C

2021/TDC(CBCS)/EVEN/SEM/
CHMHCC–602T/055

TDC (CBCS) Even Semester Exam.,
September—2021

CHEMISTRY

(6th Semester)

Course No. : CHMHCC–602T

(Organic Chemistry)

Full Marks : 50
Pass Marks : 20

Time : 3 hours

The figures in the margin indicate full marks for the questions

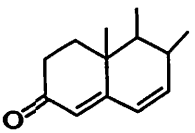
SECTION—A

Answer any *ten* questions : 2×10=20

1. How can you distinguish between $CH_3-\overset{\overset{O}{\|}}{C}-OH$ and CH_3-OH by IR-spectroscopy?

2. State the electronic transitions that take place when an α, β-unsaturated carbonyl compound is irradiated by UV-radiation.

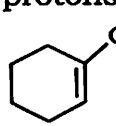
3. Calculate the λ_{max} value of the following compound :



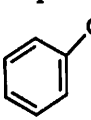
4. How can the intermolecular and intramolecular H-bonding be distinguished by IR-spectroscopy?

5. What is chemical shift in NMR-spectroscopy?

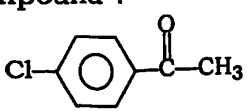
6. Comment on the given δ-value of the methyl protons in the following compounds :



and



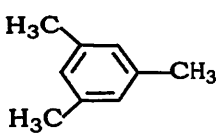
7. Comment on the number of signals and their splitting, if any, in the NMR-spectrum of the following compound :



8. How many NMR-signals would you expect from each of the following?

(i) $CH_3—O—CH_3$

(ii)



9. Give the structure of α- and β-isomer of glucose in Fischer representation.

10. What happens when glucose is treated with phenylhydrazine? Give equations also.

11. What are epimers? Give an example.

12. How would you show that sucrose is made up of a unit each of D-glucose and D-fructose and it does not contain any 'free' carbonyl group?

13. What do you mean by 'hypsochromic shift'?

14. What are the characteristics of a good dye?

15. Write one synthesis of phenolphthalein. Mention the chromophore and auxochrome present in the dye.

16. What are mordant dyes? Give one example.

17. Provide one method of synthesis and one application of polyester.

18. What is Buna-S rubber?

19. What is anionic polymerization? Why does the substrate in an anionic polymerization contain an electron withdrawing substituent?

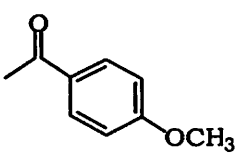
20. What are elastomers and plasticizers?

SECTION—B

Answer any *five* questions : 6×5=30

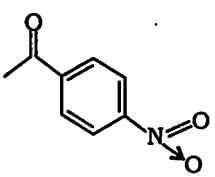
21. *(a)* Which of an isolated carbonyl group and a conjugated carbonyl group absorbs at higher frequency? Justify your answer. 2

(b) Which out of the following compounds (*I*) and (*II*) is expected to show a lower C=O stretching frequency? Defend your answer : 2



(*I*)

and

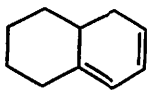
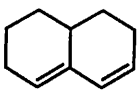


(*II*)

(c) While the λ_{max} for 1,3-butadiene is observed at 217 nm, that of 1,3,5-hexatriene appears at 258 nm. Explain the observation. 2

22. *(a)* Which region in the IR-spectra is called 'fingerprint region'? 2

(b) How will you distinguish between the following pair of compounds by UV-visible spectroscopy? 2

 and 

(*I*) (*II*)

(c) Explain, why the observed $n \rightarrow \pi^*$ absorption of acetone occurs at 279 nm in hexane, 270 nm in ethanol and 265 nm in water. 2

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

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

24. *(a)* Illustrate shielding and deshielding of protons taking ethyne and benzene as example. 4

(b) How can you distinguish between toluene and benzoic acid by ^{1}H-NMR spectroscopy taking chemical shift and splitting pattern in consideration? 2

25. *(a)* What is Ruff degradation? Discuss the reaction taking D-glucose as the starting material. 1+2=3

(b) Convert D-glucose into gluconic acid. 1

(c) D-glucose and D-fructose form the same osazone. Explain. 2

26. *(a)* What is Kiliani-Fischer synthesis? Discuss the reaction taking D-arabinose as the starting material. 1+2=3

(b) Represent the formula of cellulose as per Haworth projection. 3

27. *(a)* Write one synthesis of methyl orange. Mention the chromophore and auxochrome present in the dye. 3+1=4

(b) Explain bathochromic shift. 2

28. *(a)* Write one method of synthesis of malachite green. 3

(b) Discuss briefly the relationship between colour and constitution. 3

29. *(a)* What is addition polymerization? 1

(b) Provide the mechanism of Ziegler-Natta catalysis. 2½

(c) Explain vulcanization of rubber. 2½

30. *(a)* Explain the mechanism of cationic polymerization reaction. 3

(b) What are isotactic, syndiotactic and atactic polymers? 3

★★★