

F.Y.B. Pharm. Sem I (Reexam).

(B Cell)

Physical organic chemistry

15/4/2013

147 1ST HALF-13 (n)-JP

Con. 5525-13.

DC-6646

(2 Hours)

[ Total Marks : 70

NOTE: i) All questions are compulsory.  
 ii) Figures to the right indicate full marks.

- Q.1a Explain for the following terms (Any five): (5)
- Specific Acid
  - Potential Energy Surface
  - Node
  - Group Orbitals
  - HOMO
  - Inductive Effect
- Q.1b Answer the following questions. Give suitable examples wherever necessary (Any three): (6)
- Draw the Lewis-dot structure for methyl cyanide. Calculate the formal charge on Nitrogen.
  - Explain the formation of a three center – two electron bond using Molecular orbital theory.
  - What is initial rate kinetics?
  - What is the importance of covalent catalysis?
- Q.1c Answer in brief (Any two): (4)
- Depict the Eyring plot to determine Activation parameters with equation for same.
  - Explain electrophilic catalysis giving suitable example.
- Q.2a Elaborate primary isotope effect, specify the purpose behind studying isotope effect with example (3)
- Q.2b Explain on the basis of Molecular orbital theory, the formation of formaldehyde molecule. Indicate the HOMO and LUMO orbitals. (3)
- OR
- Q.2b Explain on the basis of Molecular orbital theory, the formation of ethane molecule. Indicate the HOMO and LUMO orbitals. (3)
- Q.2c Explain phase transfer catalysis with a suitable example (3)
- Q.2d Draw resonating structure/s for the following molecules: (2)
- $\text{CH}_2\text{NO}_2^-$
  - $\text{CH}_3\text{CO}_2^-$
- Q.3a Give the mathematics for Eyring equation for Transition State (3)
- Q.3b Compare the symmetry elements in a planar methyl versus a pyramidal methyl. Explain the formation of the group orbitals for a planar methyl using Walsh diagram. (3)
- Q.3c "Water in gas phase has two ionization energies corresponding two lone pairs on oxygen atom". Explain using Molecular orbital theory. (3)
- Q.3d The half-life of a first order reaction is 35 min. Calculate the time required to complete 65% of the reaction. (2)
- Q.4a How will one follow the kinetics of a reaction. Explain with a suitable example. (3)
- Q.4b Discuss the strengths and drawbacks of Molecular orbital theory. (3)
- Q.4c Depict the energies of molecular orbitals in methyl chloride based on rules of QMOT. (3)

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- Q.4d Explain reaction catalyzed by a nucleophile with example. (2)
- Q.5a Justify the following statements giving suitable examples: (3)
- Dipole moments of  $\text{CH}_3\text{Br}$  and  $\text{CH}_3\text{F}$  are the same.
  - Decreasing 's' character leads to decreasing bond angles.
  - C-C in benzene has a bond order of 1.5.
- Q.5b On the basis of Molecular orbital theory, explain formation of methyl radical. (3)
- Q.5c Classify charge-transfer complexes. Give examples from each class. (3)
- Q.5d The activation energy of a reaction was found to be 41.1 KJ/mol. At 25°C the rate constant was  $0.0112 \text{ sec}^{-1}$ . At what temperature would this reaction go twice as fast. (2)  
(Given gas constant  $R = 8.3145 \text{ J/mol/K}$ )
- Q.6a Explain the kinetic and thermodynamic control during HBr addition to 1,3-butadiene (4)
- Q.6b Explain Hammond's postulate using reaction coordinate diagrams (4)
- OR**
- Q.6b Explain the effect of specific acid on rate of reaction, with suitable derivation and example (4)
- Q.6c Define Hybridization index. Explain the formation of  $\text{SF}_6$  based on hybridization theory. (3)
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