RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

FIRST YEAR [BATCH 2016-19]
B.A./B.Sc. SECOND SEMESTER (January – June) 2017
Mid-Semester Examination, March 2017

Date : 16/03/2017

CHEMISTRY (General)

Time : 12 noon– 1 pm

Paper : II

Full Marks : 25

[Use a separate Answer Book for each group]

Group – A

[*Attempt one question from each Unit*]

Unit – I [5]

1. a) Draw a plot of 3D speed distribution for N_2 and H_2 at same temperature, T (in same diagram). Explain. [3]

   b) From kinetic theory of gas, show that $C_{rms} = \sqrt{\dfrac{3RT}{M}}$. [2]

2. a) Write down the expression for Maxwell's 3D speed distribution and explain the terms. [2]

   b) Find out the $\bar{C}_v$ for NO molecule, applying law of equipartition of energy. [3]

Unit – II [5]

3. a) 1 mole of an ideal gas is expanded under isothermal condition from (P_i, V_i) to (P_f, V_f) with $V_f > V_i$ in (i) single step and (ii) in a quasistatic manner. Calculate graphically the work done in each case. [2+2]

   b) Comment what would be the magnitude of work done if the reverse process is carried out in a quasistatic manner. [1]

4. a) Starting with the mathematical representation of First law of Thermodynamics show that work done under adiabatic condition is independent of path. [2]

   b) Consider a system subdivided into 'n' sub-systems (i = 1,2...n). X is the measured value of a certain variable for the entire system and x_i(i = 1,2...n) are the values of the same for the different subsystems i = 1,2...n. State how are quantities X and x_i (i =1,2...n) related when the variable is (i) extensive (ii) intensive? [1·5+1·5]
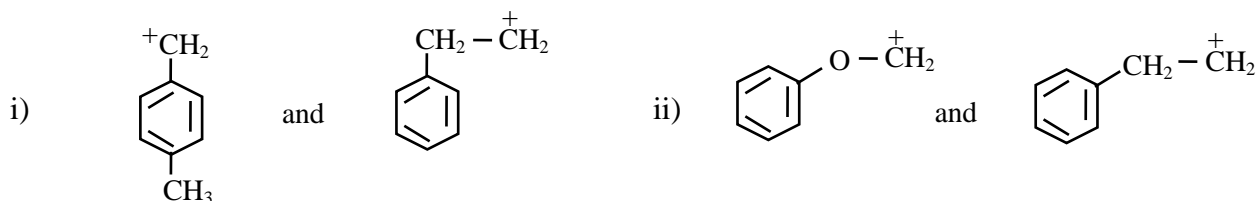
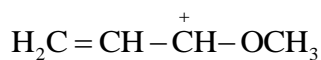## Group – B

[*Attempt one question from each Unit*]

Unit – I [5]

5. a) Write four conditions necessary for resonance to occur in a molecule. [2]

   b) Which one of the following is more stable. Explain your answer : [2×1·5]

6. a) Write note on : Inductive effect. [3]

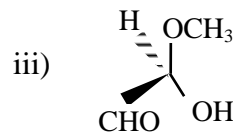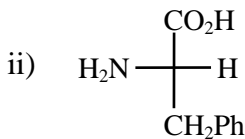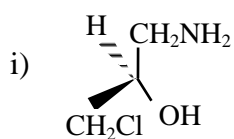   b) Write all the resonating structures of the following and indicate which cannonical form contributes most. [2]

$$H_2C = CH - \overset{+}{C}H - OCH_3$$

Unit – II [5]

7. a) Give R/S configurational descriptor to the following compounds : [3]

i)

H, CH$_2$NH$_2$

CH$_2$Cl OH

ii)

CO$_2$H

H$_2$N———H

CH$_2$Ph

iii)

H, OCH$_3$

CHO OH

b) Write the structure of the following compounds in Fischer projection formula. [2]
   i) D- glyceraldehyde   ii) L-lactic acid

8. a) Define with an example : plane of symmetry [2]
   b) Write short note on : S_N^2 reaction [3]

Group – C
[*Attempt any <u>one question</u>] [1×5]

9. a) Draw the qualitative MO diagram for N_2 molecule and comment on the Bond order of N_2, N_2^+, N_2^-. [3]
   b) Arrange the following in increasing order of Lewis acidity — SiF$_4$, SiCl$_4$, SiBr$_4$, SiI$_4$ [2]

10. a) Draw the qualitative MO diagram for NO molecule and explain that NO is a Π-acid ligand. [3]
    b) For $CaO + SiO_2 \rightarrow CaSiO_3$, explain the reaction in terms of acid-base concept. [2]

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