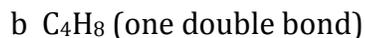
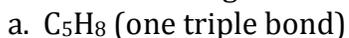
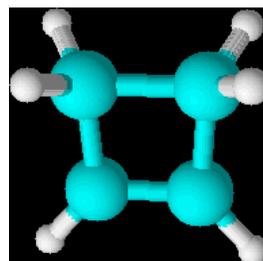
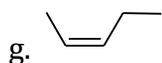
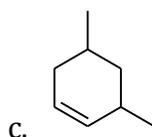
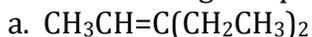


Nomenclature and Structural Formulas

1. For the following compounds write the structural formulas and IUPAC names for all possible isomers having the indicated number of multiple bonds:



2. Name the following compounds by the IUPAC system:

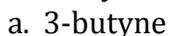


(all H's are shown)

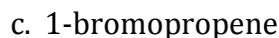
3. Write the structural formula for each of the following compounds:



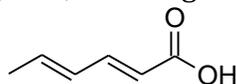
4. Explain why the names given are incorrect, and give a correct name in each case.



5. Which of the following compounds can exist as *cis-trans* isomers? If such isomerism is possible, draw the structures in a way that clearly illustrates the geometry, indicating which is *cis* and which is *trans*.



6. Sorbic acid is an antimicrobial agent used as a preservative to prevent the growth of mold, yeast, and fungi on food. Its formula is:

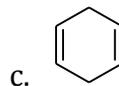


Is the molecule cumulated, conjugated, or nonconjugated?

Electrophilic Additions to Alkenes

7. Write the structural formula and IUPAC name of the product when each of the following reacts with one mole of bromine:

- $\text{CH}_3\text{CH}=\text{CHCH}_3$
- $\text{CH}_2=\text{CHCl}$



8. What reagent will react by addition to what unsaturated hydrocarbon to form each of the following compounds?

- $\text{CH}_3\text{CHBrCHCH}_3$
- $(\text{CH}_3)_2\text{CHOSO}_3\text{H}$
- $(\text{CH}_3)_3\text{COH}$

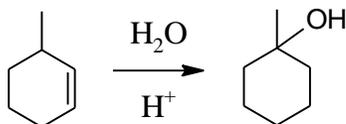


9. Classify each of the following reagents as an electrophile, nucleophile, or neither:

- H_3O^{1+}
- HBr
- Cl^{1-}

10. Explain why water can act as both an electrophile and a nucleophile.

11. The acid-catalyzed hydration of 1-methylcyclohexene give 1-methylcyclohexanol:



Write each step in the mechanism of this reaction.

12. When 2-methylpropene reacts with water and an acid catalyst, only one product is observed: 2-methyl-2-propanol (*tert*-butyl alcohol)

- Draw the structures of the two intermediate carbocations that could form from protonation of 2-methyl-2-propanol. Which is more stable (with lower energy)?
- Draw reaction energy diagram for the formation of these two intermediate carbocations. Use the diagram to explain why only one alcohol is formed.

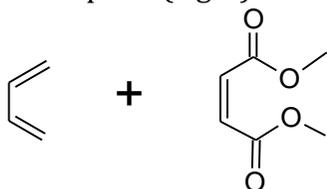
13. Caryophyllene is an unsaturated hydrocarbon found in oil of cloves. It has the molecular structural formula $\text{C}_{15}\text{H}_{24}$. Hydrogenation of caryophyllene give a saturated hydrocarbon $\text{C}_{15}\text{H}_{28}$. Does caryophyllene have any rings? How many? What else can be learned about the structure of caryophyllene from its hydrogenation?

Reactions of Conjugated Dienes

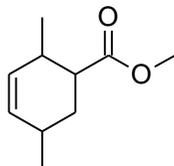
14. Draw the resonance contributor to the carbocation $(\text{CH}_3)_2\text{CHCH}^+\text{CH}=\text{CHCH}(\text{CH}_3)_2$. Does the ion have a symmetric structure?

15. Adding one mole of hydrogen chloride to 1,3-hexadiene give two products. Give their structures, and write all of the steps in a reaction mechanism that explains how each product is formed.

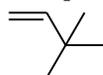
16. Predict and name the product of the following Diels-Alder reaction for the diene (left) and the dienophile (right) as shown:

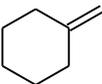


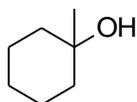
17. Give the structures of the diene and dienophile that made the following:



18. Write the reaction mechanism that clearly shows the structure of the alcohol obtained from the sequential hydroboration and H₂O₂/OH¹⁻ oxidation of



19. Write equations (no reaction mechanisms) to show how  could be converted to



20. Given the information that free-radical stability follows the same order as carbocation stability ($3^\circ > 2^\circ > 1^\circ$), predict the structure of polypropylene produced by the free-radical polymerization of propene.

21. Show reactions and describe two simple chemical tests that could be used to distinguish cyclohexane from cyclohexene. (*Hint: Both tests produce color changes when alkenes are present.*)

22. Give the structural formulas and names of the alkenes that on ozonolysis give:

- (CH₃)₂C=O and CH₂=O
- only (CH₃)₂C=O

Reactions of Alkynes

23. Write structural equations and names of products for the following reactions:

- 2-pentyne + H₂ (1 mol, Lindlar's catalyst)
- 3-hexyne + Cl₂ (2 mol)

24. Determine which alkyne and reagent will give:

