FYUG Even Semester Exam., 2025

CHEMISTRY

(2nd Semester)

Course No. : CHMDSC–151

(Organic Chemistry—I)

Full Marks : 70
Pass Marks : 28

Time : 3 hours

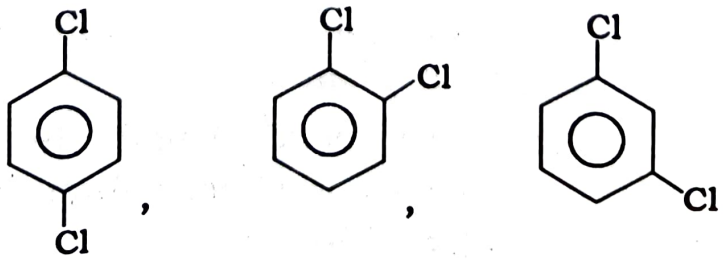
The figures in the margin indicate full marks for the questions

UNIT—I

1. Answer any *two* of the following questions : 2×2=4

(a) What do you mean by electrophile and nucleophile? Give example of each.

(b) What is dipole moment? Arrange the following compounds in increasing order of dipole moment :



(c) Between formic acid and acetic acid, which one is more acidic and why?

2. Answer any *one* of the following questions : 10

(a) (i) What are carbanion and carbon-free radical? Write the formation, structure and hybridization of central carbon in the following : 2+3=5

$\overset{\ominus}{C}H_3$, $\dot{C}H_3$

(ii) Explain why aliphatic amines are more basic than aromatic amines. 2

(iii) What is triplet carbene? Why is triplet carbene more stable than singlet carbene? 1+2=3

(b) (i) Explain the hybridization of carbon in ethylene. 2

(ii) How will you differentiate between inductive effect and electromeric effect? 2

(iii) Explain why—

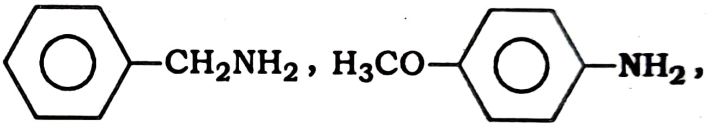
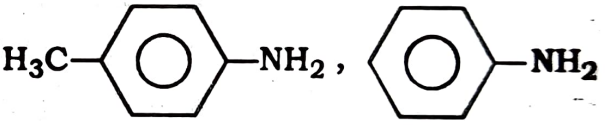
(1) carboxylic acid is stronger acid than phenol;

(2) C—Cl bond length in vinyl chloride is shorter than that in alkyl chloride. 1½×2=3

(iv) Arrange the following as per given instructions : 1×3=3

(1) $CH_3\dot{C}H_2$, $\dot{C}H_3$, $(CH_3)_2\dot{C}H$, $(CH_3)_3\dot{C}$ (Increasing stability)

(2) ICH_2COOH, $ClCH_2COOH$, $BrCH_2COOH$, FCH_2COOH
(Increasing acid strength)

(3)  , 

(Increasing basicity)

UNIT—II

3. Answer any *two* of the following questions : 2×2=4

(a) State Markovnikov's rule. Give one example.

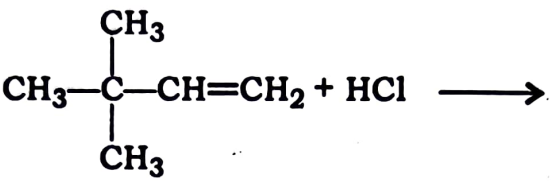
(b) What is Wurtz reaction? Give one example.

(c) Identify *A* and *B* :

$$CH_3—C\equiv CH \xrightarrow{O_3} A \xrightarrow[Zn]{H_2O} B$$

4. Answer any *one* of the following questions : 10

(a) *(i)* Complete the following reactions and write the mechanisms : 2+2=4

(1) 

(2) $(CH_3)_3CCl \xrightarrow[\Delta]{KOH\ (alc)}$

(ii) What is ozonolysis reaction? An alkene on ozonolysis yield acetone and acetaldehyde as products. Determine the structure of alkene. 1+2=3

(iii) Write the mechanism of free radical halogenation of methane. 3

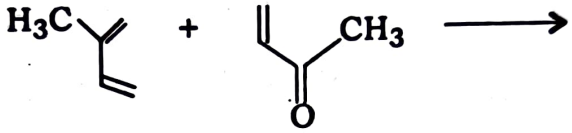
(b) *(i)* Write a short note on 'peroxide effect'. 2

(ii) Write the mechanism of benzylic bromination of toluene. 3

(iii) Explain why alkynes are less reactive towards electrophilic addition reaction. 2

(iv) Complete the following reactions : 1×3=3

(1) $CH_2=CH-CH=CH_2 + Br_2$ (1 mole) $\longrightarrow$

(2) 

(3) $CH_3-C\equiv CH + H_2O \xrightarrow[H_2SO_4]{HgSO_4}$

UNIT—III

5. Answer any *two* of the following questions : 2×2=4

(a) State and explain Hückel's rule of aromaticity.

(b) How will you convert benzene to *(i)* acetophenone and *(ii)* benzene hexachloride? 1+1=2

(c) What are annulenes? Give one example. 1+1=2

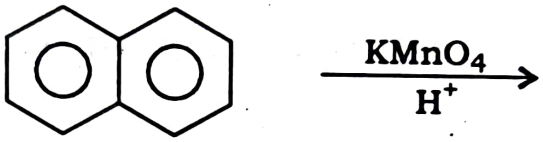
6. Answer any *one* of the following questions : 10

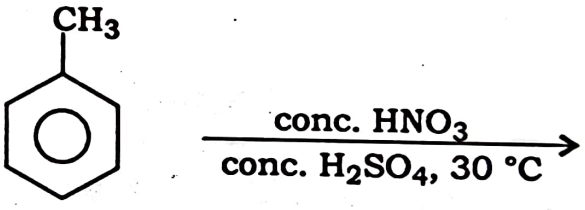
(a) *(i)* What is Friedel-Crafts reaction? Discuss the mechanism of acylation of benzene. 1+2½=3½

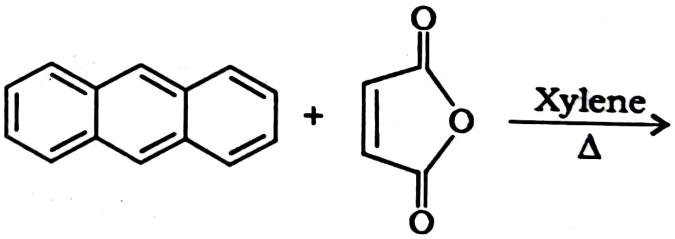
(ii) Chlorine atom is *ortho- para-* directing even though it has –I effect. Explain. 2

(iii) Explain why naphthalene is more reactive than benzene. 1½

(iv) Complete the following reactions : 1×3=3

(1) 

(2) 

(3) 

(b) (i) Define aromatic, antiaromatic and nonaromatic compounds. Give one example of each. 3

(ii) Discuss the mechanism of nitration of benzene. 2½

(iii) How will you convert benzene into naphthalene? 2

(iv) Discuss one method of preparation of anthracene. 2½

UNIT—IV

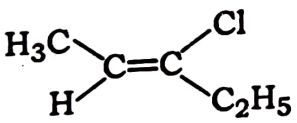
7. Answer any *two* of the following questions : 2×2=4

(a) Define chirality. Indicate the chiral carbon in the compound

$CH_3—CHCl—CH(CH_3)_2$ 1+1=2

(b) Distinguish between enantiomers and diasteriomers.

(c) Assign *E / Z* configuration to the following : 1+1=2



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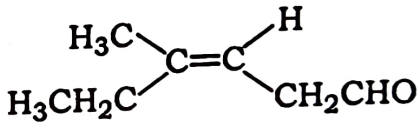
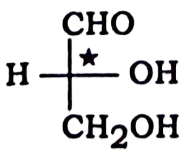


8. Answer any *one* of the following questions : 10

(a) *(i)* How can a racemic mixture of lactic acid be resolved? Discuss briefly. 3

(ii) Assign *R / S* configuration of (★) marked carbon of the following : 1+1=2

(1)



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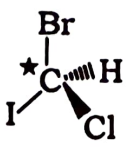

(iii) Draw chair and boat conformation of cyclohexane. Which conformation is more stable and why? (½+½)+2=3

(iv) Draw the most stable conformation of 1,2- and 1,4-disubstituted cyclohexane. 1+1=2

(b) (i) Give a brief account of Baeyer's Strain theory. What are the limitations of this theory? 3+1=4

(ii) Draw the energy diagram of cyclohexane and explain relative stability of different conformers. 3

(iii) Write short notes on the following : 1½+1½=3

(1) Meso compound

(2) Racemic mixture

UNIT—V

9. Answer any *two* of the following questions : 2×2=4

(a) Why does glucose exhibit mutarotation?

(b) How will you convert glucose to—

(i) glucaric acid;

(ii) sorbitol? 1+1=2

(c) How is cellulose structurally different from starch?

10. Answer any *one* of the following questions : 10

(a) *(i)* What do you understand by epimers and anomers? Give example of each. (1+1)+(½+½)=3

(ii) How is ring size of glucose molecule established? 3

(iii) How will you convert the following? 2+2=4

(1) Fructose to glucose

(2) Glucose to arabinose

(b) *(i)* Establish the structure of sucrose. 4

(ii) Write a short note on 'Wohl degradation'. 2

(iii) Explain the following : 1½+1½=3

(1) Sucrose is a non-reducing sugar.

(2) Sucrose does not show mutarotation.

(iv) How does glucose react with phenyl hydrazine? 1

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