

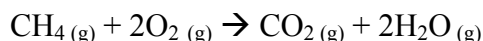
## Chemical Reactions 8

# Combustion Reactions

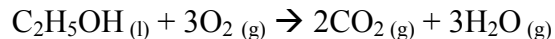
### INFORMATION

**Combustion reactions** are simple reactions involving hydrocarbons (compounds containing carbon, hydrogen, and sometimes oxygen) reacting exothermically with oxygen to produce carbon dioxide and water<sup>1</sup>.

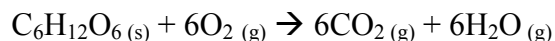
A simple, balanced combustion reaction (the hydrocarbon in this reaction is methane, also called natural gas) looks like this:



The hydrocarbons combusted can also be oxygen-containing, such as sugars or alcohols. For example, the combustion of ethanol:



And the combustion of glucose:



### Critical Thinking Questions

- Combustion reactions generate relatively large amounts of heat. With only a spark or small flame to get them going, they will ignite and continue to burn until one of the reactants (usually the hydrocarbon fuel) is completely consumed. With this in mind, is it reasonable that the reverse of the combustion reaction (water and carbon dioxide forming a hydrocarbon) will ever take place? Explain why or why not in grammatically correct English.
- The primary octane in gasoline is called 2,3,4-trimethylpentane, and it has a formula of  $\text{C}_8\text{H}_{18}$ . It has a density of 0.719 g/mL. Americans consume approximately  $1.5\text{E}11$  gallons of gasoline each year.
  - Write a balanced equation for the combustion of 2,3,4-trimethylpentane.
  - If 1 gallon = 3.785 liters, and 1 pound = 454 grams, determine how many pounds of carbon dioxide are generated by the combustion of gasoline in the United States every year.

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<sup>1</sup> These products are ideal. In reality, many combustion reactions also produce carbon monoxide and other compounds resulting from the presence of impurities in the compound being combusted, improper ventilation, and other factors.