

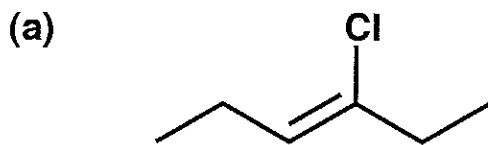
Last Name Answer

First Name Key

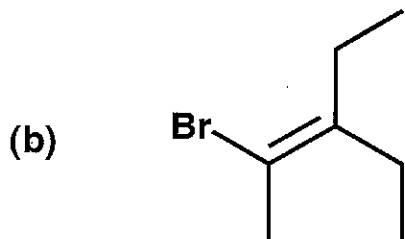
General Instructions:

- (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.

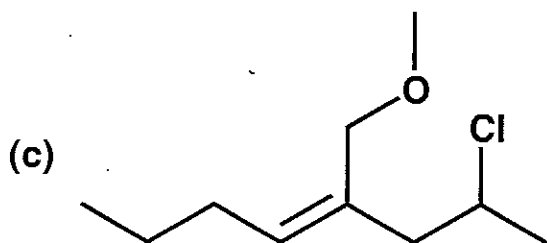
1. (9 points) For each alkene below, circle the proper stereoisomer designation.



E Z Neither



E Z Neither



E Z Neither

+3 for
each
correct
circle

Name _____

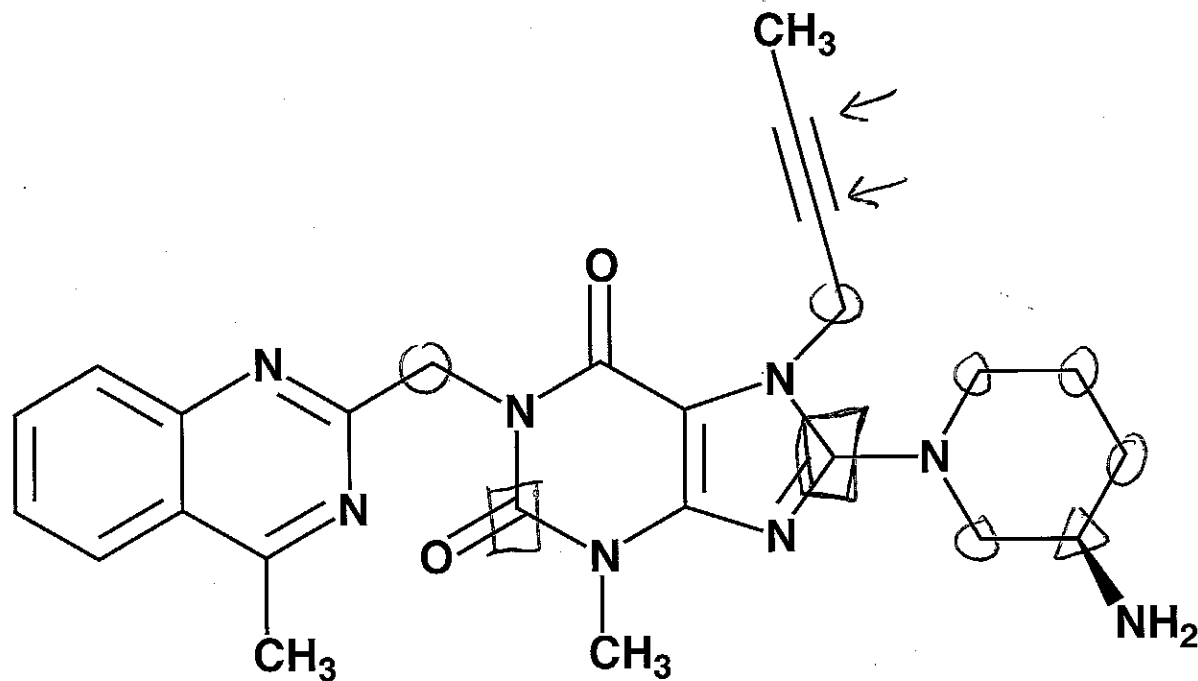
2. (11 points) The molecule below, linagliptin, is a drug used for treatment of type 2 diabetes.

+6 Put a CIRCLE around each sp^3 -hybridized carbon atom that is bonded to 2 and only 2 hydrogen atoms.

+1 Put a TRIANGLE around each sp^3 -hybridized carbon atom that is bonded to 1 and only 1 hydrogen atom.

+2 Put a SQUARE around each sp^2 -hybridized carbon atom that is not bonded to another carbon.

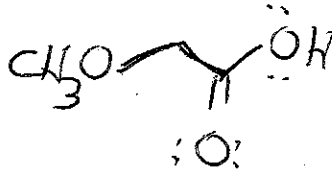
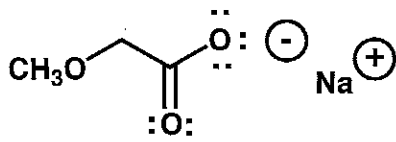
+2 Draw an ARROW to indicate each sp -hybridized carbon atom.



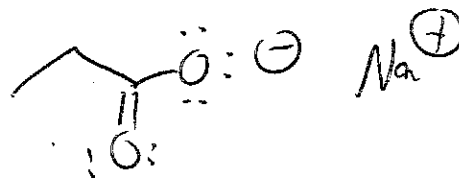
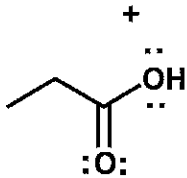
Name _____

3. (24 points)

(a) Draw in the other side of the Brønsted acid-base equilibrium involving the two species shown below.



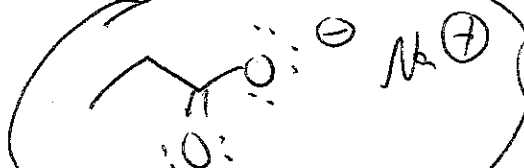
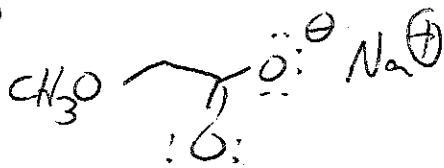
(+4)



(+4)

(b) Draw the two bases from the equilibrium above in the space below, and CIRCLE the one that is stronger.

+2 for each correct structure



+3 for circle

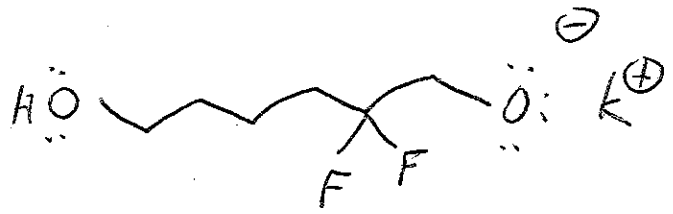
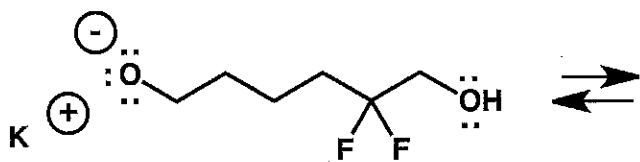
(c) Which side of the the equation in part (a) is favored (circle the correct word below)?

(+2)

LEFT

RIGHT

(d) Draw in the other side of the Brønsted acid-base equilibrium involving the single species below.



(+5)

(e) Which side of the the equation in part (d) is favored (circle the correct word below)?

LEFT

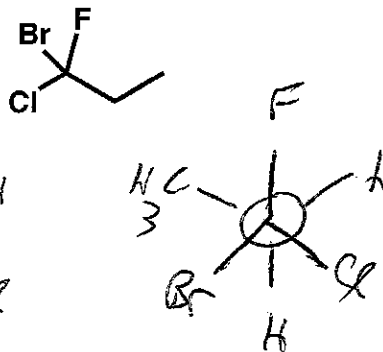
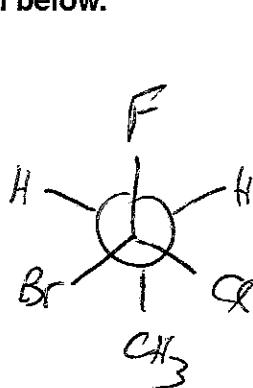
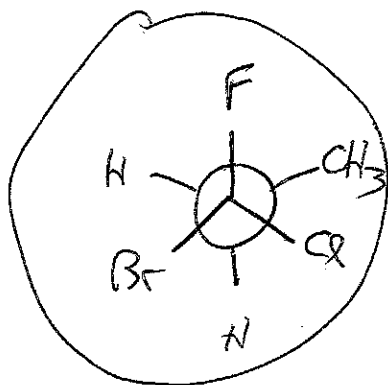
RIGHT

(+2)

4. (13 points)

Name _____

(a) Draw Newman projections showing the three different staggered conformations available to the molecule shown below.



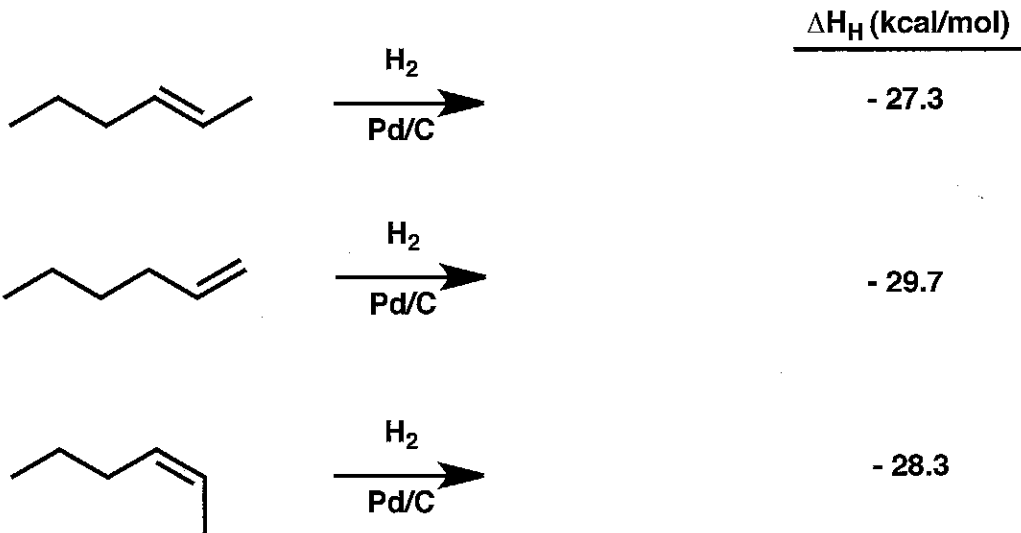
+3 for each
correct Newman
projection

(b) Atoms become larger and more bulky as one moves down a column of the periodic table. Based on this information, CIRCLE the most stable conformation above.



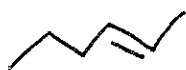
5. (9 points) The three hydrogenation reaction shown below all lead to the same product. What is the name of this product?

NAME: hexane (+3)



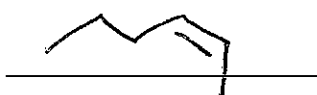
Based on the heats of hydrogenation given for the three reactions, draw the appropriate alkene structure in each space below.

Most stable



+2

Intermediate stability



+2

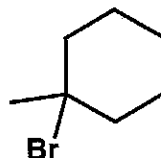
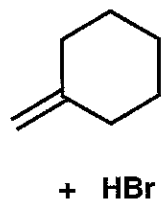
Least stable



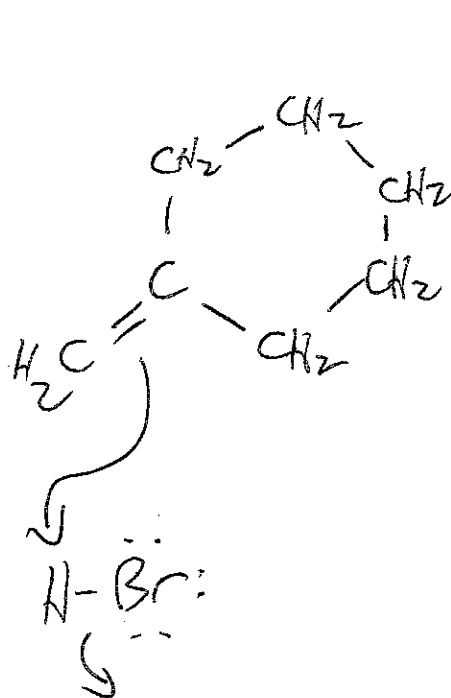
+2

Name _____

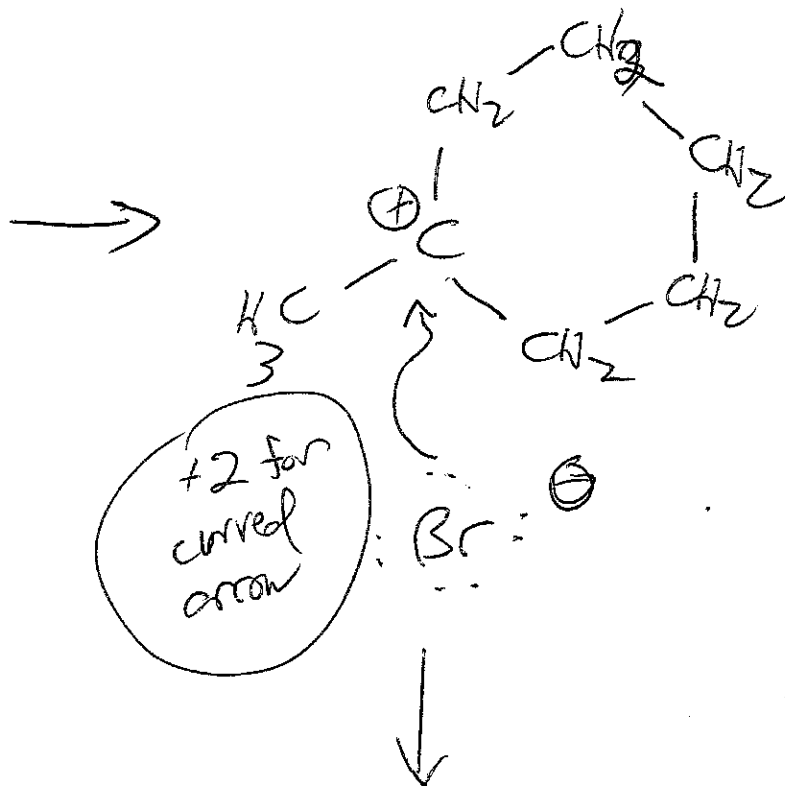
6. (9 points) Provide a mechanism ("curved arrows") for the reaction shown below. Show every atom in each structure you draw.



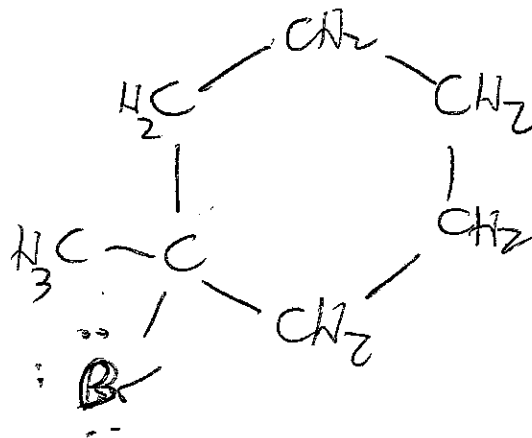
+3 for carbocation



+2 for each curved arrow



+2 for curved arrow



Name _____

7. (25 points)

Molecule X has the formula C_8H_{14} and reacts with two molar equivalents of H_2 in the presence of Pd/C; no further reaction occurs if additional H_2 is present. The product is an alkane that contains one (and only one) 4° carbon atom.

Propose FIVE possible structures for X.

+5 for each correct structure

Possibilities include:

