Code Number: **A**

Aakash
Medical | IIT-JEE | Foundations

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Mock Test Paper for Class-XII

Time: 3 hrs.

CHEMISTRY

Max. Marks: 70

Roll No. | | | | | | | | | | | |

GENERAL INSTRUCTIONS

Read the following instructions carefully.

(a) There are 33 questions in this question paper with internal choice.

(b) SECTION A consists of 16 multiple -choice questions carrying 1 mark each.

(c) SECTION B consists of 5 short answer questions carrying 2 marks each.

(d) SECTION C consists of 7 short answer questions carrying 3 marks each.

(e) SECTION D consists of 2 case - based questions carrying 4 marks each.

(f) SECTION E consists of 3 long answer questions carrying 5 marks each.

(g) All questions are compulsory.

(h) Use of log tables and calculators is not allowed.

SECTION-A

The following questions are multiple choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

Multiple Choice Questions

Q1. Williamson's synthesis of preparing dimethyl ether is an **[1]**

(a) S_N1 reaction (b) Elimination reaction

(c) S_N2 reaction (d) Nucleophilic addition reaction

Q2. Which of the following isomer has the highest melting point? **[1]**

(a) 1,2-dichlorobenzene (b) 1,3 -dichlorobenzene

(c) 1,4-dichlorobenzene (d) All isomers have same melting point

Q3. Which of the following statements is correct? **[1]**

(a) Fibrous proteins are generally soluble in water

(b) Albumin is an example of fibrous proteins

(c) In fibrous proteins, the structure is stabilised by hydrogen bonds and disulphide bonds

(d) pH does not affect the primary structure of protein

Q4. Which of the following reactions is used to prepare salicylaldehyde? **[1]**

(a) Kolbe's reaction (b) Etard reaction

(c) Reimer-Tiemann reaction (d) Stephen's reduction

Q5. Solubility of gases in liquids decreases with rise in temperature because dissolution is an **[1]**

(a) Endothermic and reversible process (b) Exothermic and reversible process

(c) Endothermic and irreversible process (d) Exothermic and irreversible process

Q6. When 1 mole of benzene is mixed with 1 mole of toluene the vapour will contain (Given : vapour pressure of benzene = 12.8 kPa and vapour pressure of toluene = 3.85 kPa). **[1]**

(a) Equal amount of benzene and toluene as it forms an ideal solution

(b) Unequal amount of benzene and toluene as it forms a non-ideal solution

(c) Higher percentage of benzene

(d) Higher percentage of toluene

Q7. Identify the law which is stated as:

"For any solution, the partial vapour pressure of each volatile component in the solution is directly proportional to its mole fraction." **[1]**

(a) Henry's law (b) Raoult's law

(c) Dalton's law (d) Gay-Lussac's Law

Q8. Which reagents are required for one step conversion of chlorobenzene to toluene? **[1]**

(a) CH_3Cl / $AlCl_3$ (b) CH_3Cl, Na, Dry ether

(c) CH_3Cl/Fe dark (d) $NaNO_2$/HCl/0-5°C

Q9. Major product obtained on reaction of 3-Phenyl propene with HBr in presence of organic peroxide **[1]**

(a) 3-Phenyl-1-bromopropane (b) 1-Phenyl-3-bromopropane

(c) 1-Phenyl-2-bromopropane (d) 3-Phenyl-2-bromopropane

Q10. Which of the following is a diamagnetic ion? (Atomic numbers of Sc, V, Mn and Cu are 21, 23, 25 and 29 respectively) **[1]**

(a) V^{2+} (b) Sc^{3+}

(c) Cu^{2+} (d) Mn^{3+}

Q11. In which of the following cases blood cells will shrink? **[1]**

(a) When placed in water containing more than 0.9% (mass/volume) NaCl solution

(b) When placed in water containing less than 0.9% (mass/volume) NaCl solution

(c) When placed in water containing 0.9% (mass/volume) NaCl solution

(d) When placed in distilled water

Q12. In which set, each ion can exhibit specific colour? (Atomic number of Sc = 21, Ti = 22, V = 23, Mn = 25, Fe = 26, Ni = 28, Cu = 29 and Zn = 30 **[1]**

(a) Sc^{3+}, Ti^{4+}, Mn^{3+} (b) Sc^{3+}, Zn^{2+}, Ni^{2+}

(c) V^{3+}, V^{2+}, Fe^{3+} (d) Ti^{3+}, Ti^{4+}, Ni^{2+}

Q13. **Assertion:** The two strands of DNA are complementary to each other. **[1]**

Reason: The hydrogen bonds are formed between specific pairs of bases.

(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

(c) Assertion is correct statement but reason is wrong statement.

(d) Assertion is wrong statement but reason is correct statement.

Q14. **Assertion:** Aquatic species are more comfortable in cold water rather than in warm water. **[1]**

Reason: Different gases have different K_H values at the same temperature.

(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

(c) Assertion is correct statement but reason is wrong statement.

(d) Assertion is wrong statement but reason is correct statement.

Q15. **Assertion:** Carboxylic acids are more acidic than phenols. **[1]**

Reason: Phenols are ortho and para directing.

(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

(c) Assertion is correct statement but reason is wrong statement.

(d) Assertion is wrong statement but reason is correct statement.

Q16. Given below are two statements labelled as Assertion (A) and Reason (R)

Assertion (A): Molarity of a solution changes with temperature.

Reason (R): Molarity is a colligative property. **[1]**

Select the most appropriate answer from the options given below.

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

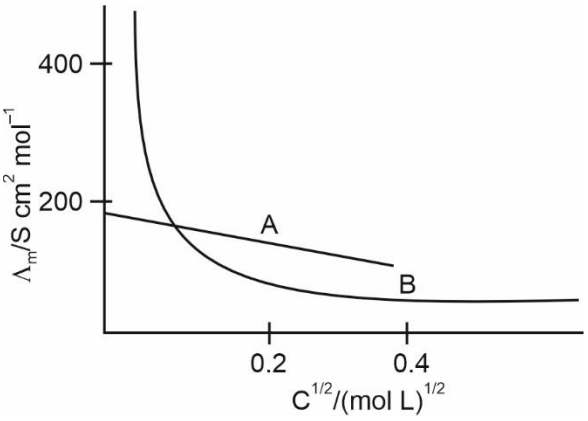
(c) A is true but R is false.

(d) A is false but R is true.

SECTION-B

This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.

Q17. The following curve is obtained when molar conductivity (Λ_m) is plotted against the square root of concentration, $C^{1/2}$ for two electrolytes A and B.



(a) How do you account for the increase in the molar conductivity of the electrolyte A on dilution? **[1]**

(b) As seen from the graph, the value of limiting molar conductivity (Λ°_m) for electrolyte B cannot be obtained graphically. How can this value be obtained? **[1]**

Q18. (a) Predict the major product of acid catalysed dehydration of 1-Methylcyclohexanol. **[1]**

(b) You are given benzene, conc.H_2SO_4, NaOH and dil. HCl. Write the preparation of phenol using these reagents. **[1]**

Q19. For a reaction the rate law expression is represented as follows:

$$\text{Rate} = k\,[A][B]^{1/2}$$

(i) Interpret whether the reaction is elementary or complex. Give reason to support your answer. **[1]**

(ii) Write the units of rate constant for this reaction if concentration of A and B is expressed in mol/L. **[1]**

OR

The following results have been obtained during the kinetic studies of the reaction: **[2]**

$P + 2Q \rightarrow R + 2S$

Exp.	Initial P (mol/L)	Initial Q (mol/L)	Initial Rate of Formation of R ($M\ min^{-1}$)
1	0.10	0.10	3.0×10^{-4}
2	0.30	0.30	9.0×10^{-4}
3	0.10	0.30	3.0×10^{-4}
4	0.20	0.40	6.0×10^{-4}

Determine the rate law expression for the reaction.

Q20. Name the following:

(a) A transition metal which does not exhibit variation in oxidation state in its compounds. **[½]**

(b) A compound where the transition metal is in the +7 oxidation state. **[½]**

(c) A member of the lanthanoid series which is well known to exhibit +4 oxidation state. **[½]**

(d) Ore used in the preparation of potassium dichromate. **[½]**

Q21. The following haloalkanes are hydrolysed in presence of aq. KOH. **[2]**

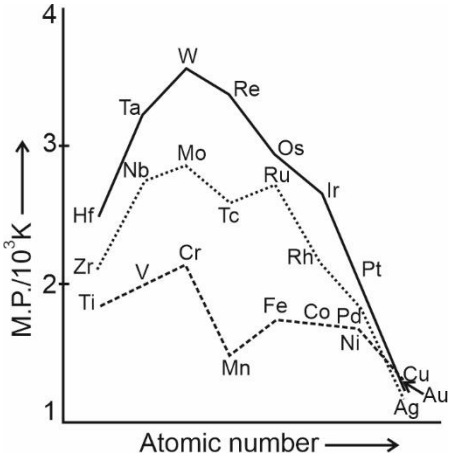
(i) 2-Chlorobutane (ii) 2-chloro-2-methylpropane

Which of the above is most likely to give a racemic mixture? Justify your answer.

SECTION-C

This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.

Q22. On the basis of the figure given below, answer the following questions:



(a) Why manganese has lower melting point than chromium? **[1]**

(b) Why do transition metals of 3d series have lower melting points as compared to 4*d* series? **[1]**

(c) In the third transition series, identify and name the metal with the highest melting point. **[1]**

Q23. Represent the cell in which the following reaction takes place. The value of E° for the cell is 1.260 V. What is the value of E_{cell}? **[3]**

$2Al(s) + 3Cd^{2+}(0.1\ M) \rightarrow 3Cd\ (s) + 2Al^{3+}\ (0.01\ M)$

Q24. Answer the following questions:

(a) $[Ni(H_2O)_6]^{2+}$ (aq) is green in colour whereas $[Ni(H_2O)_4(en)]^{2+}$(aq) is blue in colour explain. Give reason in support of your answer. **[1]**

(b) Write the formula and hybridization of metal atom in the following compound: **[2]**

tris(ethane-1,2-diamine) cobalt(III) sulphate

OR

In a coordination entity, the electronic configuration of the central metal ion is $t_{2g}^3 e_g^1$

(a) Is the coordination compound a high spin or low spin complex? **[1]**

(b) Draw the crystal field splitting diagram for the above complex. **[2]**

Q25. (i) For M^{2+}/M and M^{3+}/M^{2+} systems, E° values for some metals are as follows:

$Cr^{2+}/Cr = -0.9$ V $\quad Cr^{3+}/Cr^{2+} = -0.4$ V

$Mn^{2+}/Mn = -1.2$ V $\quad Mn^{3+}/Mn^{2+} = +1.5$ V

$Fe^{2+}/Fe = -0.4$ V $\quad Fe^{3+}/Fe^{2+} = +0.8$ V

Use this data to comment upon

(a) The stability of Fe^{3+} in acid solution as compared to that of Cr^{3+} and Mn^{3+}. **[1]**

(b) The ease with which iron can be oxidised as compared to the similar process for either Cr or Mn metals. **[1]**

(ii) What can be inferred from the magnetic moment of the complex $K_4[Mn(CN)_6]$ magnetic moment: 2.2 BM? **[1]**

Q26. An alkene 'A' (Molecular formula C_5H_{10}) on ozonolysis gives a mixture of two compounds 'B' and 'C'. Compound 'B' gives positive Fehling's test and also forms iodoform on treatment with I_2 and NaOH. Compound 'C' does not give Fehling's test but forms iodoform. Identify the compounds A, B and C. Write the reaction for ozonolysis and formation of iodoform from B and C. **[3]**

Q27. (a) A non-reducing disaccharide 'A' on hydrolysis with dilute acid gives an equimolar mixture of D-(+) glucose and D-(-)-Fructose. **[2]**

$$\underset{[\alpha]_D = +66.5^\circ}{A} + H_2O \xrightarrow{HCl} \underset{+52.5^\circ}{C_6H_{12}O_6} + \underset{-92.4^\circ}{C_6H_{12}O_6}$$

Identify A. What is the mixture of D-(+)-glucose and D-(-)-fructose known as?

Name the linkage that holds the two units in the disaccharide.

(b) α-amino acids have relatively higher melting points than the corresponding halo acids. Explain. **[1]**

Q28. Give the structures of A, B and C in the following reactions:

(a) $C_6H_5NO_2 \xrightarrow{Fe/HCl} A \xrightarrow{HNO_2;\ 273\ K} B \xrightarrow{C_6H_5OH} C$ **[1½]**

(b) $C_6H_5N_2Cl \xrightarrow{CuCN} A \xrightarrow{H_2O/H^+} B \xrightarrow{NH_3;\ \Delta} C$ **[1½]**

SECTION-D

The following questions are case-based questions. Each question has an internal choice and carries 4 (1+1+2) marks each. Read the passage carefully and answer the questions that follow.

Q29. Read the following text carefully and answer the questions that follow:

Aarav Sharma is very fond of a special drink made by his grandmother using different fruits available in their hometown. It has an outstanding taste and also provide great health benefits of natural fruits. He thought of utilizing his grandmother recipe to create a new product in the beverage market that provide health benefits and also contain fizziness of various soft drinks available in the market.

(i) How he can add fizz to the special drink made by his grandmother? **[1]**

(ii) What is the law stated in the chapter that can help Aarav to make his drink fizzy? **[1]**

(iii) What precautions he should take while bottling so that his product does not lose fizz during storage and handling across long distance? **[2]**

OR

The mole fraction of helium in a saturated solution at 20°C is 1.2×10^{-6}. Find the pressure of helium above the solution. Given, Henry's constant at 20°C is 144.97 kbar.

Q30. Read the following text carefully and answer the questions that follow:

Many chemical and biological processes depend on osmosis, the selective passage of solvent molecules through the porous membrane from a dilute solution to a more concentrated one. The osmotic pressure π depends on molar concentration of the solution (π = CRT). If two solutions are of equal solute concentration and, hence, have the same osmotic pressure, they are said to be isotonic. If two solutions are of unequal osmotic pressures, the more concentrated solution is said to be hypertonic and the more diluted solution is described as hypotonic. Osmosis is the major mechanism, for transporting water upward in the plants. Transpiration in the leaves supports the transport mechanism of water. The osmotic pressure of seawater is about 30 atm; this is the pressure that must be applied to the seawater (separated from pure water using a semi-permeable membrane) to get drinking water.

(i) What will happen if a plant cell is kept in a hypertonic solution? **[1]**

(ii) Blood cells are isotonic with 0.9% sodium chloride solution. What happens if we place blood cells in a solution containing 1.2% sodium chloride solution? **[1]**

(iii) What happens when the external pressure applied becomes more than the osmotic pressure of solution? **[2]**

OR

Which mechanisms helps in the transportation of water in a plant?

SECTION-E

The following questions are long answer types and carry 5 marks each. All questions have an internal choice.

Q31. (a) Write the rate law for a first order reaction. Justify the statement that half-life for a first order reaction is independent of the initial concentration of the reactant. **[2½]**

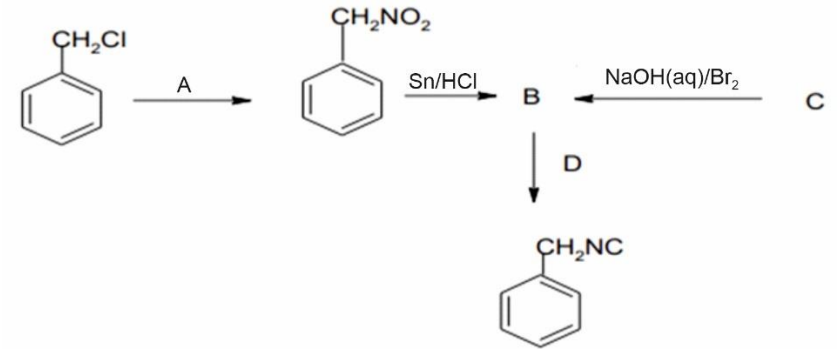
(b) For a first order reaction, show that the time required for 99% completion of a first order reaction is twice the time required for the completion of 90%. **[2½]**

OR

(a) For the reaction $A \rightarrow B$, the rate of reaction becomes twenty seven times when the concentration of A is increased three times. What is the order of the reaction? **[2]**

(b) The activation energy of a reaction is 75.2 kJ mol^{-1} in the absence of a catalyst and it lowers to 50.14 kJ mol^{-1} with a catalyst. How many times will the rate of reaction grow in the presence of a catalyst if the reaction proceeds at 25°C? **[3]**

Q32. (a) Identify A to D. **[2]**



(b) Distinguish between the following pair of compounds: **[2]**

(i) Aniline and Benzylamine.

(ii) Methylamine and Dimethylamine.

(c) Complete the following: **[1]**

$$CH_3CH_2CN \xrightarrow{LiAlH_4} A \xrightarrow{0°C/HNO_2} B$$

OR

(a) Account for the following: **[2]**

(i) Direct nitration of aniline yields significant amount of meta derivative.

(ii) Primary aromatic amines, cannot be prepared by Gabriel phthalimide synthesis.

(b) Carry out the following conversions: **[2]**

(i) Ethanoic acid into methanamine.

(ii) Aniline to p-Bromoaniline.

(c) Arrange the following in increasing order of basic strength. **[1]**

Aniline, p-nitroaniline and p-toludine.

Q33. (a) When a chromite ore (A), is fused with an aqueous solution of sodium carbonate in free excess of air, a yellow solution of compound (B) is obtained. This solution is filtered and acidified with sulphuric acid to form compound (C). Compound (C) on treatment with solution of KCl gives orange crystals of compound (D). Write the chemical formulae of compounds A to D. **[2]**

(b) Describe the cause of the following variations with respect to lanthanoids and actinoids: **[3]**

(i) Greater range of oxidation states of actinoids as compared to lanthanoids.

(ii) Greater actinoid contraction as compared to lanthanoid contraction.

(iii) Lower ionisation enthalpy of early actinoids as compared to the early lanthanoids.

OR

(a) What happens when **[2]**

(i) Manganate ions (MnO_4^{2-}) undergoes disproportionation reaction in acidic medium?

(ii) Lanthanum is heated with Sulphur?

(b) Explain the following trends in the properties of the members of the First series of transition elements: **[3]**

(i) $E°\ (M^{2+}/M)$ value for copper is positive (+0.34 V), in contrast to the other members of the series.

(ii) Cr^{2+} is reducing while Mn^{3+} is oxidising, though both have d^4 configuration.

(iii) The oxidising power in the series increases in the order $VO_2^+ < Cr_2O_7^{2-} < MnO_4^-$.

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