Marks : 70 **Time : 3 Hrs**

General Instructions:

1. Sections A: Q. No. 1 contains **10** multiple choice questions carrying **one mark** each
Q. No. 2 contains **8** very short answer type questions carrying **one mark** each
2. **Section B:** Q. No. 3 to Q. No. 14 are **12** short answer-I type questions **carrying two marks** each. Attempt any **eight** questions.
3. Section C: Q. No. 15 to Q. No. 26 are **12** short answer-II type questions carrying **three marks** each. Attempt any **eight** questions.
4. Section D: Q. No 27 to Q. No. 31 are **5** long answer type questions carrying **four mark** Attempt any **three** questions.

SECTION A

Q.1. Select and write correct answer: 10.

1. p-type semi-conductor is formed when trace amount of impurity is added to silicon. The number of valence electrons in the impurity atom must be
(a) 3 (b) 5 (c) 1 (d) 2

2. Nylon -6, 6- polymer is represented as ……

(a) $_n\left[NH-(CH_2)_5-CO\right]$

(b) $-NH-(CH_2)_5-CO-$

(c) $\left[\begin{matrix}O\\ \|\\ C-(CH_2)_5-NH\end{matrix}\right]_n$

(d) $\left[\begin{matrix}O\\ \|\\ C-(CH_2)_8-NH\end{matrix}\right]_n$

3. 2-pentanone and 3-Methylbutan -2-one are
(a) Optical isomers (b) Geometrical isomers (c) Metamers (d) Tautomers

4. The optically inactive compound is …….
(a) Glucose (b) Lactic acid (c) 2-chlorobutane (d) 2-chloropropane

5. Among the following the strongest base is
(a) $C_6H_5NH_2$ (b) $p-NO_2-C_6H_4NH_2$
(c) $m-NO_2-C_6H_4NH_2$ (d) $C_6H_4(NH_2)_2$

6. The following solutions requires three moles of $AgNO_3$, for the complete precipitation of all the chloride ions present in it
(a) One litre of 1M [Co $(NH_3)_6]\ C\ell_3$ (b) Three litres of 1 M [Co $(NH_3)_4\ C\ell_2]$ Cl
(c) One litre of 1.5 M [Co $(NH_3)_5$,CI]$C\ell_2$ (d) All the above

7. In the electrolysis of molten $A\ell_2O_3$ with inert electrodes
(a) Al is oxidized at anode to $A\ell^{3+}$ (b) O_2, gas is produced at anode
(c) O_2 is reduced at cathode (d) O_2 is oxidized at anode

8. The amount of work done, when 20×10^{-3} kg of Argon (Mol. wt. = 40) expands reversibly from a pressure of 10 atm. to 1 atm. at a temperature, t°C is
(a) $-\frac{2.303R(273+t)}{2} \times 10^{-3}$ (b) $+\frac{2.303R(273+t)\log 0.1}{2} \times 10^{-3}$
(c) $+\frac{2.303Rt}{2}$ (d) $-\frac{2.303R(273+t)}{2}$

9. If mass is expressed in gram then Kb is given by

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(a) $\frac{M_2\Delta T_b \times W_1}{1000 \times W_2}$ (b) $\frac{W_2}{\Delta T_b \times W_1 \times M_2} \times 10000$

(c) $\frac{M_2\Delta T_b \times W_2}{1000 \times W_1}$ (d) $\frac{W_2}{\Delta T_b \times W_1 \times M_2} \times 1000$

10. Which of the following is not acid-base conjugate pair?

(a) HNO_2, NO_2^- $(b) CH_3NH_3^+, CH_3NH_2$

(c) $C_6H_5COOH, C_6H_5COO^-$ (d) H_3O^+, OH^-

Q.2 Answer the following 8.

1. CsCℓ crystallizes in cubic unit with $C\ell^-$at corners and Cs^+at the centre of the cube. How many CsCℓ molecules are there in each unit cell?

2. What are carbohydrates?

OR

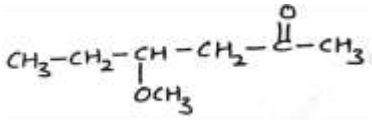
Define carbohydrates

3. Find out the EAN of the following compounds.

(i) $[Zn(NH_3)_4]^{+2}$ (ii) $[Fe(CN)_6]^{-4}$

4. Give uses of $KMnO_4$

5. Give IUPAC name of



6. A reaction takes place in two steps.

(i) $NO_{(g)} + C\ell_{2(g)} \rightarrow NOC\ell_{2(g)}$

(ii) $NOC\ell_{2(g)} + NO_{(g)} \rightarrow 2NOC\ell_{(g)}$

Identify reaction intermediate

What is the molecularity of each step?

7. How will you lower the vapour pressure of a solution?

8. What is standard state of substance?

SECTION B

Attempt any eight 16.

Q.3. Give physical properties of HCℓ.

Q.4. Give classification of ether.

Q.5. Give the structures of the following compounds:

3-Bromo-2-methylpentane

2-Bromo-3-ethyl-2-methylhexane

Q.6. Name the factors governing the equilibrium constants of the coordination compounds.

Q.7. A certain reaction occurs in the following steps

(i) $C\ell_{(g)} + O_{3(g)} \rightarrow C\ell O_{(g)} + O_{2(g)}$

(ii) $C\ell O_{(g)} + O_{(g)} \rightarrow C\ell_{(g)} + O_{2(g)}$

(a) What is the reaction molecularity of each of elementary steps?

(d) Identify the reaction intermediate and write the chemical equation for overall reaction.

Q.8. Which of the following solution will have higher freezing point depression and why?

a. 0.1 molal NaCl b. 0.05 molal $A\ell_2(SO_4)_3$

Q.9. How is hardness of water removed?

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Q.10. Give reasons:
(i) The dissolution of ammonium chloride in water is endothermic still it dissolves in water.
(ii) A real crystal has more entropy than an ideal crystal

Q.11. Which species in each of the following pairs is better reducing agent under standard state conditions? E° values are given. Give reasons for your answer:
(i) $K_{(s)}$ (−2.93 V) or $Mg_{(s)}$ (−2.36 V)
(ii) $Co^{2+}_{(aq)}$(1.81 V) or $In_{(s)}$ (−0.14 V)

Q.12. Give some examples of reaction where transition metals are used as catalysts.

Q.13. Calculate $\Delta_r H^\circ$ of the reaction $CH_{4(g)} + O_{2(g)} \rightarrow CO_2 + H_2O_{(g)}$
From the following data.

Bond	C-H	O=O	C=O	O – H
ΔH° /kJ mol^{-1}	414	499	745	464

Q.14. Why freezing point of solvent is lowered by dissolving a non-volatile solute into it?

SECTION C

Attempt any eight 24.

Q.15. Identify A, B and C and write the complete balanced reaction.
Phthallic acid $\xrightarrow{NH_3} A \xrightarrow{\Delta} B \xrightarrow{-NH_3} C$

Q.16. What happens when glucose is treated with (i) Bromine water (ii) Dilute nitric acid

Q.17. Write a note on p-type semiconductor.

OR

Explain p-type semiconductor using an example.

Q.18. Give action of hot and dilute sulphuric acid on
(1) Ethoxy ethane (2) Methoxy benzene
(3) 2-Methoxy propane

Q.19. Convert the following.
(1) Benzyl alcohol to benzyl cyanide
(2) Tert-butyl bromide to isobutyl bromine
(3) Aniline to chlorobenzene

Q.20. Explain in brief, the trends in atomic and ionic radii of the transition series.

Q.21. Arrange the following compounds in the decreasing order of their solubility in water.
Ethylamine, diethylamine and triethylamine.
Ethylamine, n-propylamine and n-butylamine.
N-butane, n-butyl alcohol and n-butylamine.

Q.22. Discuss structure and shape of
(i) ICℓ (ii) ClF_3 (iii) BrF_3 (iv) BrF_5

Q.23. What are the units of rate constant of first order reaction?

Q.24 Write a note on buffer action of an acidic buffer.

Q.25 Calculate ΔH° from the following data for the reaction $2C\ell F_{3(g)} + O_{2(g)} \rightarrow C\ell_2O_{(g)} + OF_{2(g)}$ Given the following data
$F_{2(g)} + C\ell F_{(g)} \rightarrow C\ell F_{3(l)}$ ΔH°= -139.2kJ

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$CIF_{3(l)} + 2O_{2(g)} \rightarrow CI_2O_{(g)} + 3OF_{2(g)}$ ΔH°= +533.4kJ

$F_{2(g)} + \frac{1}{2}O_{2(g)} \rightarrow OF_{2(g)}$ ΔH°= +24.7kJ

Q.26 Explain the mechanism of preparation of L.D.P.?

SECTION D

Attempt any three: 12

Q.27 (i) Define the terms:
Reference electrode
Standard hydrogen electrode
(ii) Write the cell reaction and calculate the emf of the cell.
$Pb_{(s)}|Pb^{2+}(1M)||KCI_{(set)}||Hg_2CI_{2(s)}|Hg$
E^0anode = - 0.126 V, E^0cathode = 0.242V.
Identify anode and cathode. Name the right hand side electrode.

Q.28. (i) How will you prepare propan-1-amine from (1) Propane nitrile (2) 1-nitropropane
(3) Propanamide
(ii) Explain Hoffmann's carbylamines test/Isocyanides test.

OR

Write short on the following :
Carbylamines reaction.

Q.29. (i) Write a note on stephen's reaction.
(ii) Write application of nanomaterials.

Q.30. (i) Fill in the blank and rewrite the balanced equation

$CH_3COOH + thionyl\ chloride \xrightarrow{\Delta} \ldots\ldots\ldots\ldots\ldots + \cdots\ldots\ldots\ldots$

$CH_3 - CH_2 - COOH + \cdots\ldots\ldots \xrightarrow{\Delta} \ldots\ldots + \cdots\ldots\ldots + H_3PO_3$

$C_6H_5COOH + \cdots \xrightarrow{\Delta} \ldots\ldots\ldots + Phosphorous\ oxychloride + HCI$

$CH_3 - COOH + phosphorous\ trichloride \xrightarrow{\Delta}$

$CH_3 - COOH \overset{NH_3}{\rightleftharpoons} \ldots\ldots\ldots \xrightarrow{\Delta} \ldots\ldots$

$\ldots\ldots \overset{NH_3}{\rightleftharpoons} \ldots\ldots\ldots \xrightarrow{\Delta} C_6H_5CONH_2$

(ii) Identify 'A' and 'B' in the following conversions

$CH_3 - I \xrightarrow{KCN} A \xrightarrow{Na/C_2H_5OH} B$

$CH_3Br \xrightarrow{AgNO_3} A \xrightarrow{Sn/HCI} B$

Q.31. Explain Stereo isomerism in coordination complexes