Enrolment Number										

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27/5/25

Winter, 2025

B. Pharm. 4th Semester Examination

Pharmaceutical Organic Chemistry-III

Course Code: BP401T

Full Marks – 75 **Time – 3 hours**

The figure in the margin indicates full marks for the questions.

1. Multiple choice questions (MCQ) (Answer all questions): **20 x 1=20**

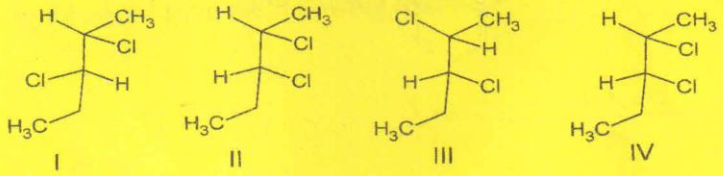
(I) Nicol prism of polarimeter is made up .....

(A) $CaCO_3$
(B) N_aCO_3
(C) $MgCO_3$
(D) K_2CO_3

(II) When 28 mg of acid is dissolved in 1 cm^3 of ethanol and the solution placed in a 10 cm long polarimeter cell, an optical rotation (α) of -4.35^0 is measured at 20^0 C length with light of wave 589 nm. What is the specific rotation of the acid?

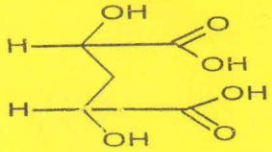
(A) -195.6
(B) -155.4
(C) -175.6
(D) -125.4

(III) All the following compound (I, II, III and IV) are stereoisomers of each other and among the .....is diastereoisomer.



(A) I
(B) II
(C) III
(D) IV

(IV) How many stereoisomers and enantio pairs are theoretically possible in the following structure?



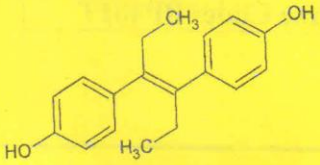
(A) 1 and 4
(B) 4 and 2
(C) 4 and 1

(D) 4 and 4

(V) Which of the following methods are used to determine the geometrical isomer?

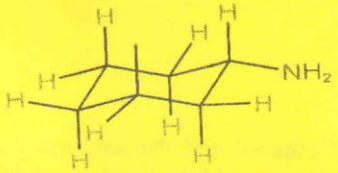
(A) UV-Vis Spectroscopy
(B) IR Spectroscopy
(C) H^1-NMR Spectroscopy
(D) All of the above

(VI) In the following compound how many geometrical isomers are found?



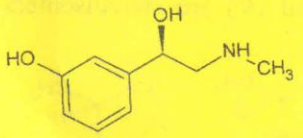
(A) 4
(B) 3
(C) 1
(D) 2

(VII) What is the name of the following compound and how many axial and equatorial positions are indicated?



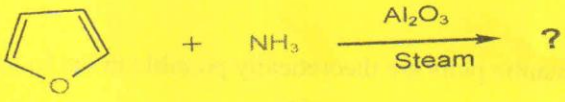
(A) Cyclohexyl amine containing 2 axial and 10 equatorial positions
(B) Cyclohexamine containing 4 axial and 8 equatorial positions
(C) Cyclohexyl amine containing 6 axial and 6 equatorial positions
(D) Cyclohexamine containing 4 axial and 8 equatorial positions

(VIII) Identify the name of drug from the following structure which is used as centrally acting adrenergic nasal decongestant and it is a conformational isomer?



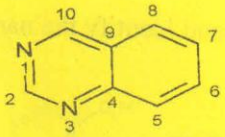
(A) Naphazoline
(B) Ephedrine
(C) Phenylephrine
(D) Oxymetazoline

(IX) Which compound is synthesized from the following reaction?



(A) Thiophene
(B) Imidazole
(C) Pyrrole
(D) Pyrazole

(X) What is the common name of the following condensed heterocycle?



(A) Quinoline
(B) Quinazoline
(C) Benzoquinazoline
(D) All of the above.

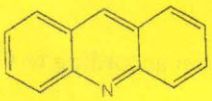
(XI) What is the name of common cholinergic drug which contain both imidazole and furan ring and used to treat Sjogren's syndrome

(A) Nicotin
(B) Rivastigmine
(C) Donepezil
(D) Pilocarpine

(XII) Stanozolol is a drug used to treat postmenopausal osteoporosis and hereditary angioedema and structurally it contains.....rings

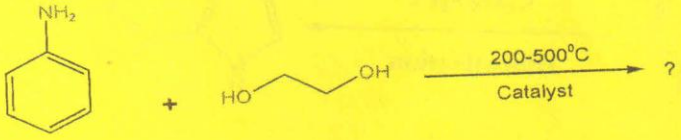
A. Imidazole and steroid ring
B. Pyrazole and steroid ring
C. Pyrrole, Pyrazole and steroid ring
D. D. Furan, Pyrazole and steroid ring

(XIII) What is the name of following condensed heterocycle?



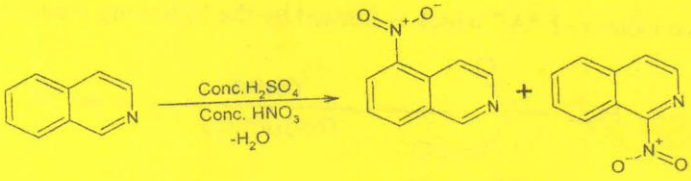
A. 2, 3-Benzoquinoline
B. Dibenzo pyridine
C. 10-Azaanthracene
D. All of the above

(XIV) Which compound is synthesized from the following reaction?



(A) Benzothiophene
(B) Indole
(C) Quinoline
(D) Acridine

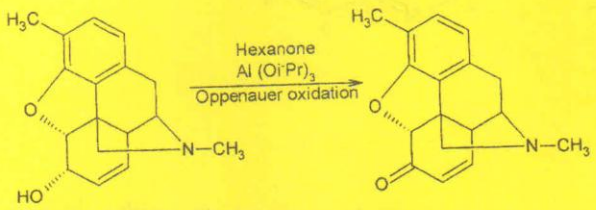
(XV) What are the major products of the following reaction?



(A) 8-nitro isoquinoline (90%)
(B) 5-nitroisoquinoline (10%)

(C) 5-nitroisoquinoline (90%)
(D) 8-nitro isoquinoline (10%)

(XVI) What is the name of starting material and product and identify the name of the reaction in the following synthetic scheme.



(A) Morphine and morphinone: Oppenauer Oxidation
(B) Codeine and Codeinone: Oppenauer Oxidation
(C) Morphine and Codeine: Baeyer–Villiger Oxidation
(D) Codeine and Morphine: Dess–Martin Oxidation

(XVII) Which of the following drug is industrially synthesized by Beckmann rearrangement reactions?

(A) Diclofinac sodium
(B) Aspirin
(C) Paracetamol
(D) Tolmitin sodium

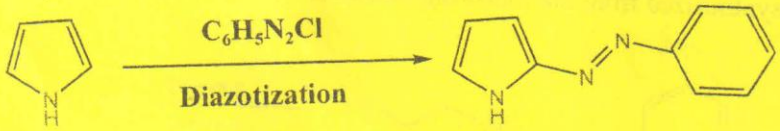
(XVIII) Caffeine is a cortical stimulant contain which of the following condensed heterocycle?

(A) Benzopyrrole
(B) Quinoline
(C) Purine
(D) Pterydine

(XIX) The order of atoms attached to chiral carbon atom according to CIP sequence rule is ...

(A) I > Br > Cl > O > F > N > C > H
(B) H> Br > Cl > O > F > N > C > I
(C) I > Br > Cl > F > O > N > C > H
(D) Cl > Br > I > O > F > N > C > H

(XX) What is the name of the product formed when pyrrole undergoes diazotization reaction in the following scheme?

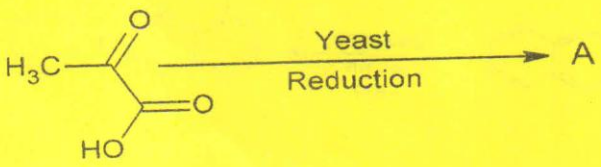


(A) 2-azopyrrole
(B) 2-aryl-pyrrole
(C) 2-phenyl-benzopyrrole
(D) None of the above

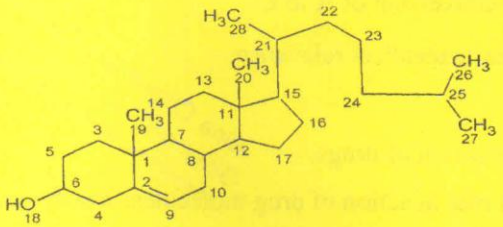
2. Short Answers (Answer any seven) **7 x 5 =35**

(I) (i) Describe chirality and chiral carbon.

(ii) Draw the structure of laevo isomer of **"A"** which is formed by the following reaction:



(iii) Deduce the number of stereogenic centre present in the following compound and determine the number of possible isomers.



[2+1+2=5]

(II) (i) Define flagpole hydrogen and flipping hydrogen phenomena in cyclohexane.

(ii) Explain the different conformation of cyclohexane. [2+3=5]

(III) (i) Define and classify heterocyclic compounds with examples and structure.

(ii) Write the synthesis of pyrrole. [3+2=5]

(III) (i)Define and deduce the mechanism of reaction of Wolff-Kishner reduction.

(ii) Enumerate the synthetic application of Wolff-Kishner reduction with reference to pyrrole and volatile compounds. [3+2=5]

(IV) Discuss the electronic factors that influence the behaviour of pyrrole, furan and thiophene towards electrophilicity and nucleophilicity. [5]

(V) (i) Distinguish between unpolarized light and plane of polarized light.

(ii) Write the principle and construction of polarimeter.

(iii) A 1.20 gm of sample of cocaine $[\alpha]_D$ =-160 was dissolved in 7.50 ml of $CHCl_3$ and placed in a sample tube having path length of 5.0 cm. What is the observed rotation? Identify the cocaine whether it is dextro or laevo? [1+2+2=5]

(VI) (i) Describe the method of preparation of azine.

(ii) Why azine is considerably weaker base than aliphatic tertiary amine-justify your answer.

(iii) Deduce the name of two drugs and their uses containing azine ring. [1+2+2=5]

(VII) (i) Explain the term racemate? Atropine is a racemic mixture of its two enantiomers, dextrorotatory (d-) and levorotatory (l-) forms. If the mixture is 100% atropine, what is the percentage of each enantiomer in the mixture?

(ii) A sample of a chiral drug solution is placed in a polarimeter. When the light source is switched on, the plane of polarized light is rotated +40°. The specific rotation of the pure (+)-isomer of the drug is +60°. (a) What is the enantiomeric excess (ee) of the solution? (b) What is the percentage of each enantiomer ([+]-isomer and [−]-isomer) in the solution? [1+1+3=5]

(VIII) (i) Deduce the synthetic scheme and mechanistic pathway of Skraup reactions for the synthesis of α and β-benzopyridine.

(ii) Draw the structure of drugs containing α and β-benzopyridine ring and their uses. [3+2=5]

(IX) In the following synthetic transformation, an aryl hydrazine (A) reacts with a β-keto acid (B) to give a hydrazone intermediate (C). Upon heating with zinc chloride, compound C undergoes cyclization and dehydration to give intermediate D, which upon decarboxylation forms a fused heterocyclic compound E.

$$A + B \xrightarrow[-H_2O]{} C \xrightarrow[ZnCl_2,\ -NH_3]{\Delta} D \xrightarrow[-CO_2]{\Delta} E$$

(i) Identify and draw the structures of compounds A to E.

(ii) Write the balanced chemical reaction for the conversion of A to E.

(iii) Name the final product E and mention its pharmaceutical relevance. [2+2+1=5]

3. Long Answers (Answer any two) **2x10 =20**

(I) (i)) Explain about tautomerism and its role in action of drugs.

(ii) Optical and geometrical isomers play crucial role in action of drug molecules: Justify your answer with suitable 3D models and examples. [4+6=10]

(II) (i) Draw the synthetic scheme of imidazole.

(ii) Imidazole and pyrazole are versatile heterocyclic compounds plays crucial role in medicinal chemistry-Justify your answer with structure of drugs (at least five).

(ii) Name two pigments which contain pyrrole ring found in human. [2+6+2=10]

(III) (i) Enumerate the principle involved in Oppenauer Oxidation. Explain the mechanistic path way of Oppenauer Oxidation.

(ii) Explain the synthetic application of Oppenauer Oxidation and its limitation. [5+5=10]