

(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. **5**  
 Explain Cheletropic reactions with a suitable example.
- B)** Complete the following reaction and explain its mechanism. **5**  
 Suggest one method to push the reaction in the forward direction.  

$$\text{CH}_3\text{COOH} + \text{C}_2\text{H}_5\text{OH} \xrightleftharpoons{\text{conc. H}_2\text{SO}_4} ?$$
- 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. **05**  
 Give the nitration reaction of isoquinoline.

**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- $\pi$ -methane
  - ii) Norrish Type I
  - iii) electrocyclic
  - 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  $4+2 \pi$  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) 05** What is the importance of quality in Industry?
- B) 05** Explain the differences between quality control and quality assurance.
- C)** Find out the Normality and Molarity of NaOH solution, when 0.2 grams of NaOH dissolved in 500 cm<sup>3</sup> of H<sub>2</sub>O.
- D) 05** 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)
- E) 05** What is purpose of sampling? Explain the sampling of flowing liquids by using multiple tube sampler.
- F) 05** Name different methods used for sampling of stack gases and describe any one of them.
- Q 5. Attempt any four of the following 20**
- A) 05** Write short notes on----  
a) Kinetic Masking  
b) Conditional stability constant
- B) 05** What are different types of EDTA titrations? Explain any two of them in brief.
- C) 05** 10.0 cm<sup>3</sup> of 0.1 M Fe(II) solution is titrated with 0.02M KMnO<sub>4</sub> 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  $E^0_{\text{Pt/Fe}^{+2}\text{Fe}^{+3}} = 0.771\text{V}$ ,  
 $E^0_{\text{Pt/MnO}_4^{-1}, \text{Mn}^{+2}} = 1.51\text{V}$  in a solution of pH=1
- D) 05** What are metal -ion indicator? Give the properties of good metal-ion indicator.

E) 10.0 ml of 0.1M Fe<sup>2+</sup> is titrated with 0.1M Ce<sup>4+</sup> 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  $E^0_{\text{PtFe}^{+3}/\text{Fe}^{+2}} = 0.771 \text{ V}$

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

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)  $\text{KMnO}_4$  is used in complexometric titration as a complexing agent/
- c) Oxidation takes place at anode in electrochemical cell.
- d) Formaldehyde is used as a masking agent in complexometric titrations
- e) EDTA titrations are carried out at presence of pH10
- f) Titration curve for Fe(II) and  $\text{KMnO}_4$  is symmetrical.
- g) Chelates increase stability of complexes.

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