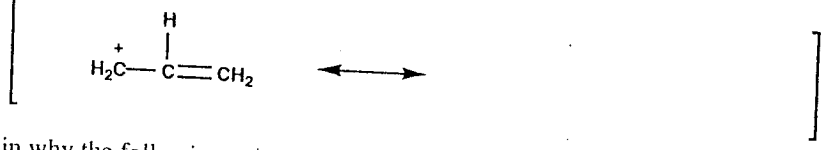
1. Indicate how you would carry out each of the following chemical transformations. What are some of the changes in the infrared spectrum that could be used to indicate whether the reaction has proceeded as indicated?

(a) 

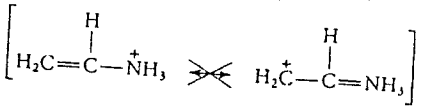
(10 pts)

(b) 1-hexanol ⟶ ⟶ hexyl methyl ether (10 pts)

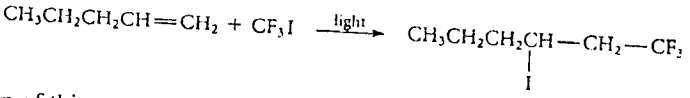
2. (a) Draw resonance structures of the following allyl cation and show how the second resonance structure can be derived from the first by curved-arrow formalism. (5pts)



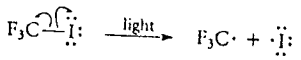
(b)Explain why the following structure is not a reasonable resonance structure. (5 pts)



3. Trifluoroiodomethane undergoes an addition to alkenes in the presence of light by a free-radical chain mechanism.



The initiation step of this reaction is the light-induced homolysis of the C—I bond:



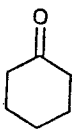
(a) Using the fishhook formalism, write the propagation steps of a free-radical chain mechanism for this reaction. (10 pts)

(b) Predict which alkene would react more rapidly with CF_3I in the presence of light: 2-methyl-1-pentene or (E)-4-methyl-2-pentene. **Explain your choice.** (10 pts)

4. Which would have a faster rate of saponification: (a) ethyl benzoate, or (b) ethyl ***p*-nitrobenzoate**? ***Why?*** (10 pts)

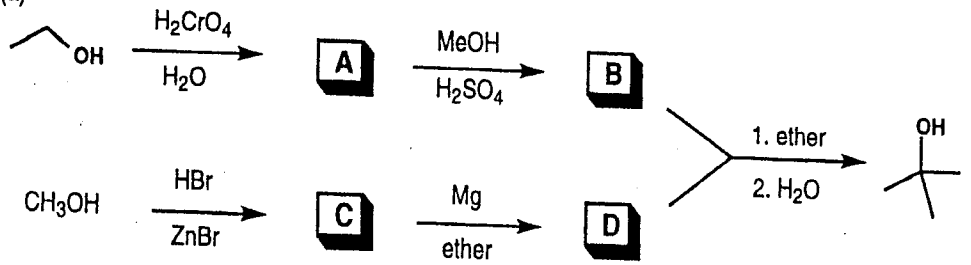
5. List the amino acid and peptide formed when the following peptide is treated with chymotrypsin:
tyr-ala-leu-tyr (5 pts)

6. Give the ***structures*** of the organic compounds present in a methanol solution of cyclohexanone that contains a trace of HCl. (10 pts)

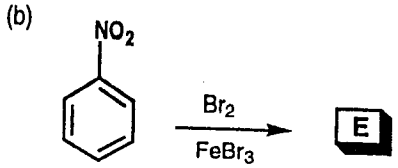


7. Predict the major product (A, B, C, D, E) of the following reactions. (15 pts)

(a)



(b)



8. Briefly define each of the following terms and give an example. (10 pts)
   (a) catalytic antibody
   (b) polar aprotic solvent