TDC (CBCS) Even Semester Exam., 2023

CHEMISTRY

(Honours)

(6th Semester)

Course No. : CHMHCC-602T

(Organic Chemistry—V)

Full Marks : 50
Pass Marks : 20

Time : 3 hours

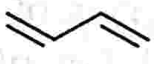
The figures in the margin indicate full marks for the questions

SECTION—A

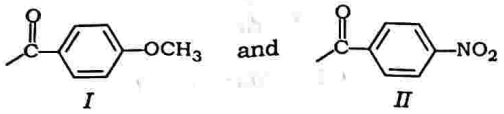
Answer any *ten* questions : 2×10=20

1. Define chromophore and auxochrome with suitable examples. 1+1=2

2. How can you distinguish the following pairs by UV-visible spectroscopy?

 and 

3. Which of the following compounds, *I* and *II*, is expected to show a lower C=O stretching frequency? Justify your answer : 2



I *II*

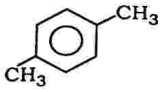
4. What do you understand by equivalent and non-equivalent protons? Explain with suitable examples.

5. How many NMR signals are expected in the following compounds? ½×4=2

   (a) Acetone

   (b) $CH_3CH_2CH_3$

   (c) $CH_3—CH=CH_2$

   (d) 

6. Explain why the aromatic protons are more deshielded than the ethylenic protons although both the types of protons are attached to sp^2 hybridized carbons.

7. Write any two isomeric forms of glucose and designate then in *D*- and *L*-configuration.

8. What is polysaccharide? Give two examples.

9. Define epimer with suitable examples.

10. What are the characteristics of good dye?

11. What are mordant dyes? Give one example.

12. Discuss briefly the relationship between colour and constitution in a good dye.

13. What are biopolymers? Give example.

14. What is ring opening polymerization? Give example.

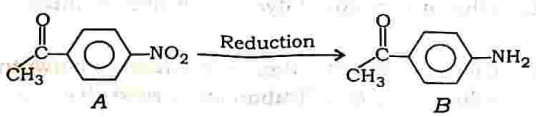
15. What is addition polymerization? Give example.

SECTION—B

Answer any *five* questions : 6×5=30

16. *(a)* In ethyl acetoacetate, a weak signal $\lambda_{max} = 275$ nm, ε_{max} 20 and a strong signal $\lambda_{max} = 245$ nm, ε_{max} 18000 is observed when irradiated in UV-visible light. Justify this observation. 3

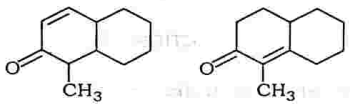
(b) In an analytical report of the following reaction, two prominent peaks for carbonyl stretching frequency $\nu_{C=O}$ are observed at 1700 cm^{-1} and 1677 cm^{-1}. Designate these peaks for compounds *A* and *B* :



A *B*

What conclusion you can draw from the above data in terms of completion of reaction? 1+2=3

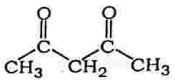
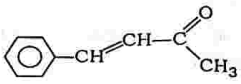
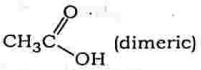
17. (a) A compound can be either *I* or *II* of the following :



I *II*

The compound exhibits λ_{max} = 225 nm. Establish the structure of the compound. 3

(b) Match the following $\nu_{C=O}$ stretching frequencies with respective compounds : 3

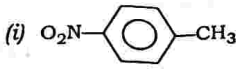
Compound	$\nu_{C=O}$
(i) 	1640 cm^{-1}
(ii) 	1828 cm^{-1}
(iii) 	1780 cm^{-1}
(iv) 	1717 cm^{-1}
(v) 	1700 cm^{-1}
(vi)  (dimeric)	1674 cm^{-1}

18. (a) What is chemical shift? How can you distinguish toluene and benzoic acid by ^{1}H-NMR spectroscopy taking chemical shift and splitting pattern in consideration? 1+2=3

(b) Draw a typical ^{1}H-NMR spectrum of ethanol explaining the chemical shift and splitting pattern of all the hydrogen involved. 3

19. *(a)* Why is TMS used as a reference compound in NMR spectroscopy? How does it help in chemical shift measurement? 2+1=3

(b) Comment on the number of signals and their splitting, if any, in the NMR spectrum of the following compounds : 1½+1½=3

(i) 

(ii) $CH_3—O—CH_2CH_3$

20. *(a)* What happens when (show only reaction)—

(i) glucose is treated with phenyl hydrazine;

(ii) glucose is treated with hydroxyl amine;

(iii) fructose is treated with sodium borohydride? 1×3=3

(b) Prove that fructose unit in sucrose molecule is a furanose ring. 3

21. *(a)* Convert the following (write only reactions) : 2×2=4

(i) D-glucose to D-arabinose

(ii) D-fructose to D-glucose

(b) What is mutarotation? Explain with suitable example. 2

22. Write one method of synthesis of each of—

(a) malachite green;

(b) phenolphthalein. 3+3=6

23. *(a)* Discuss briefly the Witt's theory of dyes. 3

(b) Write one synthesis of methyl orange. 3

24. *(a)* What are Ziegler-Natta catalysts? Write the advantages of using Ziegler-Natta catalyst in polymer industry. 2+2=4

(b) Write a note on 'phenol-formaldehyde resin'. 2

25. *(a)* What are Buna-S rubbers? Explain the vulcanization of rubber. 2+2=4

(b) Write the expression for number average molecular weight and weight average molecular weight for polymers. 1+1=2

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