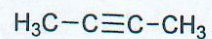
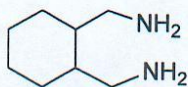
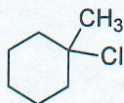
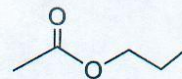
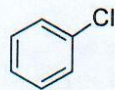
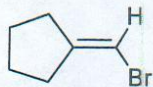
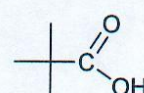
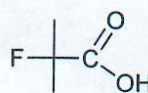
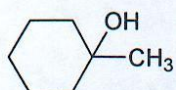


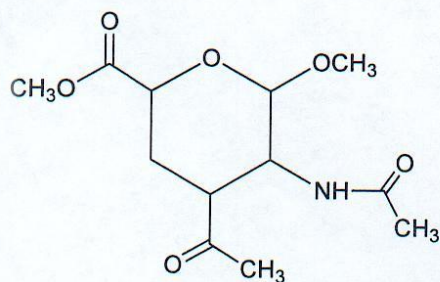
1. a) Circle **ALL** of the compounds below that would react with NaOH.



b) Rank the structures below from the most acidic (#1) to the least acidic (#5). Put your assignments in the boxes below the structures.



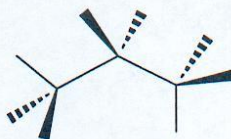
c) Circle **AND** name all of the functional groups in the molecule shown below.



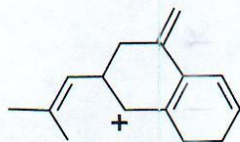
2.....

d) Draw all of the achiral isomers of methyl-hydroxy-cyclohexane (i.e. cyclohexane with one hydroxy (OH) group and one methyl group). In each case, clearly show the isomer in its most stable conformation. Draw each isomer only once.

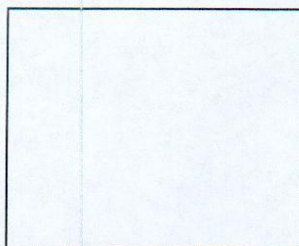
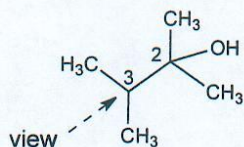
e) Complete the structure below to show a meso compound with the formula $C_3H_4Cl_2Br_2$. Show all atoms (including hydrogens) in final answer.



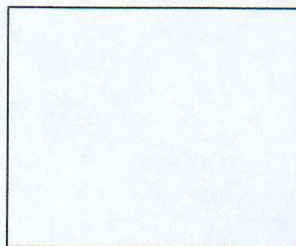
f) Draw all reasonable resonance structures that will stabilize the carbocation shown below.



g) Consider the conformations about the C3-C2 bond of the molecule shown below (view as indicated by the arrow). Draw Newman projections to indicate the most and least stable conformations of this molecule.

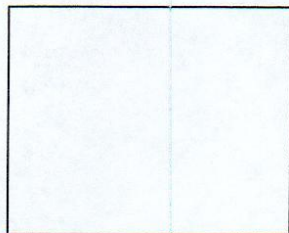


most stable

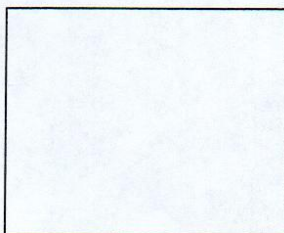


least stable

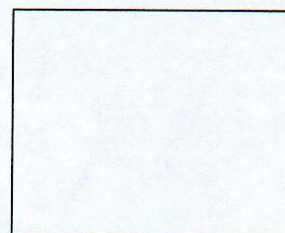
h) Compound 1 is chiral and has the formula $C_6H_{12}O_2$. Treatment of compound 1 with H_3O^+ gives one molecule with the formula CH_2O as well as one molecule of compound 2 that is chiral and has the formula $C_5H_{12}O_2$. Treatment of compound 2 with CrO_3/H_3O^+ gives compound 3 which is achiral and has the formula $C_5H_{10}O_2$. Draw compounds 1-3 in the boxes below. For chiral compounds you may draw either enantiomer.



compound 1

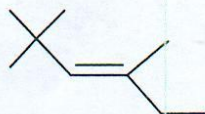
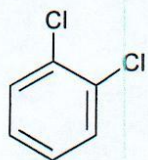
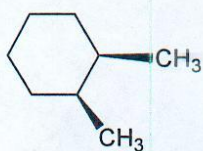
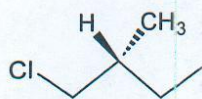


compound 2



compound 3

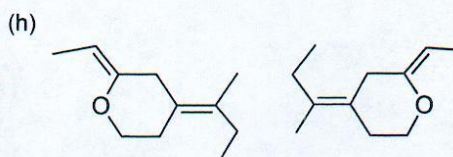
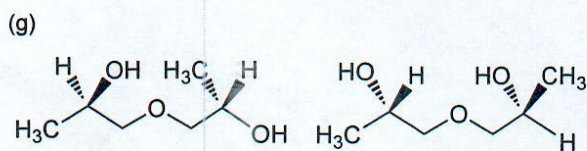
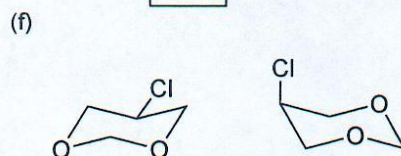
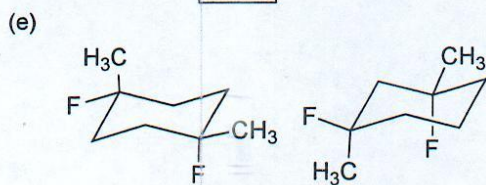
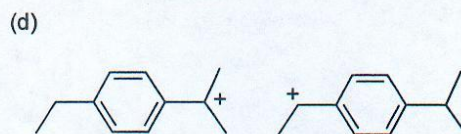
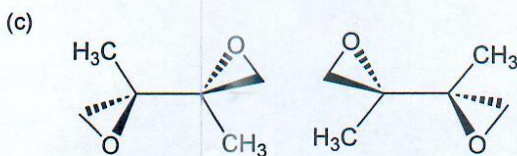
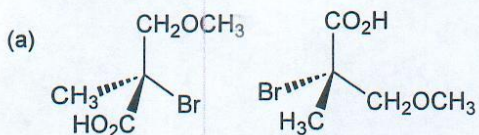
2. Name the following compounds using IUPAC nomenclature, including as necessary designation of stereochemistry.



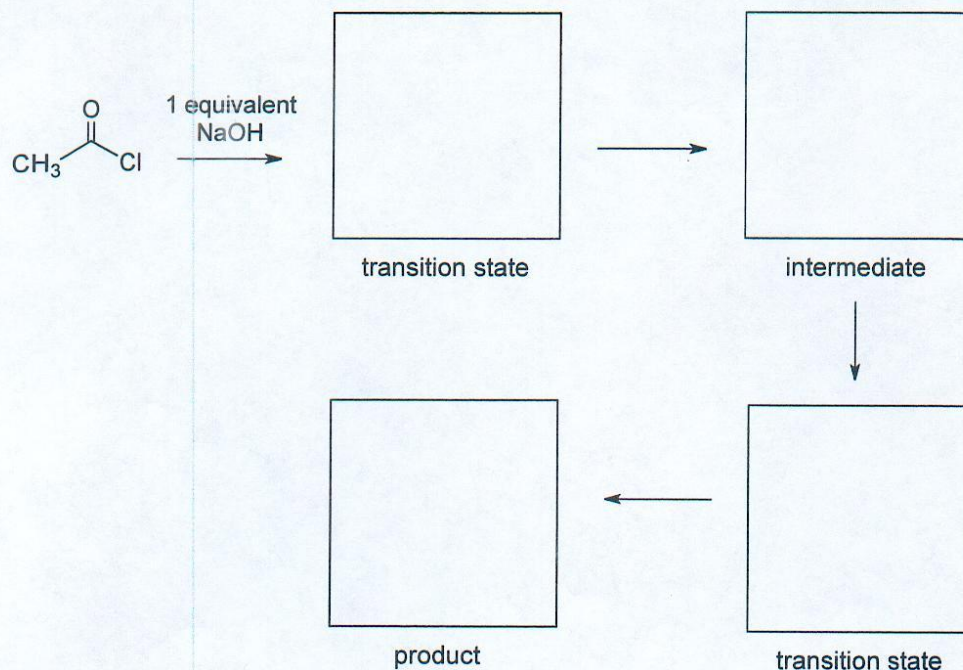
3. Shown below are a number of pairs of structural formulas. In the box below each pair, place the number (related to one of the terms listed below) that best describes the relationship between the two structures.

NOTE: Each term may be used more than once and not all of the terms need be used.

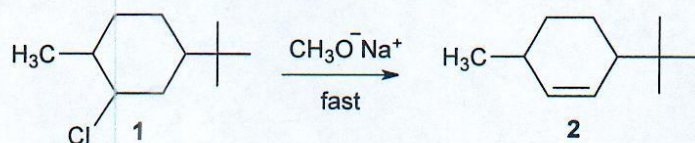
1. constitutional isomers
2. diastereomers
3. identical
4. enantiomers

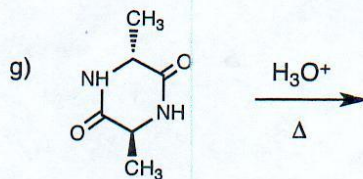
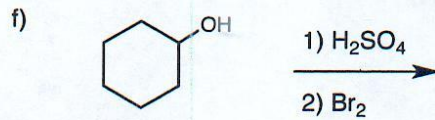
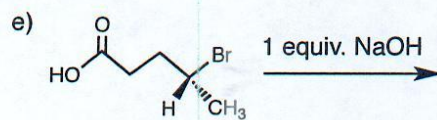
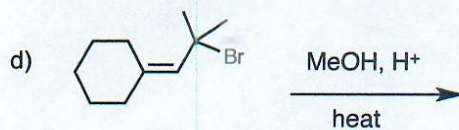
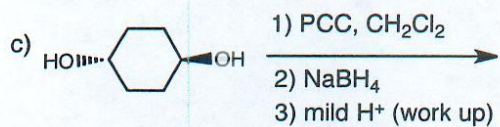
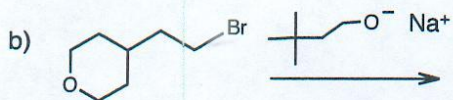
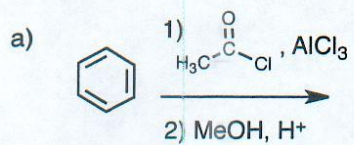


4 a) Complete the following scheme by filling in the boxes with the appropriate structures.



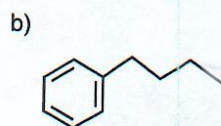
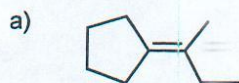
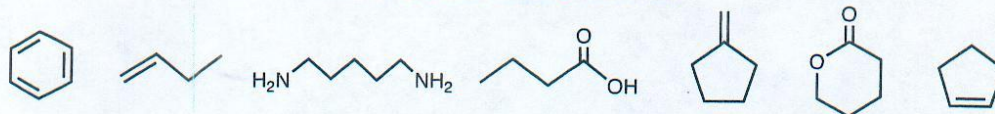
b) All of the different stereoisomers of 1-chloro-3-tert-butyl-5-methylcyclohexane were treated with sodium methoxide in separate reactions. Only one of these isomers, called compound **1**, underwent a rapid reaction to give compound **2** as the only product. Redraw compound 1 in a chair form showing the appropriate stereochemistry and conformation that would lead to the rapid formation of product **2** (you may draw either enantiomer of compound **1**).





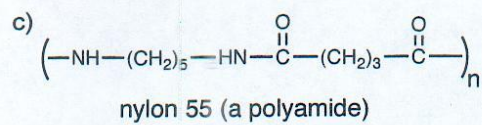
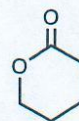
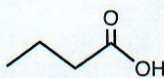
6. Using any of the starting materials shown below as the ONLY carbon sources, as well as any additional inorganic reagents you require, outline syntheses of the following compounds. No mechanistic information is required. There may be more than one correct answer in some cases.

Available Organic Starting Materials

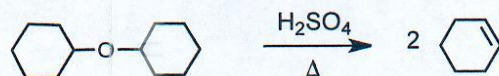


6. continued...

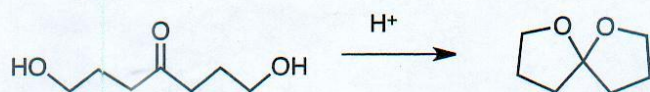
Available Organic Starting Materials



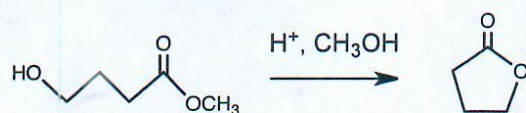
7. a) Draw a mechanism that can explain how the following reaction takes place. It is not necessary to show any transition states.



b) Draw a detailed mechanism for the reaction shown below. It is not necessary to show any transition states.



c) Draw a mechanism for the transesterification reaction shown below. It is not necessary to show any transition states.



The End