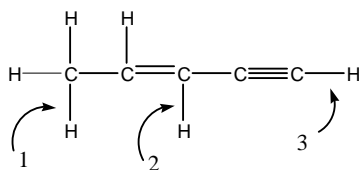


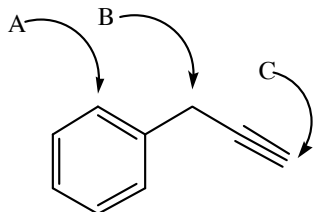
Useful Information: Strain energies

$\text{CH}_3 \leftrightarrow \text{H}$	1, 3 diaxial interaction	3.8 kJ/mol
$\text{H} \leftrightarrow \text{H}$	eclipsed	4.0 kJ/mol
$\text{H} \leftrightarrow \text{CH}_3$	eclipsed	6.0 kJ/mol
$\text{CH}_3 \leftrightarrow \text{CH}_3$	eclipsed	11 kJ/mol
$\text{CH}_3 \leftrightarrow \text{CH}_3$	gauche	3.8 kJ/mol

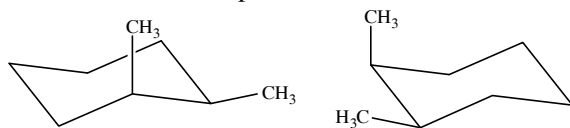
1. Of the C–H bonds indicated in the molecule below, which is the longest?



- a) 1
 b) 2
 c) 3
 d) All have the same bond length.
2. Identify the hybridization of each atom indicated in the molecule below.

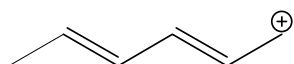
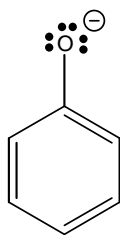


- a) sp sp^2 sp^3
 b) sp^3 sp sp^2
 c) sp^2 sp^3 sp
 d) sp^3 sp^2 sp^3
 e) sp^2 sp sp^3
3. What is the relationship between the two structures shown below?

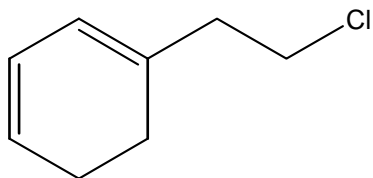


- a) identical
 b) constitutional isomers
 c) stereoisomers
 d) conformers
 e) different compounds with different molecular formulas.
4. Which of the compounds below has the lowest boiling point?
- a) 2,4-dimethylpentane
 b) 2,3-dimethylbutane
 c) 2-methylpentane
 d) 3-methylpentane
 e) 2-methylhexane

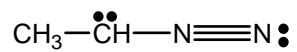
5. Draw all resonance structures of the two ions shown below.



6. What is the molecular formula of the compound shown?



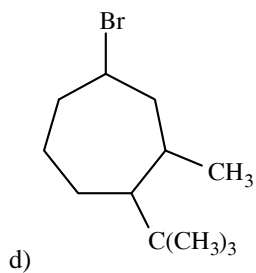
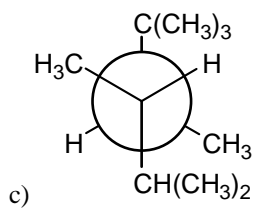
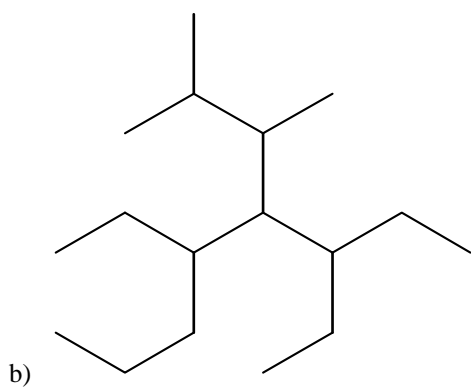
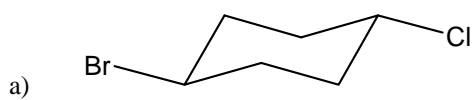
7. Indicate any formal charges in the molecule drawn below by writing the formal charge next to the atom.



8. Draw the condensed structural formula of all esters with the formula $\text{C}_4\text{H}_8\text{O}_2$.

9. Draw the condensed structural formula of all ketones with the formula C_4H_8O .
10. *Using skeletal structures only*, draw the structures of all isomers, both constitutional isomers and stereoisomers, having the formula $C_6H_{11}Cl$ and containing one five-membered ring. Underneath each skeletal structure, write the IUPAC name for that compound.
11. The following name is *incorrect*:
- 2-isopropyl-4-*tert*-butylpentane
- What is the correct IUPAC name of this compound?
12. According to your instructor, how do two conformations of a compound differ from each other?

13. Give the complete IUPAC names of each compound below:



14. Consider the following two compounds:

trans-1,2-dimethylcyclohexane

cis-1,3-dimethylcyclohexane

Draw the most stable conformation of each molecule. Determine the total strain energy of each structure. Indicate which, if either, is more stable, and calculate the energy difference between the two structures. (Do not draw the Newman projections.)

15. Consider the molecule 2,3-dimethylbutane. Sighting along the C2-C3 axis, draw the Newman projections of the two staggered conformations of this molecule, and calculate the total strain energy in each conformation. Indicate which conformation is more stable.