B.Sc. III Semester Degree Examination, Nov./Dec. 2013
Paper – III : CHEMISTRY

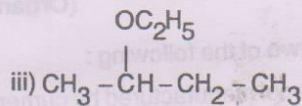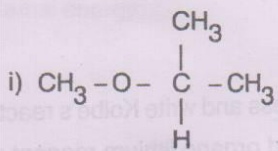Time : 3 Hours

Max. Marks : 80

Instructions : 1) *Question paper has* **four** *Sections.* **All** *Sections are* **compulsory.**
2) *Answer for* **all** *Sections should be written in the* **same** *answer book.*

SECTION – A

**(Inorganic, Organic and Physical)**

1. Answer **any ten** of the following : (10×2=20)

 a) Define the term ionic bond.

 b) What is lattice energy ?

 c) What are protonic and non-protonic solvents ?

 d) What is bond order ?

 e) Why two S-orbitals do not form a π-bond ?

 f) How triol is prepared from fats and oils ?

 g) What is the effect of electron releasing group on acidity of alcohols ?

 h) What are epoxides ?

 i) Phenol is acidic. Why ?

 j) Write the IUPAC name of

$$
\text{i) } CH_3 - O - \overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle H}{|}}{C}} - CH_3 \qquad\qquad \text{iii) } CH_3 - \overset{\overset{\displaystyle OC_2H_5}{|}}{CH} - CH_2 - CH_3
$$

 k) What is refractive index ?

 l) What is inversion temperature ?

 m) Write the equation and units of the rate constant of second order reaction.

 n) What is viscosity ?

 o) Write any two postulates of transition state theory.
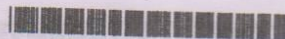
SECTION – B

(Inorganic)

2. Answer **any two** of the following :   (2×4=8)

   a) Calculate lattice energy of NaCl crystal from the following data using Born-Haber cycle.

      i) Sublimation energy of Na (S.E.) = 108.5 KJ/mole

      ii) Dissociation energy of Cl_2 (D.E.) = 243.0 KJ/mole

      iii) Ionisation energy of Na (I.E.) = 495.2 KJ/mole

      iv) Heat of formation of $NaCl_{(s)}$ ΔH_f = –381.8 KJ/mole

   b) Discuss the difference between bonding and antibonding molecular orbitals.

   c) Write a note on solubility of alkali metals in liquid ammonia.

3. Answer **any two** of the following :   (2×6=12)

   a) Explain the formation of O_2 molecule with the help of molecular orbital energy level diagram and calculate its bond order.

   b) Explain the following reactions in liquid SO_2 with one example for each type :

      i) Redox reaction

      ii) Complex formation reaction

      iii) Solvolysis reaction.

   c) What is hydrogen bonding ? Explain with suitable example the intermolecular and intramolecular hydrogen bonding.

SECTION – C

(Organic)

4. Answer **any two** of the following :   (2×4=8)

   a) How is phenol manufactured by cumene process and write Kolbe's reaction.

   b) Explain the reactions of Grignard reagent and organo lithium reagent with epoxides.

   c) Describe the mechanism of esterification of ethyl alcohol by acetic acid.

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5. Answer **any two** of the following :   (2×6=12)

   a) How are monohydric alcohols are classified give one method of preparation of each ?

   b) Explain the mechanism of the following reactions

      i) Reimer – Tiemann's reaction

      ii) Fries rearrangement.

   c) How ethers are prepared by Williamson ether synthesis and write their physical properties and one chemical reaction ?

SECTION – D

(Physical)

6. Answer **any two** of the following :   (2×4=8)

   a) Write a note on Joule-Thomson coefficient.

   b) How to determine the order of a reaction experimentally by isolation method ?

   c) What is Parachor and explain its application in deciding the structure of benzene ?

7. Answer **any two** of the following :   (2×6=12)

   a) Discuss the principle involved and experimental method of determination of surface tension.

   b) Derive an expression for the rate constant of bimolecular reaction based on collision theory.

   c) Derive an expression for $C_p – C_v = R$ and define enthalpy and its relation with internal energy.

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