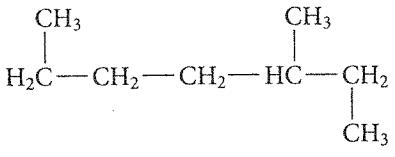
Section Summary

- Hydrocarbons are compounds that contain only carbon atoms and hydrogen atoms.
- Alkanes are made up of single bonds only. Alkenes are hydrocarbons that have at least one double bond, while alkynes have at least one triple bond.
- Cyclic hydrocarbons include alkanes, alkenes, and alkynes in the shape of a ring. Aromatic hydrocarbons are ring structures that are derived from benzene.
- Hydrocarbons are insoluble in water but are soluble in non-polar solvents, such as benzene. They are ranked as follows from highest to lowest boiling point: aromatic and cyclic hydrocarbons, alkynes, alkanes, alkenes.
- All hydrocarbon names are based on the structure of the compound and follow IUPAC rules. The names are so precise that the structure of the compound can be drawn from them.

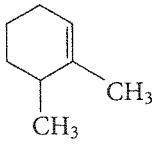
Review Questions

1. K/U What is a homologous series? Identify two examples of molecules that are part of the same homologous series.
2. C Draw a three-dimensional diagram of ethane.
3. C Using 2-methylheptane as an example, identify and explain the three basic parts to the naming of an organic molecule.
4. K/U Identify the general formula for each of the following.
   a. an alkane
   b. an alkene with one double bond
   c. an alkyne with one triple bond
5. A Identify four hydrocarbons encountered in everyday life. For each example, state the uses and appropriate expanded molecular formulas of the hydrocarbon.
6. K/U Compare and contrast unsaturated and saturated hydrocarbons. Describe one physical property that would be different between the two if they had the same number of carbons.
7. T/I Name each of the following compounds.
   a.

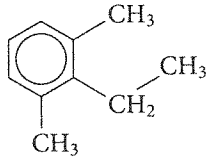


   b.

   c.



   d.



8. C Draw a condensed structural formula for each of the following compounds.
   a. 2,4-dimethylpent-2-ene
   b. 3,5-diethyl-3,4,7,8-tetramethyl-5-propyldec-1-yne
   c. 1,3-dimethylcylobutene
   d. 4-ethyl-2-phenyloctane
9. C Draw a line structural formula for each of the following compounds.
   a. but-1-yne
   b. 3,5-hex-1-yne
   c. 3-cyclobutyl-4-ethylhexane
   d. 1,3-dimethylbenzene
10. T/I You are given samples of hexane, hex-1-ene, hex-1-yne, and cyclohexane.
    a. Design an investigation to distinguish these four liquids.
    b. Predict the results of the investigation. Refer to **Table 1.7** and **Table 1.9** for help.
11. K/U What is the general formula for a saturated cyclic hydrocarbon? What straight chain hydrocarbon has the same formula?
12. A Give an example of a naturally found:
    a. cyclic hydrocarbon.
    b. aromatic hydrocarbon.
13. K/U Why is it unnecessary to number the multiple bonds in the following molecules?
    a. propyne
    b. cyclobutene
14. K/U Why is a ring in the centre of the structural formula for benzene more appropriate than alternating single and double bonds?