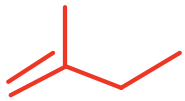
Polytechnic Tutoring Center

Midterm I REVIEW KEY – CM 2213, Fall 2021

Disclaimer: This mock exam is only for practice. It was made by tutors in the Polytechnic Tutoring Center and is not representative of the actual exam given by the Academic Department.

Problem 1

A) Start by drawing the LINE STRUCTURE of **2-methylbut-1-ene** and write the formula below**.**



C_5H_{10}

B) How would you classify **2-methylbut-1-ene?** Circle all correct answer choices.

a. Internal
b. Terminal
c. Monosubstituted
d. Disubstituted
e. Trisubstituted
f. Tetrasubstituted
g. Cis
h. Trans

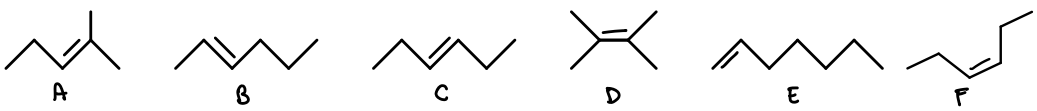
C) Draw an isomer of **2-methylbut-1-ene** that fits the given criteria.

a. 1 set of H, 1 set of C

b. 4 sets of H, 5 sets of C

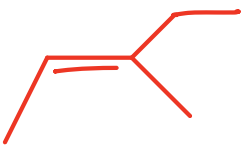
c. 6 sets of H, 5 sets of C

D) Rank the following alkene isomers of C6H12 from lowest energy to highest energy. If two isomers will have approximately the same energy, cross out the < symbol and replace it with =.



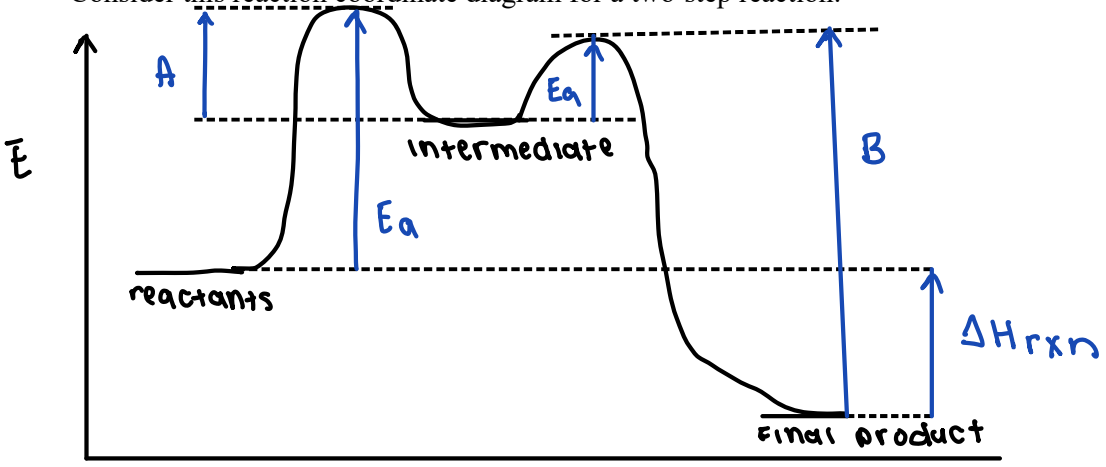
LOWEST: D < A < B = C < F < E HIGHEST

E) Is there an additional alkene isomer of C6H12 that is not shown in part d)? If yes, draw it



Problem 2

Consider this reaction coordinate diagram for a two-step reaction:



A) The first step of this reaction converts the reactants into the intermediate. The second step of this reaction converts the intermediate into the final product.

Circle the correct choice:

Step 1	endothermic or exothermic?	Fast or slow?
Step 2	endothermic or exothermic?	Fast or slow?
Overall Reaction	endothermic or exothermic?	

B) Reaction coordinate diagrams can be read in both the *forward* and *reverse* directions. This allows us to understand under what circumstances a reaction will be reversible.

The arrow labeled "A" on the above diagram shows the activation energy (Ea) for the intermediate transforming back into the reactants. The arrow labeled "B" on the diagram shows the Ea for the final product transforming back to the intermediate.

Based on this, what can you say about the *rates* of the reverse reaction?

The reverse reaction of step 1 is favored and exothermic. In contrast, the reverse reaction of step 2 is not favored and endothermic. Thus, the rate of the reverse of step 1 will be fast while the rate of the reverse of step 2 will be the slow, rate-determining step for the overall reverse reaction.

Problem 3

A) Draw three stable isomers with this formula. Include all lone pairs.

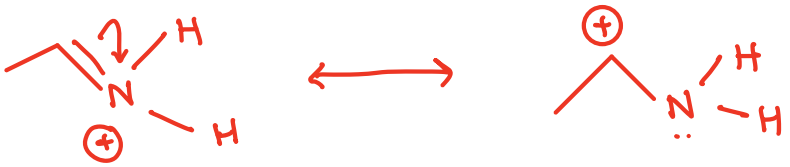
List the functional group(s) present in each compound on the line provided below the structure. Be as specific possible.

Formula: C3H8O

Functional Groups: 2° alcohol 1° alcohol ether

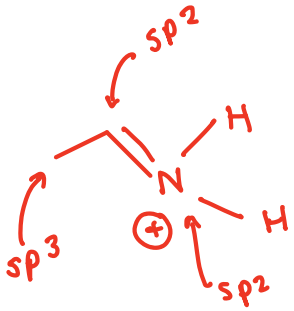
B) Draw two structures with the formula given that fit the criteria provided. Your two structures should be resonance forms of the same compound. Include all lone pairs and non-zero formal charged.

Formula: C2H6N+



C) Add in curved arrows to transform Structure I into Structure II in part b)

D) Redraw the major resonance form from part B) and label the hybridization of each non-H atom (sp, sp2, or sp3).



Problem 4

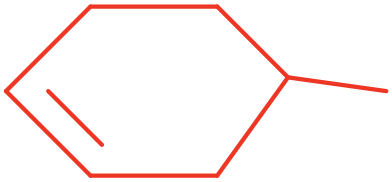
For each name: Draw the structure of the compound based on the name (line structures are fine)
Determine if the name given is the correct IUPAC name
If the name is not correct, provide the correct IUPAC name

A) 1-methylcyclohex-3-ene

Is this name correct? NO

Correct name:

4-methylcyclohex-1-ene



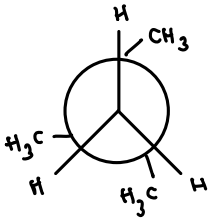
B) 2-methyl-5-propylheptane

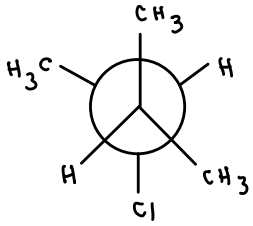
Is this name correct? NO

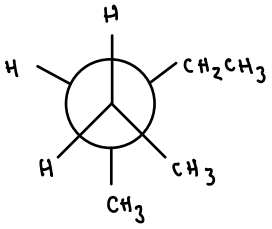
Correct name: 5-ethyl-2-methyloctane

Problem 5

For each Newman projection: Determine the IUPAC name of the compound
Label the conformation shown as *lowest energy, highest energy,* or *intermediate energy.*
Draw the Lewis Structure
Draw the line Structure



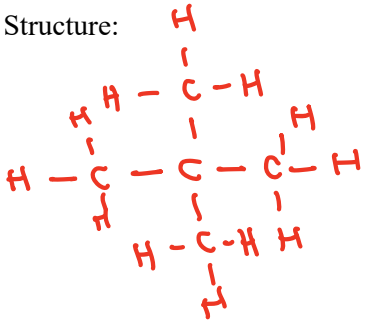


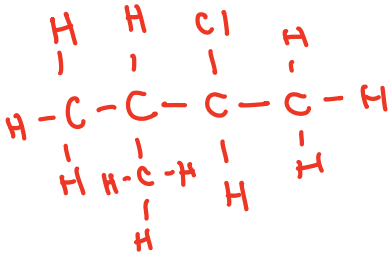


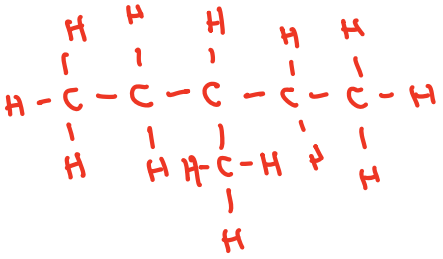
IUPAC Name: 2-2-dimethyl propane | 2-chloro-3-methylbutane | 3-methylpentane

Relative Energy: highest energy | lowest energy | intermediate energy

Lewis Structure:







Line Structure: