

[TIME: 3 HOURS]

[MARKS: 100]

Please check whether you have got 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 calculators is allowed.

Q.1 Answer any four of the following:

20

- A) Discuss the various grades of laboratory reagents.
- B) Calculate the molarity and molality of 69.8% (w/w) nitric acid solution.
[Given: molecular weight of nitric acid =63 and density of nitric acid solution =1.42 gm⁻³]
- C) Discuss the importance of quality concepts in industry.
- D) Calculate the percentage composition of each element present in urea.
[Given: atomic weight of: H=1.008, N= 14.007, O= 15.999 and C= 12.011].
- E) Discuss the different equipments for the sampling of compact solids.
- F) Write a note on: 'Preservation and dissolution of the sample'.

Q.2 Answer any four of the following:

20

- A) What are redox indicators? Discuss the use of diphenylamine as a redox indicator mentioning the role of acid mixture.
- B) 10.0cm³ of 0.2M Fe (II) solution is titrated with 0.2M KMnO₄ at pH 2 in acidic medium. Calculate the potential:
 - a)at half the equivalence point
 - b)at the equivalence point
 - c) after addition of double the volume of titrant required at the equivalence point.

Given: $E^{\circ}_{\text{Pt}/\text{Fe}^{3+}, \text{Fe}^{2+}} = 0.771\text{V}$ and $E^{\circ}_{\text{Pt}/\text{MnO}_4^-, \text{Mn}^{2+}} = 1.510\text{V}$,
Comment on the nature of the titration curve.
- C) Discuss the theory of redox indicators.
- D) Calculate the values of pMg when: a) 0.0 cm³ b) 5.0 cm³ c) 10.0 cm³ and d)11.0 cm³ of 0.01 M EDTA is added to a 10.0 cm³ of 0.01 M Mg²⁺ buffered to a constant pH of 10.0.
Draw the nature of titration curve (pMg versus volume of EDTA) .
[Given: $K_{\text{MY}} = 4.9 \times 10^8$ and α_4 for EDTA at pH of 10.0 = 0.35].
- E) Discuss the use of EDTA as titrant. Write any three advantages of EDTA as a titrant.
- F) What are the different methods to increase selectivity in EDTA titrations? Discuss any two of them in brief.

Q.3 Answer any four of the following:

20

- A) Discuss the principle of flame photometric analysis.
- B) With the help of a neat diagram explain an electrothermal atomizer.
- C) Give any three applications and two limitations of AAS.

- D) Derive a mathematical relationship between the intensity of fluorescent radiation and the concentration of the solution.
- E) What is phosphorimetry? What are the factors affecting fluorescence and phosphorescence.
- F) Explain why sample solutions for nephelometry and turbidimetry have to be prepared very carefully. Draw a neat labelled diagram of a nephelometer.

Q.4 Answer any four of the following:

20

- A) What are the factors affecting solvent extraction? Explain any one.
- B) What is solid phase extraction? Give any three applications.
- C) What are the requirements for high pressure pump used in HPLC? Name any two pumps.
- D) Draw a neat labelled diagram of a typical HPLC unit and explain the function of degasser and precolumn.
- E) Mention the different detectors used in HPTLC and explain any one.
- F) What are the advantages and limitations of HPTLC?

Q.5A) Answer any five of the following

05

- a) What are certified reference materials?
- b) What is the normality of 0.01M sulphuric acid?
- c) Name any one concentration unit independent of temperature.
- d) What is the condition in which the molarity and formality of the solution will be same?
- e) Mention any one difficulty encountered in the sampling of gases.
- f) What is ambient sampling?
- g) Name the equipment used for sampling of flowing liquids.
- h) Define: 'Bulk ratio' with respect to sample size.

B) Select the correct option and complete the following statements: (any five)

05

- a) During the direct EDTA titrations, _____ is added to metal ion solution to prevent precipitation of hydroxides of metal ion.
 i) tartarate ii) formaldehyde iii) sodium cyanide
- b) The transition potential of ferroin indicator is _____ V in 1M H₂SO₄.
 i) 0.76 ii) 1.14 iii) 0.61
- c) During the titration of Fe²⁺ against Ce⁴⁺, the potential of indicator electrode before the equivalence point depends on the ratio of _____.
 i) $\frac{[Fe^{2+}]}{[Fe^{3+}]}$ ii) $\frac{[Ce^{3+}]}{[Ce^{4+}]}$ iii) $\frac{[Fe^{2+}]}{[Ce^{4+}]}$
- d) EDTA is standardized using standard solution of _____.
 i) ZnSO₄ ii) NaOH iii) HCl
- e) Of the following, _____ is estimated by indirect EDTA titrations only.
 i) PO₄³⁻ ii) Cu²⁺ iii) Zn²⁺

- f) Eriochrome Black T indicator exhibits _____ colour between pH of 7 to 11.
i) red ii) blue iii) orange
- g) Ferroin indicator is a complex of with _____ with Fe(II).
i) 1,10-phenanthroline ii) diphenylamine iii) diphenylbenzidine

C) **State whether true or false: (any five)**

05

- a) Nitrogen is used as an inert gas in hollow cathode lamp.
b) Flame photometry gives the information of the molecular condition of the sample.
c) Flame photometry cannot be used for analysis of non-radiating elements.
d) Turbidimetry is used to measure the amount of growth of a test bacteria in a liquid nutrient medium.
e) Fluorescence is delayed phosphorescence.
f) Phosphorescence of a solution is generally observed at liquid nitrogen temperature.
g) For molecular weight determination by turbidimetry, a plot of turbidance versus concentration is plotted.
h) In nephelometric analysis, highly monochromatic radiation is not necessary.

D) **Select the correct option and complete the following statements: (any five)**

05

- a) When the separation factor for the two solutes are very close, _____ extraction method is used.
(batch , continuous, counter current)
- b) Partition coefficient is equal to _____ if the molecular state of the solute remains unchanged.
(distribution ratio, separation factor, equilibrium constant)
- c) If the $pH_{1/2}$ values of two metals are _____, excellent separation is achieved by controlling the pH.
(very close, similar, very far)
- d) Due to different _____ of the solutes in between the two liquid phases, separation of the solutes occur in HPLC.
(solubilities, adsorption, absorption)
- e) In HPLC, the _____ at which the peak occurs on the chromatogram is characteristic of the analyte.
(concentration, retention time, peak area)
- f) _____ detector used in HPLC is highly temperature sensitive.
(UV, Refractive index, Fluorescence)
- g) The _____ method of sample injection in HPLC is reliable with respect to reproducibility.
(manual, stop flow, sample loop)

(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.

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

- A. Give an account of the following with suitable examples: **5**
 (i) Inversion centre (ii) Identity
- B. Discuss the point group assigned to diatomic linear molecules . **5**
- C. Compare homonuclear and heteronuclear diatomic molecules **5**
- D. Discuss using Walsh diagram, H_3^+ ion is triangular . **5**
- E. Draw the molecular orbital energy level diagram for H_2O molecule. Comment on its magnetic property. **5**
- F. (i) Write in short the importance of symmetry in chemistry.(2 points) **2**
 (ii) Explain in HCl molecule, the $3p_z$ orbital of chlorine is involved in bonding with 1s of hydrogen **3**

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

- A. What are lattice parameters. Derive a relationship between lattice constant (a) of a cubic crystal and density of the crystal material. **5**
- B. Show that packing factor for body centered cubic (bcc) lattice is 0.68. **5**
- C. For a simple cubic (sc) unit cell - **5**
 (i) Calculate the number of atoms per unit cell (sc).
 (ii) Find the atomic radii (r) of a metal which crystallises in sc structure with length of unit cell 326 pm.
- D. With suitable example, explain Frenkel defect in ionic solids. **5**
- E. Write a short note on conventional superconductor . **5**
- F. Explain the terms: **5**
 (i) Superconducting Transition Temperature (T_c)
 (ii) Ideal and hard superconductors.

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

- A. (i) What are inner transition elements? **2**
 (ii) Give reason, lanthanide shows +3 as their common oxidation states. **3**
- B. Explain magnetic properties of lanthanides ions are different from those of transition metal ions. **5**
- C. Give the factors affecting the rate of ion exchange and explain the role of complexing agent in elution of lanthanide ions, by ion exchange method. **5**

- D.** Give reasons:
- Yttrium occurs invariably with some lanthanides. **2**
 - Post lanthanides have abnormal high densities. **3**
- E.** On the basis of electronic configuration of lanthanides, explain the colour of lanthanide ions in solution or their compounds. **5**
- F.** Give the commercial and nuclear applications of lanthanides. **5**
- 4.** Attempt **any four** of the following:
- What are acid, basic and amphiprotic solvents? Explain with suitable examples. **5**
 - Name the oxyacids of chlorine. Discuss their acid strength in detail. **5**
 - Write a short note on metal-ammonia solutions. **5**
 - Discuss the structure of XY_7 type of interhalogens with suitable examples. **5**
 - Give the three steps involved in the formation of Sulphuric acid. Explain the effect of pressure on the formation of SO_3 . **5**
 - Discuss the allotropic forms of Oxygen. **5**
- 5.** Answer the following :
- State whether the following statements are true or false: **(Any five)** **5**
 - Hydrogen molecule belongs to $C_{\infty v}$ point group.
 - Centre of inversion is absent in C_6H_6 molecule.
 - NO forms NO^+ , the single electron is lost from antibonding orbital.
 - Bond order of CO molecule is 3.
 - Trans-dichloroethylene belongs to C_{2h} point group.
 - $C_{\infty v}$ is the higher symmetry point group.
 - Photoelectron spectrum of water shows two bands.
 - Though BeH_2 and H_2O molecule have same number of peripheral atoms their structures are different.
 - Select and write the appropriate answer **(any five)**: **5**
 - $ABAB$ --- type of arrangement of spheres is found in _____ close packing.
 - Simple cubic (sc)
 - face-centered cubic (fcc)
 - Hexagonal.
 - The number of atoms in face-centered cubic unit cell is _____.
 - 2
 - 4
 - 6
 - In Schottky defect of ionic solids, _____ is missing.
 - a cation
 - an anion
 - both cation and anion.
 - The effect of ejecting out the flux lines of magnetic field by a superconductor is known as _____ effect.
 - Meissner
 - Doppler
 - Steric
 - In C_{60} Fullerene there are _____ five membered rings.
 - 10
 - 12
 - 20

- f. Presence of foreign atoms in ionic crystals leads to _____ defect.
 (i) impurity (ii) vacancy (iii) interstitial (self)
- g. Coordination number in face centered cubic lattice is:
 (i) 6 (ii) 8 (iii) 12
- h. A point in crystal lattice signifies _____ of particles.
 (i) size (ii) volume (iii) position of the centre

C. Fill in the blank by choosing the appropriate answer from below (any five):- **5**

- (most, least, hydrolysis, Gadolinite, Dy^{3+} , Gd^{3+} , similar, Os, partition, different,)
- a. Solvent extraction is based on _____ law.
- b. Nb – Ta shows _____ chemical properties.
- c. bis(2-ethylhexyl) phosphoric acid is less susceptible to _____ as compared to TBP.
- d. _____ is less reactive (noble) because of lanthanide contraction.
- e. _____ is a silicate of lanthanides.
- f. La^{3+} ion is _____ hydrated.
- g. _____ ion shows highest experimental magnetic moment.

D. Match the Columns: (any five) **5**

A		B	
a	Protonic solvent	1	Chlorine
b	Rhombic sulphur	2	NO^+
c	Maximum electron affinity	3	V_2O_5
d	Bromine Trifluoride	4	-2
e	Autoionisation of N_2O_4	5	Flourine
f	Catalyst in manufacture of H_2SO_4	6	HCl
g	Oxidation state of Group-16 elements	7	Bent T-shape
		8	NO^-
		9	Puckered ring
		10	-6
		11	Triangular

[Time :3 Hours]

[Marks:100]

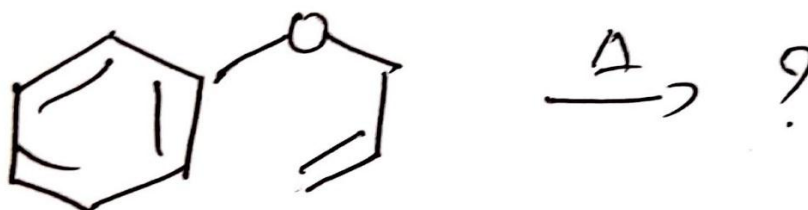
NB:-

1. Please check whether you have received the right question paper
2. All questions are Compulsory
3. Figures to the right indicates full marks
4. Use of logtables/non-programmable calculator is permitted

Q.1

Answer **any four** questions out of the following.

- A a) Discuss the BAC² mechanism of hydrolysis of esters 3
 b) Distinguish between electrophiles and nucleophiles. 2
 B a) Discuss the stereochemistry of NGP with a suitable example 3
 b) Complete the following reaction and name the reaction involved: 2

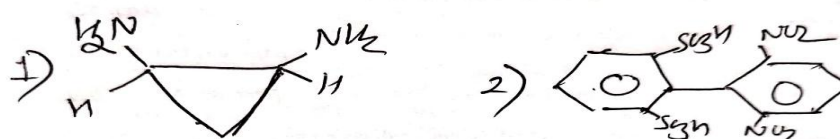


- C a) Explain with mechanism cope reaction. 3
 b) Explain cheletropic reaction with suitable example. 2
 D a) What are electrocyclic and sigmatropic reactions? Explain with examples. 3
 b) Complete the following and name the reaction: 2
 Butadiene + acrylonitrile $\xrightarrow{\text{heat}}$?
 E With the help of a neat and labelled Jablonski diagram explain different physical processes associated with excited molecules. 5
 F a) Explain Norrish type I reaction at room temperature. 3
 b) Distinguish between thermal and photochemical reactions. 2

Q.2

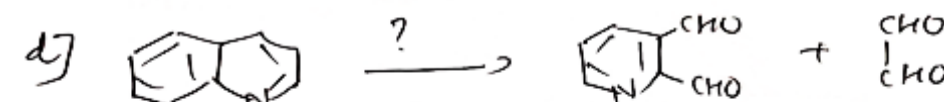
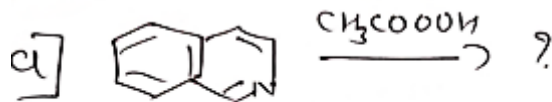
Answer **any four** questions out of the following:

- A Write a note on the stereochemistry of biphenyls. 5
 B a) State whether the following compounds are optically active or optically inactive. Justify your answer. 3



- b) Define plane of symmetry with an example. 2
 C Give the Skraup synthesis for the preparation of quinoline. Write the reaction of quinoline with nitrating mixture. 5

D Complete the following reactions.



E a) What are the disadvantages of agrochemicals? 3

b) Draw the resonating structures of Pyridine-N-oxide. 2

F What are Agrochemicals? Give two advantages of it. Write the synthesis of indole 3 acetic acid with their application. 5

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

A Explain Chemoselectivity with two suitable examples. 5

B Define Convergent synthesis. Give one example of convergent synthesis. 5

C a) Calculate the % atom economy for the following reaction: 3



b) Give the advantages of bio-catalysts 2

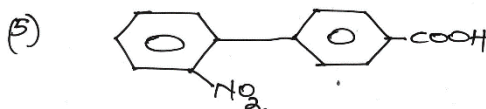
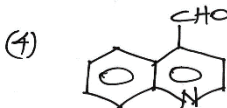
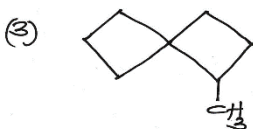
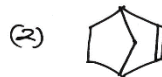
D Give the synthesis of the following from a suitable starting compound: 5

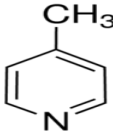
- 1) p-bromobenzoic acid
- 2) 1-phenyl ethanol using a suitable Grignard reagent.

E Write the structural formula for each of the following compounds: 5

- 1) Quinoline-5-carboxaldehyde
- 2) Bicyclo[2.2.1] hepta-2,5-diene
- 3) Spiro[2.5] octane
- 4) 2, 3'-dimethyl diphenyl
- 5) 1,3-dichloro-1,2-butadiene

F Give IUPAC names for each of the following compounds. 5



- Q.4 Answer **any four** of the following :
- A Explain the following terms used in spectroscopy with suitable example: **5**
- 1) Auxochrome
 - 2) Bathochromic shift
- B Explain the fragmentation of the following molecules: **5**
- 1) Ethyl methyl ketone
 - 2) 2-methyl pentane
- C Give analytical evidence to prove the following: **5**
- 1) Citral is an acyclic monoterpene
 - 2) Nicotine has N-methyl pyrrolidine ring.
- D Give the reactions for Hofmann Exhaustive Methylation and degradation of: **5**
- 
- E Give the synthesis of Nicotine from nicotinic acid. **5**
- F a) Give Ott's synthesis of adrenaline **3**
 b) State isoprene rule. **2**
- Q.5 A Select the correct answer and fill in the blanks (**any Five**) **5**
- a) Cope elimination is observed in _____
 i) N-substituted amide ii) aromatic ketoxime iii) tertiary amine oxides
 - b) All nucleophiles are _____
 i) Lewis acid ii) Lewis base iii) neutral
 - c) 1,3,5-Hexatriene undergoes electrocyclic reaction to form _____
 i) 1,3-Cyclohexadiene ii) cyclohexene iii) 1,4-Cyclohexadiene
 - d) In NGP the stereochemistry of product is _____
 i) changed ii) retained iii) inverted
 - e) _____ is a thermodynamic term.
 i) electrophilicity ii) nucleophilicity iii) basicity
 - f) Homolytic fission of covalent bond results into formation of _____
 i) carbocation ii) free radical iii) carbanion
 - g) Norrish Type-I reaction occurs in _____
 i) Ethane ii) Dimethyl ketone iii) benzene
 - h) Benzophenone reacts with isopropyl alcohol in presence of light to form benzpinacol is an example of _____ reaction
 i) photoreduction ii) photooxidation iii) photosensitization
- B State whether the following are True or False (**any Five**) **5**
- a) Trans-1,2-Dichloro cyclopropane is optically active.
 - b) Trans-1,3-Dimethyl cyclobutane is achiral
 - c) In quinoline electrophilic substitution takes place at 2 position .
 - d) Methanol is reactant used for the Skraup synthesis of quinoline.
 - e) The dipole moment of pyridine N-Oxide is more than pyridine.

- f) DDT and BHC belong to the class of Insecticides
g) Fungistatics kill the fungi.

Q.5 C State true or false. (Attempt any Five) 5

- Reactions with higher E-factor are more desirable
- Carbon tetrachloride is an example of green solvent
- A synthesis in which the product is obtained through a series of single step reactions is called convergent synthesis
- Biginelli reaction is an example of multi component synthesis
- Atom economy is higher when by-products are not formed in any chemical reaction.
- Molecular formula of biphenyl is $(C_6H_5)_2$
- In spiro compounds the two rings are attached such that one carbon atom is common to both the rings.
- Quinoline is benzo[c] pyridine.

Q.5 D Match the columns (Attempt any Five) 5

Column A

- Adrenaline
- Citral-b
- Nicotine
- Isoprene
- Protein hormone
- Increase in intensity of absorption
- Auxochrome

Column B

- OH group
- Tobacco leaves
- Neral
- Hyperchromic effect
- Epinephrine
- 2-methyl butadiene
- Insulin

(REVISED COURSE 2018)

(3Hours)

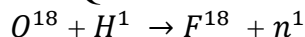
[Total Marks: 100]

- N.B.: (1) All questions are compulsory.
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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 $R = 8.314 \text{ J/mol/K}$	
Planck constant $h = 6.625 \times 10^{-34} \text{Js}$	
Speed of light in vacuum $c = 3.0 \times 10^8 \text{ m/s}$	$\frac{2.303 RT}{F} = 0.0592 \text{ at } 298 \text{ K}$

- Q1.** Answer the following (**any four**)
- A.** Define dipole moment. Explain how dipole moment is useful in deciding geometry of
 i) CH_4 molecule ii) NH_3 molecule. (5)
- B.** Derive expression for the wave numbers of line in the rotational spectrum of a diatomic molecule. (5)
- C.** What is a vibrational-rotational spectrum? Write any four characteristics of vibrational – rotational spectrum of a diatomic molecule. (5)
- D.** What are the three kinds of scattered beams of radiation in Raman spectrum? Explain the quantum theory of Raman spectra. (5)
- E.** The frequency separation of successive lines in the rotational spectrum of $^1\text{H}^{35}\text{Cl}$ is $1.09 \times 10^5 \text{ m}^{-1}$, while that of $^1\text{H}^{37}\text{Cl}$ is $2.12 \times 10^5 \text{ m}^{-1}$. Calculate isotopic mass of ^37H . (5)
- F.** A substance was irradiated with visible radiation of wavelength $5 \times 10^{-7} \text{m}$. The first stokes line appeared at $6 \times 10^{-7} \text{m}$. Calculate the Raman shift and energy change for the transition. (5)
- Q2.** Answer the following (**any four**)
- A.** Define molal elevation constant. (5)
 0.75g of solute was dissolved in 90g of benzene at 298K. The solution had a boiling point 0.30K higher than that of benzene. If K_b for benzene is $2.53 \text{K mol}^{-1} \text{kg}$, calculate the molar mass of the solute.
- B.** State Raoult's law. (5)
 Describe the Ostwald and Walker's method to determine vapour pressure.
- C.** Derive thermodynamically the relation between the freezing point depression of a dilute solution of non-volatile solute and the mole fraction of the dissolved solute. (5)
- D.** What is reverse osmosis? Give its applications (any two) (5)
- E.** Explain the Lindeman's unimolecular theory of reaction rate. (5)
- F.** With the help of suitable diagram explain flash photolysis technique for studying kinetics of fast reactions. (5)

- Q3.** Answer the following (**any four**)
- Explain the construction, principle and working of Geiger muller counter. (5)
 - Discuss the use of radioisotope as tracers in Photosynthesis and hydrolysis of esters. (5)
 - Discuss the factors controlling nuclear fission process. (5)
 - What is a nuclear power reactor? Explain the basic components of a power reactor. (5)
 - Calculate the Q value and threshold energy of the following nuclear reactions. (5)



Given

$$O^{18} = 17.9992\text{amu}$$

$$F^{18} = 18.0010\text{amu}$$

$$H^1 = 1.0078\text{amu}$$

$$n^1 = 1.0089\text{amu}$$

- Define half life period. A wooden chair and a freshly cut tree gives 3.8 and 7.6 counts $\text{min}^{-1}\text{g}^{-1}$ of carbon whose half life time is 5760 years. Calculate the age of the wooden chair. (5)

- Q4** Answer the following (**any four**)
- What is electrophoresis? How it is studied experimentally? (5)
 - Explain Helmholtz and Stern's concept of electrical double layer. (5)
 - Give an account of colloidal electrolytes. (5)
 - Define : i) adsorbate ii) adsorbent. (5)

Assuming that the adsorption of hydrogen gas forms a complete monolayer on the surface of charcoal, the volume of hydrogen reduced to S.T.P. was found to be 1.80cm^3 per gm of the adsorbent. Calculate the surface area of adsorbent if area occupied by one hydrogen molecule is $15.8 \times 10^{-20} \text{m}^2$

- Discuss any two methods by which colloids acquire electric charge. (5)
- Give application of surfactants in i) food industry ii) pesticide formulation (5)

- Q5**
- Fill in the blanks with the correct option provided (any five)** (5)

- The dipole moment of HCl molecule is ----- HF molecule.
(a) greater than (b) lesser than (c) same as
- The molecular energies can be arranged as -----.
(a) $E_{\text{ele}} > E_{\text{vib}} > E_{\text{rot}}$ (b) $E_{\text{ele}} > E_{\text{rot}} > E_{\text{vib}}$ (c) $E_{\text{vib}} > E_{\text{ele}} > E_{\text{rot}}$
- Raman shift is ----- for stokes line.
(a) negative (b) positive (c) zero
- Scissoring vibrations are -----
(a) In plane vibration. (b) out of plane vibrations (c) coupled vibrations
- A linear molecule like XeF_2 will show ----- vibrations.
(a) 4 (b) 5 (c) 9
- UV – Vis are associated with ----- transitions
(a) vibrational (b) rotational (c) Electronic spectra
- Rayleigh scattering takes place when -----.
(a) $\lambda_i > \lambda_s$ (b) $\lambda_i = \lambda_s$ (c) $\lambda_i < \lambda_s$
- The unit for moment of inertia is -----.
(a) Kgm^2 (b) Kgm (c) Kg/m^2

B State whether the statement is **TRUE or FALSE** (**any five**). (5)

1. A semipermeable membrane is permeable to solute molecules.
2. According to Raoult's law relative lowering of vapour pressure for a solution is equal to mole fraction of solute.
3. For slow reactions probability factor $P < 1$
4. Addition of a non-volatile solute to a solvent will lead to an increase in freezing point.
5. Liquids with weak intermolecular forces are less volatile.
6. The rate of most of the reactions increase by factor of two for 10 degree rise in temperature.
7. According to collision theory, the colliding molecules possess translational motion only.

C Match the following (**any five**) (5)

Column A	Column B
1. Chain reaction	a. not affected by magnetic field
2. Stellar bodies	b. reaction proceeds at steady rate
3. γ rays	c. minimum energy for reaction to proceed.
4. Multiplication factor =1	d. thermonuclear reactions
5. Threshold energy	e. release of positrons
6. Artificial radioactivity	f. secondary neutrons
7. Radioactive dating	g. C^{12}
8. Dead time	h. Primary neutrons
	i. C^{14}
	j. no response from the counter

D State whether the statement is **TRUE or FALSE** (**any five**). (5)

1. Lyophilic sols are less stable than lyophobic sols.
2. Langmuir's isotherm fails at high pressure.
3. Charcoal is a good adsorbent for permanent gases.
4. Fog is a colloidal system of liquid in gas.
5. The movement of dispersion medium under the influence of an electric field is called electro-osmosis.
6. Chemisorption is an irreversible process.
7. Gel is a system in which liquid is a dispersed phase and solid is the dispersion medium.
