

[3762]-81

S.E. (Chem. Engg.) (I Sem.) EXAMINATION, 2010

CHEMISTRY—I

(2003 COURSE)

Time : Three Hours

Maximum Marks : 100

N.B. :— (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6 from Section I and Q. No. 7 or Q. No. 8, Q. No. 9 or Q. No. 10, Q. No. 11 or Q. No. 12 from Section II.

(ii) Answers to the two Sections should be written in separate answer books.

(iii) Neat diagrams must be drawn wherever necessary.

(iv) Figures to the right indicate full marks.

(v) Assume suitable data, if necessary.

SECTION I

1. (a) Draw the resonance structure of the following compounds : [6]

(i) Aniline

(ii) Anthracene

(iii) *p*-nitrophenol.

P.T.O.

(b) Give reasons :

[6]

(i) Pyrrole is weaker base than pyridine.

(ii) Chloroacetic acid is more stronger than bromoacetic acid and iodoacetic acid.

(c) Define Tautomerism. Explain tautomerism in ethyl acetoacetate. [4]

Or

2. (a) Explain the formation of carbanion by any *two* methods and explain structure and stability of carbanion. [6]

(b) What is hyperconjugation? Explain the relative stability of primary, secondary and tertiary carbonium ion. [6]

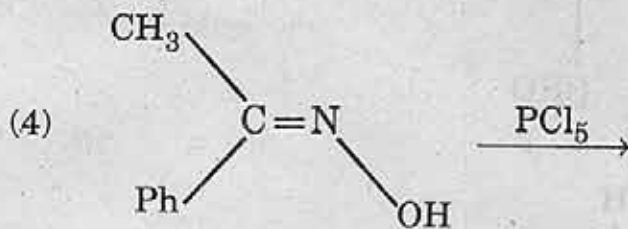
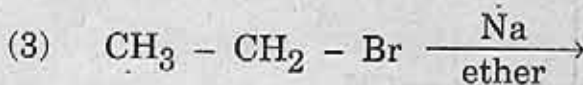
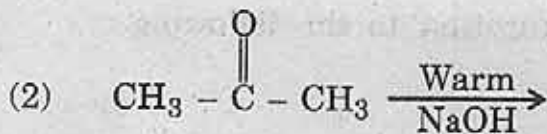
(c) Define and give *two* examples of each :

(i) Electrophile

(ii) Nucleophile. [4]

3. (a) Predict the products (any *three*) : [6]

(1) Aniline $\xrightarrow{\text{conc. H}_2\text{SO}_4}$



(b) Explain mechanism, stereochemistry and effect of substrate, solvent for $\text{S}_{\text{N}}1$ reaction. [6]

(c) Explain mechanism of Beckman rearrangement. [4]

Or

4. (a) Explain the mechanism of E_1 and E_2 elimination reaction. [6]

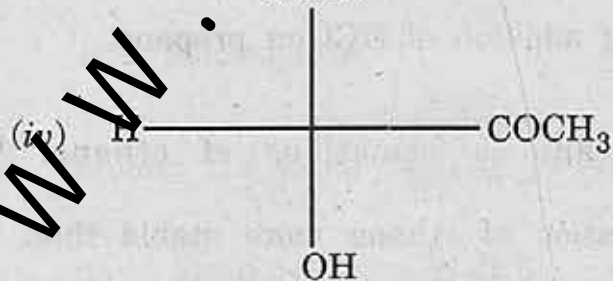
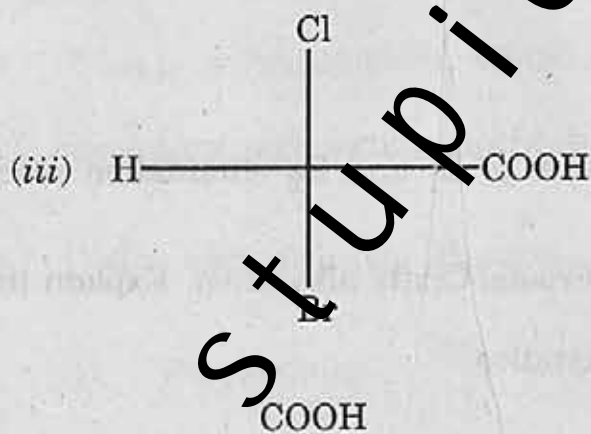
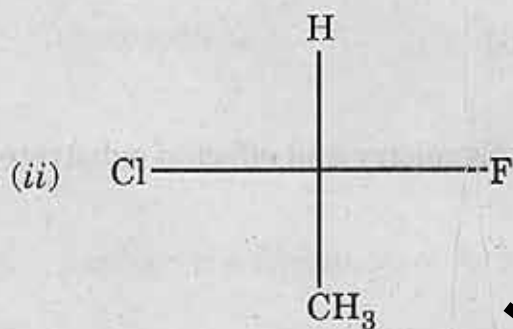
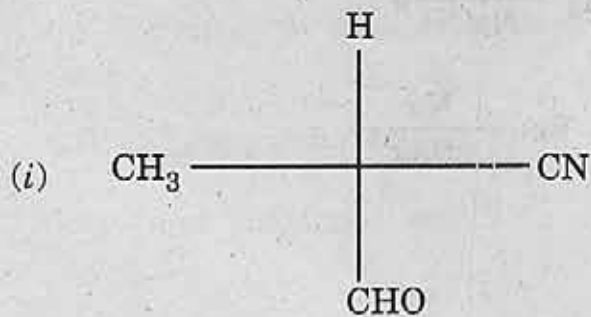
(b) Give mechanism of Friedal-Crafts alkylation. Explain limitation of Friedal-Crafts alkylation. [6]

(c) Give mechanism of addition of HCl on propane. [4]

5. (a) Draw the important conformations of ethane. Why is staggered conformation of ethane more stable than eclipsed conformation ? [6]

(b) Assign R and S configuration to the following :

[6]



(c) Give preparation methods of the following (at least one each) : [6]

(i) Furan

(ii) Thiophene

(iii) Pyrrole.

Or

6. (a) Give reason :

(i) Staggered conformation of *n*-butane is stable.

(ii) Pyrrole is more reactive than furan.

(iii) Thiophene is more stable than furan and pyrrole. [6]

(b) (i) Explain geometrical isomerism with suitable examples. [4]

(ii) Explain nucleophilic substitution in pyridine. [4]

(c) Predict the products :

(i) Indole + $\text{CHCl}_3 + 3 \text{NaOH} \rightarrow$

(ii) Quinoline + $\text{HNO}_3 + \text{H}_2\text{SO}_4 \rightarrow$. [4]

SECTION II

7. (a) Define the surface tension and explain the method for determination of surface tension. [6]
- (b) Define coefficient of viscosity. How is it determined? [6]
- (c) Find the interplaner distance in a crystal in which a series of planes produce a first order reflection from a copper X-ray tube ($\lambda = 1.539 \text{ \AA}$) at an angle of 22.5° . [4]

Or

8. (a) Describe the Bragg's method of crystal analysis. [6]
- (b) Derive Stokes' law. [6]
- (c) Explain the factors affecting viscosity of liquids. [4]
9. (a) State and explain van der Waals' equation. [6]
- (b) What is root mean square velocity and average velocity? How are they related? [6]

- (c) The van der Waals' constants of a gas are $a = 0.751 \text{ dm}^6 \text{ atm mol}^{-2}$ and $b = 0.0226 \text{ dm}^3 \text{ mol}^{-1}$. Calculate its critical constants. [4]

Or

10. (a) Derive kinetic gas equation. [6]
- (b) Derive an expression for collision diameter. [6]
- (c) Oxygen at 1 atm pressure and 0°C has a density of 1.4290 grams per litre. Find the RMS velocity of oxygen molecules. [4]
11. (a) Depression in freezing point is a colligative property. Explain. [7]
- (b) What is meant by lowering of vapour pressure? Define relative lowering of vapour pressure. [7]
- (c) 1.56 gm of solute dissolved in 100 gm of benzene raised its B.P. by 0.36°C . The K_b for 1000 gm of benzene is 2.57. Calculate Molecular weight. [4]

Or

12. (a) Elevation in boiling point is a colligative property. Explain. [7]
- (b) State and derive Raoult's law of vapour pressure. Describe any one method to find the relative lowering of vapour pressure of a given solvent. [7]
- (c) A solution containing 6.32 gm of a non-volatile substance in 86.7 gm of water depressed the F.P. by 0.753°C . Calculate the molecular weight of solute if K_f for 100 gm of water is 18.6. [4]