RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

FIRST YEAR [2019-22]

B.A./B.Sc. FIRST SEMESTER (July – December) 2019

Mid-Semester Examination, September 2019

Date : 16/09/2019 **INDUSTRIAL CHEMISTRY (Honours)**

Time : 11 am – 12 noon **Paper: I [CC 1]** Full Marks : 25

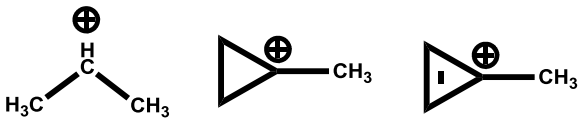
[Use a separate Answer Book for each Unit]

Unit - I

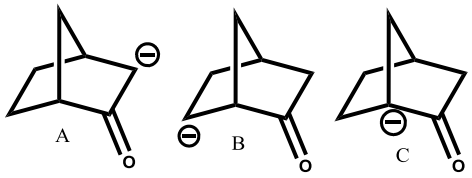
Answer any three questions from question no. 1 to 5 [3×5]

1. a) What are electrophilic and nucleophilic carbene? Give one example of each. [2]

   b) Arrange the following carbocations in increasing order of stability with justification: [3]



2. a) Arrange the following carbanions in increasing order of stability with justification: [3]



   b) Draw the structures of CH_3^+ and CH_5^+. Which one is not electron deficient? Which one is the more acidic and why? [2]

3. a) Construct an energy profile diagram for a reaction [5]

   $A \rightleftharpoons B \rightleftharpoons C$ rate constant for A to B = K_1 , B to A = K_{-1}, B to C = K_2 and C to D= K_{-2}

   In which relative stability of three species C>A>B and for which the relative order of rate constant is $K_2 > K_{-1} > K_1 > K_{-2}$

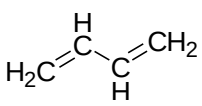
   i) How many intermediates are there?

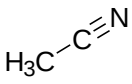
   ii) How many transition states are there?

   iii) Which is the rate determining step in forward direction?

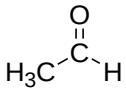
   iv) Define the Exothermic and Endothermic steps for this reaction.

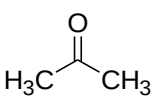
4. a) Draw the orbital diagram of the following molecules. [3]

   i) 

   ii) 

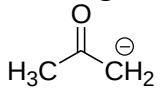
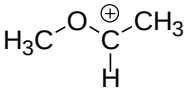
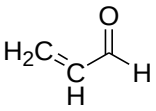
   b) Explain the order of electrophilicity of the following carbonyl compounds. [2]

   i) 

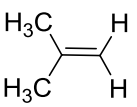
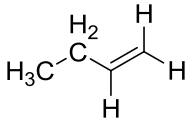
   ii) 

   iii) 

5. a) Draw the resonace structure of each of the following species indicating the major contributing structure. [3]

i)  ii)  iii) 

b) Predict the stability order of the following alkenes with brief explanation. [2]

 and 

Unit - II

Answer any two questions from question no. 6 to 8 [2× 5]

6. a) Calculate the electronegativity of hydrogen from the following data :

E_{H-H}=458 kJ/mol, E_{F-F}=155kJ/mol, E_{H-F}=565kJ/mol, $\chi_P(F)$=4.0

b) Explain the fact :

$IE_1(_{29}Cu) > IE_1(_{30}Zn) > IE_1(_{31}Ga)$

c) "AgCl is white while AgI is yellow"— explain why? [2+2+1]

7. Write the answer of the question properly.

a) Calculate the $\chi_P(Cl)$ and $\chi_M(Cl)$ from the following data:
EA(F)=3.62 eV/atom, IP(F)=17.4 eV/atom

b) Explain the facts :

IE (PF_3)>IE(PH_3)
EA(F)<EA(Cl)

c) "The mixture of Zr and Hf is very difficult to separate"— Explain why? [2+(1+1)+1]

8. a) Write the ground state term symbol of d^3 and d^7 system of an atom. [3]

b) Calculate the first Bohr radius of He^+ ion. Given the first radius of H atom = 0·529Å [2]

———— × ————