1. Which of the following alkenes can exist as cis-trans isomers? Write their structures. **(20%)**

   (a) $CH_2=CHCH_2CH_2CH_2CH_3$ (b) $CH_2=C(C_2H_5)_2$

   (c) $CH_3CH=CHC_6H_5$ (d) $CH_3CH_2CH=CHBr$

2. Please give an example describe what is (1) Adenine, (2) Nucleotide, (3) Nucleoside, (4) DNA, (5) RNA, respectively. **(20%)**

3. Describe how the primary, secondary, tertiary and quaternary structures of a protein differ. **(15%)**

4. Using the symbol R, write a general formula for (a) a primary alcohol, (b) a secondary alcohol, and (c) a tertiary alcohol. **(15%)**

5. Describe the alternative definitions of acids and bases on the basis of Arrhenius, Bronsted-Lowry and Lewis concepts, respectively. **(10%)**

6. Write a structural formula for each of the following compounds. **(10%)**

   (1) Ethyl ether, (2) Formalin, (3) Phosphate, (4) Glycerol, (5) Toluene

7. Which amines shown as follows are (a) primary, (b) secondary, (c) tertiary amines? Please also give an IUPAC name for these amines, respectively. **(10%)**

   (1) $(CH_3)_2CHNHCH_3$, (2) $(CH_3CH_2CH_2)_2NCH_3$,

   (3) $(C_2H_5)_2CHNH_2$, (4) $(C_3H_7)_2NH$, (5) $(C_4H_9)_3N$