(2½ Hours) [Total Marks : 60

N.B. : (1) **All** questions are **compulsory.**
(2) **Figures** to the **right** indicate **full** marks.

1. (a) Answer any **two** of the following :- **8**
   (i) Explain 'QSAR' and discuss how the Taft equation helps to predict the effect of steric factors on the biological activity of a drug.
   (ii) Discuss Hansch analysis. Explain what is meant by a regression correlation.
   (iii) Describe the modern method of drug design based on computer - aided molecular graphics.
   (iv) Explain clearly, the term 'prodrugs'. Illustrate how the carboxylic acid group and the alcohol group are utilised in the synthesis of prodrugs.

   (b) Attempt any **one** of the following :- **4**
   (i) Give the synthesis and application of methotrexate.
   (ii) Give the synthetic route and the uses of-
   I] Fluoxetine
   II] Cetrizine.

2. (a) Answer any **two** of the following :- **8**
   (i) Give the structure of nicotinamide adenine dinucleotide (NADH) and give any two of its biomodeling studies.
   (ii) What is the mechanism of the conversion of methylmalonyl-CoA to succinyl-CoA brought about by a Coenzyme vitamin B_{12}- dependant enzyme.
   (iii) Give any two metabolic functions of pyridoxal phosphate. Give a biomodel which helps to show that the proton - transfer stages of pyridoxal phosphate-mediated transaminations are stereospecific.
   (iv) Give the structure of lipoic acid and explain its mechanism of action in pyruvate dehydrogenase.

   (b) Answer any **one** of the following :- **4**
   (i) With respect to cytochromes, explain oxygen activation in biological systems.
   (ii) Give the structure and mechanism of action of biotin. What is 'biomodeling'?

3. (a) Answer any **two** of the following :- **8**
   (i) Write a note on enzyme-catalysed reduction reactions in organic chemistry, giving three examples.
   (ii) Discuss how hydroxylation reactions in biological systems are catalysed by enzymes.
   (iii) Explain how β – lactam antibiotics are produced via fermentation methods, giving relevant equations.

(iv) How are isolated enzymes used for the hydrocyanation of m-phenoxybenzaldehyde? What is meant by 'immobilised' enzymes? 4

3. (b) Attempt any **one** of the following :-
(i) Explain how L-ephedrine can be synthesised via microbial transformation.
(ii) Write a note on enzyme - catalysed hydrolysis reactions giving four examples.

4. (a) Answer any **two** of the following :- 8
(i) With reference to green chemistry write notes on :
I] Ionic Liquids
II] Solid supported green synthesis.
(ii) How do the following contribute to green synthesis -
I] Super critical carbon dioxide
II] Green oxidation catalysts
Give examples to support your answer.
(iii) Show how the following are used in green synthesis -
I] Solid phase synthesis
II] Bio catalysts
(iv) Write a note on microwave-assisted reactions, with reference to green chemistry.

(b) Attempt any **one** of the following : 4
(i) For the synthesis of para amino diphenylamine, compare the conventional method of synthesis with the green method.
(ii) What is the green method for the synthesis of adipic acid? Show how it is environmentally benign compared to the traditional process.

5. Anwer any **four** of the following :- 12
(a) Explain how biotechnology helps in drug design.
(b) Write a note on the concept of 'soft drugs'. What are the properties of soft drugs?
(c) Give the structure and catalytic mechanism of thiamine pyrophosphate with respect to pyruvate decarboxylase.
(d) What are co-enzymes? Write and explain the structures of FAD and $FADH_2$ and give one biomodeling study of FAD.
(e) Explain the role of phosphoglucomutase in the breakdown of glycogen.
(f) Describe the reaction catalysed by the enzyme glucose pyrophosphorylase in the synthesis of glycogen.
(g) Give examples of ultrasound-assisted reactions and explain why they are called green reactions.
(h) What are the factors to be considered while designing a green synthesis. Write a note on green reagents.
