Table 8.1.2
 10 Straight-Chain Alkanes You Need to Know

Name	Molecular formula	Structural formula	Ball and stick model	Space filling model
methane	CH₄	H 		
<i>eth</i> ane	C ₂ H ₆	H H 1 H—C—C—H H H		
<i>prop</i> ane	C ₃ H ₈	H H H H—C—C—C—H H H H		
butane	C ₄ H ₁₀	H H H H 		
<i>pent</i> ane	C ₅ H ₁₂	H H H H H 		
hexane	C ₆ H ₁₄	H H H H H H H H H H H H H H H H H H H		
<i>hept</i> ane	C ₇ H ₁₆	H H H H H H H H H H H H H H H H H H H		
octane	C ₈ H ₁₈	H H H H H H H H H H H H H H H H H H H		
nonane .	C ₉ H ₂₀	H H H H H H H H H H H H H H H H H H H		
decane	C ₁₀ H ₂₂	H H H H H H H H H H H H H H H H H H H	- 60 00 00 00 00 00 00 00 00 00 00 00 00	4898

8.1 Activity: Building and Naming Structural Isomers

Question

How many structural isomers are there for hexane?

Background

Structural isomers have the same molecular formula, but are different arrangements of the same atoms. The general formula for an alkane is $C_nH_{(2n+2)}$.

Procedure

1. You will need one organic chemistry model kit to share with your partner. Working together, construct and name the structural isomers of C_6H_{14} .

Results and Discussion

1. Draw the condensed structural formula for hexane.

- 2. Using your model kit, build hexane.
- 3. Build the different structural isomers of C_6H_{14} . Draw the condensed structural formula for each isomer you build. Write the name of each isomer under its condensed structural formula.

- 4. How many structural isomers are there for hexane? ____
- 5. Build 3-hexene. Draw the condensed structural formula for the two geometric isomers of 3-hexene, and write the name of each one under its formula.

8.1 Review Questions

- 1. How is a condensed structural formula different from a carbon skeleton formula? Use an example.
- Draw carbon skeleton structural formulas for all of the isomers of the alkane with seven carbon atoms.
 Under each diagram, write the isomer's name.

 What is the difference between a structural isomer and a geometric isomer? Use an example in your answer.

4. Draw 1-pentene. Does this molecule exhibit *cis-trans* isomerism? Explain.

5. Classify the following as being cis or trans isomers:(a)

$$C = C$$
 CH_3
 $CH_2 - CH_3$

(b)
$$CH_3-CH_2-CH_2$$
 H $C=C$ $CH_2-CH_2-CH_3$

- 6. An important nutrient for your body is fat. Infants require a diet high in fat for brain development. Your body needs fats for energy and to dissolve certain vitamins. Fats in foods are classified as saturated, unsaturated, and polyunsaturated. Animal products contain a high level of saturated fats. What is meant by the term "saturated"?
- 7. (a) Unsaturated fats are generally a liquid at room temperature. What is meant by the term "unsaturated"?
 - (b) Which of the following are unsaturated: alkanes, alkenes, alkynes, cycloalkanes, aromatics?
- 8. Classify the following as alkane, alkene, alkyne, cycloalkane, or aromatic without drawing the structure. Some may have more than one classification.

(a) C₅H₁₀_____

(b) C₁₅H₃₂_____

(c) C₉H₁₆

(d) C₆H₆_____

9. Name the following compounds.

$$CH_{2}-CH_{3}$$
 $CH_{3}-CH_{2}-CH_{2}$
 $CH_{3}-CH_{2}-CH_{2}$

$$CH_3 - CH_2 - CH - CH_2 - CH_3$$

(d)

$$CH_2$$
 C CH_2 CH_3

(e)

$$CH_2$$
 CH_3 CH_3 CH_3

$$\begin{array}{c|c} CH \equiv C - CH - CH - CH_3 \\ & | & | \\ CH_3 - CH_2 & CH_2 - CH_3 \end{array}$$

- 10. Draw condensed structural formulas for the following compounds.
 - (a) 4-ethyl-3,5-dimethylnonane
 - (b) 5,6-dimethyl-3-heptyne
 - (c) trans-2-heptene
 - (d) 1,3-dimethyl-2-propylcycloheptane
 - (e) 4,5,5-trimethyl-2-heptyne
 - (f) ethylcyclohexane
 - (g) 3,3-methyl-4-ethyloctane
 - (h) 3-cyclopentyl-5,5-dimethyl-1-hexene