

Last Name \_\_\_\_\_

First Name \_\_\_\_\_

**General Instructions:**

- (i) Use scratch paper at back of exam to work out answers; final answers must be recorded at the proper place on the exam itself for credit. Models are allowed.
  - (ii) Print your name on each page.
  - (iii) Please keep your paper covered and your eyes on your own work. Misconduct will lead to failure in the course.
1. (15 points) Draw a molecular structure that corresponds to each name below. Your drawing should show ALL ATOMS in the molecule (including H's).

(a) ethylcyclopentane

(b) 5-vinyl-1-octene

(c) Z-4-trifluoromethyl-2-hexene

Name \_\_\_\_\_

2. (28 points) For each of the molecules drawn below, determine whether each of the descriptive phrases (1-6) is applicable. Write as many of the indicated numerals as appropriate on the line below each molecule. Numerals may be used more than once, or not at all.

1 = Contains at least one  $sp^3$ -hybridized carbon.

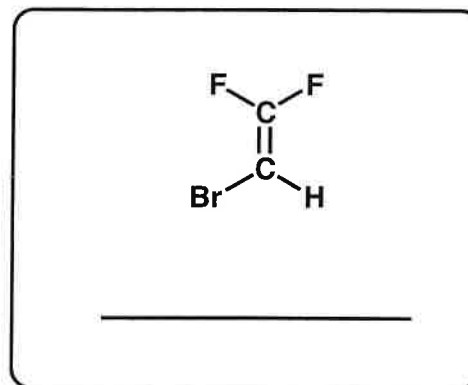
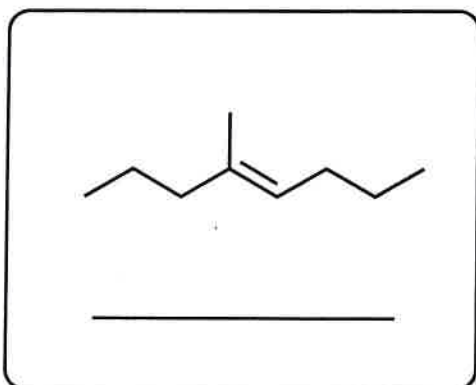
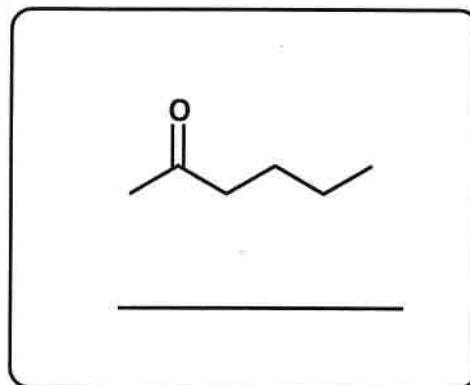
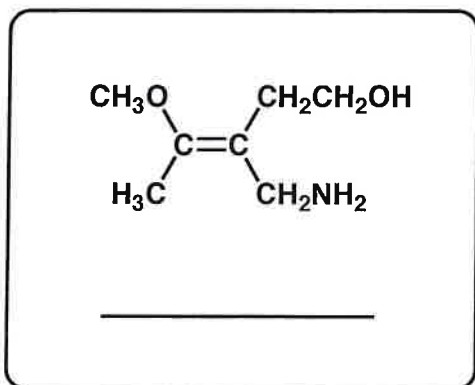
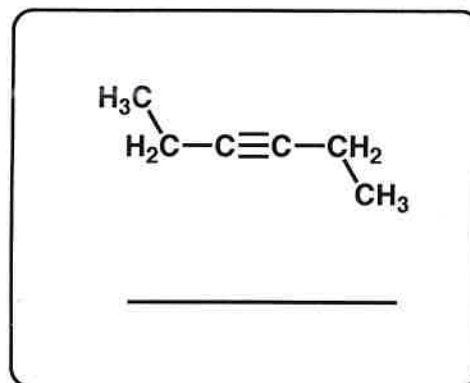
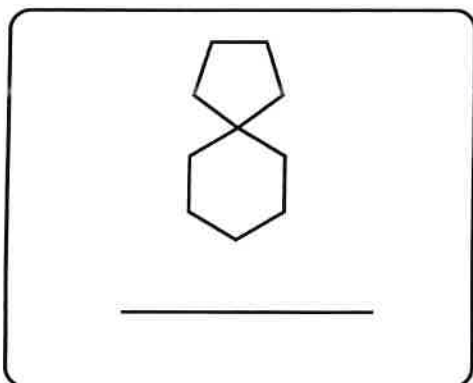
2 = Contains at least one  $sp^2$ -hybridized carbon.

3 = Contains at least one  $sp$ -hybridized carbon.

4 = E configuration

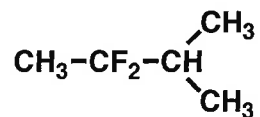
5 = Z configuration

6 = Unsaturation number  $\geq 2$

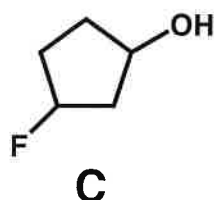
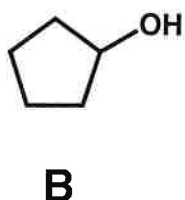


Name \_\_\_\_\_

3. (15 points) In the molecule drawn below, there is one bond that has more than one possible staggered conformation. Draw all three staggered Newman projections about this bond. CIRCLE the conformation(s) you expect to be most stable.



4. (8 points) Order the four molecules shown below in terms of INCREASING  $\text{pK}_a$ , from LEFT to RIGHT.

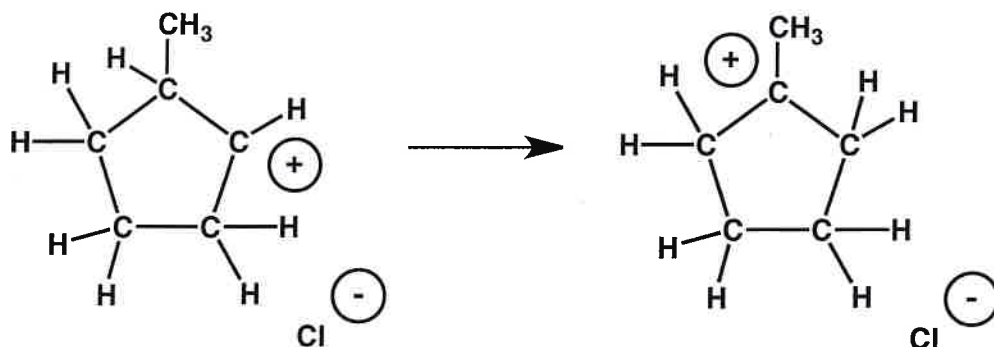


Increasing  $\text{pK}_a$ :

\_\_\_\_\_ < \_\_\_\_\_ < \_\_\_\_\_ < \_\_\_\_\_

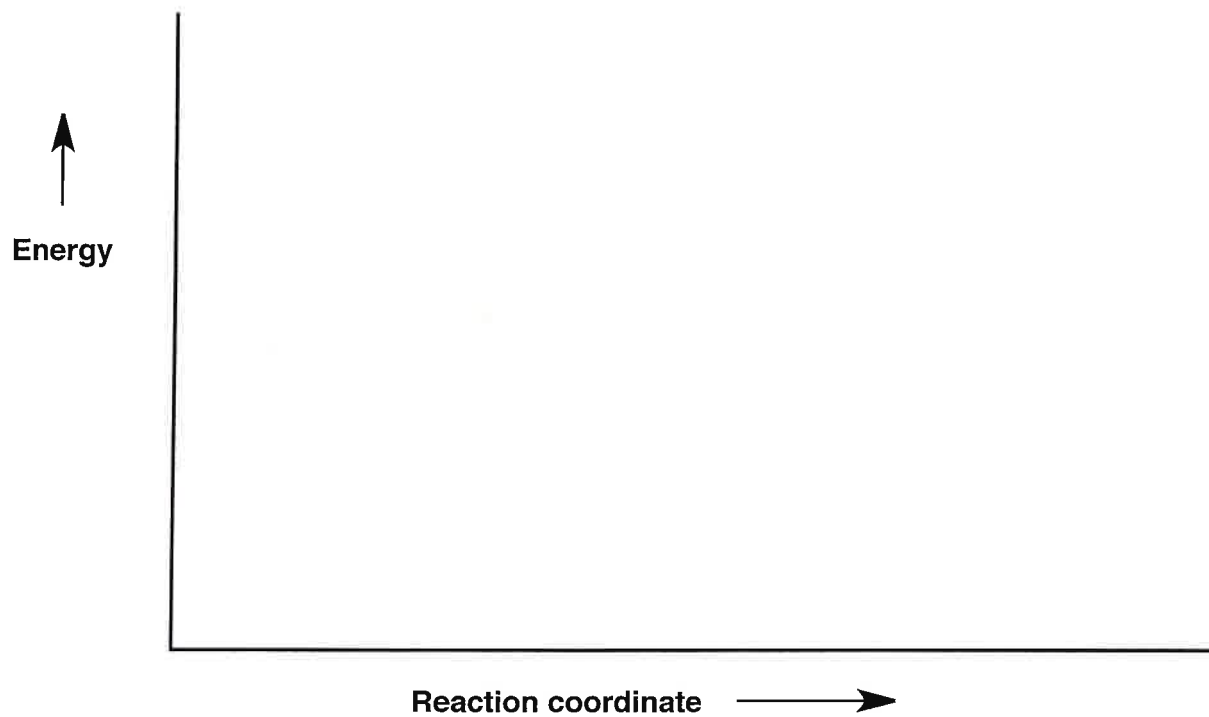
Name \_\_\_\_\_

5. (10 points) Consider the reaction process shown below.



(a) Draw a mechanism ("curved arrows") for this process.

(b) Draw a reaction energy diagram for this process.



Name \_\_\_\_\_

6. (24 points)

(a) Propose FOUR possible structures for a molecule that has the formula  $C_5H_{12}O$ .

(b) Propose FOUR possible structures for a molecule that has the formula  $C_6H_{11}Cl$ .