

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

SECOND YEAR

B.A./B.SC. THIRD SEMESTER (July – December), 2011

Mid-Semester Examination, September, 2011

Date : 12/09/2011

CHEMISTRY (Honours)

Time : 2 pm – 4 pm

Paper : III

Full Marks : 50

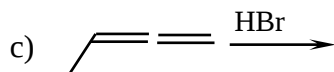
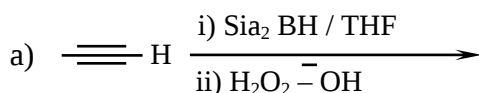
(Use separate answer scripts for each group)

Group – A

Answer **any two** questions :

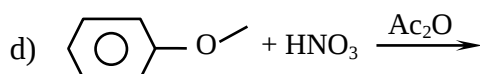
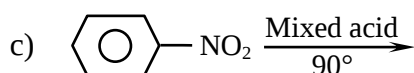
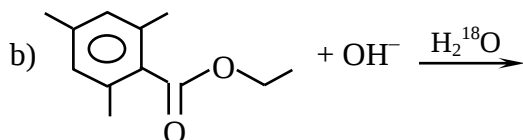
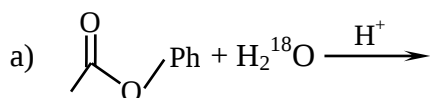
1. Complete the following reactions and write mechanism for each reaction.

[2×4 = 8]



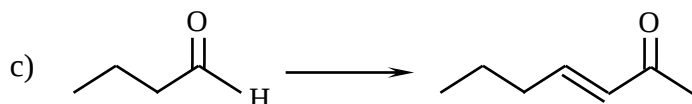
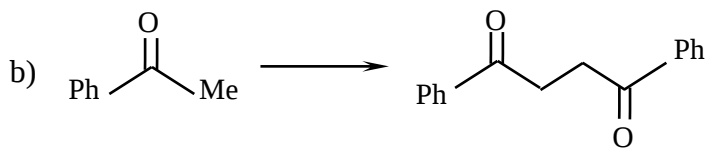
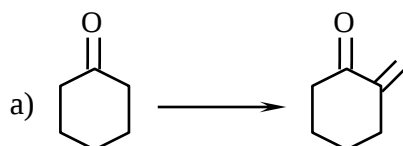
2. Complete the following reactions and give mechanism for each reaction.

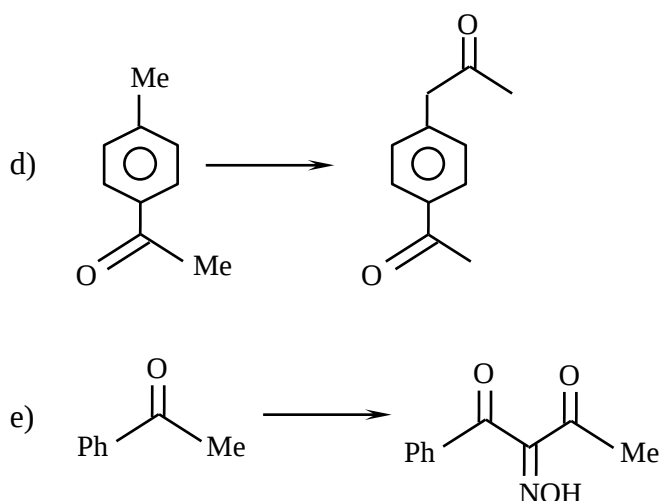
[2×4 = 8]



3. Carry out the following conversions. Mechanism is not necessary. (any four)

[2×4 = 8]





Group – B

Answer **any two** questions :

4. a) What are expected changes in bond order that accompany the following ionisation processes. [3]
 - i) $O_2 \rightarrow O_2^+$
 - ii) $N_2 + e^- \rightarrow N_2^-$
 - iii) $O_2 + e \rightarrow O_2^-$
- b) Draw molecular orbitals for a hypothetical linear H_4 molecule and arrange the increasing energy of each molecular orbitals. [1]
- c) Explain conductors, semiconductors and insulators in terms of Band theory. [3]
- d) Would decrease, increase or have no effect on the acidity of the solution when a solution of $AlCl_3$ in liquid carbonyl chloride is treated with $CaCl_2$. [2]
5. a) Explain why the conductivity of Ge is enhanced manifolds when trace amount of arsenic is added to it. [3]
- b) Write the importance or utility of Lux-Flood concept with example. [2]
- c) Complete and explain the reaction with acid-base concept when SbF_5 is added to BrF_3 . [2]
- d) Write down the I.U.P.A.C. name of the following : [2]
 - i) $[(CO)_3Fe(CO)_3Fe(CO)_3]$
 - ii) $[Co(NH_3)_6][Cr(CN)_6]$
6. a) Explain the greater stability of R_2OBF_3 than R_2SBF_3 and R_2SBH_3 than R_2OBH_3 [2]
- b) Arrange in increasing order and explain the acidity of the oxyacids of chlorine. [2]
- c) Distinguish between the followings with suitable example. (any two) [1.5 × 2 = 3]
 - i) Ambidentate Ligands and Flexidentate Ligands
 - ii) Fluxional complexes and Template Complexes.
 - iii) Bridging Ligand and Chelating Ligand.
 - iv) Labile Complex and Inert Complex.
- d) Give an example with formula of the following : [4 × 1/2 = 2]
 - i) Tetradentate Ligand
 - ii) Tridentate Ligand
 - iii) Perfect Complex
 - iv) Imperfect Complex

Group – C

Answer **any two** questions :

7. a) Prove that the rate of change of chemical potential of the i th component in a mixture, with change of pressure is equal to its partial molar volume. Hence find out an expression for the chemical potential of the i th-component in a mixture of ideal gases as a function of its mole fraction. [4]
b) Chemical potential of a substance is often referred to as its “escaping tendency”. —Explain. [2]
c) $W_A^{sl} = W_C^l$. Can you justify this relation? [2]
8. a) Using a suitable plot of μ vs T , discuss how the melting point of a pure substance depends on pressure. [3]
b) Describe the generation of viscosity from microscopic point of view. Also comment on the pressure independence of viscosity of gas. [3]
c) Spreading coefficient cannot be negative. True or False? —Justify. [2]
9. a) Show that $\left(\frac{\partial A}{\partial n_i}\right)_{T,V,n_{j \neq i}} = -T \left(\frac{\partial S}{\partial n_i}\right)_{U,V,n_{j \neq i}}$ [3]
b) 21 gm of N_2 and 40 gm of O_2 are mixed at a constant $T = 300K$ under a constant pressure of 100 Kpa. Assuming the gases to behave ideally, find out ΔG per mole ΔS per mole for the mixing. [3]
c) Show that for a soap bubble in air, the inside pressure is higher than that of outside by $\frac{4\gamma}{r}$. [2]