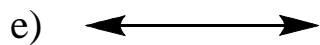
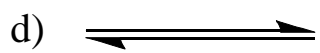
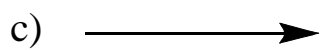


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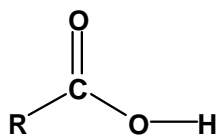
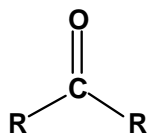
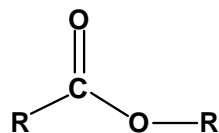
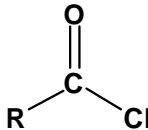
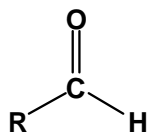
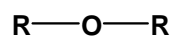
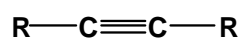
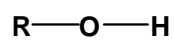
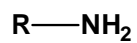
Final Exam for Organic I

1) Explain in a simple phrase what is meant in a chemical sense by the following arrows. (-1 pt for each incorrect)



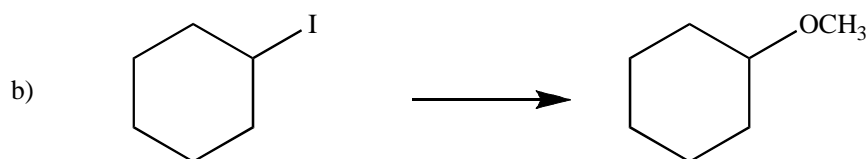
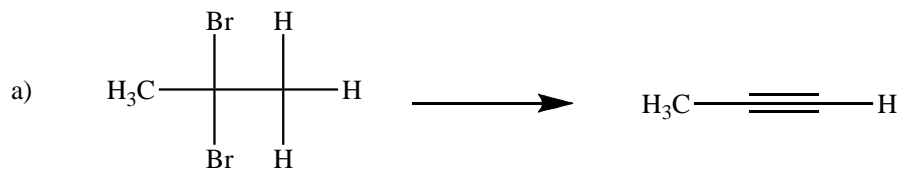
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2) Name the classes of compound that the following molecules belong to (E.g. alkane, amide, etc). (-1 pt for each incorrect)

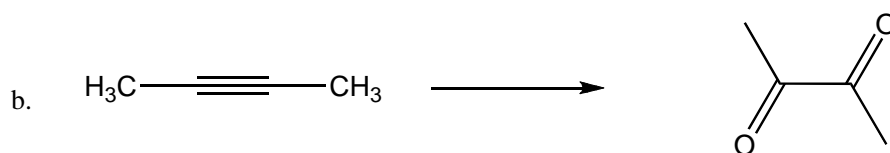
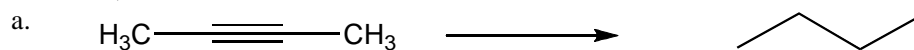


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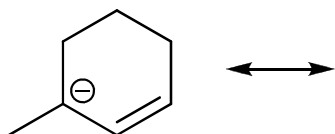
3) Classify each of the following reactions as either an Elimination, Addition or Substitution.
(-1 pt for each incorrect)



4) Indicate for each reaction if the process is an **oxidation**, **reduction** or **neither**. (-1 pt for each incorrect)

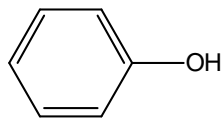


5) (5 pts)(i) Write the other resonance form for the following species.
(ii) Indicate which is major and minor contributor (or if they are the same energy).
(iii) Use curly arrows to show the movement of electrons which converts one into the other.

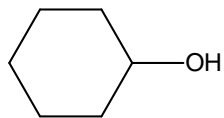


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6) Explain *with Lewis structures* why phenol is a much stronger acid than cyclohexanol. (2 pts)

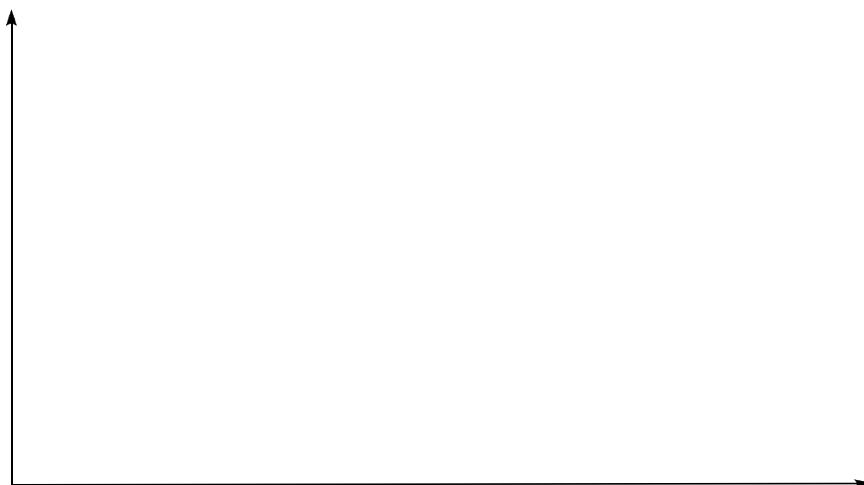


$pK_a = 10.0$



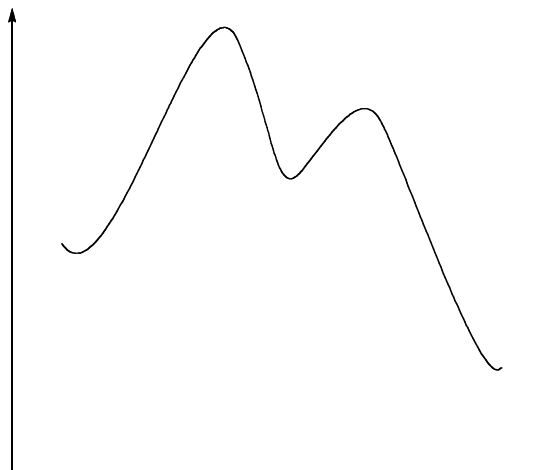
$pK_a = 18.0$

7) With the aid of a distribution graph for T_{low} and T_{high} , show how reaction rates go up with temperature. Label the axes and mark E_a . (2pts)

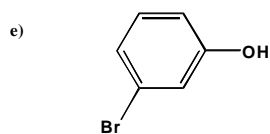
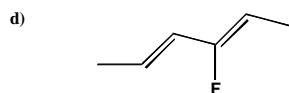
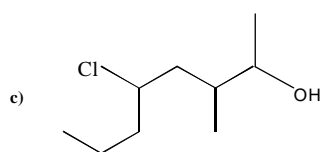
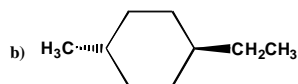
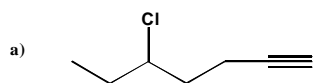


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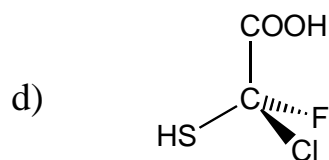
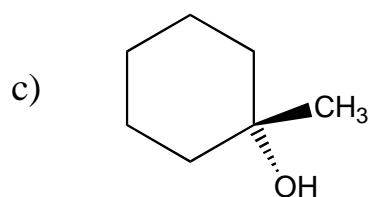
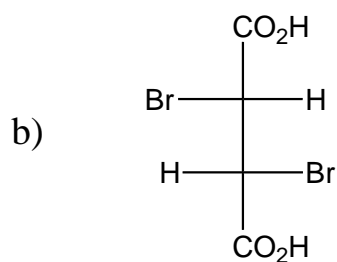
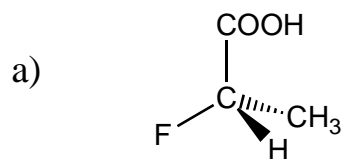
8) On the below energy level diagram, label (a) the axes (b) the reactants and products (c) any transitions states and E_a , (d) (ΔH° for the overall reaction (e) is this reaction exothermic or endothermic (f) and why this reaction more likely to proceed by an E_1 than a E_2 mechanism? (4 pts)



9) Name the following molecules in IUPAC form. (10 pts)



11) Asterix any chiral atoms in these molecules, and assign R or S to each chiral center. (8 pts)

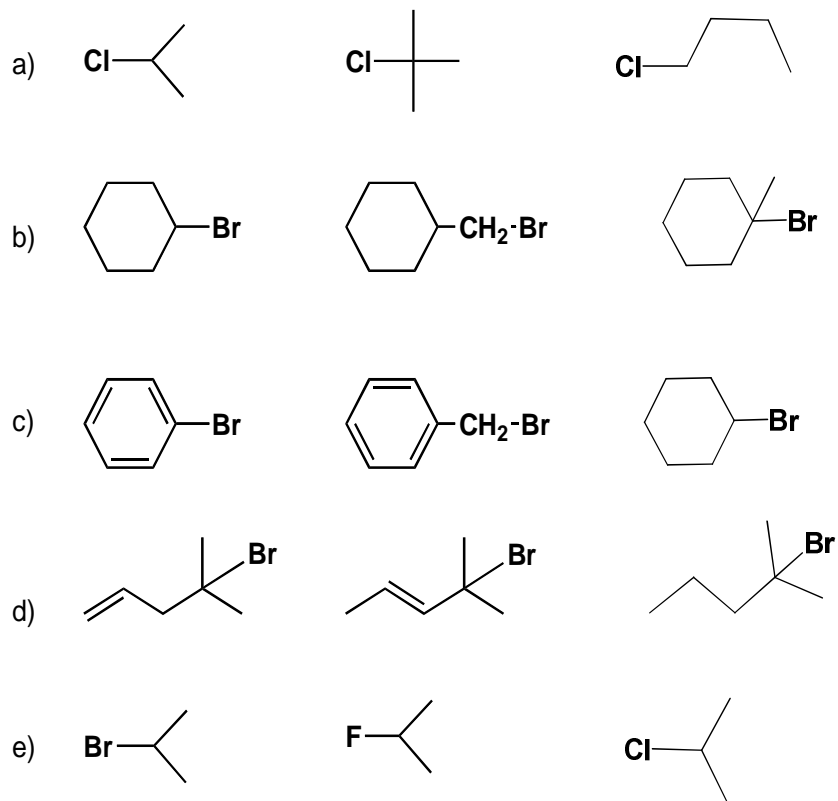


12) Which of the above molecules are achiral, and in a sentence explain why they are achiral. (1 pts)

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13) Circle the more stable member of each pair, and in a phrase explain your choice. (5 pts)

Phrase:



14) Ethyl-cyclohexane exists as two chair conformations that are in equilibrium. (3 pts.)

(i) In the chair conformation, draw the two positions the ethyl group (or any group) can be in.

(ii) Chair ethylcyclohexane is more stable with the ethyl group in which of the two positions?

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(iii) In a **sentence** explain why one is more stable.

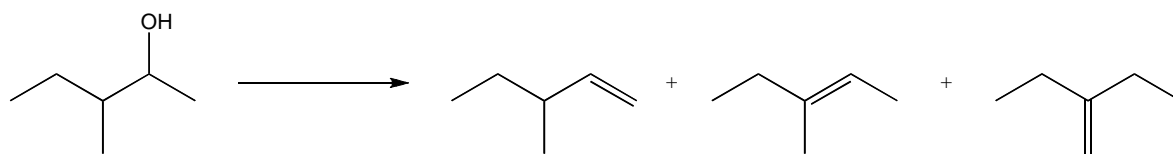
15) The Hammond Postulate predicts that the transition state in an endothermic reaction will more closely resemble the reactants or products in structure (Circle correct word.)? (2 points)

16) Name the two allowed geometries for an E₂ elimination reaction to proceed. (2 pts)

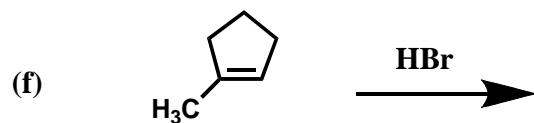
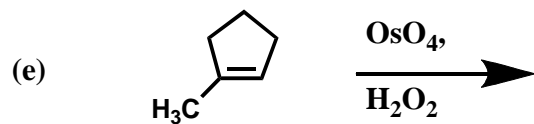
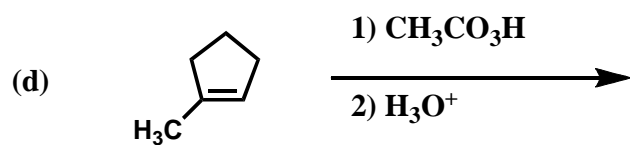
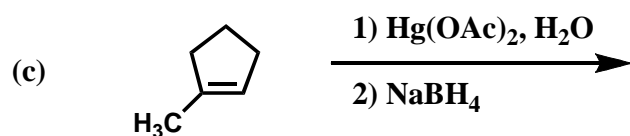
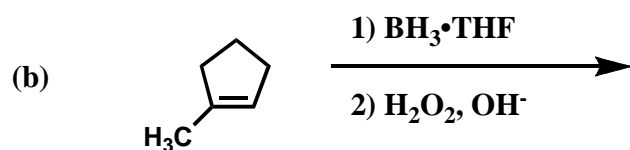
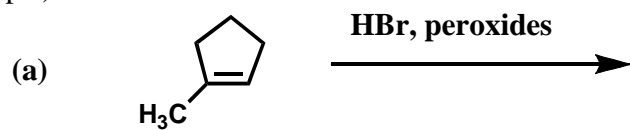
17) Which conformation of bromo-cyclohexane undergoes reaction with potassium t-butoxide, and use a Newman diagram to explain your choice. (2 pts)

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18) Provide a mechanistic explanation (using curly arrows) for the observed mixture of products in the following dehydration reaction, circle the major product, and state why you think it is the major product. (6 pts)



19) Give the products of following reactions, paying attention to any possible stereochemistry. (12 pts)



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20) Provide examples of the following mechanisms by choosing an appropriate reactant and reagent, then drawing curly arrows to show how the mechanism proceeds. (15 pts)

a) S_N1

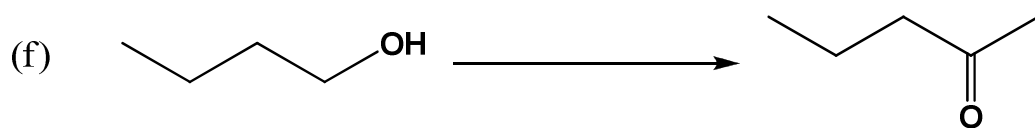
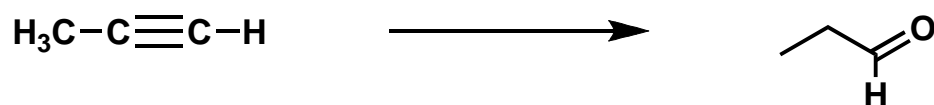
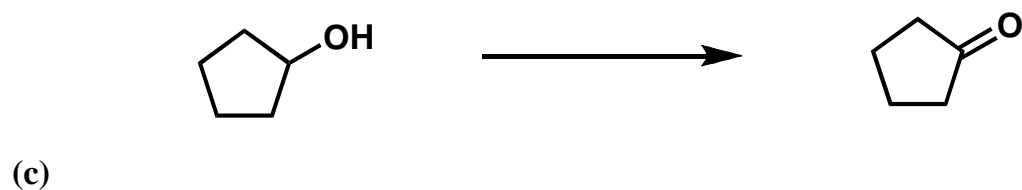
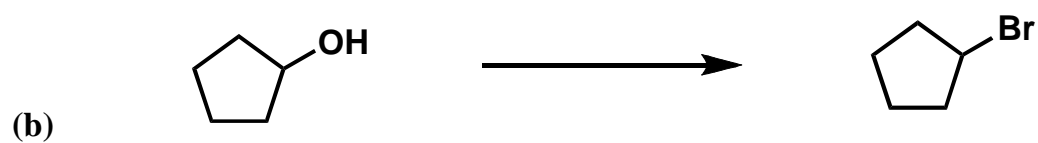
b) S_N2

c) E1

d) E2

e) Ad_{E2} (electrophilic addition) with Br_2 .

22) Give reagents to perform the following transformations. (12 pts)



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23) As found in your notes, fill in the table with the formula for the best reagent to convert a 1°, 2°, or 3° alcohol into a 1°, 2°, or 3° alkyl halide(3 pts):

Summary of Best Alcohol to Alkyl Halide Transformations

<u>Alcohol Class</u>	<u>Alkyl Chloride</u>	<u>Alkyl Bromide</u>	<u>Alkyl Iodide</u>
Primary	_____	_____	_____
Secondary	_____	_____	_____
Tertiary	_____	_____	_____

24) Name the principle four spectrometers used in Organic Chemistry and give their principle use. (6 pts)