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Candidates must write the Code on the title page of the answer book.

- Please check that this question paper contains 12 printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains 33 questions.
- Please write down the Serial Number of the question before attempting it.
- 15 minute time has been allotted to read this question paper. The students will read the question paper only and will not write any answer on the answer-book during this period.

I-PRE BOARD EXAMINATION

CHEMISTRY (THEORY)

Time allowed : 3 hours

Maximum Marks : 70

General Instructions :

- All questions are compulsory.*
- There are 33 questions in this questions paper.*
- Section A: Q. no. 1 to 2 are case based questions having four MCQ or Reason Assertion type based on given passage each carrying one mark.*
- Section A: Q. no. 3 to 16 are MCQs and reason assertion type questions carrying one mark each.*
- Section B: Q. no. 17 to 25 are short answer questions and carry 2 marks each.*
- Section C: Q. no. 26 to 30 are short answer questions and carry 3 marks each.*
- Section D: Q. no. 31 to 33 are long answer questions carrying 5 marks each.*
- There is no overall choice. However an internal choices have been provided.*
- Use of calculators and log tables is not permitted.*

SECTION - A

(Objective type)

Read the passage given below and answer the following questions :

Primary and secondary alcohols can be prepared by reduction of aldehydes and ketones. These are also called carbonyl compounds. Carbonyl compounds are reduced to corresponding alcohols by catalytic hydrogenation, such as finely divided platinum palladium, nickel etc. they can also reduced to corresponding alcohols by complex metal hydrides such as lithium aluminium hydride (Li AlH_4). Alcohols can also be prepared

by hydration of alkenes. The hydration of alkenes can be carried out either indirectly or directly. In the indirect process alkenes are passed through conc. H_2SO_4 to form alkyl hydrogensulphates. These upon hydrolysis with boiling water give alcohols. In case of unsymmetrical alkenes Markounikov's rule is applied.

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

- i) When propanone is reduced with NaBH_4 the alcohol formed : 1
- a) Primary
 - b) Secondary
 - c) Tertiary
 - d) All
- ii) The tertiary alcohol can be obtained by hydration of: 1
- a) 2-methyl prop-1-ene
 - b) Propene
 - c) But-1-ene
 - d) but-2-ene

OR

Which of the following is a secondary allylic alcohol ?

- a) but-3-en-2-ol
- b) but-2-en-2-ol
- c) Prop-2-enol
- d) Butan-2-ol

iii) Propanal on reduction with Pt by addition of H_2 gas gives a compound 'A' which on reaction with $KMnO_4$ in the presence of acidic medium gives compound 'B'. Compounds 'A' and 'B' are :-

1

- a) Propanol and Propanoic acid
- b) Isopropyl alcohol and propanoic acid
- c) Ethanol and Ethanoic acid
- d) Propanone and propanoic acid

iv) An organic compound 'X' with molecular formula C_4H_8 on hydration in the presence of conc. H_2SO_4 gives compound 'B'. What is the IUPAC name of the compound 'B' ?

1

- a) 3-methyl propanol
- b) 2-methyl propan-2-ol
- c) Butan-1-ol
- d) Butan-2-ol

2. Read the passage given below and answer the following questions :

The amount of moisture that leather adsorbs or loses is determined by temperature, relative humidity, degree of porosity and the size of the pores. Moisture has great practical significance because its amount affects the durability of leather and in articles such as shoes, gloves and other garments, the comfort of the wearer. High moisture content accelerates deterioration and promotes mildew action. On the other hand, a minimum amount of moisture is required to keep leather properly lubricated and thus prevent cracking.

The study indicates that adsorption of moisture by leather is a multi-molecular process and is accompanied by low enthalpies of adsorption. Further 75% relative humidity the adsorption is a function of surface area alone. Untanned hide and chrome tanned leathers have the largest surface areas. the leather tanned with the vegetable tanning materials have smaller surface areas since they are composed of less hide substance and the capillaries are reduced to smaller diameters in some cases probably completely filled by tanning material.

This process of tanning occurs due to mutual coagulation of positively charged hide with negatively charged tanning material. The result of the study indicated that untanned hide and chrome -tanned leather adsorb the most water vapour.

In these questions a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

- a) Assertion and reason both are correct statement and reason is correct explanation for assertion.
- b) Assertion and reason both are correct statement and 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.
- i) Assertion: Vegetable tanned leather can not adsorb a large amount of moisture. 1
Reason : Porous materials have higher surface area.
- ii) Assertion: Animal hide soaked in tannin results in hardening of leather. 1
Reason : Tanning occurs due to mutual coagulation.
- iii) Assertion: Adsorption of moisture by leather is physisorption. 1
Reason : It is a multimolecular process and is accompanied by low enthalpies of adsorption

- iv) Assertion: The vegetable tanning materials have smaller surface areas. 1
Reason : The capillaries present in leather are reduced to smaller diameters.

OR

- Assertion: Leather adsorbs different amount of moisture.
Reason : Some moisture is necessary to prevent cracking of leather.

Following questions (No. 3-11) are multiple choice questions carrying one mark each.:

3. Which of the following defects is also known as dislocation defect. 1
a) Frenkel defect
b) Schottky defect
c) Non-stoichiometric defect
d) Simple interstitial defect.
4. Highest boiling point is found in : 1
a) 0.1 M NaCl
b) 0.1 M BaCl₂
c) 0.1 M Sucrose
d) 0.1 M KCl
5. The total number of tetrahedral voids in the face centred unit cell is : 1
a) 6 b) 8 c) 10 d) 12
6. The electrochemical cell stops working after some times because :- 1
a) Electrode potential of both the electrodes becomes zero
b) Electrode potential of both the electrodes becomes equal.
c) One of the electrodes is eaten away.
d) The cell reaction gets reversed.

7. The mole fraction of the solute in one molal aqueous solution is : 1
- a) 0.027 b) 0.036 c) 0.018 d) 0.009

OR

Which will form maximum boiling azeotrope?

- a) $\text{HNO}_3 + \text{H}_2\text{O}$ solution
b) $\text{C}_2\text{H}_5\text{OH} + \text{H}_2\text{O}$ solution
c) $\text{C}_6\text{H}_6 + \text{C}_6\text{H}_5\text{CH}_3$ solution
d) None of these
8. Which of the following is the reason for zinc not showing variable oxidation state: 1
- a) Inert pair effect
b) Completely filled 3d-subshell
c) Completely filled 4s. subshell
d) Common ion effect

OR

Which of the following is a diamagnetic ion (atomic numbers of Sc, V, Mn and Cu are 21, 23, 25 and 29 respectively)

- a) V^{2+}
b) Sc^{3+}
c) Cu^{2+}
d) Mn^{3+}
9. Ambidentate ligands like NO_2^- and SCN^- are : 1
- a) Unidentate
b) Didentate
c) Polydentate
d) Has variable denticity

OR

The formula of the coordination compound tetra ammineaquachlorido cobalt (III) chloride is :

- a) $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})\text{Cl}]\text{Cl}_2$
- b) $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})\text{Cl}]\text{Cl}_3$
- c) $[\text{Co}(\text{NH}_3)_2(\text{H}_2\text{O})\text{Cl}]\text{Cl}_2$
- d) $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})\text{Cl}]\text{Cl}$

10. The reagent which doesnot react with both acetone and benzaldehyde is : 1

- a) Sodium hydrogensulphite
- b) Phenyl hydrazine
- c) Fehling's solution
- d) Grignard reagent

11. Propanamide on reaction with Br_2 inaqueous NaOH gives : 1

- a) Propanamine
- b) Ethanamine
- c) N-Methyl ethanamine
- d) Propane nitrile

OR

IUPAC name of product formed by reaction of CH_3NH_2 with two moles of $\text{C}_2\text{H}_5\text{Cl}$:

- a) N, N-Dimethylethanamine
- b) N, N-Diethyl methanamine
- c) N-Methyl ethanamine
- d) N-Ethyl, N-Methyl ethanamine

In the following questions (Q. No. 12-16) a statement of assertion followed by a statement of reason is given. Choose the correct answer of the following choices.

- 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.
12. **Assertion :** Acetic acid is stronger than formic acid. 1
Reason : In acetic acid the electron releasing methyl group makes it difficult to break the O-H bond.
13. **Assertion :** Conductivity of an electrolyte decreases with decrease in concentration. 1
Reason : Number of ions per unit volume increases on dilution.
14. **Assertion :** $[\text{Pt}(\text{en})_2\text{Cl}_2]^{2+}$ complex is less stable than $[\text{Pt}(\text{NH}_3)_4\text{Cl}_2]^{2+}$ complex. 1
Reason : $[\text{Pt}(\text{NH}_3)_4\text{Cl}_2]^{2+}$ complex shows chelate effect.
15. **Assertion :** Phenol is more acidic than p-methylphenol 1
Reason : The presence of an electron releasing group in p-methylphenol makes it less acidic.
16. **Assertion :** Osmotic pressure is a colligative property. 1
Reason : Osmotic pressure is directly proportional to molarity.

SECTION - B

The following questions Q. No. 17-25 are short answer type and carry 2 marks each.

17. In the given reaction $\text{A} + 2\text{B} \rightarrow 2\text{C}$ the rate of formation of C is $2.5 \times 10^{-4} \text{ mole L}^{-1}\text{S}^{-1}$ calculate the (i) rate of reaction (ii) rate of disappearance of B. 2
18. Write the IUPAC name and hybridisation of the complex $[\text{CoF}_6]^{3-}$ 2
[Given at no. of Co=27]

OR

$[\text{NiCl}_4]^{2-}$ is paramagnetic while $[\text{Ni}(\text{CO})_4]$ is diamagnetic though both are tetrahedral, why ?

19. Write two differences between physisorption and chemisorption. 2

OR

Define the following terms with suitable example each :

- i) Associated colloid
 - ii) Lyophilic colloid
20. Write the IUPAC names of the following coordination compounds : 2
- i) $[\text{Cr}(\text{en})_3]\text{Cl}_3$
 - ii) $[\text{Pt}(\text{NH}_3)_2\text{Cl}(\text{NH}_2\text{CH}_3)]\text{Cl}$
21. A solution is obtained by mixing 300 g of 25% solution and 400 g of 40% solution by mass. Calculate the mass percentage of the resulting solution. 2

OR

An aqueous solution of 2% non-volatile solute exerts a pressure of 1.004 bar at the normal boiling point of the solvent. What is the molar mass of the solute.

22. How will you convert : 2
- i) Ethanoic acid to methanamine
 - ii) benzoic acid to benzaldehyde
23. Give a simple chemical test to distinguish between the following : 2
- i) Acetophenone and Benzophenone
 - ii) Ethanal and Benzaldehyde
24. Write the mechanism of hydration of ethene to form ethanol. 2
25. Explain the following reactions : 2
- i) Cannizzaro reaction
 - ii) Wolff-Kishnor reduction

SECTION - C

Q. No. 26-30 are short-answer type II carrying 3 marks each.

26. Give reasons :

3

- i) Pentahalides of phosphorus are more covalent than trihalides.
- ii) Dioxygen is a gas but sulphur a solid
- iii) White phosphorus is kept in water.

27. The conductivity of 0.20 M solution of KCl at 298 K is 0.0248 S cm^{-1} . Calculate its molar conductivity.

3

OR

The resistance of a conductivity cell containing 0.001 M KCl solution at 298 K is 1500 Ohm. What is the cell constant if conductivity of 0.001 M KCl solution at 298 is $0.146 \times 10^{-3} \text{ S cm}^{-1}$.

28. Explain the following reactions :

3

- i) Rosenmund reduction
- ii) Kolbe's reaction
- iii) HVZ reaction

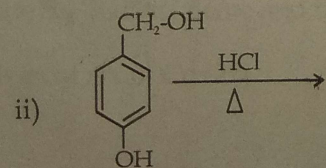
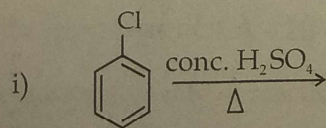
29. A first order reaction is 40% complete in 80 minute. Calculate the value of rate constant (k). In what time will the reaction be 90% completed.

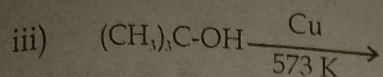
[Give $\log 2=0.3010$, $\log 3=0.4771$, $\log 4=0.6021$, $\log 5=0.6771$, $\log 6=0.7782$]

3

30. Write the major products of the following reactions :

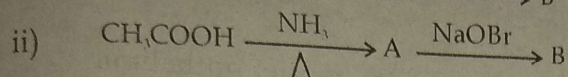
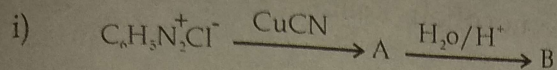
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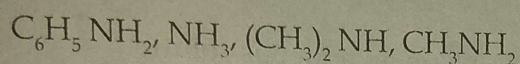


OR

Write the structures of A and B in the following reactions :



iii) Arrange in increasing order of basic strength :



SECTION-D

Q. No. 31 to 33 are long answer type carrying 5 marks each.

31. a) Give reasons :

3

i) Helium does not form compounds like xenon.

ii) HClO_4 is a stronger acid than HOCl

iii) Nitrogen does not form pentahalide.

b) Write one reaction as an example of each to show that conc. H_2SO_4 acts as :

i) an oxidising agent

ii) a dehydrating agent

OR

a) Account for the following :

i) Hydration enthalpy of F^- ion is more than Cl^- ion. 1

ii) SO_2 is a reducing agent whereas TeO_2 is an oxidising agent in group-16 oxides. 1

b) Write the reaction of F_2 with water, why does I_2 not react with water? 2

c) Draw the structure of XeF_2 1

32. a) If the radius of the octahedral void is r and radius of the atoms in close-packing is R derive relation between r and R . 2

b) Write difference between Frenkel and Schottky defect. 3

OR

- a) Silver crystallises in fcc Lattice. If edge length of the cell is 4.077×10^{-8} cm and density is 10.5 gm cm^{-3} calculate the atomic mass of silver. 2
- b) Write difference between crystalline and amorphous solids 3
33. a) Give reasons : 3
- i) Aromatic primary amines can not be prepared by gabriel phthalimide synthesis. 3
- ii) $(\text{CH}_3)_2\text{NH}$ is more basic than $(\text{CH}_3)_3\text{N}$ in an aqueous solution.
- iii) Ammonolysis of alkyl halides is not a good method to prepare pure primary amines.
- b) Distinguish between the following : 2
- i) $\text{CH}_3\text{CH}_2\text{NH}_2$ and $(\text{CH}_3\text{CH}_2)_2\text{NH}$
- ii) $\text{C}_6\text{H}_5\text{NH}_2$ and CH_3NH_2

OR

- a) Complete the following reactions : 3
- i) $\text{C}_6\text{H}_5\text{NH}_2 + \text{CHCl}_3 + \text{alc-KOH} \rightarrow$
- ii) $\text{C}_6\text{H}_5\text{NH}_2 + \text{Br}_2 (\text{aq}) \rightarrow$
- iii) $\text{C}_6\text{H}_5\text{N}_2\text{Cl} + \text{H}_3\text{PO}_2 + \text{H}_2\text{O} \rightarrow$
- b) Write the chemical reaction of CH_3NH_2 with benzoylchloride and write the IUPAC name of the product obtained. 1
- c) Why pK_b value of aniline is larger than ammonia. 1

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