Q.P. 63653

Semester I- Paper II **Set 1**

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

i. b
ii. c
iii. a
iv. a
v. a
vi. c
vii. c
viii. a
ix. a
x. c
xi. a.
xii. c.
xiii. c (Dextro)
xiv. a (2)
xv. b (6)
xvi. a (2)
xvii. c (X ray diffraction)
xviii. a (Resolution)

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

i. False
ii. True
iii. False
iv. False.
v. True
vi. True

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

i. c $2NO \rightarrow N_2 + O_2$
ii. f (ethyl p-azoxy Cinnamate)
iii. a. Argon.
iv. e ; diamagnetic.
v. d (Geometrical isomerism)
vi. b (optically inactive)

Paper II **Set 1**

Q.2. (A)

i) Order of a reaction :Sum of the exponents to which the concentration terms in a rate equation must be raised determining the rate of a reaction **(1)**

ii) Molecularity of a reaction: The number of molecules taking part in the step leading to the reaction **(1)**

iii) Rate of a reaction: It is the change in concentration of a reactant or product per unit time **(1)**

iv) Half life time of a reaction: Half life time is the time it takes for the concentration of a reactant to fall to half of its original value **(2)**

Q.2. (B)

Given $k = 2.0 \times 10^{-2}\ s^{-1}$: $t = 100$ s 'a' = 1.2 mol/L and the reaction is 1st order

To find : i) concentration remaining i.e 'a-x'

Solution:

Rate constant for first order reaction

$$k = \frac{2.303}{t} \log \frac{a}{(a-x)}$$ **(1 mark)**

$$2.0 \times 10^{-2} = \frac{2.303}{100} \log \frac{(1.2)}{a-x}$$

$$\frac{2.0 \times 10^{-2} \times 100}{2.303} = \frac{\log (1.2)}{a-x}$$

$$0.868 = \frac{\log 1.2}{a-x}$$ **(4 marks)**

Antilog (0.868) = 1.2 /(a-x) : 7.379 = 1.2/ (a-x)

$\therefore$ a-x = 0.163 mol/L

Ans: concentration of 'A' remaining after 100s is 0.163 mol/L

Q.2. (C)

Derive an expression for the rate constant of a second order reaction of reactants having equal concentration

Second order reaction is when the rate of the reaction is proportional to the second power of the concentration of the reactant. The rate is influenced by the concentration of two reactants

$2\,A \longrightarrow$ products

Rate = $k\,[A]^2$ **1 mark**

Let 'a' mol/dm^3 be the initial concentration of the reactant at time

x' mol/dm^3 of the reactant react at time t and get converted to products

(a-x) mol/dm^3 will be the concentration of reactant at time t **1 mark**

Rate $dx/dt = k\,(a-x)^2$ where 'k' is the rate constant

$$\int_{x=0}^{x=x} dx / (a-x)^2 = k \int_{t=0}^{t=t} dt$$

$1/(a-x) + \text{constant} = kt$ ..... eq (1)

when t=o .... x=o .....substituting in eq (1)

$\therefore$ constant $= -1/a$

Substituting $-1/a$ in constant in eq (1)

$1/(a-x) - 1/a = kt$

$k = \frac{x}{a(a-x)} \times \frac{1}{t}$

3 marks

Set - I

2.(D) Definition- 1 Mark
Equation – 1 Mark

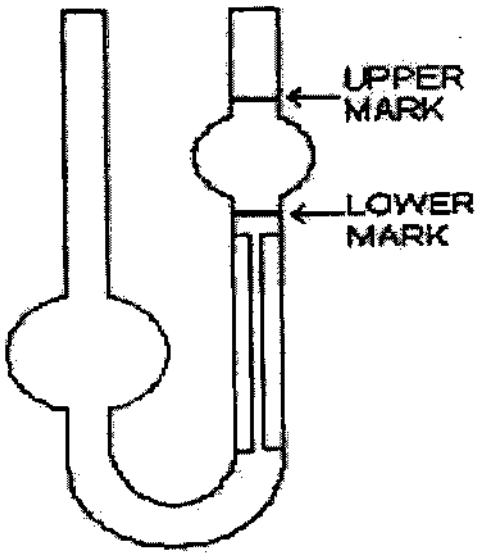

Diagram- 1 Mark
Procedure- 2 Marks

Viscosity of Liquid- The resistance offered to the flow by a liquid is a characteristic property, this resistance is called Viscosity.

Procedure-

i) Ostwald's Viscometer consists of bulb 'A' with mark above (a_1) and below(a_2) and attached to a capillary tube and a storage bulb (C).
ii) A definite volume of liquid is introduced in to C and sucked in to tube above mark 'a_1'.
iii) The time required to flow the liquid from marks a_1 and a_2 is determined. The viscometer is cleaned, dried.
iv) The experiment is repeated with water.
v) Since, t_l, t_w, d_l, d_w and η_w are known η_l is calculated as

$$\eta_l = t_l/t_w \times d_l/d_w \times \eta_w$$

Questions should be —
WRITTEN IN LEGIBLE HANDWRITING IN BLACK INK.
SIGNS, SKETCHES OR FIGURES IF ANY BE DRAWN IN NEAT BLACK INK,
so as to avoid mistakes in the printed question papers.

Duration ..... Hours. Total Marks assigned to the paper .....

Q. No.		Marks
	N.B. :	
2 · C E)	Solution -	
	Given, $n_1 = 30$, $n_2 = 25$	
	$d_1 = 0.85 \times 10^3 \text{ kg m}^{-3}$	
	$d_2 = 1.0 \times 10^3 \text{ kg m}^{-3}$	
	$\gamma_1 = ?$	
	$\gamma_2 = 7.2 \times 10^{-2} \text{ N m}^{-1}$.	
	$\therefore \frac{\gamma_1}{\gamma_2} = \frac{n_2 d_1}{n_1 d_2}$ → 1 mark	
	$\therefore \frac{\gamma_1}{7.2 \times 10^{-2}} = \frac{25 \times 0.85 \times 10^3}{30 \times 1 \times 10^3}$	3 marks
	$\therefore \gamma_1 = \frac{25 \times 0.85 \times 10^3 \times 7.2 \times 10^{-2}}{30 \times 1 \times 10^3}$	
	$\therefore \gamma_1 = \frac{1530}{30,000}$	
	$\gamma_1 = 0.051 \text{ N m}^{-1}$	1 mark.

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Set-I

06/17

Q. No.

2. CF): Definition of Liquid Crystal - 1mark

Naming of different classes - 1mark

Explanation of each class with example → 3 marks

Liquid Crystals - A substance which flows like a liquid but has some degree of ordering in the arrangement of its molecules is called Liquid Crystals.

Liquid crystals are classified in to three catagories -

1) Smectic Liquid Crystals - flow in layers in different planes and sheets gidding over each other. It has Non - Newtonian motion. Examples - ethyl - azoxy benzoate, ethyl - p - azoxy cinnamate.

2) Nematic Liquid crystals - They flow more readily. Their flow is Newtonian. They have thread like structure. Examples - p - azoxy anisole, p - methoxy cinnamic acid.

3) Cholesteric Liquid Crystals - These have some nematic and smectic characteristics. They have high non - Newtonian flow.

Example - Chloesteryl benzoate.

3 A What is diagonal relationship between elements ? 5M
Explain it w.r.to Be and Al.

Ans: The elements that are placed diagonally opposite to each other in 2nd and 3rd periods of the P.T. show similarities in properties This behaviour of the elements is called IM diagonal relationship

only four similarities bet" Be and Al — 4M

B. How does nitrogen differ from other group 15 elements

Ans Any 5 differences of nitrogen from other group 15 elements 5M
each point 1M each =

C. How is Na_2WO_4 prepared, State any two each of its properties and uses

Ans: any one method of prepan — 1M.
2 properties of Na_2WO_4 — 2M
2 uses " " — 2M

D. Formulate the hydroxides of alkali metals and compare their basic strengths

Ans. Hydroxides of alkali metal have general formula
→ MOH - LiOH, NaOH, KOH, RbOH, & CsOH. — 2M.
Basic Strength.
→ The alkali metals are highly electropositive therefore their hydroxides are the strongest bases known — 1M
→ The Electropositive character of the metals ↑ from Li to Cs.
hence basic character of their hydroxides ↑ from — 1M
LiOH to CsOH.
→ As the size of the cation ↑ from Li to Cs the internuclear distance bet" metal ions and OH^- ion increases and ionisation of the hydroxides ↑ from — 1M
LiOH to CsOH.

E. Give important application of group IA 5M

Ans: any 5 applications — 5M
1 appln — 1M - each —

F What are carbides, How are alkali metal carbides prepared? (5m)

Ans: Definition- 1M.

1 preparation of any carbides of alkali metal

$2Li + 2C \rightarrow Li_2C_2$ (lithium carbide — 1M) 1M each.

$2Na + C_2H_2 \rightarrow 2NaHC_2 + H_2\uparrow$

$2NaHC_2 \rightarrow Na_2C_2 + C_2H_2\uparrow$ — (2m)

The metal like Potassium, rubidium, & Cs react with graphite & form highly coloured carbide

1M each for each carbide prepared

Q

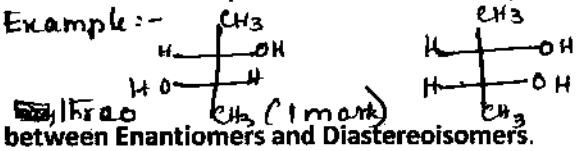
4 A **Answer any four of the following**

Explain the terms with suitable examples — **5 marks**

a)Threo isomer : For nomenclature of a molecule containing 2 chiral centres, Erythro & Threo notation is used. If similar groups in a projection formula are on opposite side, then isomer is Threo isomer (1½ mark)

b) Erythro isomer :- If similar groups in a projection formula are on the same side, then isomer is Erythro (1½)

Example :-



Threo (1 mark) Erythro

4. B **i)Distinguish between Enantiomers and Diastereoisomers.** — **3 marks**

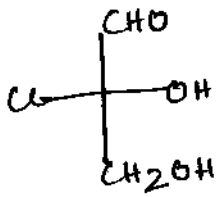
(each point of difference 1mark)

Enantiomers	Diastereomers.
1. Are non superimposable mirror-imposable mirror images of eathotha	1. Are non-superimposable but they are not mirror images of each other
2. Same phytical & chemical properties	2. They differ in physical & chemical properties.
3. They cannot be separated by fractional dist^{n}/cry^{n}	3. They can be separated by repeated fractional distillation/crystallisation

ii) Assign R or S descriptors — **2marks**

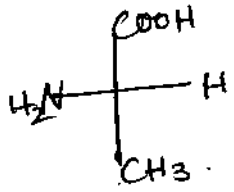
(each correct descriptor 1 mark)

a)



S (1 mark)

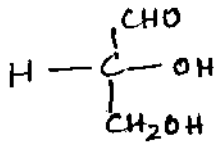
b)



S (1 mark).

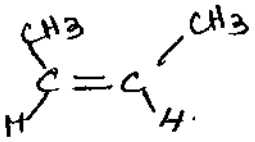
4. C **i) Give the structures of the following** **2marks**

a) D-Glyceraldehyde



(1mark).

b)Cis -2-butene



(1mark)

ii)Identify chiral and achiral molecules (1mark each) **3 marks**

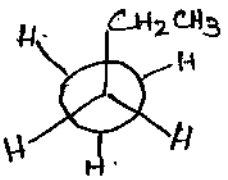
a) CH_3CHBr_2 achiral

b) $CH_3CH(OH)Br$ chiral

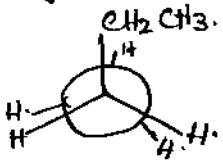
c) $C_2H_5CH(Cl)CH_3$ chiral

4. D **Draw the conformations of n-Butane for rotation about C_1-C_2 bond, discuss their relative stabilities.** **5marks**

Conformations of n-Butane for rotation about C_1-C_2 bond – n Butane has Two conformations considering rotation



Staggered



Eclipsed

(2marks).

Relative stabilities

1) staggered form is the most stable conformation as all atoms are far as possible (1mark)

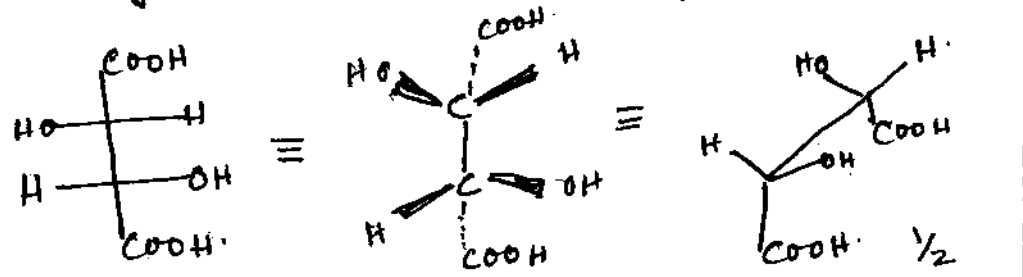
2) Eclipsed form is less stable than staggered, due to repulsive interaction between eclipsed hydrogen atoms & ethyl group. (1mark)

P.E diagram (1mark).

Q. No. | Marks 5 marks

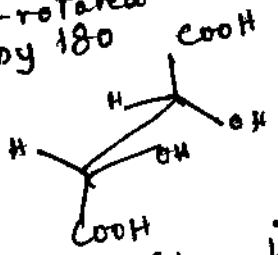
4 E) Convert the following molecules from Fischer projection formula to Sawhorse formula

i)

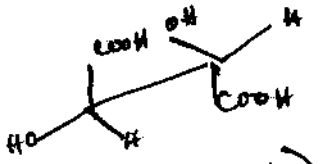


Lower chiral C rotated by 180

Upper chiral C-rotated by 180

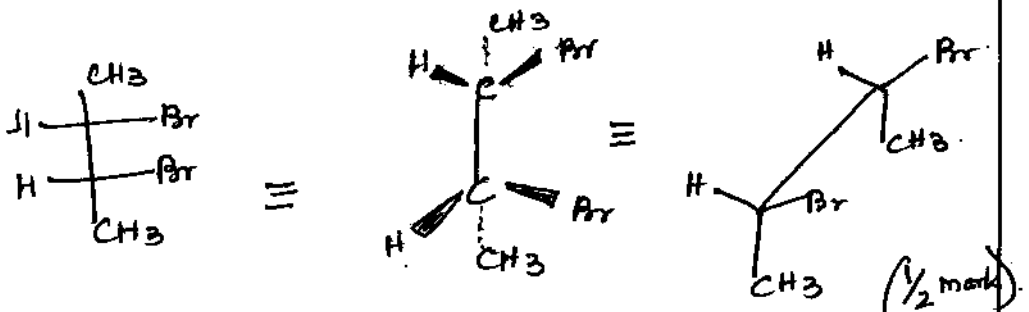


(1 mark)



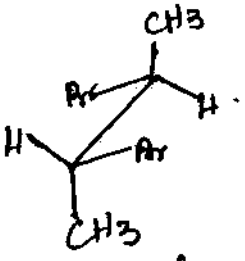
(1 mark)

ii)

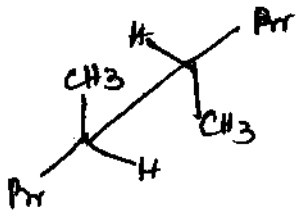


(1/2 mark)

Upper chiral C-rotated by 180°



(1 mark)



(1 mark)

4 F

i)Characteristics of Meso isomers.
(each 1 mark) **3 marks**

1. The meso-isomer is optically inactive due to internal compensation. (1mark)
2. Meso form possess a plane of symmetry (½ mark)
3. It is superimposable on its mirror image (1mark) structure (½ mark).

ii)Causes of geometrical isomerism
((each 1 mark) **2marks**

1. Geometrical isomerism is caused by the restricted rotations about the double bond.
2. In the inter conversion of cis isomer into trans, one of the carbon atoms must be rotated by 180° about the sigma bond, This decreases overlap & pi bond breaks.

   Hence all groups have fixed positions w.r. to double bond & it causes geometrical isomerism.

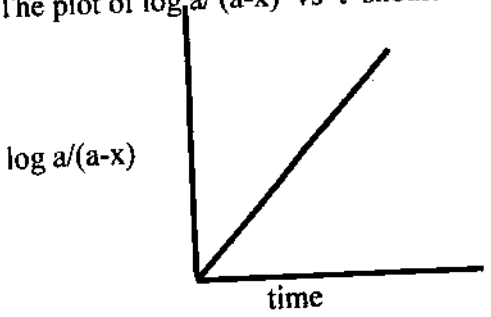
Paper II **Set 1**

Q.5.(A) .Graphical method :

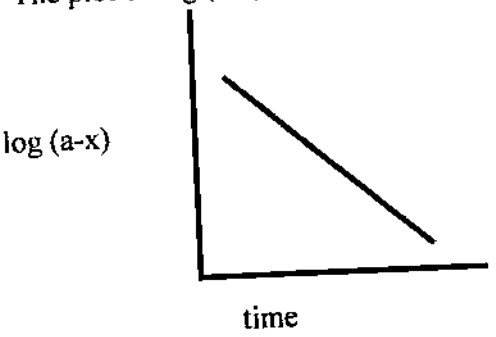
For a given reaction let the values of Initial concentration is 'a' mol/L and 'x' mol/L is extent of reaction at various intervals of time t. **1mark**

For a first order reaction

- The plot of log a/ (a-x) vs t should be a straight line with a positive slope passing through the origin **1mark**

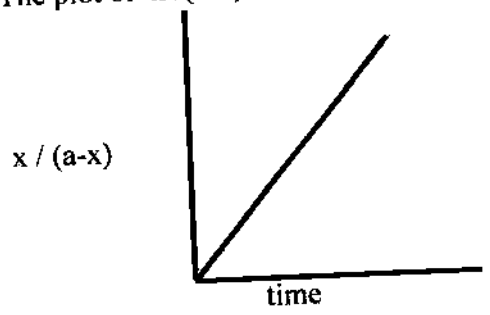


- The plot of log (a-x) vs t should be a straight line with a negative slope with an intercept at y axis **1mark**

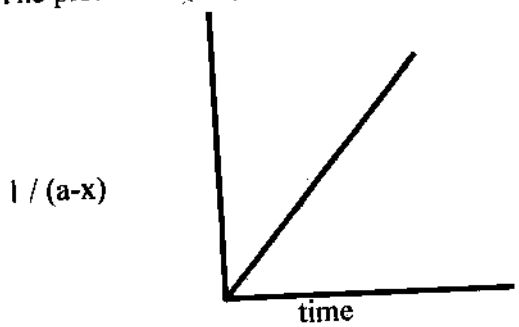


For a second order reaction

- The plot of x /(a-x) vs time should be a straight line with a positive slope passing through the origin **1mark**



- The plot of 1 /(a-x) vs time is a straight line with a positive slope and having an intercept with the y axis **1mark**



Q. No.		Marks
5. (B)	Optically active Compound - A compound that can rotate the plane of polarised light is called optically active compound.	1 mark

Solution - Given,

$n = 1.6$, $d = 0.87\ g\ cm^{-3}$

$MW = 78$.

Molar refraction

$$R_M = \frac{n^2 - 1}{n^2 + 2} \times \frac{M}{d}$$ → 1 mark

$$= \frac{(1.6)^2 - 1}{(1.6)^2 + 2} \times \frac{78}{0.87}$$ → 2 mark

$$= 0.3421 \times 89.6551$$

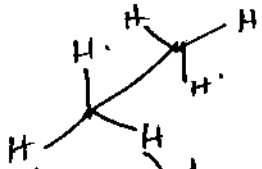
Molar refraction = $30.6710\ cm^3\ mol^{-1}$ → 1 mark

5 E	**What is Conformational analysis? Draw the various conformations of Ethane using Saw horse and Newman projection formula.**	5marks

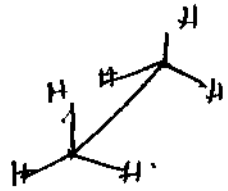
Explanation :Conformational analysis The study of the relative stabilities of the various conformations and relating the properties of the molecule to the stability is called conformational analysis. (1mark)

Conformations of Ethane

Saw horse projection formula.

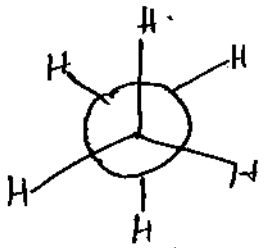


(1mark) staggered

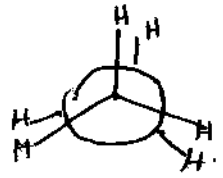


Eclipsed (1mark)

Newman projection formula.



Staggered (1mark)

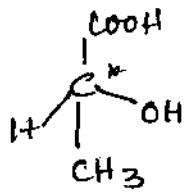


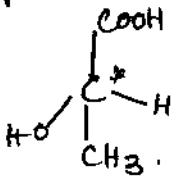
Eclipsed (1mark)

F	**Explain optical isomerism in Lactic acid.**	5marks

1) Lactic acid has one asymmetric carbon atom. (1mark)

2) The number of optical isomers is $2^1 = 2$ (1mark)

3) 



1 mark

4) They are 2 optical isomers :- dextro & laevo (1mark)

5) Lactic acid exhibit optical isomerism due to the presence of one chiral atom (1mark)

Q-5. C. Name any two oxides of carbon. Write any two sources and control measures for each oxides of carbon.

Ans: (1) CO (Carbon monoxide)
(2) CO_2 (Carbon dioxide) } 1M.

two sources
any two sources — 1M each (2M)

any two control measure (1M each (2M)

D. Write a note on acid rain — 5M.

→ Oxyacids of sulphur are sulphurous acid and sulphuric acid and that of 'N' even nitrous acid of nitric acid. These acids form in an environment are responsible for acid rain. 1M

→ Reactions involved:

$$2SO_2 + O_2 \longrightarrow 2SO_3 \uparrow \quad 1M$$
$$SO_3 + H_2O \longrightarrow H_2SO_4 \uparrow$$
$$2NO + O_2 \longrightarrow 2NO_2 \uparrow$$
$$3NO_2 + H_2O \longrightarrow 2HNO_3 + NO \quad 1M$$

→ Rain tends to be naturally acidic with pH 5.6-5.7 due to presence of atm. CO_2 as H_2O to produce carbonic acid. This causes minerals to dissolve but due to contribution of SO_x, NO_x disturb the balance and convert natural acid mildly acidic, acid into precipitation with far-reaching environmental consequences - 1M

→ Acid rain cause extensive damage to naturals and terrestrial ecosystems such as waters, forests, vegetation etc. etc. 1M

→ It damages building & structural materials as well as valuable ancient sculptures, (Taj Mahal).

→ Acidification of soils with the consequent effects on microbial and soil fauna and fixation of nitrogen.

Any 5 points — 6 M.