

All questions are compulsory. Part I contains 3 questions in three printed pages, which are to be solved in the space provided. Part II may be collected after submitting Part I.

Q. No. 1. Indicate the most appropriate answer by entering A, B, C or D in boxes provided in front of the questions (sub-parts i-x). Use a blue or a black point pen. Each sub-part carries 1.5 mark. [10x1.5=15]

(i). All eicosanoids are derived from arachidonic acid which has.....

- (A) 22 carbon atoms with three double bonds (B) 22 carbon atoms with four double bonds
(C) 20 carbon atoms with three double bonds (D) 20 carbon atoms with four double bonds

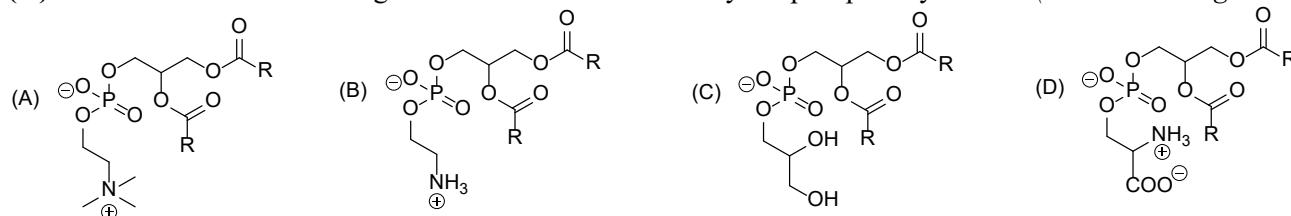
(ii). Micelles of fatty acids in water are organized such that the _____ faces the solvent and the _____ are directed toward the interior

- (A) carboxylic acid groups, hydrocarbon chains heads (B) hydrophilic heads, hydrophobic tails
(C) hydrocarbon chains, carboxylic acid groups (D) both (A) and (B)

(iii). Which of the following is NOT characteristic of alkaloids?

- (A) names generally end in "...ine" (B) alkaline or basic in nature
(C) Occur in free form or salts of acids (D) Cyclic saturated azaheterocycles

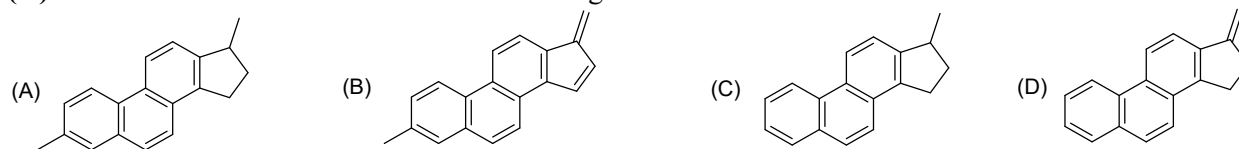
(iv). Which one of the following is the correct structure of Glycerophosphatidylcholine (where R = long chain alkyl)?



(v). Which of the following is **not a true** statement regarding biosynthesis of terpenes?

- (A) Isopentenyl pyrophosphate isomerize (via + H⁺ and then - H⁺) to give dimethylallyl pyrophosphate
(B) Isopentenyl pyrophosphate combine with dimethylallyl pyrophosphate to give geranyl pyrophosphate
(C) Two molecules of geranyl pyrophosphate combine to form squalene
(D) Two molecules of farnesyl pyrophosphate combine to form squalene

(vi). Cholesterol on distillation with Se at 360 °C gives



(vii). Rancidity of lipid-rich food stuff is due to

- (A) Hydrogenation of unsaturated fatty acids. (B) Oxidation of unsaturated fatty acids.
(C) Dehydrogenation of saturated fatty acids. (D) Reduction of fatty acids

(viii). Which one of the following is not present in the structure of Morphine?

- (A) Piperidine ring (B) Methoxy group
(C) Alcoholic group (D) Double bond.

(ix). Which one of the following is not true about the chemistry of quinine?

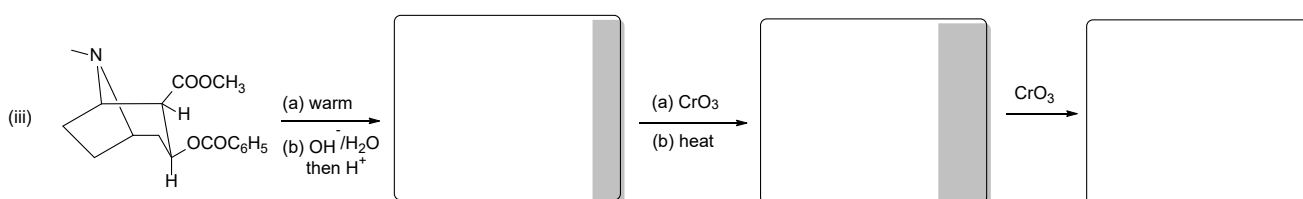
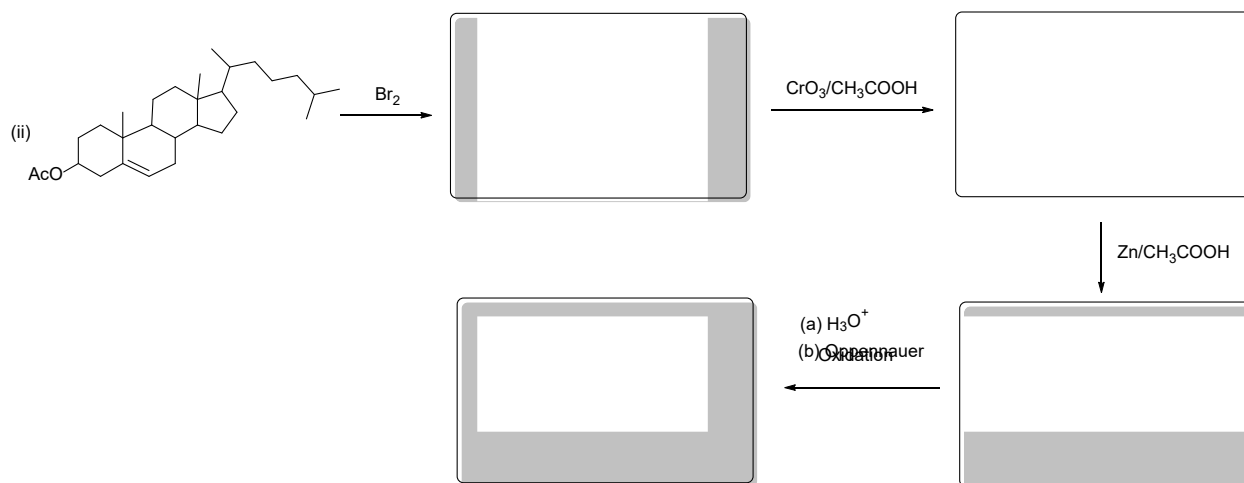
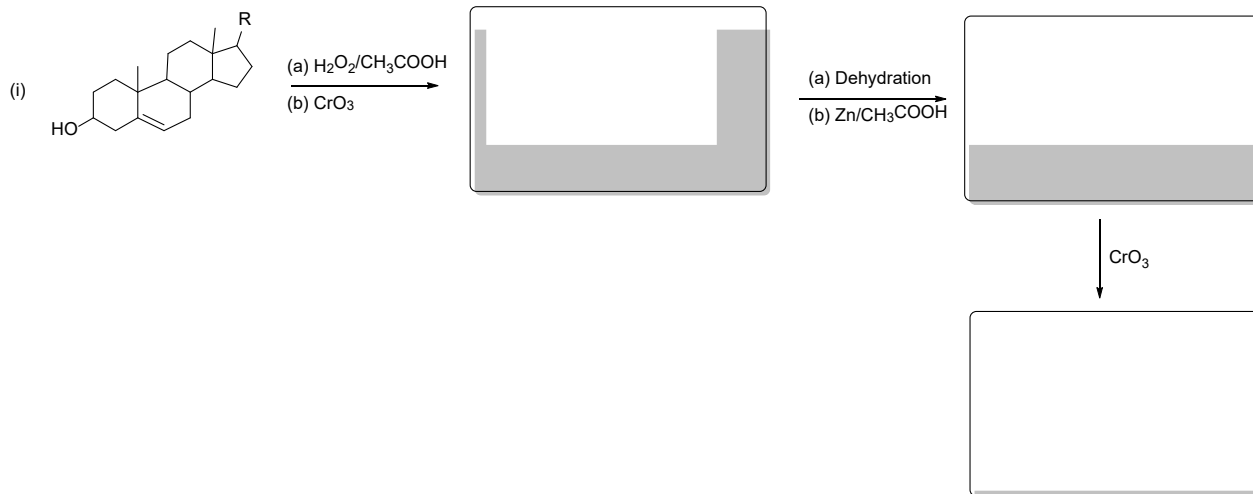
- (A) It reacts with two moles of CH₃I to form diquaternary salt
(B) On controlled oxidation, it yield formic acid
(C) It consumes one mole of H₂/Pd
(D) It gives yellow precipitate with dinitrophenyl hydrazine

(x). A tripeptide has

- (A) 3 peptide chains covalently joined to each other (B) 4 amino acids and 3 peptide bonds
(C) 3 peptide chains joined via Hydrogen bonding (D) 3 amino acids and 2 peptide bonds

Q. No. 2. (i). Complete the following reactions (with correct stereochemistry, wherever applicable)

[10x1.5=15]



.....ROUGH WORK.....

Q. No. 3. (i). Propose a detailed synthetic scheme for converting β -mycrene to *p*-cymene

[5]

(ii). Disodium glutamate (1 equivalent) was titrated with HCl.

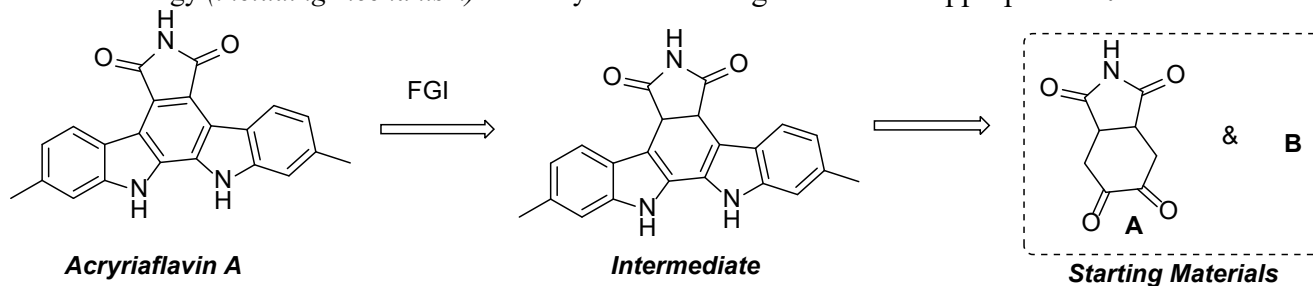
[2+3]

(a) Draw the predominant structural form(s) that will be formed in this process.

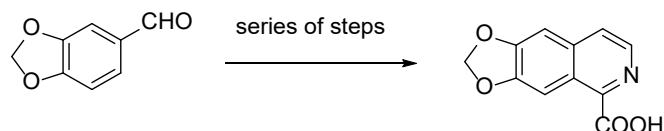
(b) Also, specifically mention the existence/coexistence of the above form(s) at specific addition of 0.5, 1.0, 1.5, 2.0, 2.5, and 3.0 equivalents of HCl in a tabular format.

All questions are compulsory. Answer the sub-parts of a question together.

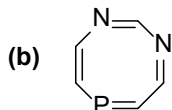
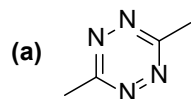
Q. No. 1. (i). Arcyriaflavin-A (structure given below) is a natural product, and a potential therapeutic agent. Propose a detailed strategy (including mechanism) for its synthesis starting from **A** and appropriate **B**. [5]



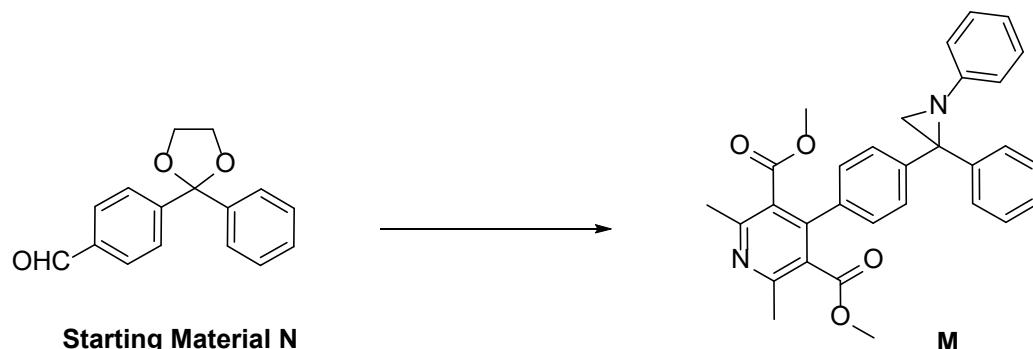
(ii). Using appropriate reactants/reagents/solvents/conditions, carry out the following conversions. [5]



Q. No. 2. (i). Write the IUPAC nomenclature names for the following heterocycles. [2x1.5=3]



(ii). Compound **M** (shown below) is a biologically active molecule. Design its synthesis (with detailed mechanism) using appropriate reactants/reagents starting from compound **N**. [7]



Q. No. 3. A biological active peptide was analyzed by chemical and enzymatic methods to determine the sequence of amino acids in it. **(i)** With the help of the given data (below), determine the correct sequence of the peptide. **(ii)** Clearly write the inferences for each data (a-f)? [2+8]

(a) Amino acid analysis revealed the composition: Asp, Asn, Glu(2), Gly, Lys, Met(2), Phe, Pro(2)

(b) Carboxypeptidase A digestion: Gly

(c) Sanger analysis afforded the DNP derivative of Glu

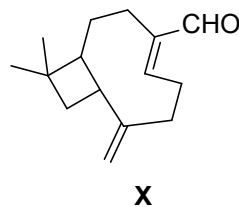
(d) Treatment of the peptide with cyanogen bromide gave three fragments: (Met*, Glu); (Asp, Gly); (Phe, Pro, Met*, Lys, Glu, Asn, Pro) : Sanger analysis of the third fragment gave the DNP derivatives of Pro. [Me* : Methionine detected as homoserine]

(e) Cleavage of the oligopeptide with trypsin gave two fragments: (Phe, Lys, Pro, Pro, Met, Glu); (Asn, Asp, Glu, Met, Gly). Sanger analysis of these two fragments both gave the DNP derivative of Glu.

(f) Cleavage of the oligopeptide with chymotrypsin gave two fragments: (Pro, Met, Pro, Glu, Phe); (Glu, Lys, Met, Asn, Asp, Gly).

Q. No. 4. (i). Among the twenty naturally-occurring α -amino acids, an amino acid does not give the typical bluish purple coloration with ninhydrin solution. It also yields a bicyclic hydantoin product. Identify the amino acid, and show the detailed mechanism for the formation of bicyclic hydantoin. [4]

(ii). Give the complete classification of the following terpenoid (X), and identify head and tails of different isoprene units by labelling as H & T and showing dotted lines. [3]



(iii). A pro-vitamin form of a vitamin on exposure to UV light converts into Vitamin D₂, which on reaction with maleic anhydride gives an adduct. Detail out all the reaction involved mentioned in the above observations. [3]

Q. No. 5. (i). Monoterpenoid derivative Y is a pleasant smelling compound with molecular formula C₁₀H₁₆O. Hydrogenation (H₂ + Pt) of Y gives a C₁₀H₁₈O product, which on oxidation under strong oxidizing conditions gave 2-isopropyl-5-methylhexane-1,6-dioic acid. Ozonolysis of the original terpenoid, Y, followed by hydrogen peroxide treatment produces a acetone and a 1,2-diketone derivative (C₇H₁₀O₂). Identify the structures of Y, and explain the given observations by writing related reactions. [2+3]

(ii). One set of Hoffmann degradation reactions (CH₃I; Ag₂O, heat) on an alkaloid T, having molecular formula, C₁₄H₁₇NO give a nitrogen containing compound P, having formula C₁₅H₁₉NO. Subsequent Hoffman degradation reactions on P give penta-1,3-diene and an amide Q, having formula C₁₁H₁₃NO. Compound Q is a tertiary amide and could also be obtained by coupling cinnamic acid (C₆H₅CH=CH-COOH) with dimethylamine [(CH₃)₂NH] Identify the structures of T, P, Q, and explain the given observations by writing related reactions. [5]

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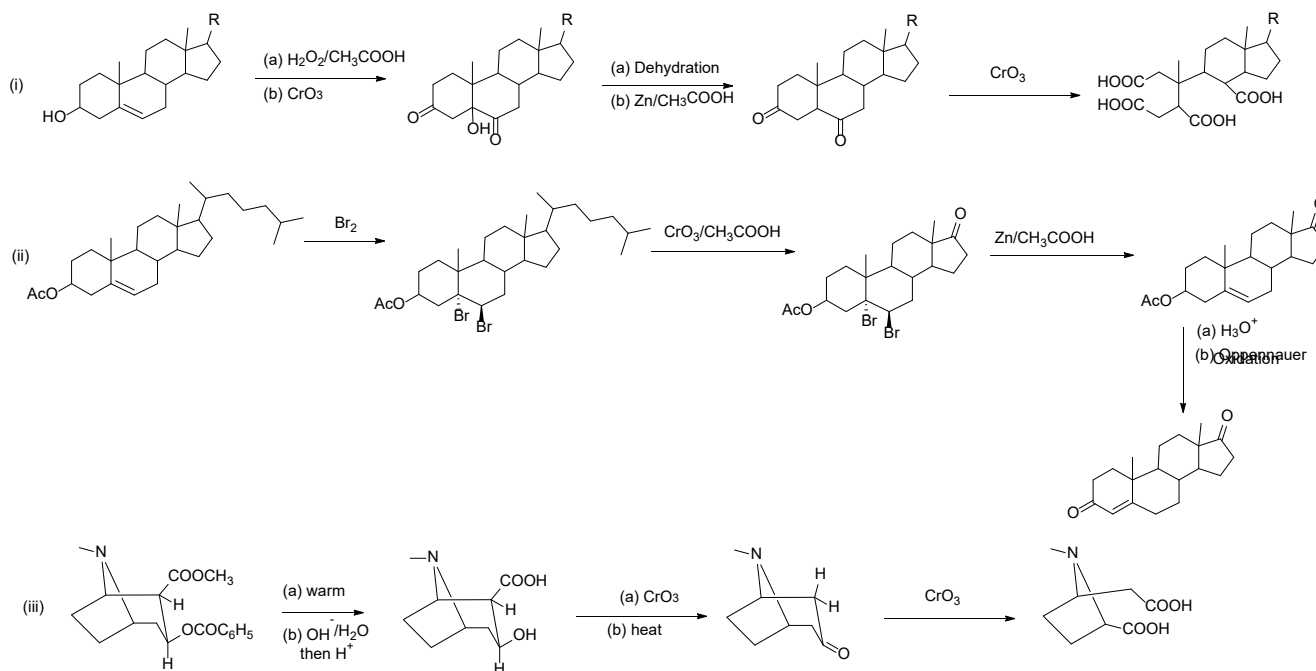
Q. No. 1.

[10x1.5=15]

(i).	D
(ii).	D
(iii).	D
(iv).	A
(v).	C
(vi).	C
(vii).	B
(viii).	B
(ix).	D
(x).	D

Q. No. 2. (i).

[10x1.5=15]



Q. No. 3. (i). β -mycrene to *p*-cymene

[5]

(ii).

(a) The predominant structural form(s) that will be formed in this process are:

[0.5x4=2.0]

(b)

[0.5x4=2.0]

Amount of HCl added	Structure no. Predominant
0.5 Eq.	
1 eq.	
1.5 eq.	
2 .eq	
2.5 eq.	
3.0 eq.	