TDC (CBCS) Even Semester Exam., 2022

CHEMISTRY

(Honours)

(2nd Semester)

Course No. : CHMHCC-201T

(Organic Chemistry—I)

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. Write IUPAC names of the following compounds : 1+1=2

(a) $HO—CH_2—\underset{\displaystyle NH_2}{\underset{|}{CH}}—COOH$

(b) $CH_3COCH_2COOC_2H_5$

2. Arrange the following as directed : 1+1=2

(a) NH_2^-, OH^-, RO^-, $RCOO^-$ (increasing basicity)

(b) $C_6H_5\overset{\oplus}{C}H_2$, $C_6H_5CH_2\overset{\oplus}{C}H_2$, $C_6H_5\overset{\oplus}{C}HCH_3$, $C_6H_5\overset{\oplus}{C}(CH_3)_2$, (increasing stability)

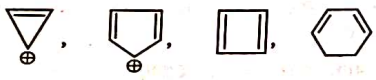
3. Define electrophiles and nucleophiles with examples. 1+1=2

4. Write the structures and IUPAC names of structural isomers of pentane.

5. What is Wurtz-Fittig reaction? Give one example.

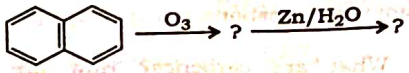
6. State 'Markownikoff's rule' and give one example.

7. Classify the following as aromatic, anti-aromatic and non-aromatic :



8. Why does benzene undergo electrophilic substitution reaction instead of electrophilic addition reaction?

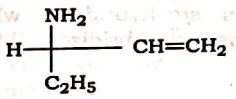
9. Complete the following reaction :



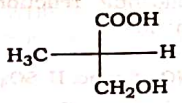
10. Define 'diastereomers' with example.

11. Assign *R*, *S* configuration to the following Fisher projections : 1+1=2

(a)



(b)



12. Why is racemic mixture optically inactive?

13. Draw the highest and lowest energy conformation of cyclohexane.

14. Calculate the angle strain of cyclopropane and cyclohexane (planar). 1+1=2

15. Write a short note on Sachse-Mohr theory of stainless ring.

SECTION—B

Answer any *five* questions : 6×5=30

16. *(a)* What are carbenes? How are they formed? Give two reactions shown by carbenes. 1+1+1=3

(b) Explain why phenol is more acidic than methanol. 1½

(c) Carbanion is sp^3-hybridized whereas carbocation is sp^2-hybridized. Why? 1½

17. *(a)* Complete the following reaction and write the mechanism : 3


+ conc. HNO_3 + conc. H_2SO_4 ⟶

(b) Give one example each of—

(i) nucleophilic substitution reaction;

(ii) electrophilic addition reaction;

(iii) rearrangement reaction. 1+1+1=3

18. *(a)* Write the mechanism of reaction involved in allylic bromination of propene. 2½

(b) Identify *A*, *B*, *C* and *D* : 2

(i) $CH_3CH{=}CH_2 \xrightarrow{B_2H_6} A \xrightarrow{H_2O_2/OH^-} B$

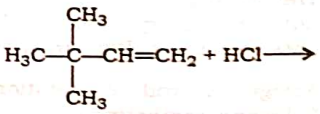
(ii) $HC{\equiv}CH + H_2O \xrightarrow[HgSO_4]{H_2SO_4} C$

(iii) $C_6H_5CH{=}CH_2 \xrightarrow[Zn/H_2O]{O_3} D$

(c) Write a short note on Diels-Alder reaction. 1½

19. *(a)* What is Corey-House synthesis? How will you prepare propane by this method? 1+2=3

(b) Write the major product of the reaction and write the mechanism. 1+2=3


$H_3C-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-CH{=}CH_2 + HCl \longrightarrow$

20. *(a)* Give the mechanism of Friedel-Crafts acylation reaction of benzene. Why is nitrobenzene a good solvent for Friedel-Crafts reaction? 3+1=4

(b) How will you prepare the following from benzene? 1+1=2

(i) Benzene hexachloride

(ii) *p*-nitrotoluene

21. *(a)* Write one method for the preparation of naphthalene. 3

(b) Explain why—

(i) naphthalene is more reactive than benzene;

(ii) 9-position of anthracene is more reactive than any other position. 1½+1½=3

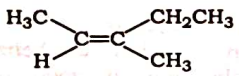
22. *(a)* Explain the term 'resolution'. Discuss one method for the resolution of racemic mixture. 1+3=4

(b) Write a short note on asymmetric synthesis. 2

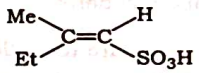
23. *(a)* The presence of a chiral carbon (C) is not a necessary condition for showing optical activity. Explain with example. 3

(b) Assign *E* and *Z* notations for the following compounds : 1+1=2

(i)



(ii)



(c) Draw the structure (Newman projection) of *meso*-tartaric acid. 1

24. Discuss the Baeyer's strain theory. What are its limitations? 4+2=6

25. *(a)* Draw different conformations of *n*-butane and show their relative stability in energy diagram. 4

(b) Chair conformation of cyclohexane is more stable than boat conformation. Explain. 2

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