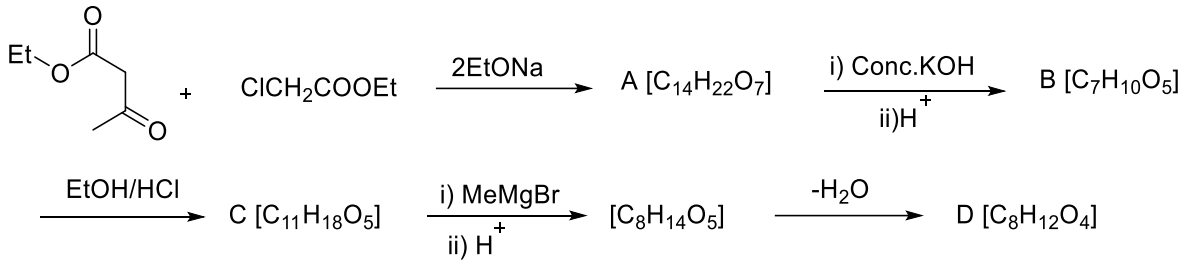
Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
Post Graduate Teaching Department of Chemistry
Master of Science (M.Sc.) CHEMISTRY Examination (CBCS): Third Semester
Paper X (Code: 3T2) (Special II- Organic Chemistry)

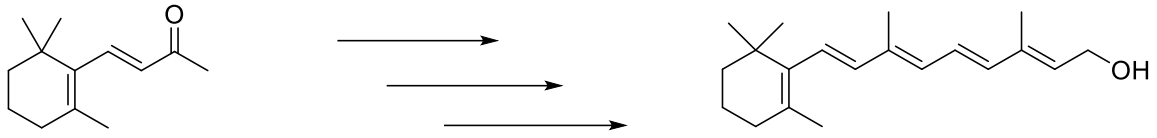
Time: Three Hours **Max. marks: 60**

N.B.: (1) All questions are compulsory.
(2) All questions carry equal marks.

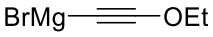
Q.1 (A) Two of the oxidation products of α-terpineol are terebic acid and terpenylic acid. Their structures established by the following synthesis 4 M



(B) The reagents required for the following conversions are indicated below. Arrange them in appropriate sequence to get the final product from the given starting material. Write the structure of intermediates if any 4 M



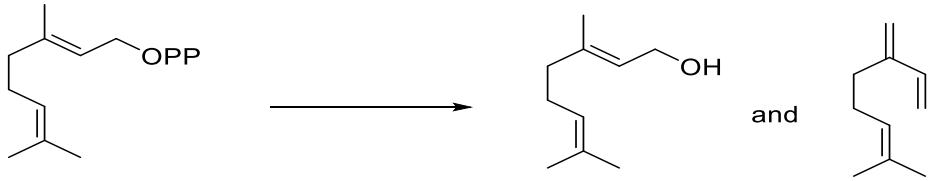
Vitamin A

Reagents: $LiAlH_4$, $MeLi/H^+$, $BrCH_2CH{=}CHCOOEt/H^+$, $H_2/Pd\text{-}BaSO_4$, H^+, 

(C) Determine the structure for β-Carotene and identify its class and sketch the mode of addition of isoprene. 4 M

OR

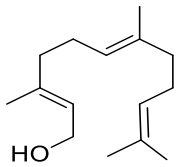
(D) Write a detailed, step by step mechanism for the following biosynthetic transformations involving the formation of acyclic monoterpenoids from geranyl pyrophosphate: 4 M



Geranyl pyrophosphate Geraniol Myrecene

(E) Write the products of the treatment of farnesol with each of the following 4 M

i) Ac_2O
ii) H_2/Pt
iii) O_3/Me_2S
iv)CrO_3

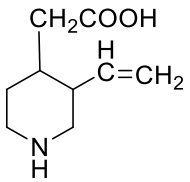


Farnesol

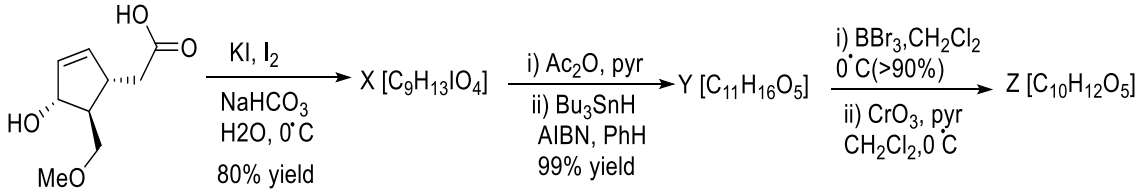
(F) Give the classification of terpenes with suitable examples. 4 M

Q.2 (A) Write the product of the treatment of Meroquinene with each of the following 4 M

i) PhCOCl
ii) HNO_2
iii) $NaHCO_3$
iv)$KMnO_4$



(B) Predict the product of following reaction with suitable stereochemistry 04

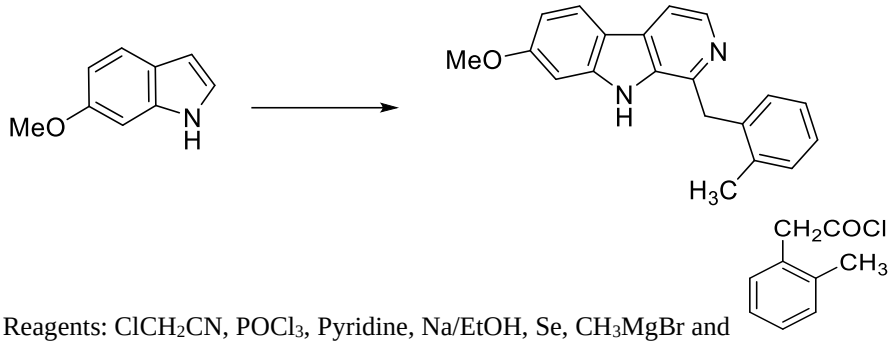


(C) Give the biosynthesis of Atropine. 4 M

OR

(D) How is structure of Nicotine established? 4 M

(E) The reagents required for the following conversions are indicated below. Arrange them in appropriate sequence to get the final product from the given starting material. Write the structure of intermediates if any 4 M



Reagents: $ClCH_2CN$, $POCl_3$, Pyridine, Na/EtOH, Se, CH_3MgBr and

(F) Illustrate the chemical degradation of ephedrine. 4 M

Q.3 (A) Write the product of the treatment of oestrone with each of the followings: 4 M

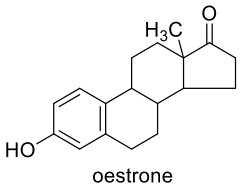
1] CH_2N_2

2] Product of [1] treated with NH_2NH_2 and *t*-BuOK

3] Product of [2] subjected to Se distillation

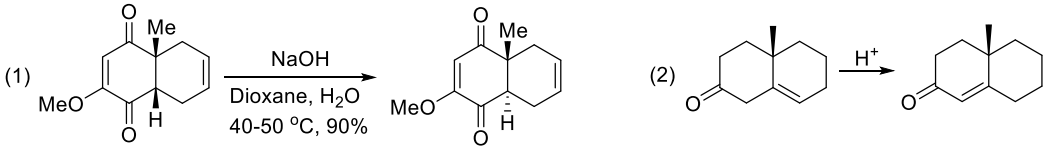
4] NH_2OH

5] Zn distillation 6] H_2/Pt 7] Ac_2O



oestrone

(B) Give the mechanism for the following transformations: 4 M

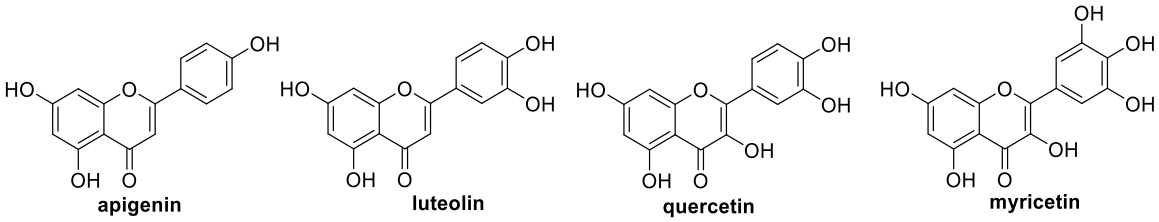


(C) What conclusion you can derive about the structure of progesterone from the following facts/observations: 4 M

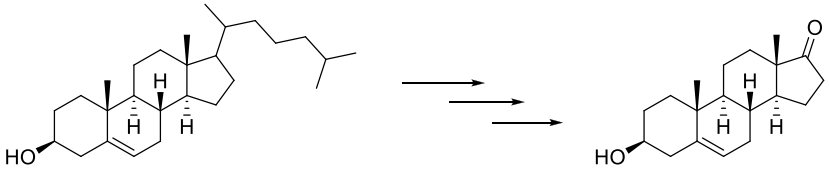
1. From analytical data, the molecular formula of progesterone has been found to be $C_{21}H_{30}O_2$.
2. It forms a dioxime with hydroxylamine.
3. When catalytically reduced, it takes up three molecules of hydrogen to form the dialcohol $C_{21}H_{36}O_2$.
4. When progesterone is heated with any halogen and NaOH, it yields haloform, *i. e.*, it undergoes haloform reaction.

OR

(D) What product(s) are obtained when each of the following are subjected to KOH fusion reaction? 4 M

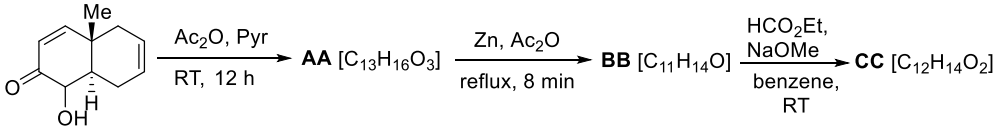


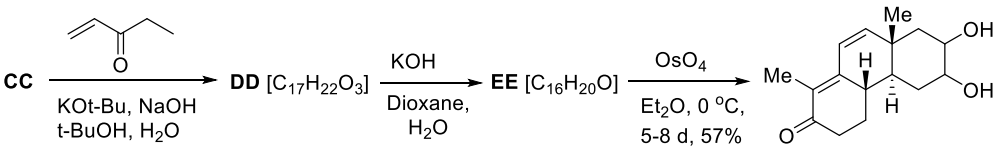
(E) The reagents required for the following conversions are indicated below. Arrange them in appropriate sequence to get the final product from the give starting material. Write the structure of the intermediate, if any. 4 M



Reagents: CrO_3-AcOH, Br_2, Zn-AcOH, Ac_2O, hydrolysis

(F) Complete the following reaction sequence: 4 M



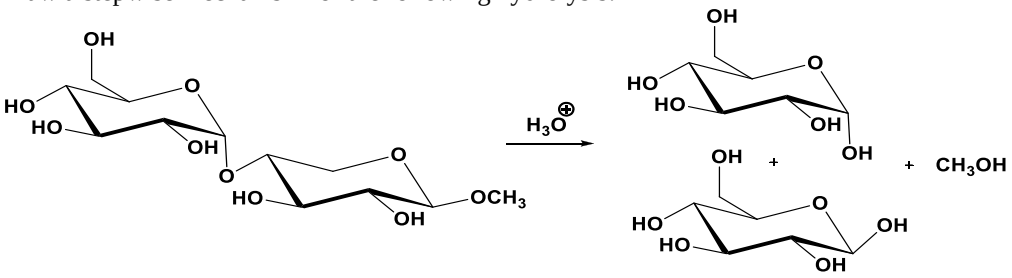


Q.4 (A) Give the amino acid sequence of the following polypeptides using only the data given by partial acidic hydrolysis: 4 M

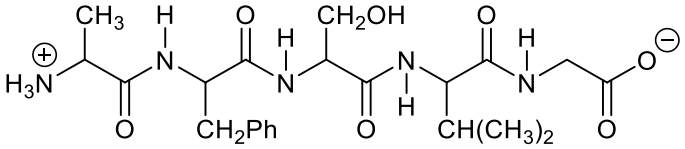
(i) $\text{Ser, Hys, Pro, Thr} \xrightarrow[H_2O]{H_3O^+} \text{Ser-Thr + Thr-Hys + Pro-Ser}$

ii) $\text{Ala, Arg, Cys, Val, Leu} \xrightarrow[H_2O]{H_3O^+} \text{Ala-Cys + Cys-Arg + Arg-Val + Leu-Ala}$

(B) Draw a stepwise mechanism for the following hydrolysis. 4 M



(C) Consider the following compound: 4 M



(*i*) What kind of peptide does this structure represent? (For example, dipeptide)
(*ii*) How many peptide bonds are present?
(*iii*) Give the name for the N-terminal amino acid.
(*iv*) Give the name for the C-terminal amino acid.

OR

(D) Show how valine can be prepared by: 4 M
- i) N-phthalimidomalonic ester synthesis
- ii) Strecker synthesis

(E) Write equations for the sequence of oxidation, methylation, and hydrolysis as applied to (+)-lactose. 4 M

(F) Discuss the chemistry of starch. 4 M

Q.5 (A) What products are obtained when each of the following reacts with Chiral 3 M
i) NH_2OH ii) Tollen's reagent (Ag_2O) iii) Na (Hg)

(B) Discuss the classification of alkaloids based on nitrogen heterocyclic ring 3 M

(C) Discuss the biosynthesis shikimic acid pathway. 3 M

(D) The peptide 'A' on reaction with 1-Fluoro-2,4-dinitrobenzene followed by exhaustive hydrolysis gave phenylalanine, alanine, serine, N-(2,4-dinitrophenyl) glycine. On the other hand peptide 'A' after two cycles of Edman degradation gave Phe-Ser as the product. The structure of the peptide 'A' is 3 M