Shahjalal University of Science & Technology, Sylhet
Department of Biochemistry & Molecular Biology
1st Year 1st Semester Examination 2011
Course No: BMB 123, Course Title: Bioorganic Chemistry-I
Credit: 3.0, Time: 3.0 hours, Marks: 70

Answer any two questions from each part

Part A

1. (a) Give the direction of dipole moment (if any) for each of the following molecules 2.5
   i) HF ii) IBr iii) Br_2 iv) CO_2 v) SO_2
   (b) What are the distinguishing features of sp^2 and sp hybrid orbitals? Explain with suitable examples 6
   (c) Define Hybridization. What is the state of hybridization of central atom in the following compounds? 2+2
   i) $BeCl_2$ ii) BF_3 iii) NH_3 iv) PCl_5
   (d) Discuss the shape of CH_4 and H_2O molecule on the basis of VSEPR theory. 5

2. (a) Give the structure and IUPAC name for all the alkanes with the formula of C_6H_{14}. 5
   (b) What is the major product expected from the following reaction? Give reason in support of your choice. 4

$$CH_3CH_2CH_3 \xrightarrow[\text{Light, 127°C}]{Br_2} CH_3CH_2CH_2Br + CH_3CHBrCH_3$$

   (c) Which of the following compounds are optically active and why? 5
   i) $CH_3CH_2CH(CH_3)CH_2OH$ ii) $CH_3CH(OH)COOH$ iii) $CH_3CHClCH_3$
   iv) $CH_3CH_2CHClCHClCH_3$ v) $CH_3CHClCHClCH_3$
   (d) Differentiate enantiomers and diasteromers. 3.5

3. (a) Write down the difference between basicity and nucleophilicity. 3
   (b) Explain why an S_N1 reaction proceeds with racemization plus inversion. 6
   (c) What is carbocation? Explain with example. 4.5
   (d) Describe two important methods for the preparation of alkyl halide. 4

4. (a) State and explain Markonikov's and Antimarkonikov's rule for alkenes with mechanism. 6
   (b) Complete the following reaction and give mechanism. 4

   (c) What is Saytzeff's rule? Arrange the following alkenes according to their stability. 1+2
   $R_2C{=}CHR$, $R_2C{=}CH_2$, $R_2C{=}CR_2$, $RCH{=}CHR$, $RCH{=}CH_2$, $CH_2{=}CH_2$
   (d) Outline the methods of preparation of alkenes. Indicate their properties and uses. 4.5

5. (a) State and explain evidence for E2 mechanism. 6
   (b) Draw and discuss the orbital structure of acetylene molecule. 4
   (c) Alcohols are higher boiling liquids as compared to alkanes, explain 2.5
   (d) Addition of HBr to 1, 3- Butadiene gives 1, 2 and 1, 4 -addition products. Discuss the effect of temperature on the equilibrium of the reaction. 5

6. (a) Explain why 3° alcohol does not undergo oxidation whereas 2° and 1° alcohol go rapidly. 3.5
   (b) Describe following reactions. 2+2
      i) Williamson synthesis
      ii) Diels-Alder reaction
   (c) Complete the following reactions. 2x5=10