Student Assessment - (Pre Board) - January 2025

Class - 12

Subject - Chemistry

Time: 180 minutes **Marks: 70**

Instructions:

1. All questions are compulsory.
2. Question numbers 1 to 18 carry 1 mark each.
3. Question numbers 19 to 25 carry 2 marks each.
4. Question numbers 26 to 30 carry 3 marks each.
5. Question number 31 and 32 carries 4 marks.
6. Question numbers 33 to 35 carry 5 marks each.

Section A

(1-18) All the questions in this section carry 1 mark each.

1. Which one is a colligative property?

   (A) Boiling Point

   (B) Freezing Point

   (C) Vapour Pressure

   (D) Osmotic Pressure

2. In respect of the equation, $k = A\ e^{-Ea/RT}$ in chemical kinetics, which of the following statement is correct?

   (A) A is adsorption coefficient

   (B) K is rate constant

   (C) Ea is energy of activation

   (D) R is Rydberg constant

3. How much charge is required for the reduction of 1 mol of Al^{3+} to Al (s) :

   (A) 96500 C

   (B) 3 x 96500 C

   (C) 3 F

   (D) both (B) and (C)

4. Which of the following species will impart colour to an aqueous solution?

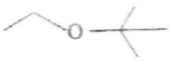
   (A) Ti^{4+}

   (B) Cu^{+}

   (C) Zn^{2+}

   (D) Cr^{3+}

5. The primary and secondary valency of Pt in $[PtCl_2(en)_2]^{2+}$ is :
   (A) 4 and 4
   (B) 4 and 6
   (C) 6 and 4
   (D) 6 and 6
6. Consider the following sequence of reactions :
   Compound A ——NaCN——> B ——Partial Hydrolysis——> CH_3CONH_2
   Identify the compound A in the above reaction?
   (A) CH_3CH_2Cl
   (B) CH_3Cl
   (C) CH_3CN
   (D) CH_3NO_2
7. Diethyl ether on heating with conc. HI will give :
   (A) One molo ethyl alcohol and one mole of ethyl iodide
   (B) Two moles of ethyl alcohol
   (C) Two moles of ethyl iodide
   (D) Two moles of methyl iodide
8. A primary alcohol can be prepared by the reaction of grignard reagent with
   (A) Acetaldehyde
   (B) Acetone
   (C) Formaldehyde
   (D) Chloroethane
9. The presence of five alcoholic group in glucose is established by its reaction with .....
   (A) HI
   (B) Bromine water
   (C) Acetic Anhydride
   (D) conc. HNO_3
10. 40% aqueous solution of formaldehyde is known as .....
11. Carbolic acid is the common name of .....
12. The structure which determine the sequence of various amino acids in a polypeptide chain is .....
13. Why lower alcohols are soluble in water?
14. Write down the structure and IUPAC name of Benzyl Alcohol.
15. Which chemical test is used to distinguish between Aniline and Ethyl amine?

16. **Assertion (A):** Hydrolysis of ether  with aq. HI is SN_1 reaction.

Reason (R): I^- is strong nucleophile so, it attacks from less hindered side.

(A) Both assertion and reason are correct and reason is the correct explanation of assertion.

(B) Both assertion and reason are correct but reason is not the correct explanation of assertion.

(C) Assertion is correct and the reason is wrong.

(D) Assertion is wrong and the reason is correct.

17. **Assertion (A):** 2° and 3° alcohols can be differentiated by $K_2Cr_2O_7$.

Reason (R): $K_2Cr_2O_7$ oxidise 2° alcohol but it does not oxidise 3° alcohols.

(A) Both assertion and reason are correct and reason is the correct explanation of assertion.

(B) Both assertion and reason are correct but reason is not the correct explanation of assertion.

(C) Assertion is correct and the reason is wrong.

(D) Assertion is wrong and the reason is correct.

18. **Assertion (A):** Nitrobenzene undergoes electrophilic substitution at m-position while nucleophilic substitution occurs at o- and p-positions.

Reason (R): Nitro group in benzene ring significantly lowers the electron density at o - and p positions while at m - position, the electron density is only originally lowered.

(C) Both assertion and reason are correct and reason is the correct explanation of assertion.

(D) Both assertion and reason are correct but reason is not the correct explanation of assertion.

(C) Assertion is correct and the reason is wrong.

(D) Assertion is wrong and the reason is correct.

Section B

(19-25) All the questions in this section are of 2 marks each. Answer to each question is required in 20 to 30 words.

19. What are primary cells? Give the construction and uses of Mercury cell.

OR

What are secondary cells? Give the construction and uses of lead storage battery.

20. Explain how a catalyst will increase the rate of a chemical reaction?

OR

Carbon dating is a technique used by archaeologists to determine the age of organic materials, such as trees, plants, animal remains, and human artefacts made from wood and leather, by measuring the amount of carbon-14 present. An archaeologist discovered that the carbon-14 content in the remains of an animal was 25% of the original carbon-14 present in the plant's body when it died.

What is the age of this sample?

(Given the half-life of carbon-14= 5730 years and log 4 = 0.6)

OR

How rate of a chemical reaction changes when volume of A_o is reduced to half for

(i) Zero order reaction

(ii) Second order reaction

21. What is meant by bidentate and ambidentate ligands ? Give two examples of each.

OR

What are homoleptic and heteroleptic complexes? Give examples.

22. Explain ionization isomerism and linkage isomerism in coordination compounds with example.

23. Which compound in each of the following pairs will react faster towards SN^2 with OH^-

(A) CH_3Br and CH_3I

(B) $(CH_3)_3CCl$ and CH_3Cl

24. Write short notes on the following :

(A) Carbyl Amine reaction

(B) Diazotisation reaction

25. Compare the basic strength of Ammonia and Aniline.

Section C

(26-30) All the questions in this section are of 3 marks each. Answer to each question is required in 50 to 70 words.

26. (a) Define ebullioscopic constant.

(b) Calculate the mass of a non volatile solute (Molar Mass 40 g/mol) which should be dissolved in 114g octane to reduce its vapour pressure to 80%.

OR

(a) Define osmotic pressure.

(b) Determine the osmotic pressure of a solution prepared by dissolving 25 mg of K_2SO_4 in 2 litre of water at 25° C, assuming that it is completely dissociated.

27. How will you bring about the following conversions :

(a) Benzene into Diphenyl

(b) Aniline into Bromobenzene

(c) Ethanol into Propanamide

28. (a)The rate of a reaction quadruples when the temperature changes from 27° C to 37° C. Calculate the energy of activation of the reaction assuming that it does not change with temperature.

(b) Define specific reaction rate.

29. (a) Write down the important structural and functional differences between DNA and RNA.

(b) Define reducing sugar with example.

30. How will you bring about the following conversions :

(a) Toluene to Benzyl Alcohol

(b) Ethanol to Propanoic Acid

(c) Phenol to Chlorobenzene

OR

30. Explain the following with example :

(a) Kolbe's reaction

(b) Riemer Tiemenn Reaction

(c) Williamson ether synthesis

Section D

(31-32) All the questions in this section are of 4 marks each.

31. Read the text carefully and answer the questions :

The colligative properties of electrolytes require a slightly different approach than the one used for the colligative properties of non -electrolytes. The electrolytes dissociate into ions in solution. It is the number of solute particles that determines the colligative properties of a solution. The electron solutions, therefore, show

abnormal colligative properties. To account for this effect we define a quantity called the van't Hoft factor, given by

i = actual no. of particles after dissociation in the solution / no. of particles initially dissolved in the solution

i = 1 (for non - electrolytes);

i > 1 (for electrolytes, undergoing dissociation)

i < 1 (for solutes, undergoing association).

(a) 0.1M K_4 $[Fe(CN)_6]$ is 60% ionized. What will be its van't Hoff factor? (1)

(b) When a solution of benzoic acid dissolved in benzene such that it undergoes in molecular association and its molar mass approaches 244. In which form Benzoic molecules will exist? (1)

(c) How does van't Hoff factor i and degree of association α are related if benzoic acid undergoes dimerisation in benzene solution? (2)

OR

What do you mean by colligative properties of solutions? (2)

32. Read the text carefully and answer the questions :

Isomers are two or more compounds that have the same chemical formula but a different arrangement of atoms. Due to the different arrangements of atoms, they differ in one or more physical or chemical properties. Two principal types of isomerism are known among coordination compounds. Stereoisomerism includes geometrical isomerism, optical isomerism while Structural isomerism consists of linkage isomerism, coordination isomerism, Ionisation isomerism and Solvate isomerism. Isomerism arises in heteroleptic complexes due to different possible geometric arrangements of the ligands. In a square planar complex of formula [MX_2L_2] X and L are unidentate, the two ligands X may be arranged adjacent to each other in a cis isomer, or opposite to each other in a trans isomer. Solvate form of isomerism is known as 'hydrate isomerism' in the case where water is involved as a solvent. This is similar to ionisation isomerism.

1. Optical isomers are called chiral. Explain (1)
2. Draw one of the geometrical isomers of the complex [$Pt(en)_2Cl_2]^{2+}$ which is optically active. (1)
3. Why thiocyanate is an ambidentate ligand? (2)

OR

Why molecular shape of $Ni(CO)_4$ is not the same as that of [$Ni(CN)_4]^{2-}$?

Section E

(33-35) All the questions in this section are of 5 marks each. Answer to each question is required in 150 to 170 words.

33. An organic compound 'M' has the molecular formula as C_7H_6O. A student carried out the following tests with the compound and tabulated her observations. Complete the table by filling up the last two columns:

Experiment	Observation	Inference	Supporting equations
P) 'M' is treated with 2,4-DNP reagent	Forms an orange-red precipitate	_____	_____
Q) 'M' is warmed with Tollen's reagent.	Forms a bright silver mirror.	_____	_____
R) 'M' undergoes a disproportionation reaction when heated with concentrated alkali.	Forms an alcohol and a sodium salt	_____	_____
S) 'M' treated with sodium borohydride	Forms the same alcohol as formed in test (R)	_____	_____
T) 'M treated with potassium permanganate	Forms a compound with molecular formula $C_7H_6O_2$	_____	_____

OR

(a) Arrange the following according to their increasing acidic strength :

Acetic acid, formic acid , fluoroacetic acid, propanoic acid.

(b) Describe the following :

(i) Cannizarro Reaction

(ii) Esterification Reaction

(iii) Cross Aldol Condensation

OR

(a) An organic compound with the molecular formula $C_9H_{10}O$ forms 2,4-DNP derivative, reduces Tollens' reagent and undergoes Cannizzaro reaction. On vigorous oxidation, it gives 1,2-benzenedicarboxylic acid. Identify the compound.

(b) Distinguish between (with chemical reactions) :

(i) Benzaldehyde and Acetophenone

(ii) Acetophenone and Benzophenone

(iii) Phenol and Benzoic Acid

34. Explain giving reasons :

(a) Transition elements and many of their compounds show paramagnetic behaviour.

(b) The enthalpy of atomization of transition metals are very high.

(c) The transition metals generally from coloured compounds.

(d) The transition metals from large number of complexes.

(e) When we move from left to right in a transition series, the decrease in atomic size is small.

OR

(a) What is lanthanoid contraction and what are its consequences?

(b) How does the acidic potassium dichromate solution will oxidize the following

(i) Ferrous Sulphate

(ii) Oxalic Acid

35.

(a) Define conductivity and molar conductivity for the solution of an electrolyte. Discuss their variation with concentration of electrolyte.

(b) Three electrolytic cells A,B,C containing solutions of ZnSO4, AgNO3 and CuSO4, 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. How long did the current flow? What mass of copper and zinc were deposited?

OR

(a) Define Kohlrausch Law

(b) The resistance of a conductivity cell containing 0.001M KCl solution at 298 K is 1500 Ω. What is the cell constant if conductivity of 0.001M KCl solution at 298 K is 0.146×10^{-3} S cm-1.

(c) How much charge is required for the following reductions:

(i) 1 mol of Al^{3+} to Al?

(ii) 1 mol of MnO_4^- to Mn^{2+}