

**CHEM 3311**

**HARRINGTON**

**Exam 4**

**1:30 – 4:00 PM May 10, 2017 in CHEM 142**

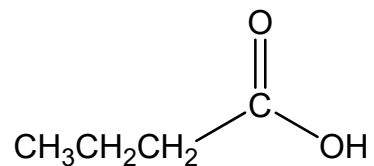
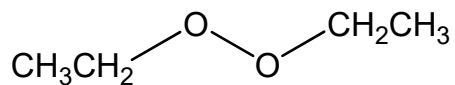
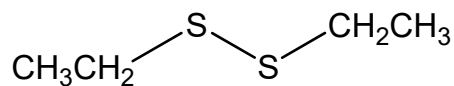
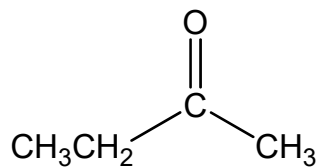
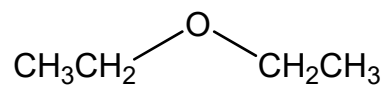
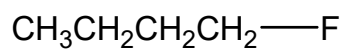
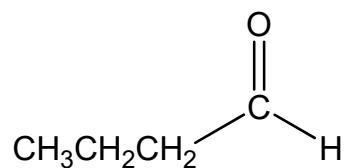
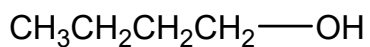
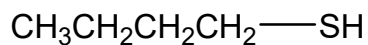
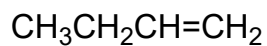
**Instructions.** No notes, books, laptops, phones, calculators, models, or stencils are allowed.

Periodic Table, Electronegativity Chart, Eclipsing and Gauche Strain Energy Tables, 1,3-Diaxial Strain Energy Table, and Table of pK<sub>a</sub> Values are provided.

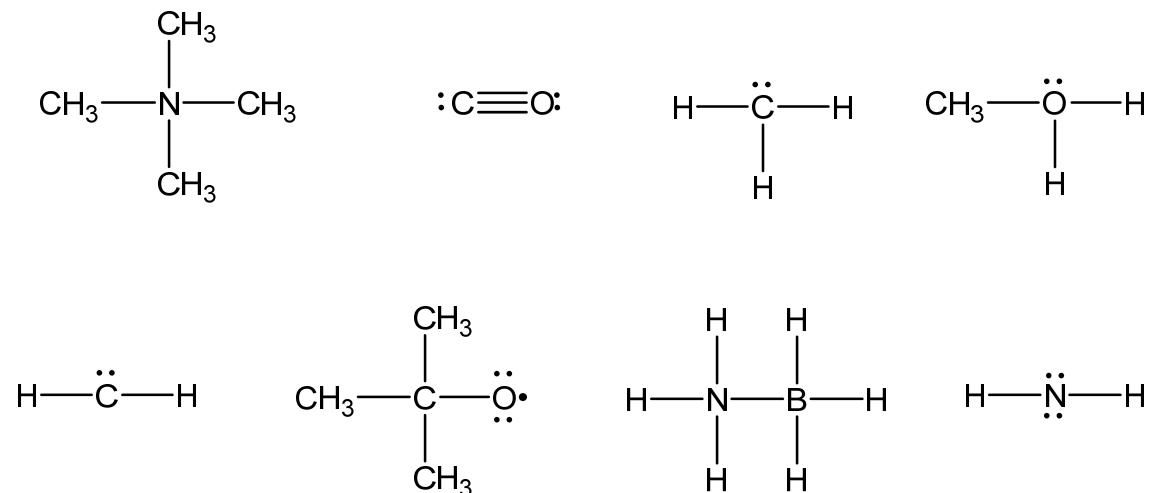
**NAME:**

	<b>Points Possible</b>	<b>Score</b>
<b>1</b>	20	
<b>2</b>	20	
<b>3</b>	20	
<b>4</b>	20	
<b>5</b>	20	
<b>6</b>	20	
<b>7</b>	20	
<b>8</b>	20	
<b>9</b>	20	
<b>10</b>	20	
<b>Exam 4 Total Raw Score</b>	200	
<b>Exam 4 Curve</b>		
<b>Exam 4 Curved Score</b>		
<b>Exam 4 Letter Grade</b>		
<b>Exam Score Replaced</b>	#	
<b>Quiz Points</b>	50	
<b>Total Points</b>	550	
<b>Final Letter Grade</b>		

1(20 points) Functional groups are the organizational theme for many organic chemistry textbooks, including *Organic Chemistry, 6<sup>th</sup> Edition*, by Loudon and Parise. Name the functional group in each molecule below.



2. (20 points) Assign the appropriate formal charge to each atom. Atoms with formal charge not assigned will be assumed to have a formal charge of 0 (zero).



3. (20 points) Circle the compound which has:

**HIGHER BOILING POINT**

chloromethane	or	octane
1-hexanol	or	1-methoxypentane
1-chloropentane	or	1-chloro-3-methylbutane
fluoroethane	or	iodoethane

**HIGHER MELTING POINT**

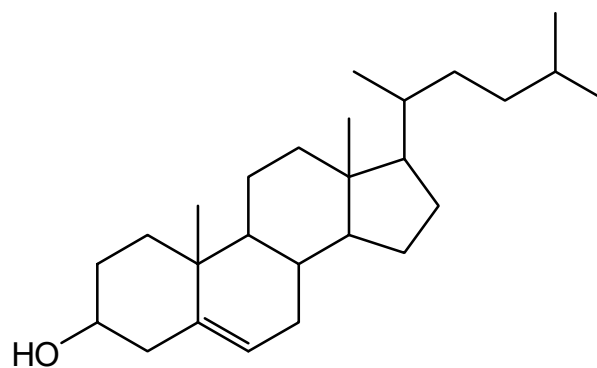
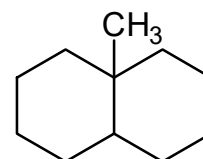
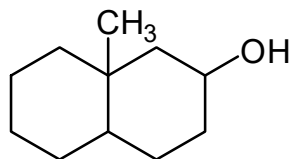
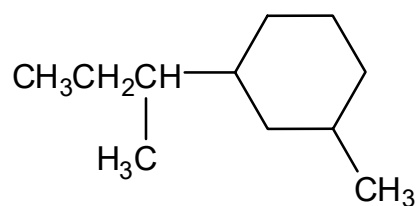
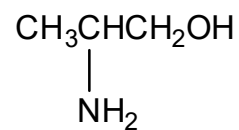
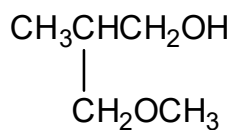
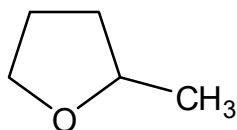
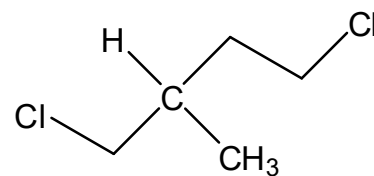
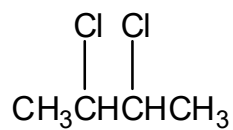
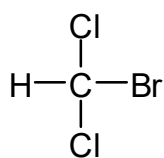
heptane	or	2-methylhexane
octane	or	2,2,3,3-tetramethylbutane

**HIGHER WATER SOLUBILITY**

2-propanol	or	cyclohexanol
1-butanol	or	1-fluorobutane
1-pentanol	or	1,5-pentanediol
diethyl ether	or	tetrahydrofuran (THF)

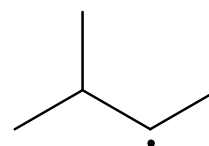
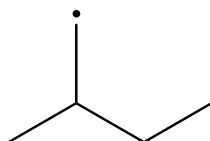
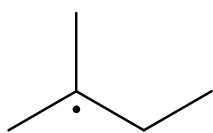


5. (20 points) Identify (with \*) all of the asymmetric carbon atoms (if any) in each of the following structures.

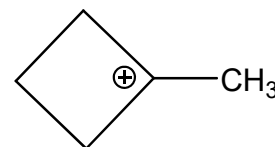
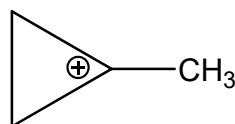
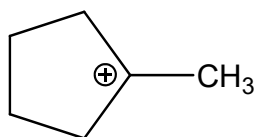


6. (20 points) Label the **most stable** and **least stable** member of each group.

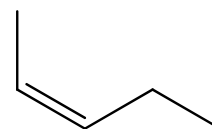
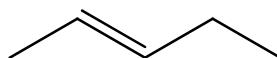
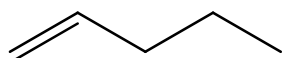
Group 1



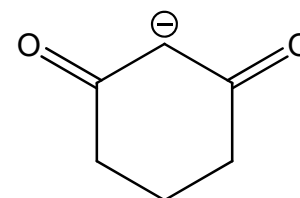
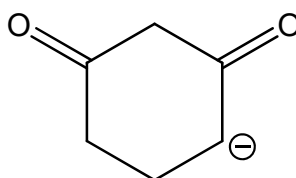
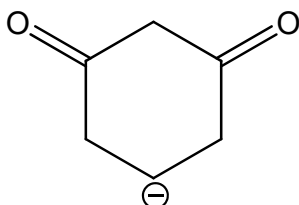
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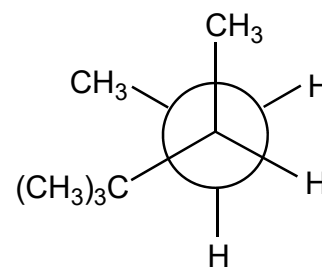
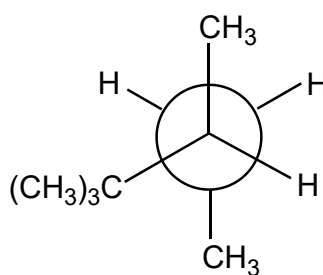
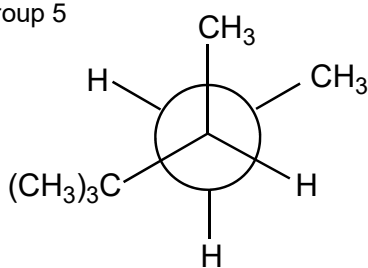
Group 3



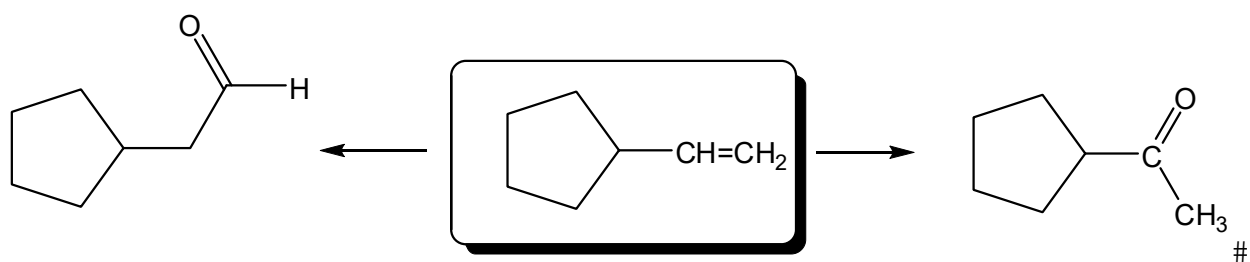
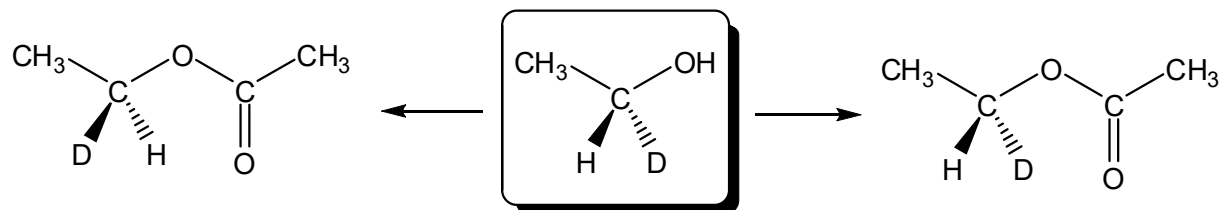
Group 4



Group 5



7. (20 points) Design a synthesis for each product from the given starting material. List any inorganic and organic reagents needed for each step. Draw structures for the products of each step. (*Hint*. More than one step is probably required.)



8. (20 points) Match each of the reactions to the correct reaction coordinate-energy diagram. Draw structures for the species present at each location (1 – 8) on the diagrams. Label each structure with the location number.

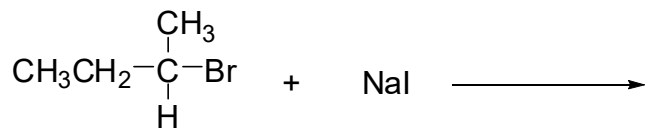


Diagram =

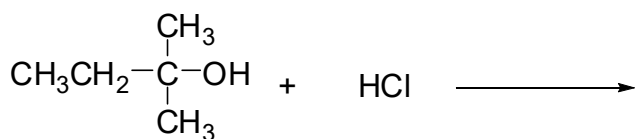


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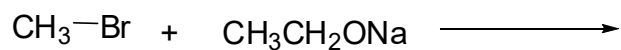


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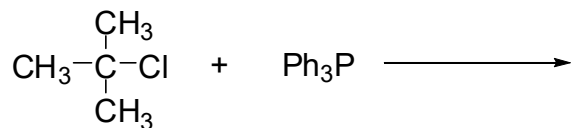


Diagram =

#

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## 8. Reaction Coordinate-Energy Diagrams

Diagram A

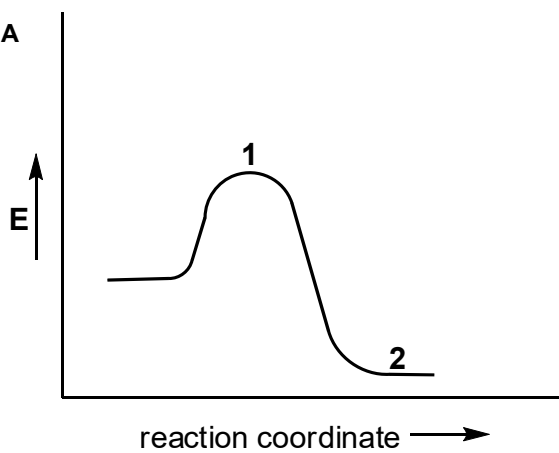


Diagram B

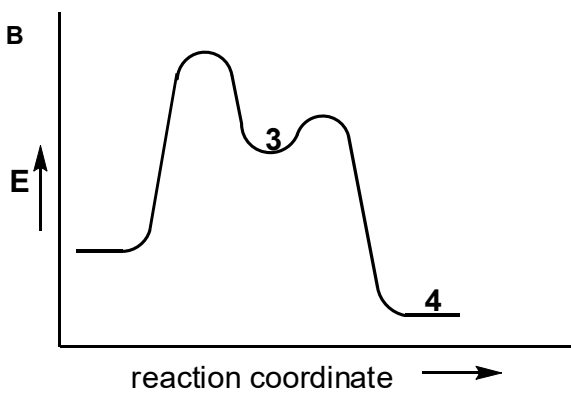


Diagram C

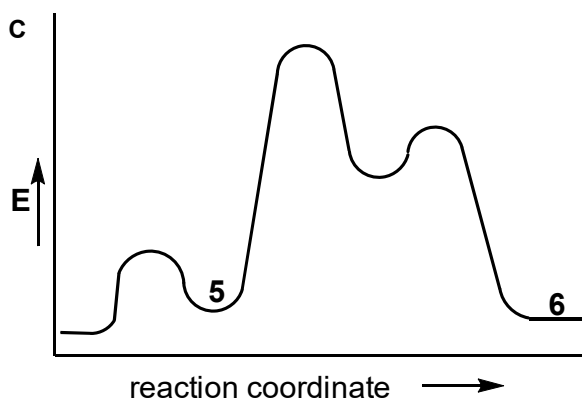
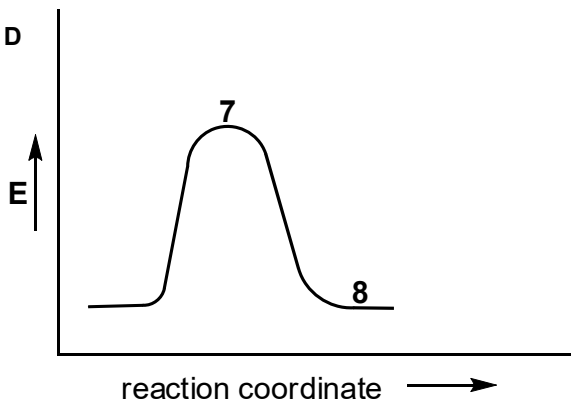
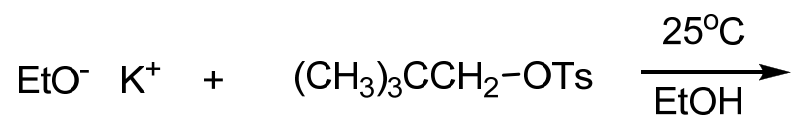
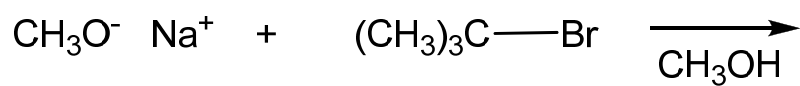
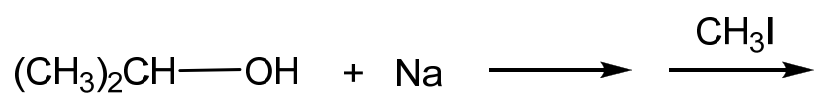


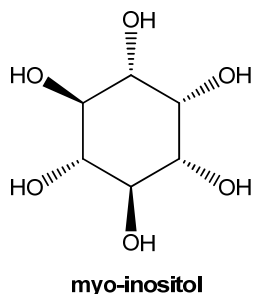
Diagram D



9. (20 points) Complete the following reactions. If no reaction is likely, explain why.



10. (20 points) myo-Inositol, a natural product found in many foods (oranges and cantaloupe), is the stereoisomer of cyclohexane-1,2,3,4,5,6-hexol shown below. Inositol is a core component of many signaling and secondary messenger molecules involved in a growing list of biological processes (insulin signal transduction, cytoskeleton assembly, gene expression).



Draw structures for the two chair conformations of myo-inositol. Which chair is more stable?

Explain in ten words or less why myo-Inositol (also known as meso-inositol) is **achiral**.

myo-Inositol is one of nine naturally occurring stereoisomers of cyclohexane-1,2,3,4,5,6-hexol. Draw flat-ring structures for the other eight stereoisomers and identify each one as chiral or achiral.

- #
- #
- #
- #
- #
- #
- #
- #
- #