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

1. (a) Answer any **two** of the following - 8

(i) (I) Explain the studies carried out by Taft, regarding 'quantitative structure - activity relationships' (QSAR) with respect to drugs. Give the Hancock modification to the Taft equation.
(II) Give the Lorenz-Lorenz equation for molar refractivity.

(ii) What is meant by 'quantitative structure activity relationship studies'? Explain the studies carried out by Hansch for quantifying the relationship of structure to the activity of the drug. Give the two forms of the modifed Hansch equations.

(iii) Give the advantages and the limitations of the use of 'computer generated molecular graphics' for the design of new drugs.

(iv) Why are drugs converted into prodrugs? Give the types and ideal properties of prodrugs. Give the structure of any two prodrugs and explain their function.

(b) Answer any **one** of the following - 4

(i) Give the synthesis and one application of each of the following-
(I) Oxyphenbutazone (II) Fenofibrate

(ii) Give the synthesis and one application of each of the following-
(I) Methotrexate (II) Diclophenac

2. (a) Answer any **two** of the following - 8

(i) Show how pyruvate dehydrogenase brings about conversion of enolic or enamine intermediate to acetyl coenzyme A

(ii) Explain the Hamiltonian mechanism (4a adduct mechanism) for the action of flavoenzymes and give a biomodel supporting this mechanism.

(iii) Explain the biosynthesis of fatty acids from acetyl coenzyme A.

(iv) What are cytochromes? Explain activation of oxygen in biological systems with reference of cytochromes.

(b) Answer any **one** of the following - 4

(i) Give the mechanism of action of acetyl coenzyme A carboxylase, which has biotin as the prosthetic group.

(ii) Give the mechanism of transamination brought about by aminotransferases or transaminases.

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3. (a) Answer any **two** of the following - 8

(i) Give any two examples of each of the following enzyme catalyzed reactions-

(I) hydroxylation (II) reduction

(ii) Give any four examples to show how microbial transformation is used in chemical synthesis.

(iii) How are enzymes immobilized ?

(iv) Giving examples, show how chiral hydroxy acids are prepared by enzymatic processes.

(b) Answer any **one** of the following - 4

(i) Give the structure and importance of glycogen. Explain the stereochemistry involved. List the names of the enzymes involved in the synthesis of glycogen.

(ii) Show how microbial transformation is used in the synthesis of L-ephedrine. Mention the importance of ephedrine.

4. (a) Answer any **two** of the following - 8

(i) (I) Explain 'solvent - free solid - state synthesis' using the example of Aldol condesation with all the required conditions.

(II) Explain the concept of 'solid - supported organic synthesis', using the example of synthesis of pyridines giving all the required conditions.

(ii) What is the importance of 'ultra - sound' in green synthesis? How is it generated and used? What are the required conditions, for the use of ultra - sound for green synthesis? Explain how Cannizaro synthesis is carried out under sonication.

(iii) Discuss the concept of Phase Transfer Catalysis (PTC). Give the advantages of PTC. Name three phase transfer catalysts and give their structures. Explain an elimination reaction using PTC, giving all the conditions.

(iv) What are the green advantages of using polymer - supported reagents? Give one example each, of reactions using polymer - supported peracid and polymer - supported chromic acid.

(b) Answer any **one** of the following - 4

(i) What is the traditional process for the synthesis of adipic acid? Give the green process for the synthesis of adipic acid, and compare the two processes.

(ii) Give the traditional process and the green process for the synthesis of Ibuprofen and give the advantage of the green process.

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Answer any four of the following - 12

(a) What are soft drugs? What are the advantages of the use of soft drugs? Give one example and explain.

(b) Give the synthesis and applications of Labetalol.

(c) Give the mechanism of conversion of pyruvate to acetolactate by acetolactate synthase, which requires thiamine pyrophosphate as a coenzyme.

(d) Explain the stereospecificity observed in the oxidation of an alcohol by alcohol dehydrogenase, which uses $NAD^+$ as a cofactor.

(e) Explain the role of phosphoglucomutase in the breakdown of glycogen.

(f) Giving examples, show how amino acids are prepared by enzymatic process.

(g) Explain, giving one example each, any three important considerations while designing a green organic synthesis.

(h) From a green chemistry perspective, why is it necessary to use reactions needing less energy? How is this done?

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