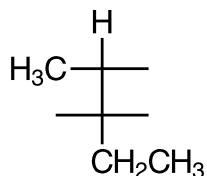
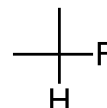


- 25 pts 1) Place the necessary groups on the structures below to give the specified compound:

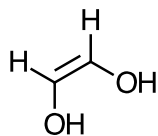
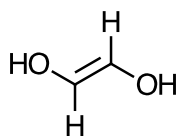
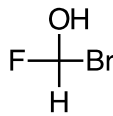
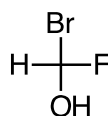
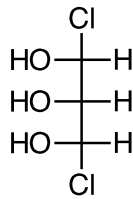
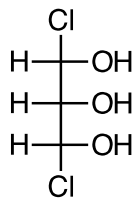
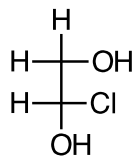
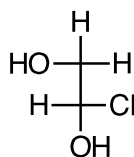


(2R,3S)-2,3-dichloropentane

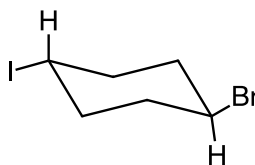
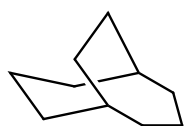


(R)-bromochlorofluoromethane

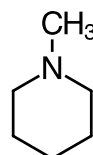
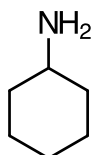
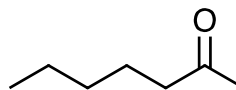
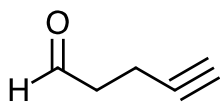
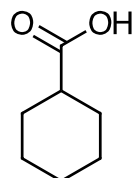
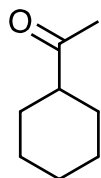
- 30 pts 2) Label each pair of compounds as either identical, structural isomers, enantiomers, or diastereomers:



20 pts 3) Name the compounds below:.

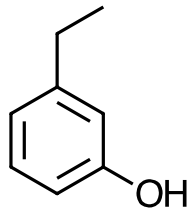
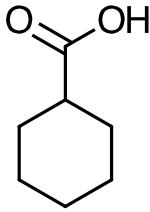
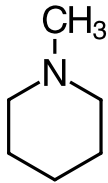
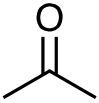


15 pts 4) Briefly describe the IR spectral characteristics that would allow you to distinguish between the following pairs of compounds:

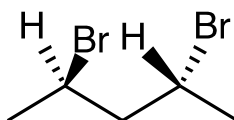
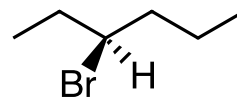
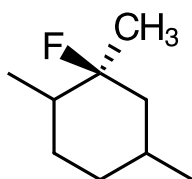


200 points total

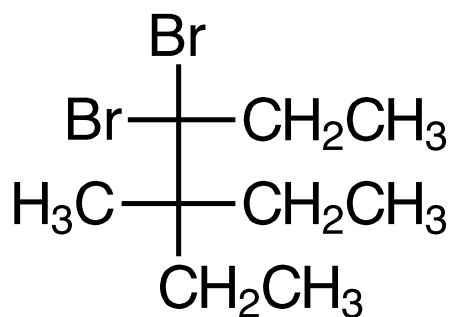
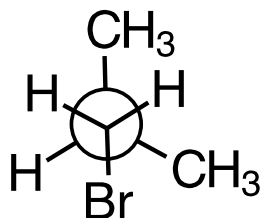
- 25 pts 5) Fill in the table below with the results of the simple chemical tests indicated. Use a + to indicate soluble and a 0 to indicate insoluble or a + to indicate bubbles with bicarbonate and a 0 to indicate no bubbles.

				
Water solubility				
H <sub>2</sub> SO <sub>4</sub> solubility				
dil aq NaOH solubility				
dil aq HCl solubility				
bubbles with aq HCO <sub>3</sub> <sup>1-</sup>				

- 25 pts 6) Label the asymmetric carbons in the following as R or S.  
Redraw the bottom one as a Fisher projection:



20 pts 7) Name the compounds below:



40 pts 9) Four points each with three free misses

- 1) In the first propagation step of the free radical chlorination of methane, which of the following occurs? 1) \_\_\_\_\_
- A) A carbon radical reacts with a chlorine radical.
  - B) A carbon radical reacts with  $\text{Cl}_2$ .
  - C) Two chlorine radicals combine.
  - D)  $\text{Cl}_2$  dissociates.
  - E) A chlorine radical abstracts a hydrogen.

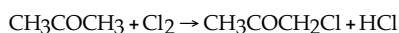
- 2) For the compound below, the number of  $1^\circ$ ,  $2^\circ$  and  $3^\circ$  hydrogens, respectively is \_\_\_\_\_. 2) \_\_\_\_\_



- A) 1, 6 and 0      B) 3, 6 and 2      C) 3, 6 and 1      D) 1, 3, and 1

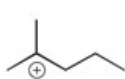
- 3) Which of the following statements correctly describes the contribution of  $\Delta S^\circ$  to  $\Delta G^\circ$ ? 3) \_\_\_\_\_
- A) The entropy term makes a greater contribution to  $\Delta G^\circ$  in exothermic reactions.
  - B) The entropy term always makes a more significant contribution to  $\Delta G^\circ$  than does the enthalpy term.
  - C) The entropy term makes a greater contribution to  $\Delta G^\circ$  at low temperatures.
  - D) The entropy term makes a greater contribution to  $\Delta G^\circ$  in endothermic reactions.
  - E) The entropy term makes a greater contribution to  $\Delta G^\circ$  at high temperatures.

- 4) Given the chlorination of acetone shown below, choose the correct rate law. 4) \_\_\_\_\_

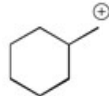


- A) rate =  $[\text{Cl}_2]$
- B) rate =  $[\text{CH}_3\text{COCH}_3]$
- C) rate =  $[\text{CH}_3\text{COCH}_3][\text{Cl}_2]^{1/2}$
- D) rate =  $[\text{CH}_3\text{COCH}_3][\text{Cl}_2]$
- E) cannot be determined from stoichiometry; must be determined experimentally

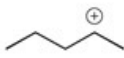
- 5) Rank the following carbocations in order of stability. (The most stable is first.) 5) \_\_\_\_\_



I



II



III

- A) I > II > III      B) II > I > III      C) III > I > II      D) I > III > II

- 6) The major monobrominated product which results when ethylcyclohexane is subjected to free radical bromination is \_\_\_\_\_. 6) \_\_\_\_\_
- A) bromomethane
  - B) a primary bromide
  - C) a quaternary bromide
  - D) a secondary bromide
  - E) a tertiary bromide

7) If (S)-glyceraldehyde has a specific rotation of  $-8.7^\circ$ , what is the specific rotation of (R)-glyceraldehyde? 7) \_\_\_\_\_  
A)  $+8.7^\circ$   
B)  $0.0^\circ$   
C)  $-8.7^\circ$   
D) cannot be determined from the information given

8) Which of the following statements is (are) true for the compound (R)-2-butanol? 8) \_\_\_\_\_  
A) This compound is optically active.  
B) This compound is chiral.  
C) This compound has an enantiomer.  
D) all of the above  
E) none of the above

9) Which of the following functional groups does not have at least one  $sp^2$  hybridized carbon atom as a constituent of the group? 9) \_\_\_\_\_  
A) ether  
B) ester  
C) carboxylic acid  
D) alkene  
E) aldehyde

10) Which of the class of organic compound below contains a carbonyl group as a part of its structure? 10) \_\_\_\_\_  
A) ester  
B) carboxylic acid  
C) aldehyde  
D) ketone  
E) all of the above

11) What term describes the structural relationship between cis-1,2-dimethylcyclopentane and trans-1,3-dimethylcyclopentane? 11) \_\_\_\_\_  
A) diastereomers  
B) constitutional isomers  
C) enantiomers  
D) not isomers  
E) conformers

12) Stereoisomers which are not mirror image isomers are \_\_\_\_\_. 12) \_\_\_\_\_

13) How many asymmetric carbons are present in the compound below?

3-ethyl-2,2,4-trimethylpentane