REV-01
MSC/23/28

2025/05

SET A

M.Sc. CHEMISTRY
FOURTH SEMESTER
ADVANCED ORGANIC CHEMISTRY
MSC - 402A

[USE OMR FOR OBJECTIVE PART]

Duration: 3 hrs. **Full Marks: 70**

Objective

Time: 30 min. **Marks: 20**

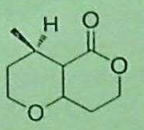
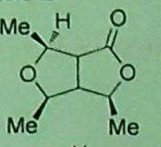
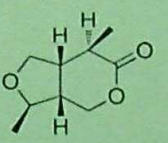
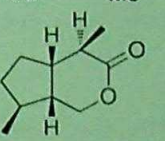
Choose the correct answer from the following: ***1×20=20***

1. Longifolene is an example of
   a. monoterpene
   b. sesterpene
   c. diterpene
   d. sesquiterpene

2. Biosynthesis of Reticuline starts from an amino acid, which is
   a. L-Serine
   b. L-Argenine
   c. L-tyrosine
   d. L- Phenylalanine

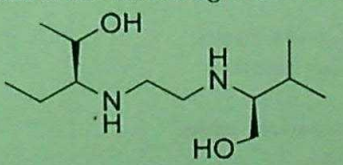
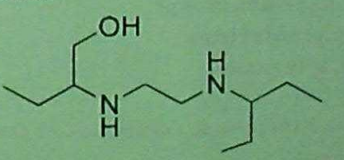
3. The basic skeleton of steroids contains
   a. Cyclopenta-phenanthrene type ring
   b. Cyclopenta-naphthalene type ring
   c. Cyclohexa-phenanthrene type ring
   d. Anthracene type ring

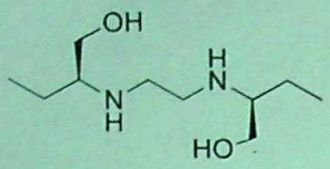
4. The example of cyclopentato monoterpene lactone is

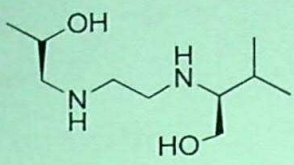
   a. 
   b. 
   c. 
   d. 

5. Biosynthesis of FPP is due to the reaction between
   a. 1eq of IPP and 1eq of DMAPP
   b. 1eq of GPP & 1eq of DMAPP
   c. 1eq of GPP & 1eq of IPP
   d. 1eq of IPP & 2 eq of DMAPP

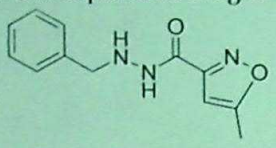
6. Which of the following is the structure of ethambutol

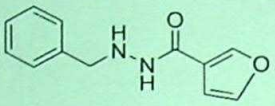
   a. 
   b. 

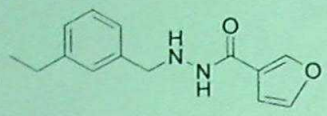
c. 

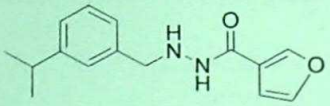
d. 

7. An antidepressant drug is

a. 

b. 

c. 

d. 

8. The starting compound used for industrial scale synthesis of enflurane is
   a. Trifluoroethanol
   b. 1-Methoxy-2-Chloro-1,1,2-trifluoroethane
   c. 2-Chloro-1,1,2-trifluoroethane
   d. 1-Methoxy-2-Chloro-2,2,2-trifluoroethane

9. An example of an inhibitory neurotransmitter is
   a. Gamma-aminobutyric acid
   b. glutamate
   c. epinephrine
   d. norepinephrine

10. Which of the following is antitubercular drug
    a. Melphalan
    b. Diphenhydramine
    c. Ethambutol
    d. Diclofenac

11. 'Corpora non agunt nisi fixata' is mentioned by
    a. Emil Fischer
    b. Paul Ehrlich
    c. Daniel Koshland
    d. None of them

12. In host–guest chemistry, the "host" typically provides:
    a. A reactive center for covalent bond formation
    b. A cavity or binding site for the guest
    c. A free radical for chain reactions
    d. An oxidizing agent

13. Which class of macrocyclic host is especially known for strong complexation with alkali metal cations?
    a. Cyclodextrins
    b. Crown ethers
    c. Calixarenes
    d. Cavitands

14. β-Cyclodextrin is composed of how many glucopyranose units?
    a. Five
    b. Six
    c. Seven
    d. Eight

15. Catenanes are mechanically interlocked molecules composed of:

a. Two or more covalently fused rings
b. Two or more interlocked macrocycles
c. A macrocycle and a linear guest
d. A macrocycle and metal center

16. Freeze-pump-thaw (FPT) method is an effective way to

a. degassing solvents, solutions, or liquid reagents
b. deionising aqueous solvents
c. mixing of solvents, solutions, or liquid reagents
d. removal solvents, solutions, or liquid reagents

17. MOF named MIL-101 and MIL-100 contain

a. Fe metal
b. Zn metal
c. Cr metal
d. Cu metal

18. The combination of [C_3 + C_2] generates

a. Tetragonal COF
b. Hexagonal COF
c. Triangular COF
d. Cubical COF

19. Covalent organic frameworks are a class of materials with permanent porosity and highly ordered structures

a. permanent porosity and highly ordered structures
b. temporary porosity and highly ordered structures
c. permanent porosity and disordered structures
d. flexible porosity and amorphous structures

20. 3D COFs needs at least one building unit having ..... geometry- fill the blanks

a. Td or orthogonal
b. C_2 or C_3
c. C_4 or C_3
d. C_4 and C_3

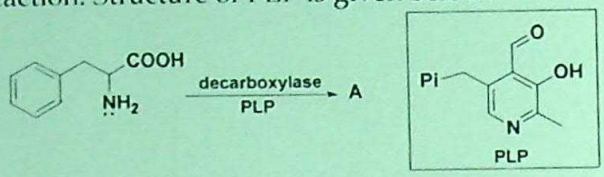
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Descriptive

Time : 2 hrs. 30 mins. **Marks : 50**

[Answer question no.1 & any four (4) from the rest]

1. a. Write down the structure of A formed in the following reactions. What is the role of PLP? Sketch out a possible mechanism of the reaction. Structure of PLP is given below. **3+2+3+2 =10**



b. Draw the structure of a neuron and label its different parts.

c. If the stepwise binding constants of 1:1 and 1:2 host guest complex are K_{11}&K_{12} and the overall binding constant is β_{12}, establish the relation of β_{12}, K_{11}&K_{12}.

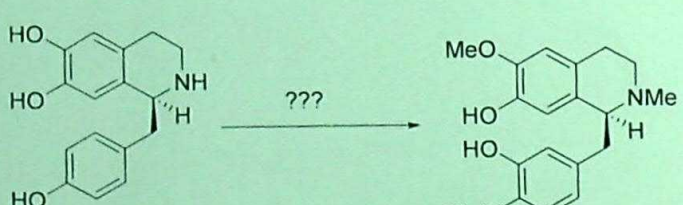
Given:

$$M(H_2O)_n^{m+} + L \overset{K_{11}}{\rightleftharpoons} ML^{m+} + nH_2O$$

$$M(H_2O)_n^{m+} + ML^{m+} \overset{K_{12}}{\rightleftharpoons} ML_2^{(2m)+} + nH_2O$$

d. Write the full form of HHTP. What will happen when boronic acid reacts with HHTP?

2. a. Sketch out the biosynthetic conversion of the following. **3+2+3+2 =10**



(S)-Norclaurine **S-Reticuline**

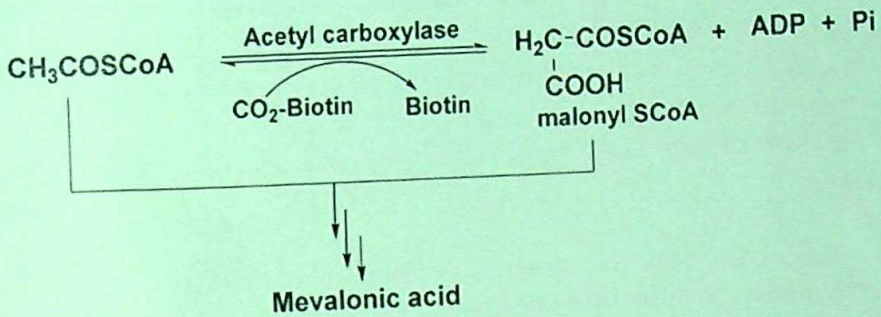
b. Which of the following is/are natural products and which is/are not natural products? Give reason.

(i) Saccharin (ii) Morphine (iii) Heroin (iv) Codeine.

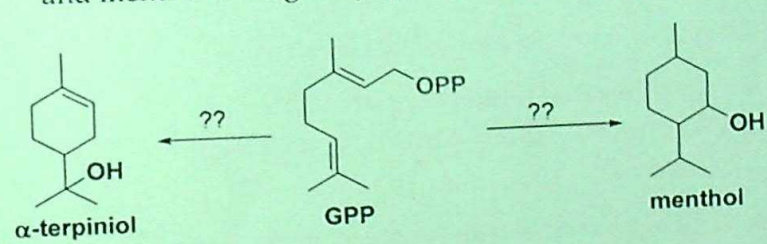
c. Give an example of crown ether with structure.

d. Write a short note on Rotaxane

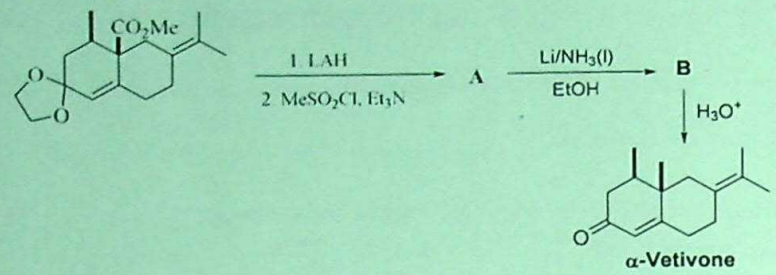
3. a. Give biosynthetic route for the biosynthesis of mavalonic acid using the following scheme. 3+4+3 =10



b. Sketch out biosynthetic route for the biosynthesis of α-terpiniol and menthol from geranyl pyrophosphate(GPP)



c. Identify 'A' and 'B' of the following reaction sequences. Give mechanism.



α-Vetivone

4. a. What are neurotransmitters? Explain the different classes of neurotransmitters with examples. 3+3+4 =10

b. What is anaesthetic activity of inhalation general anaesthetics? Mention its different stages.

c. Illustrate the industrial scale synthesis of enflurane and discuss its hepatotoxicity.

5. a. What is Ibuprofen? Discuss the green synthesis of it. Justify why is your synthesis considered to be green. 4+3+3 =10

b. What are anti-tubercular drugs? Explain with examples.

c. Write a note on anti-neoplastic drugs.

6. a. Discuss the Induced-Fit theory in host guest chemistry. 3+4+3 =10

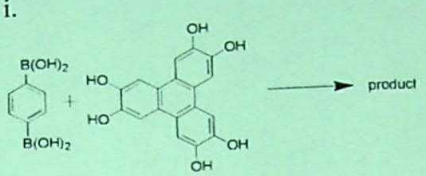
b. What are the various molecular interactions are known in molecular recognition? write a short note on π-π stacking in supramolecular chemistry.

c. What is cryptand? Give an example and discuss its synthesis.

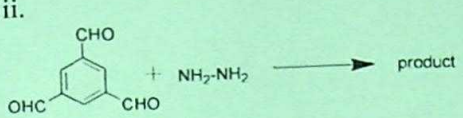
7. a. Draw the structures of two building blocks of COFs having C_3 symmetry and $-NH_2$ group. 3+4+3 =10

b. Write the product (i.e. COF) of the following reactions

i.



ii.



c. Write three applications of COF materials.

8. a. Discuss the single-crystal X-ray diffraction (SCXRD) and powder X-ray diffraction (PXRD) method of analysis of COF materials. **4+3+3 =10**

b. Discuss the solvothermal method of synthesis for preparation of COFs.

c. What is BioMOFs? Give two examples. Write down some applications of BioMOFs.

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