[Time: Three Hours] **[Marks: 100]**

Please check whether you have got the right question paper

NB: 1.All questions are compulsory
2. Answers to the same questions must be written together
3. Figures to the right indicate full marks
4. The use of log table/ non programmable calculator is allowed

Q 1 (A) Select the correct option and complete the following statements **(Any twelve)** **(12)**

i) The rate law of the reaction A + 2B ⟶ Product is given by d[Product]/dt = k[A]^2.[B]. If A is taken in large excess, the order of the reaction will be _____ .
a) 0 b) 1 c) 2

ii) _____does not influence the rate of reaction.
a) Concentration of the reactants
b) Temperature of the reactants
c) Molecularity of the reactants

iii) For a single step reaction A + 2B⟶ Products, the molecularity is _____.
a) 1 b) 2 c) 3

iv) _____ property increases with rise in temperature.
a) Viscosity b) Surface Tension c) Vapour pressure

v) Unit of Surface tension is _____.
a) N m^{-1} b) Nm^2 c) N^{-1}m

vi) Plants get water through the roots because of _____.
a) viscosity b) capillary action c) gravity

vii) Fullerene is an allotrope of _____.
a) sulphur (b) carbon (c) tin

viii) Ion O_2^{-2} is called _____ ion .
a) oxide b) peroxide c) superoxide

ix) Li combines with nitrogen to form _____.
a) LiN b) Li_2N c) Li_3N

x) Outer electronic configuration of Group 14 is ____.
a) ns^2np^1 b) ns^2np^2 c) ns^2np^3

xi) Alkali metals react with water to form hydroxides _____alkali metal reacts least vigorously.
a) Li b) Na c) Cs

xii) Oxidation state of sulphur in H_2SO_4 is ____.
a) +6 b) +5 c) -6

xiii) Molecule even with one chiral carbon atom can have_____.
a) Enantiomers b) diastereomers c) both a and b

xiv) The _____isomer has atleast two similar groups on the same side of the double bond.
a) Cis b) trans c) Cis and trans

xv) _____ used to measure optical rotation.
a) Colorimeter b) Polarimeter c) Potentiometer

xvi) A broken wedge in Flying wedge formula indicate the bond _____ plane of paper.
a) above the b) on the c) below the

xvii) _____ is present in the meso form of tartaric acid.
a) Plane of symmetry b) Axis of symmetry c) Both a and b

xviii) Similar physical and chemical properties are observed in_____.
a) enantiomers b) geometrical isomers
c) diastereoisomers

(B) State whether the following statements are True or False (3)
(Any Three)

i) Molecularity of a reaction is always an integral whole number.

ii) A molecule on the surface of a liquid is surrounded by other. molecules and they are equally attracted in all directions.

iii) Metallic character increases across the period as we move from left to right.

iv) Electronegativity of fluorine is more than that of chlorine.

v) Nicol prism is used for obtaining plane polarized light.

vi) X-ray diffraction is employed to find the absolute configuration of a molecule.

(C) Match the following columns **(Any Five)** (5)

Column A		**Column B**	
(i)	Unit of rate constant of first order reaction	(a)	Al_2O_3
(ii)	Coefficient of Viscosity	(b)	$Ca(OH)_2$
(iii)	Amphoteric	(c)	Two asymmetric carbon
(iv)	Caustic soda	(d)	s^{-1}
(v)	Tartaric acid	(e)	NaOH
(vi)	Meso form	(f)	$\pi r^4 t\, p / 8vl$
		(g)	mol L^{-1} s^{-1}
		(h)	Plane of symmetry

Q. 2 Attempt any Four of the following

(A)		Derive an expression for the rate constant of a second order reaction of reactants having equal concentration.	**(5)**
(B)	i)	What is meant by order of a reaction?	**(1)**
	ii)	Explain the half life time method for the determination of order of a reaction.	**(4)**
(C)		A first order reaction takes 20 minutes for 25% decomposition. Calculate the	**(5)**
	i)	rate constant	
	ii)	time taken for 75% of the reaction to be completed.	
(D)	i)	Define Viscosity of liquid?	**(1)**
	ii)	Explain determination of viscosity by Ostwald's viscometer?	**(4)**
(E)		At 293K, water formed 30 drops while flowing through the capillary of a Stalagmometer and an organic liquid formed 49 drops. Calculate the surface tension of organic liquid if the densities of water and organic liquid are 0.998×10^3 kg m^{-3} and 0.851×10^3 kg m^{-3} respectively and surface tension of the water at 293K is 7.28×10^{-2} N m^{-1}.	**(5)**
(F)		Define refractive index. How is Abbe's refractometer used for determining refractive index of any liquid?	**(5)**

Q. 3 Attempt any Four of the following

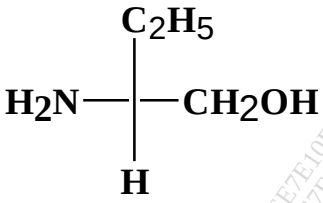
(A)	What is inert pair effect? Explain with suitable examples.	**(5)**
(B)	Explain the diagonal relationship between beryllium and alumunium	**(5)**
(C)	Illustrate the anomalous behaviour of nitrogen.	**(5)**
(D)	How is calcium carbonate prepared? Explain its important applications.	**(5)**
(E)	How is sodium chloride obtained ? Mention any three of its properties .	**(5)**
(F)	What are carbides ? How are alkali metal carbides prepared?	**(5)**

Q. 4 **Attempt any Four of the following**

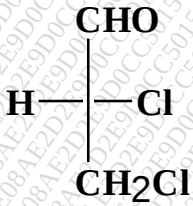
(A) Explain the terms i) asymmetric carbon and ii) diastereomers **(5)**

(B) Assign 'R' or 'S' descriptors to the following molecules by mentioning priority order of substituents. **(5)**

a)



b)



(C) Distinguish between the following: **(5)**

i) racemic mixture and meso form

ii) optical isomerism and geometrical isomerism

(D) Discuss the following terms: **(5)**

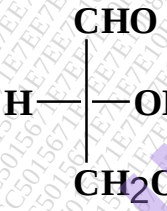
i) chirality

ii) enantiomers

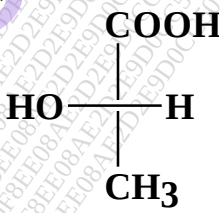
(E) i) What is resolution of racemic mixture? **(2)**

ii) Assign 'D' and 'L' nomenclature to the following compounds. **(3)**

a)



b)



(F) Discuss conformational analysis of ethane. **(5)**

Q 5 **Attempt any Four of the following**

(A) Draw a graph of **(5)**

i) log a / (a-x) vs time.

ii) log (a-x) vs time.

for a first order reaction where 'a' is the initial concentration of the reactant and '(a-x)' is the concentration of the reactant remaining at a particular time.

iii) How is the rate constant determined from each of the graph.

(B) Define Optically active compound? The density of methyl acetate is 0.928×10^3 kg m^{-3} at 293 K. Its refractive index for sodium D-line is 1.3594. Calculate its molar refractivity. (Given : Molecular weight of Methyl acetate = 74). **(5)**

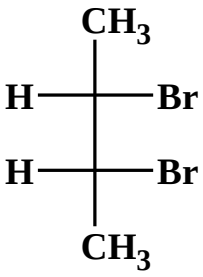
(C) Name the oxides of carbon. Write any one source of emission and control measure for each of the oxides of carbon. **(5)**

(D) Write short note on acid rain. **(5)**

(E) Explain optical isomerism of lactic acid. **(5)**

(F) Convert the following Fisher projection formulae to Sawhorse projection formulae. **(5)**

a)



b)