(3 Hours) **Total Marks: 100**

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.

Section I

Q 1. **Attempt ANY FOUR of the following**

A) What are pericyclic reactions? Describe their characteristics. Explain Cheletropic reactions with a suitable example. **5**

B) Complete the following reaction and explain its mechanism. Suggest one method to push the reaction in the forward direction. **5**

$$CH_3COOH + C_2H_5OH \overset{\text{conc. } H_2SO_4}{\rightleftharpoons} ?$$

C) Distinguish between the following:
i) Nucleophilicity and Basicity **3**
ii) Homolytic and Heterolytic fission **2**

D) What is NGP? Give an example of NGP in nucleophilic substitution reactions. Explain its mechanism **5**

E) Explain phosphorescence and vibrational relaxation using a neatly labelled Jablonski diagram. **5**

F) Define Triplet State. Explain the photochemical reduction of benzophenone. **5**

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

A) Explain the following terms with examples:
a) Rotation-reflection axis **3**
b) Centre of symmetry **2**

B) What do you mean by chirality. Explain it for Cummulenes and Spirans. **5**

C) Give the detailed synthesis and uses of Endosulphan **5**

D) What are biopesticides? Explain the use of Neem oil as biopesticide. **5**

E) **a)** Explain why pyridine-N-oxide undergoes electrophilic substitution at 2 and 4 position. **3**
b) Draw the resonating structure of pyridine-N-oxide. **2**

F) Write the Bischler Napieralski synthesis for isoquinoline. Give the nitration reaction of isoquinoline. **05**

Q. 3 A) Fill in the blanks with the most correct option (Any Five) **05**

a) Electrophilicity is a …….. and …….. term.
i) relative ; thermodynamic ii) relative; kinetic
iii) absolute; thermodynamic iv) absolute; kinetic

b) Reaction intermediate is a ……. .
i) low energy, definite molecular species
ii) low energy, indefinite molecular species
iii) high energy, definite molecular species
iv) high energy, indefinite molecular species

c) Photochemical cleavage of carbonyl compounds to form alkane and carbon monoxide is called …….. reaction.
i) di-π-methane ii) Norrish Type I
iii) eletrocyclic iv) Norrish Type II

d) …… are electron deficient species that attack at positions of high electron density.
i) electrophile ii) acid
iii) base iv) nucleophile

e) _____is due to restricted rotation around carbon-carbon single bond.
i) Atropisomerism ii) Isomerism
iii) Stereoisomerism iv) Geometrical isomerism

f) Nitration of Pyridine-N-oxide takes place at _____ position.
i) 1 ii) 2
iii) 3 iv) 4

g) Which alcohol is used in Skraups synthesis_____?
i) Methanol ii) Ethanol
iii) Glycerol iv) Isopropanol

h) Auxins are _____.
i) Plant growth regulators ii) Insecticides
iii) Pesticides iv) Biopesticides

Q. 3 B) State whether the following statements are TRUE or FALSE (Any Five) **05**

a) Diel's Alder is a 4+2 π cycloaddition reaction.
b) Acid catalysed hydrolysis of esters is called saponification.
c) Electronic transition from $S_1 \rightarrow T_1$ is a forbidden transition.
d) In isoquinoline electrophilic substitution takes place at 5 and 8 position.
e) Dipole moment of pyridine-N-oxide is less than pyridine.
f) Centre of inversion is also known as rotation-reflection axis.
g) Karanja oil is a bio-pesticide.

Section II

Q 4.		**Attempt any four of the following**	**20**
	A)	What is the importance of quality in Industry?	**05**
	B)	Explain the differences between quality control and quality assurance.	**05**
	C)	Find out the Normality and Molarity of NaOH solution, when 0.2 grams of NaOH dissolved in 500 cm^3 of H_2O.	
	D)	2.0 grams of glucose are dissolved in 100 grams of water. calculate the Molality and Mole fraction of glucose in the solution. Given (Atomic weight of carbon=12, hydrogen=1.0, oxygen =16)	**05**
	E)	What is purpose of sampling? Explain the sampling of flowing liquids by using multiple tube sampler.	**05**
	F)	Name different methods used for sampling of stack gases and describe any one of them.	**05**
Q 5.		**Attempt any four of the following**	**20**
	A)	Write short notes on---- a) Kinetic Masking b) Conditional stability constant	05
	B)	What are different types of EDTA titrations? Explain any two of them in brief.	05
	C)	10.0 cm^3 of 0.1 M Fe(II) solution is titrated with 0.02M $KMnO_4$ at pH=1 in acidic medium. Calculate the potential when a) 5.0 ml of titrant is added b) 10.0 ml of titrant is added. Write the equation. Given $E^0_{Pt/\ Fe+2\ Fe+3} = 0.771V$, $E^0_{Pt/MnO4\ -1,\ Mn+2} = 1.51V$ in a solution of pH=1	05
	D)	What are metal -ion indicator? Give the properties of good metal-ion indicator.	05

E) 10,0 ml of 0.1M Fe+2 is titrated with 0.1M Ce+4 solution in presence of sulphuric acid. Calculate electrode potential when 05

a) 2.0 ml of titrant 0.1M Ce (IV) has been added
b) 5.0 ml of titrant 0.1M Ce (IV) has been added

Given $E^0_{PtFe+,3Fe+2} = 0.771V$

, $E^0_{pt/Ce+3.\ Ce+4} = 1.44V$

F) Give the role of indicator in redox titrations, explain the use of diphenyl amine in redox titrations. 05

Q. 6 A) Fill in the blanks with correct alternative give in bracket **(Any Five)** **05**

[Molarity, ppm, ppt , small , large , M/2, M, Compact, analytical reagent , CRM ,unity]

a) A certified reference material is ----------

b) If the Molecular mass of a dibasic acid is M, its equivalent weight will be--------

c) Auger sampler is used for sampling of ---------solids.

d) The sum of mole fraction of all the components in a solution is always --------

e) '--------is used for high precision work.it will contain trace impurities.

f) Milligrams per litre is also known as----------

g) In sampling of solids, bulk ratio should be as -------as possible

h) Number of moles per litre of solution is known as---------

Q. 6 B) **State true or false (Any Five)** **05**

a) Ferroin is an indicator used in redox titration.

b) $KMnO_4$ is used in complexometric titration as a complexing agent/

c) Oxidation takes place at anode in electrochemical cell.

d) Formaldehyde is used as an masking agent in complexometric titrations

e) EDTA titrations are carried out at presence of pH10

f) Titration curve for Fe(II) and $KMnO_4$ is symmetrical.

g) Chelates increases stability of complexes.

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