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(CBCS)

(6th Semester)

CHEMISTRY

TWELFTH (B) PAPER

(Natural Products)

Full Marks : 75

Time : 3 hours

The figures in the margin indicate full marks for the questions

(SECTION : A—OBJECTIVE)

(Marks : 10)

Tick (✓) the correct answer in the brackets provided :

1×10=10

1. Alkaloids are

- (a) acid-like ()
- (b) alkali-like ()
- (c) water-like ()
- (d) gas-like ()

2. Sesquiterpenes consist of _____ isoprene units.

- (a) two ()
- (b) three ()
- (c) four ()
- (d) five ()

3. In the analysis of terpene, UV-Vis spectra gives useful information regarding
- (a) the number of double bonds ()
 - (b) the degree of substitution of double bonds ()
 - (c) Both (a) and (b) ()
 - (d) Neither (a) nor (b) ()
4. The usual range of proton NMR spectrum is
- (a) 0.5–1.5 ppm ()
 - (b) 20–50 ppm ()
 - (c) 1–100 ppm ()
 - (d) 1–10 ppm ()
5. The total number of chiral centres in rotenone is
- (a) six ()
 - (b) four ()
 - (c) three ()
 - (d) zero ()
6. In morphine, the C-5 oxygen bridge and the C-6 hydroxyl are
- (a) *syn* to each other ()
 - (b) *anti* to each other ()
 - (c) *trans* to each other ()
 - (d) *cis* to each other ()
7. In Wessely-Moser rearrangement, demethylation is brought about by
- (a) hydriodic acid ()
 - (b) hydrochloric acid ()
 - (c) perchloric acid ()
 - (d) peracids ()
8. Pheromones are chemical compounds which can be detected
- (a) at moderate concentrations only ()
 - (b) only at high concentrations ()
 - (c) even at low concentrations ()
 - (d) None of the above ()

9. Which one of the following is an example of chiral marine natural product?

- (a) Didemnenone A ()
- (b) Paraconic acid ()
- (c) Corey lactone benzoate ()
- (d) (-) Khusimone ()

10. The key intermediate in the production of isoflavonoid phytoalexins is

- (a) naringenin ()
- (b) hydrogenistein ()
- (c) liquiritigenin ()
- (d) daidzein ()

(SECTION : B—SHORT ANSWERS)

(Marks : 15)

Answer the following questions :

3×5=15

UNIT—I

1. What are pseudo-alkaloids? Give one example.

OR

2. Write the name and structure of a tetraterpenoid which is responsible for the deep red colour of ripe tomato.

UNIT—II

3. What do you understand by chemical shift in ^1H NMR spectra?

OR

4. Mention one advantage and one disadvantage of mass spectrometry over other spectrometry.

UNIT—III

5. How will you distinguish between (S)- and (R)-isomers of benzyloquinoline alkaloids?

OR

6. Explain why neomenthyl chlorides react 200 times faster than menthyl chlorides in E2 elimination reaction.

UNIT—IV

7. Discuss plant-insect interaction with suitable examples.

OR

8. Explain how even small change in structure of a pheromone could result in large in its physiological profile.

UNIT—V

9. Write the structure of reserpine. Mention its medicinal use.

OR

10. Name one paraconic acid. Write its structure and mention its medicinal values.

(SECTION : C—DESCRIPTIVE)

(Marks : 50)

Answer the following questions :

10×5=50

UNIT—I

1. (a) What is isoprene rule? Write a skeleton structure of monoterpene. 3
(b) Mention two general properties of terpenes. 2
(c) Starting from R-(–)-mevalonic acid, describe the biosynthesis of geranyl-geranyl pyrophosphate, GGPP (the precursor of all diterpenes). 5

OR

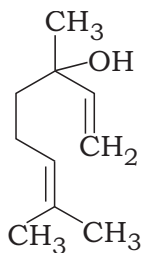
2. (a) How is UV-spectroscopy useful in alkaloid detection? 2
(b) Draw the structures of the following compounds and indicate how many isoprene units they contain : 3
(i) Camphore
(ii) α-pinene
(c) Explain Hoffmann degradation of alkaloids. What are its limitations? 5

UNIT—II

3. (a) What do you understand by multiplicity of signals? 3
- (b) Discuss the application of IR spectra in critical analysis of —C=O stretching frequencies. 3
- (c) Discuss the advantage of spectroscopic method over classical method for structure elucidation of organic compounds. 4

OR

4. (a) Using IR spectroscopy, how will you distinguish between ketone and alcohol? 2
- (b) Discuss the basic principles of proton NMR spectroscopy. 3
- (c) The mass spectrum of linalool (below) gives at m/z values at 154, 136 and 93. Draw the fragmentation pattern for this : 5



UNIT—III

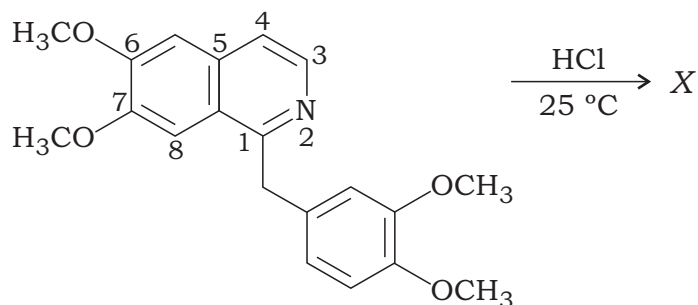
5. (a) Explain why the skeletal structure of naturally occurring germacranolides could assume different stereochemical shapes. 2
- (b) Write the structure of morphine and identify the chiral centres. 3
- (c) Write the names and structures of all the stereoisomers of menthol. 5

OR

6. (a) Write the structure of rotenone. How many chiral centres does it have? Identify them. 3
- (b) Write the structure of vinblastine. Mention its medicinal uses. 3
- (c) Elucidate the absolute stereochemistry of (–)-abietic acid. 4

UNIT—IV

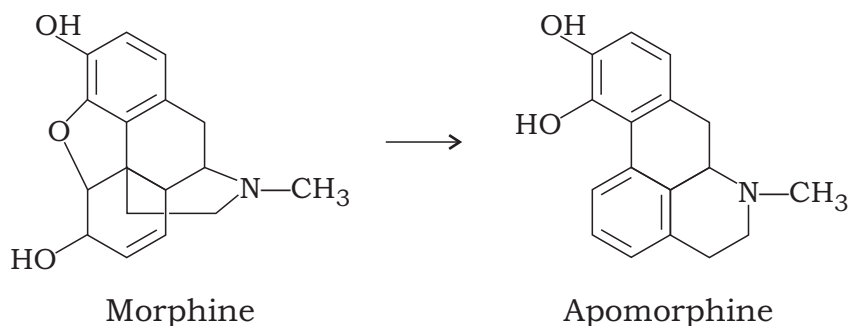
7. (a) Discuss Wessely-Moser rearrangement. 3
- (b) Identify the missing compound X in the given reaction : 3



- (c) Explain defensive secretion of insects with suitable examples. 4

OR

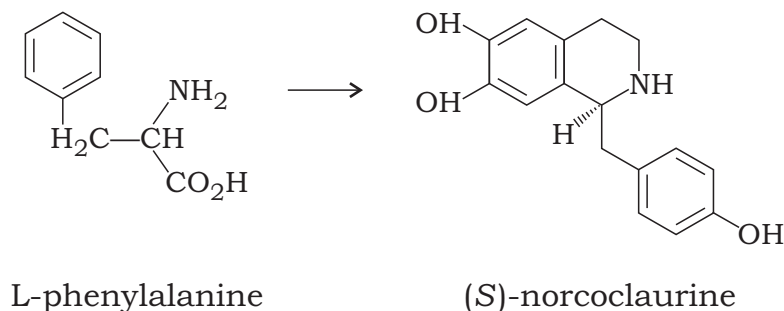
8. (a) What are insect pheromones? How are they classified? 2
- (b) Discuss Nametkin rearrangement with suitable example. 3
- (c) Discuss the rearrangement of morphine in the acid catalyzed reaction resulting in the formation of apomorphine with suitable mechanism : 5



UNIT—V

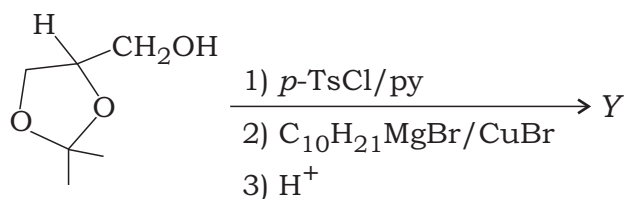
9. (a) What are semiochemicals? 2
- (b) Explain how morphinandienone alkaloids are produced by species of the genus Papaver. Write the structure of one such alkaloid. 3

- (c) What are the steps involved in the biosynthesis of (S)-norcoclaurine from L-phenylalanine? 5



OR

10. (a) Identify the missing compound Y from the following, an intermediate in the synthesis of hexadecanolide, a semiochemical from oriental hornet, *Vespa orientalis* : 2



- (b) Write the name and structure of first member of benzyloquinoline alkaloids family. 2
- (c) Explain the steps involved in the biosynthetic transformation of 1,2-dehydroreticulium ion to thebaine. 6

★ ★ ★