following is a more stable complex and why?



Q4. What is the effect of decreasing concentration on the molar conductivity of weak electrolytes? A \rightarrow B

Q5. What happens if external potential applied becomes greater than E°_{cell} of electrochemical cell?

Q6. Write the IUPAC name of



Q7. The negative part of the addendum (the molecule to be added) adds on the carbon atom of the double bond containing the least number of hydrogen atoms. This rule is known as

- (a) Saytzeffs rule
- (b) Peroxide rule
- (c) Markovnikov's rule
- (d) van't hoff rule

Q8. Zr and Hf have almost equal atomic and ionic radii because

- (a) of diagonal relationship
- (b) of lanthanoid contraction.
- (c) of electron – electron repulsion
- (d) both belong to same transition series

Q9. The equivalent conductance of Ba^{2+} and Cl^- are respectively 127 and 76 $\text{ohm}^{-1} \text{cm}^{-1} \text{eq}^{-1}$ at infinite dilution. The equivalent conductance of BaCl_2 at infinite dilution will be

- a. 139.5
- b. 203
- c. 279
- d. 101.5

Q10.. An increase in the conductivity equivalent of a solid electrolyte with dilution is primarily due to

- a. increased ionic mobility of ions
- b. 100 percent electrolyte ionisation with natural dilution
- c. increase in both ion numbers and ionic mobility
- d. A rise in ion counts

Q11..Among the following which are ambidentate ligands?

(i) SCN^-

(ii) NO_3^-

(iii) NO_2^-

(iv) $\text{C}_2\text{O}_4^{2-}$

(a) (i) and (iii)

(b) (i) and (iv)

(c) (ii) and (iii)

(d) (ii) and (iv)

Directions:

These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following

- (a) Both assertion and reason are true and the reason is the correct explanation of assertion.
- (b) Both assertion and reason are true but the reason is not the correct explanation of assertion.
- (c) Assertion is true but reason is false.
- (d) Assertion is false but reason is true.
- (e) Assertion and reason both are wrong.

Q.12. Assertion : If a liquid solute more volatile than the solvent is added to the solvent, the vapour pressure of the the Solution may increases ie $P_s > P_o$

Reason : In the presence of a more volatile liquid solute, only the solute will form the vapours and solvent will not

Q13 Assertion : When a solution is separated from the pure solvent by a semipermeable membrane, the solvent molecules pass through it from pure solvent side to the solution side.

Reason : Diffusion of solvent occurs from a region of high concentration solution to a region of low concentration solution..

Q14 Assertion : When NaCl is added to water a depression freezing point is observed.

Reason : The lowering of vapour pressure of a solution causes depression in the freezing point.

Q15 Assertion: Molarity of a solution in liquid state changes with temperature.

Reason: The volume of a solution changes with change in temperature.

Q16. Assertion: When methyl alcohol is added to water, boiling point of water increases.

Reason: When a volatile solute is added to a volatile solvent elevation in boiling point is observed.

Read the passage given below and answer the following questions

The half-life of a reaction is the time required for the concentration of reactant to decrease by half, i.e., $[A]_t = [A]/2$. For first order reaction, $t_{1/2} = 0.693/k$. This means $t_{1/2}$ is independent of initial concentration. Figure shows that typical variation of concentration of reactant exhibiting first order kinetics. It may be noted that though the major portion of the first order kinetics may be over in a finite time, but the reaction will never cease as the concentration of reactant will be zero only at infinite time.

The following questions are multiple choice question. Choose the most appropriate answer:

Q17 A first order reaction has a rate constant $k = 3.01 \times 10^{-3} \text{ /s}$. How long it will take to decompose half of the reactant?

(a) 2.303 s

(b) 23.03 s

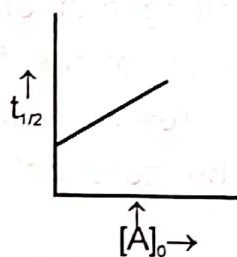
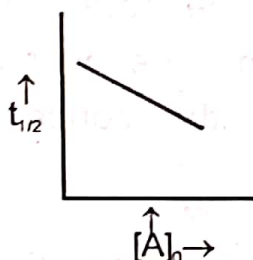
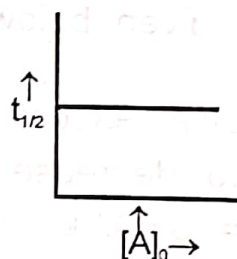
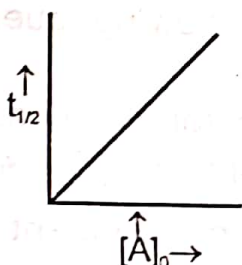
(c) 230.3 s

(d) 2303 s

Q18 For the half-life period of a first order reaction, which one of the following statements is generally false?

- (a) It is independent of initial concentration.
- (b) It is independent of temperature.
- (c) It decreases with the introduction of a catalyst.
- (d) None of these.

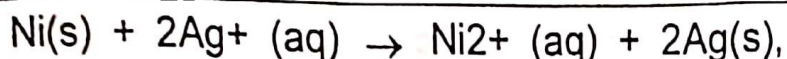
Q19 The plot of $t_{1/2}$ vs initial concentration $[A]_0$ for a first order reaction is given by



Q20 What is the unit of rate constant for a first order reaction?

- (a) S^{-1}
- (b) $mol/l/s$
- (c) $l/mol/s$
- (d) none of these

Q21. Determine the values of ΔG° for the following reaction :



$$E^\circ = 1.05 \text{ V}$$

$$(1F = 96500 \text{ C mol}^{-1})$$

Q22. (a) Why do transition elements show variable oxidation states?

(b) Cr^{2+} is reducing in nature while with the same d-orbital configuration (d^4) Mn^{3+} is an oxidising agent.

Q23. Rearrange the compounds of each of the following sets ~~in order of~~ reactivity towards $\text{S}_\text{N}2$ displacement :

(i) 2-Bromo-2-methylbutane, 1-Bromopentane, 2-Bromopentane

(ii) 1-Bromo-3-methylbutane, 2-Bromo-2-methyl-butane, 3-Bromo-2-methylbutane

OR

Q23.(a) Why KCN is used in preparation of Nitriles from alkyl halide not AgCN ?

(b) Why Preparation of alkyl halide from alcohol using thionyl chloride is best method for preparation?

Q24. (i) Out of 1 M glucose and 2 M glucose, which one has a higher boiling point and why?

(ii) What happens when the external pressure applied becomes more than the osmotic pressure of solution?

Q25 Why non ideal solution shows positive deviations from Raoult's law?

OR

Q25. Why osmotic pressure is the best colligative property for the determination of molecular mass of polymers?

Q26. Write chemical formula for the following-

(a) (1) Tetraammineaquachlorido cobalt (iii) chloride

(2) Tetrachloridonickelate(ii)-

(b) Write the IUPAC name of $[\text{CrCl}_2(\text{en})_2]\text{Cl}$

OR

Q26.(a) what is the configuration of an octahedral complex having d^4 configuration and $\Delta_0 > P$.

(b) what are Heteroleptic complexes? give example.

(c) Define CFSE?

Q27..A solution of glycerol ($\text{C}_3\text{H}_8\text{O}_3$) in water was prepared by dissolving some glycerol in 500 g of water. This solution has a boiling point of 100.42°C while pure water boils at 100°C . What mass of glycerol was dissolved to make the solution?

(K_b for water = $0.512 \text{ K kg mol}^{-1}$)

OR

Q27. Determine the osmotic pressure of a solution prepared by dissolving $2.5 \times 10^{-2} \text{ g}$ of K_2SO_4 in 2 L of water at 25°C , assuming that it is completely dissociated.

($R = 0.0821 \text{ L atm K}^{-1} \text{ mol}^{-1}$, Molar mass of $\text{K}_2\text{SO}_4 = 174 \text{ g mol}^{-1}$)

Q28. For the complex $[\text{Fe}(\text{en})_2\text{Cl}_2] \text{Cl}$, (en = ethylene diamine), identify

(i) the oxidation number of iron,

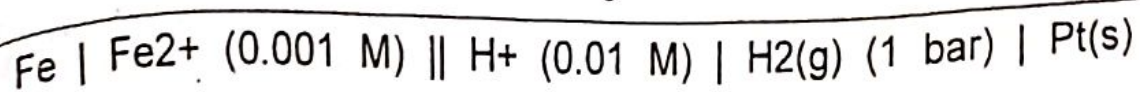
(ii) the hybrid orbitals and the shape of the complex,

(iii) the magnetic behaviour of the complex,

Q29. Calculate emf of the following cell at 25°C :

XII- Chemistry

[P.T.O.]

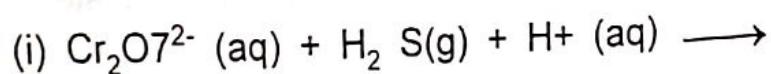


$$E_0(\text{Fe}^{2+} \mid \text{Fe}) = -0.44 \text{ V} \quad E_0(\text{H}^+ \mid \text{H}_2) = 0.00 \text{ V}$$

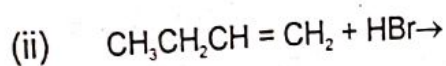
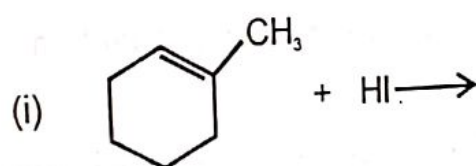
Q30/ The rate constant for a first order reaction is 60 s^{-1} . How much time will it take to reduce the initial concentration of the reactant to its 1/10th value?

Q31 (a). Describe the preparation of potassium dichromate from chromite ore. What is the effect of change of pH on dichromate ion?

(b) Complete the following chemical reaction equations :



Q32 (a). Complete the following reaction equations



(b) How will you convert 2-bromopropane to 1-bromopropane? ✓^0

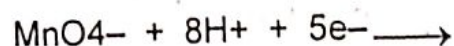
Q33. (i) Mn shows the highest oxidation state of +7 with oxygen but with fluorine it shows the highest oxidation state of +4.

(ii) Which transition metal of 3d series has positive $E_0(\text{M}_2^+/ \text{M})$ value and why?

(iii) What is Misch metal? write its one use.

(iv) Name a member of the lanthanoid series which is well known to exhibit +2 oxidation state.

(v) Complete the following equation :



OR

Q33. Assign reasons for the following :

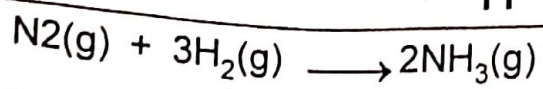
- (i) Copper (I) ion is not known in aqueous solution.
- (ii) Transition metals generally form coloured compounds.
- (iii) why $\text{La}(\text{OH})_3$ is most basic while $\text{Lu}(\text{OH})_3$ is least basic?
- (iv) Write one similarity and one difference between the chemistry of lanthanoids and that of actinoids.

Q34. (a) For a reaction $\text{A} + \text{B} \longrightarrow \text{P}$, the rate is given by $\text{Rate} = k[\text{A}][\text{B}]^2$

- (i) How is the rate of reaction affected if the concentration of B is doubled?
 - (ii) What is the overall order of reaction if A is present in large excess?
- (b) In general, it is observed that the rate of a chemical reaction doubles with every 10 degree rise in temperature. If the generalization holds good for the reaction in the temperature range of 295 K to 305 K, what would be the value of activation energy for this reaction ?
- $[R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}] (\log 2 = 0.3010)$

OR

- Q34 (a). A reaction is of second order with respect to a reactant. How will the rate of reaction be affected if the concentration of this reactant is (i) doubled, (ii) reduced to half?
- (b) Define specific reaction rate?
 - (c) Express the rate of the following reaction in terms of the formation of ammonia :



- (d) What is the effect of catalyst on activation energy.
- Q35. (a) What are fuel cells? Give an example of a fuel cell.
- (b) The resistance of 0.01 M NaCl solution at 25°C is 200 Ω . The cell constant of the conductivity cell is unity. Calculate the molar conductivity of the solution.
- (c) State Faraday's first law of electrolysis. How much charge in terms of Faraday is required for the reduction of 1 mol of Cu_2^+ to Cu.

OR

- (a) State Kohlrausch law of independent migration of ions.
- (b) Write the reaction takes place at anode and cathode of a fuel cell.
- (c) Calculate the degree of dissociation (α) of acetic acid if its molar conductivity (Λ_m) is 39.05 S cm² mol⁻¹.

Given: $\lambda^\circ(\text{H}^+) = 349.6 \text{ S cm}^2 \text{ mol}^{-1}$ and $\lambda^\circ(\text{CH}_3\text{COO}^-) = 40.9 \text{ S cm}^2 \text{ mol}^{-1}$

Case Based Question-Read the passage and answer the following Questions

To explain bonding in coordination compounds various theories were proposed. One of the important theories was the valence bond theory. According to that, the central metal ion in the complex makes available a number of empty orbitals for the formation of coordination bonds with suitable ligands. The appropriate atomic orbitals of the metal hybridize to give a set of equivalent orbitals of definite geometry. The d-orbitals involved in the hybridization may be either inner d-orbitals i.e., $(n - 1)d$,

or outer d-orbitals i.e., nd.

For example, Co^{3+} forms both inner orbital and outer orbital complexes, with ammonia forms $[\text{Co}(\text{NH}_3)_6]^{3+}$ and with fluorine it forms $[\text{CoF}_6]^{3-}$ complex.

Q36. $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$ (at. no. of Cr = 24) has a magnetic moment of 3.83 B.M. What is the correct distribution of 3d-electrons in the central metal of the complex

Q37. Explain why $[\text{Co}(\text{NH}_3)_6]^{3+}$ is an inner orbital complex whereas $[\text{Ni}(\text{NH}_3)_6]^{2+}$ is an outer orbital complex. (At. no. Co = 27, Ni = 28)
