

(3 Hours)

(Total Marks : 100)

Please check whether you have the right question paper.

- N.B.:**
- 1) All questions are **Compulsory**
 - 2) **Figures** to the **Right** indicate **full** marks
 - 3) Use of log table/non-programmable calculator is allowed.

Q.1. Attempt **any four** of the following:

- A Describe three mechanisms responsible for the transport of dissolved species to and from the electrode surface in polarography. 5
- B What are the advantages and limitations of a dropping mercury electrode? 5
- C In a polarographic analysis of Cd^{+2} , the following results were obtained. 5
 $i_d = 6.34 \text{ mA}$, $D = 6.2 \times 10^{-6} \text{ cm}^2 \text{ s}^{-1}$, $m = 2.38 \text{ mgs}^{-1}$ $t = 2.9 \text{ s}$
 Calculate the concentration of Cd^{+2} in the sample solution.
- D The following data were obtained from the polarographic analyses of standard Pb^{+2} solutions. 5

Pb^{+2} (mM)	0.0	0.51	1.02	2.04	3.06	4.08
i_d (μA)	1.32	5.65	10.70	19.08	27.91	36.08

Two aqueous samples from the Silver valley area were analysed and gave i_d of 7.75 and 30.01 μA respectively. What are the Pb^{+2} concentrations in these two samples?

- E With the help of a labelled diagram, describe rotating platinum electrode. Give any one of its limitation. 5
- F Explain: a) use of gelatin in polarographic analysis. 3
 b) with an example any one type of titration curve obtained in amperometric titrations. 2

Q.2. Attempt **any four** of the following:

- A Explain the principle of GC. 5
- B How do gas-liquid and gas-solid chromatography differ? 5
- C Explain flame ionisation detector in GC. Give one advantage. 5
- D The retention times of two components X and Y on column were found to be 3.45 min and 5.16 min respectively. Calculate i) HETP for each peak, ii) number of theoretical plates for each component, if the width of the two peaks is 0.42 and 0.63 min. respectively and the time for mobile phase was 0.18 min. with the length of the column as 0.231 m. 5
- E What is ion exchange chromatography? Give any four ideal properties of resin. 5

- F Define ion exchange capacity. How can the ion exchange principle be applied to demineralisation of water? 5
- Q.3 Attempt **any four** of the following:
- A Discuss pasteurization and pH control as methods of food preservation. 5
- B Write the nutrients present in milk and discuss the detection of any four adulterants in milk. 5
- C Describe Cole's Ferricyanide method to estimate reducing sugars in honey. 5
- D What is the role of chicory in coffee? Discuss the analysis of coffee for caffeine. 5
- E Write the composition of face powder and describe a method to estimate amount of calcium and magnesium in face powder complexometrically. 5
- F Discuss: a) ash analysis of lipstick and 3
 b) the constituents present in antiperspirants 2
- Q.4 Attempt **any four** of the following:
- A Discuss the factors that influence the TG curve. 5
- B Draw a schematic diagram of DTA set up and discuss any three of its components. 5
- C Explain: a) TGA curve of $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ and 3
 b) DTA curve of $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ 2
- D Discuss the application of TGA for the determining the percentage composition of mixture of calcium oxalate and magnesium oxalate. 5
- E Describe the experimental set up for thermometric titrations and explain its application in the titration of boric acid against NaOH. 5
- F Explain the significance of any five parameters w.r.t. validation of analytical methods. 5
- Q.5.A State true or false (**any five**) 5
- a) Oxygen gas is bubbled through the experimental solution prior to polarographic analysis.
- b) Amperometric titrations may lead to inaccurate results due to co-precipitation.
- c) KCl is added as a supporting electrolyte in polarography.
- d) In polarography, DME is used as non-polarisable electrode.
- e) The rotating platinum electrode, can be used at positive potential upto + 0.9V versus SCE.
- f) The diffusion current is directly proportional to the concentration of electroactive species.
- g) A non-polarisable electrode will have its own potential.
- h) The magnitude of diffusion current is also known as wave height.

Q.5.B Select the correct option (**any five**)

5

- a) Theoretical plates are used to _____.
- i) estimate the efficiency of a column ii) determine the thickness iii) measure the distribution of the analyte between mobile phase and stationary phase.
- b) In GC, _____ is used for electron capture detector.
- i) beta ray source ii) UV lamp iii) mercury vapour lamp
- c) The affinity for the resin increases as the charge on the ion _____.
- i) increases ii) decreases iii) remains same
- d) Anion exchange resin is a polymer containing _____ groups as an integral part of the resin.
- i) amino ii) sulphonic iii) carboxylic
- e) Smaller the size of the hydrated ion, affinity of the resin for the ions will _____.
- i) be more ii) be less iii) remain same
- f) In _____ columns a thin layer of adsorbent is coated to the inner walls of the column.
- i) open tubular ii) packed iii) both (i) and (ii)
- g) Band broadening due to concentration gradient within the band is known as _____.
- i) Eddy diffusion ii) Longitudinal diffusion iii) Non equilibrium mass transfer

Q.5 C State true or false (**any five**)

5

- a) Salts of sulphur dioxide are used as preservative for fruits.
- b) Deodorants arrest perspiration.
- c) Determination of lactose in milk by Lane Eynon method involves a redox reaction.
- d) Polyphenols are adulterants in tea.
- e) The role of mannitol in determination of boric acid titrimetrically, is to maintain the pH.
- f) Antiperspirants can act as deodorants.
- g) Food treated with irradiation during preservation does not become radioactive itself.
- h) The action of sodium salt of benzoic acid as preservative is pH dependent.

Q.5 D Select the correct option (any five)

- a) How many peaks are seen in the DTA curve for dehydration of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$?
- i) three endothermic ii) two endothermic
iii) three exothermic iv) two exothermic.
- b) In the application of DTA, which of the following parameters is measured for glasses?
- i) composition ii) solubility iii) cooling temperature iv) transition temperature
- c) What do the horizontal flat plateaus in the TGA curve indicate?
- i) weight loss ii) melting process iii) no weight loss iv) enthalpy change
- d) Which of the following process can be studied by DTA?
- i) phase diagrams ii) fragmentation of molecule
iii) bending vibrations in molecules iv) none of these.
- e) Which of the following option is appropriate for TGA and DTA?
- i) TGA and DTA measure only weight
ii) TGA measures only weight while DTA measures other factors as well.
iii) TGA and DTA measure only temperature.
iv) TGA measures only temperature while DTA measures other factors as well.
- f) Which of the following is the essential condition for thermometric titrations?
- i) enthalpy change ii) weight change
iii) no change in enthalpy iv) none of these.
- g) Select the false statement from the following?
- i) Method validation is an integral part of good analytical practice.
ii) Method validation can be used to judge the quality, reliability and consistency of analytical results.
iii) Method validation is not required for established methods revised to incorporate improvements.

(Time: 3 Hours)

Total marks: 100

N.B. (1) All Questions are compulsory.

(2) Figures to the right indicate full marks.

(3) Use of logarithmic table/non-programmable calculator is allowed.

Q.1. Answer **Any Four** of the following:-

- A. Give any five limitations of valence bond theory as applied to metal-ligand bonding. 5
- B. Explain the splitting of d orbitals of the central metal atom in square planar crystal fields. 5
- C. How does crystal field splitting affect hydration energy & enthalpy of formation in transition metal complexes? 5
- D. Write a note on Jahn-Teller distortions with reference to Z-in situation in a complex with octahedral geometry. 5
- E. What is Crystal Field Stabilization Energy (CFSE)? Calculate CFSE for d^3 & d^4 configurations in weak field octahedral complexes. 5
- F. Explain how Electron Spin Resonance (ESR) spectra help as an evidence for covalence in metal complexes. 5

Q.2. Answer **Any Four** of the following:-

- A. Draw a neat labeled molecular orbital diagram for Hexafluoro ferrate (III) ion; $[\text{FeF}_6]^{3-}$. 5
- B. Discuss the terms thermodynamic stability & kinetic stability. 5
- C. What is the role of 'size & charge of the central metal ion' on the stability of the complexes. 5
- D. Write a note on the Dissociative mechanism for Ligand Substitution Reactions. 5
- E. Explain 'Anation Reactions' with respect to metal complexes. 5
- F. Discuss 'Intra ligand electronic transitions' in coordination compounds. 5

Q.3 Answer **any four** of the following:

- A. Discuss the following two methods of synthesis of organometallic compounds of main group elements. 5
- (a) Metal-metal exchange reaction
- (b) oxidative-addition reaction
- B. Explain the following chemical reactions of organometallic compounds of main group elements. 5
- (a) reactions with protic reagents.
- (b) reactions with oxygen and halogens.
- C. (a) Mention the requirements of metal to be a good catalyst. 3
- (b) Write note on σ bonded covalent organometallic compounds. 2
- D. Describe the methods of preparation of ferrocene. 5
- E. Explain: sulphonation and alkylation reactions of ferrocene. 5
- F. Explain the mechanism involved in hydrogenation of alkene using Wilkinson's catalyst. 5

Q.4 Answer **any four** of the following:

- A. Define metallurgy. Write a brief note on the hydrometallurgy. 5
- B. Explain the following terms by giving examples. 5
 (a) mineral (b) gangue
- C. (a) Give an account of the various reactions that takes place in the following process with respect to extraction of copper by pyrometallurgy (any one) 3
 (i) roasting (ii) smelting
 (b) Discuss the Gravity separation method used for concentrating ores. 2
- D. Explain: (a) Neon is used in safety devices. 3
 (b) Helium and neon do not form clathrate compounds. 2
- E. Give the preparation of the xenon hexafluoride and discuss their structure. 5
- F. Discuss the role of sodium and potassium ions in biological systems. 5

Q.5 A.State whether following statements are true or false:- **(Any Five)** 5

- (a) Crystal field theory takes into account overlapping of metal and ligand orbitals.
 (b) Weak field ligands form high spin complexes.
 (c) $10 Dq$ value in tetrahedral complexes is higher than in square planar complexes.
 (d) CO is a strong field ligand.
 (e) ESR spectrum of $[\text{IrCl}_6]^{2-}$ is a straight line.
 (f) In octahedral complexes metal d orbitals are split into two levels.
 (g) In tetrahedral complexes none of the ligands directly approach metal d orbitals.
 (h) $[\text{Fe}(\text{CN})_6]^{3-}$ is a high spin complex.

B. Fill in the blanks with appropriate words given in the bracket:- **(Any Five)** 5
 (SN^1CB , 50, more, diamagnetic, dissociation constant, 45, allowed, decreases, less, paramagnetic, association constant, SN^2 , forbidden, increases)

- (a) On the basis of magnetic behavior, $[\text{Fe}(\text{CN})_6]^{3-}$ is _____.
 (b) Reverse of stability constant is _____.
 (c) Complexes with chelate groups are _____ stable than those with unidentate ligands.
 (d) Base hydrolysis reaction with proton abstraction is supposed to take place by _____ mechanism.
 (e) Transitions which involve a change in the azimuthal quantum number are Laporte _____.
 (f) Number of microstates in d^2 configuration is _____.
 (g) Stability of complexes _____ with π bonding capacity of the ligands.

(C) Select and write the appropriate answers:

(Attempt **any five**)

- (a) In metathesis, organometallic compound when treated with a binary halide, exchange of a formal Carbanion R^- with a _____ takes place.
 (i) halide ion (ii) carbon (iii) metal
- (b) The metal hydrogen exchange reactions are called as _____ reactions.
 (i) metallation (ii) transmetallation (iii) methylene insertion
- (c) metal or nonmetal halides when treated with _____ under suitable conditions, methylene insertion takes place in M-Cl bond.
 (i) diazomethane (ii) alkyl group (iii) none of the above
- (d) During nitration ferrocene undergoes _____.
 (i) reduction (ii) substitution (iii) oxidation
- (e) Condensation of ferrocene rings with formaldehyde and amine is called _____ reaction.
 (i) hydrolysis (ii) alkylation (iii) Mannich
- (f) Ferrocene obeys _____ rule.
 (i) Pauli's (ii) Hund's (iii) 18 electron
- (g) When the reactants and catalyst are in the same phase, catalysis is referred as _____.
 (i) heterogeneous (ii) substitution (iii) homogeneous
- (h) A catalyst influences the rate of a Chemical reaction but it normally _____ the equilibrium of the reaction.
 (i) alters (ii) affects on (iii) does not alter

(D) State whether the following statements are **true** or **false**:

(Attempt **any five**)

- (a) Copper matte contains sulphides of copper and iron.
- (b) Highly pure Si can be obtained by Zone refining method.
- (c) The gas evolved during roasting of sulphides ore is H_2S .
- (d) $XeOF_4$ has a square pyramid structure.
- (e) Steric number of XeO_2F_2 is 4.
- (f) The transition element present in hemoglobin is iron.
- (g) To maintain high concentration of K^+ ion inside the cell and high concentration of Na^+ outside the cell in the blood plasma an ion pump is developed across the cell membrane.

[Time: 3 Hours]

[Marks: 100]

Please check whether you have got the right question paper.

- N.B:**
1. All questions are compulsory.
 2. All questions carry equal marks.
 3. Figures to the right indicates full marks.
 4. The use of log table/non-programmable calculator is allowed.

Q.1 Answer any four of the following:

- A Explain the stereospecificity when but-2-ene undergoes epoxidation using a peracid followed by acid hydrolysis. 05
- B Explain the primary structure of proteins? Draw the structure of
i) Gly-Ala. ii) Gly-Ala-Gly. 05
- C Explain the following with one example:
i) Enantiomeric excess. ii) Diastereomeric excess. 05
- D Explain the stereospecificity of the addition reaction of bromine to but-2-ene. 05
- E What are basic α - amino acids? Give one example. How is glycine prepared by Strecker synthesis? 05
- F Write the following reaction and discuss its stereochemistry.
1-bromo-1,2-diphenyl propane + KOH/ alcohol -----> 05

Q.2 Answer any four of the following:

- A What is Beckmann rearrangement? Explain its mechanism with a suitable example. 05
- B a) Explain the mechanism of Michael addition reaction. 03
b) Write the application of pinacol-pinacolone rearrangement. 02
- C a) Explain Killiani-Fischer synthesis with suitable example. 03
b) Explain the action of the following reagents on D- Glucose:
i) H_2/Ni ii) Br_2 water 02
- D a) Write the methylation reaction of α -D- Fructopyranose. 03
b) Why sucrose does not show mutarotation? 02
- E Convert open chain Fischer projection formulae into Haworth formulae:
1) α -D- Ribopyranose
2) β -D- Glucopyranose 05
- F a) What is the action of excess of phenyl hydrazine on D-Fructose? 03
b) What are epimers and give one example? 02

Q.3 Answer any four of the following:

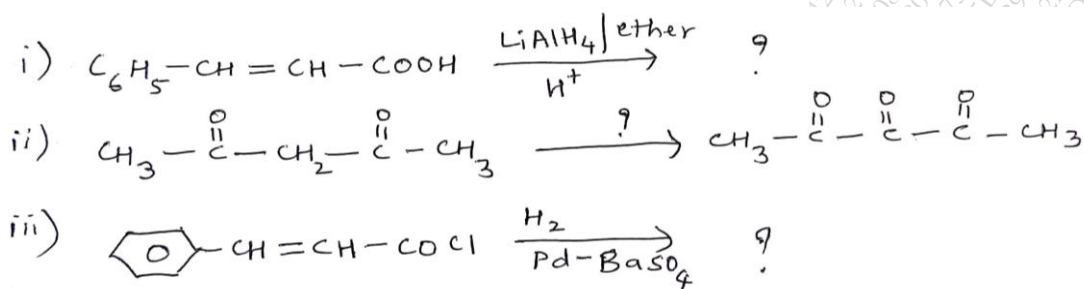
- A How does one determine from IR spectrum? 05
 i. Progress of the reaction.
 ii. Hydrogen bonding in the molecule.
- B Predict the number of signals and the splitting pattern in PMR spectra of the following compounds. 05
 i. Ethyl methyl ketone.
 ii. 1-propanol.
- C An organic compound has the molecular formula $C_4H_8O_2$. Determine the index of its hydrogen deficiency and deduce its structural formula from the following spectral data. Also write the name of the compound? 05
 IR (cm^{-1}): 3000-2500 (broad) , 1740.
 PMR (δppm): 1.0 (3H,triplet) , 1.7 (2H, multiplet), 4.2 (2H, triplet) & 10.2(1H,singlet).
- D An organic compound has the molecular formula $C_8H_{10}O$. Determine the index of its hydrogen deficiency and deduce its structural formula from the following spectral data. Also write the name of the compound? 05
 IR (cm^{-1}): 3500, 1600, 1570, 760 & 710.
 PMR (δppm): 1.6 (3H,douplet) ,4.2 (1H, singlet, D_2O exchangeable), 4.9 (1H,quartet), 7.4 (5H, multiplet).
- E Explain the hydrolysis of nucleic acids and write the structure of purine bases present in DNA and RNA? 05
- F Explain the secondary structure of RNA & DNA? 05

Q.4 Answer any four of the following:

- A a) What are plastics? Explain the difference between thermoplastics and thermosetting polymer. 03
 b) Give the preparation and application of polystyrene. 02
- B a) Explain Rosenmund reduction with suitable example. 03
 b) What is Lindlar's catalyst? Explain its selectivity. 02
- C a) Give the preparation and uses of Nylon- 6. 03
 b) Write the biomedical uses of synthetic polymer. 02
- D How is Raney-Ni prepared? How is it used in the reduction of the following compounds? 05
 i) Olefins ii) Nitriles iii) Nitro compounds.
- E a) Distinguish between addition polymer and condensation polymer. 03
 b) Write the structure of the polymer obtained by polymerisation of phenol and formaldehyde. 02

F a) Complete the following reactions:

03



b) Write any two uses of m-CPBA in synthetic organic chemistry?

02

Q.5 A State true or false (Any Five)

05

- Polypeptides are derived from two to nine molecules of amino acids.
- Zwitter ion is a dipolar ion.
- Glycine is an example of acidic amino acid.
- Stereochemically equivalent ligands are called homotopic ligands.
- The molecule of ethanal does not have a enantiotopic face.
- In a stereoselective reaction both stereoisomers are equally formed.
- Enzymatic reduction of pyruvic acid is an example of enantiomeric excess reaction.
- S_N1 reaction proceeds with retention of configuration.

Q.5 B Choose the correct option and rewrite the statement (Any Five)

05

- Conversion of aldohexose to aldopentose is _____ method.
(Wohl's / Killiani Fisher / Beckmann)
- _____ number of stereoisomers are possible for a aldohexose.
(6 / 8 / 9)
- The sugar that yields only glucose on its hydrolysis is _____
(Maltose / Lactose / Fructose)
- When monosaccharides are treated with excess phenyl hydrazine they form _____
(Osazones / Phenyl hydrazine / Alcohols)
- The reaction of α -haloketone with alkoxide to give ester is known as _____
(Favorskii rearrangement / Wittig rearrangement / Beckmann rearrangement)
- The reaction of _____ with acid (Conc. H_2SO_4) is called Pinacol- Pinacolone rearrangement.
(Pinacol / Ketoxime / α -haloketone)
- Wittig reagent is _____
(Ph_3P / $Ph_3P=CH_2$ / $[Ph_3PCH_3]^+ I^-$)

Q.5 C State True or False (Any five)

05

- Magnetic anisotropy brings about shielding of aromatic protons.
- Intense absorption band around 1700cm^{-1} indicates the presence of hydroxyl group.
- $3000-1000\text{cm}^{-1}$ region is known as fingerprint region.
- The type of radiation used in IR spectroscopy is microwaves.
- The aldehydic protons is found at 9-10 ppm in NMR.
- Adenine is a derivative of pyrimidine.
- RNA molecule contains Uracil.
- Adenine and thymine are bonded by two hydrogen bonds.

Q.5 D Match the columns (Any five)

05

- | | |
|--------------------------|---|
| i) Teflon | a) Allylic bromination |
| ii) Neoprene | b) Adipic acid |
| iii) SeO ₂ | c) Addition polymer |
| iv) Pd-BaSO ₄ | d) Natural rubber |
| v) BaO | e) Chemoselective oxidizing agent |
| vi) NBS | f) Reduction of acid chloride to aldehyde |
| vii) Nylon 66 | g) Stabilizer |

(3Hours)

[Total Marks: 100]

- N.B.: (1) All questions are compulsory.
 (2) Figures to the right indicate full marks.
 (3) Use of log tables/ non programmable calculator is allowed.

Constants	
Avogadro's Number $N = 6.023 \times 10^{23}$	Charge on electron = $1.66 \times 10^{-19} \text{C}$
Boltzmann constant $k = 1.38 \times 10^{-23} \text{J/K}$	Mass of an electron = $9.1 \times 10^{-31} \text{Kg}$
Faraday constant $F = 96500 \text{ coulombs}$	$\Pi = 3.142$
Gas constant $R = 8.314 \text{ J/mol/K}$	$\frac{2.303 RT}{F} = 0.0592 \text{ at } 298 \text{ K}$
Planck constant $h = 6.625 \times 10^{-34} \text{Js}$	
Speed of light in vacuum $c = 3.0 \times 10^8 \text{ m/s}$	

- Q1 **Answer the following (any four)**
- A Derive expression for the cell emf for concentration cell with transference reversible to cation. (5)
- B Set up the electrode concentration cell without transference reversible to cation using HCl electrolyte and obtain an expression for its emf. (5)
- C Define: Overvoltage. How is it determined experimentally? (5)
- D A solution of silver nitrate with concentration of $0.1 \text{ mole per dm}^3$ is electrolysed with a platinum cathode. Predict whether hydrogen gas will be liberated at cathode or silver will get deposited. (5)
 Assume overvoltage of hydrogen on platinum to be equal to zero and $E^0_{\text{Ag}/\text{Ag}^+} = 0.799 \text{ V}$.
- E The emf of the following cell with transference is 0.020 volt . Calculate the transport number of cation and anion. (5)
 $(-) \text{Ag (s)} - \text{AgCl(s)} \mid \text{HCl (} a_1 = 0.017 \text{)} \mid \text{HCl (} a_2 = 0.008 \text{)} \mid \text{AgCl (s)} - \text{Ag (s)} (+)$
- F Define activity coefficient. Obtain the expressions for activities of uni-bivalent and uni-trivalent electrolytes. (5)
- Q2 **Answer the following (any four)**
- A a) Define : i) Polymerization ii) Degree of polymerisation (2)
 b) The intrinsic viscosity of a solution of polymer in an organic solvent is 1.82 dl g^{-1} at 298 K . Calculate the Molar mass of the polymer (Given $K = 5.1 \times 10^{-4} \alpha = 0.73$). (3)
- B What are light emitting polymers? Give their applications. (5)
- C Classify the polymers on the basis of their source and structure with suitable examples. (5)

- D a) Explain the term curing agents. What are their types? (3)
 b) What are antioxidants? How are they classified? (2)
- E Describe the method of determination of molecular weight of polymer using Ostwald's viscometer. (5)
- F A polymer sample has 100g, 200g and 300g of polymers of molecular weight 10,000, 20,000 and 30000 respectively. Calculate (i) \overline{Mn} (ii) \overline{Mw} (5)

Q3 **Answer the following (any four)**

- A State de-Broglie's equation. Prove that de – Broglie wavelength of electron is given by $\lambda = h / \sqrt{2meV}$, where m is the mass of electron accelerated by a potential V. (5)
- B State the drawbacks of classical mechanics. Explain any one in detail. (5)
- C Define commutative and non commutative operators. State whether the following operators are commutative or non commutative? (5)
 i) $\hat{A} = d/dx$ and $\hat{B} = x^2$ on function $f(x) = e^{-2x}$
 ii) $\hat{A} = d/dx$ and $\hat{B} = \int$ on function $f(x) = \sin 5x$
- D Define the following: (5)
 i) Valence band ii) Conduction band iii) Forbidden energy gap
 iv) Conductors v) Insulators
- E Explain the construction and working of Bacon's $H_2 - O_2$ fuel cell. (5)
- F State Heisenberg's uncertainty principle. Calculate uncertainty in the position of electron weighing 9.1×10^{-31} kg and moving with $1/5$ th of velocity of light, if the uncertainty in momentum is 2.5%. (5)

Q4 **Answer the following (any four):**

- A Explain the working of NMR Spectrometer with the help of a diagram. (5)
- B Explain relaxation processes in NMR spectroscopy? Why is relaxation process important? (5)
- C What is Larmor's Precession? Explain in detail. (5)
- D With the help of schematic diagram describe the construction and working of E.S.R. Spectrometer (5)
- E What is hyperfine structure? How does it arise? (5)
- F How does ESR spectrum of hydrogen differ from deuterium? (5)

Q5A **Fill in the blanks with the correct option provided (any five)** (5)

- a) For electrolytes of the same type the values of mean ionic activity coefficient are ----- .
 i) Nearly the same ii) Different iii) Zero
- b) $ZnCl_2$ is an example of-----.
 i) Uni - univalent electrolyte ii) bi-bivalent electrolyte
 iii) bi univalent electrolyte

- c) In a ----- the electrical energy available for doing work is less than free energy decrease.
 i) reversible cell ii) irreversible cell iii) electrolytic cell
- d) For concentration cell, E°_{cell} is -----.
 i) zero ii) negative iii) one
- e) Saturated solution of KCl is used in making salt bridge because
 i) velocity of K^+ and Cl^- is nearly same ii) velocity of K^+ and Cl^- is different.
 iii) KCl is soluble in water.
- f) Tafel proposed, the theory of -----.
 i) electrolytic dissociation ii) hydrogen overvoltage iii) both (i) and (ii)
- g) In concentration cell two electrodes are chemically ----- .
 i) identical ii) different iii) inert
- h) Reduction of metal ion leads to deposition of the metal on the ----- .
 i) anode ii) cathode iii) reference electrode

B State whether the following statements are TRUE or FALSE (any five). (5)

- a) Vulcanized rubber is an example of thermosetting plastic.
- b) Thermoplastic polymers cannot be recycled.
- c) Antistatic agents are hygroscopic chemicals.
- d) For synthetic polymers $\overline{Mw} > \overline{Mn}$.
- e) The degree of polymerization is a measure of weight of polymer.
- f) Methyl cellulose is a semi synthetic polymer.
- g) Epoxy resins are thermosetting resins.

C Match the following (any five) (5)

Column A	Column B
1. Einstein	a. Finite valued
2. Quanta	b. Range of energy of an electron
3. Compton	c. Quantisation of radiation
4. Dynamic variable	d. p-n junction
5. Planck	e. Discrete packets of energy
6. State function	f. Momentum
7. Depletion layer	g. Scattering of electrons
8. Energy Band	h. Transverse waves
	i. Photoelectric effect
	j. Infinite valued

D State whether the following statements are TRUE or FALSE, (any five) (5)

- a) ESR spectroscopy is useful in the study of metal complexes
- b) The mutual exchange of spin in precessing nuclei gives rise to spin-spin relaxation
- c) The NMR spectrum cannot be recorded with zero spin nuclei.
- d) The hyperfine structure of the ESR spectrum is due to nucleus-nucleus interaction
- e) With the process of transfer of hydrogen nucleus to higher energy state by absorption of radiation is called excitation
- f) A nucleus with zero spin interacts with the applied magnetic field.
- g) For ^{12}C the total spin of the nucleus is one.