

Combustion

Low/Medium Objectives
For 5 lesson block

- ❖ Name the common pollutants in the air
- ❖ State the source of each of these pollutants.
- ❖ Describe and explain the presence of oxides of nitrogen in car engines and their catalytic removal.

Lesson 21

Combustion

From Google dictionary

com·bus·tion

/kəm' bəsCH(ə)n/

noun

the process of burning something.
"the combustion of fossil fuels"

synonyms: **burning**; [More](#)

• CHEMISTRY

rapid **chemical combination** of a substance with oxygen, involving the production of heat and light.

This is close to what we want in chemistry

Combustion Word equation

Fuel + Oxygen → Carbon dioxide + water

***Carbon dioxide is a greenhouse gas

What if there isn't enough oxygen?

Fuel + Oxygen → Carbon monoxide + water

***Carbon monoxide is poisonous

What if there is even less oxygen?

Fuel + Oxygen → Carbon (soot/smoke)+ water

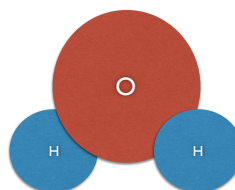
***Carbon/soot causes global dimming

Molecular formula

REMINDER!!










The molecular formula tells us how many atoms are in a compound.










In this molecule are 2 atoms of hydrogen (H) and one atom of oxygen (O)



We write this as H₂O

this number has to be small

<u>Molecular formula</u>		<u>KEY</u>
	H_2	 hydrogen atoms
	H_2O	 oxygen atoms
	CO_2	 carbon atoms
	NH_3	 nitrogen atoms
	CH_4	

<u>NAME THE COMPOUND</u>		<u>KEY</u>
	hydrogen gas (element)	 hydrogen atoms
	water (di-hydrous oxide)	 oxygen atoms
	carbon dioxide	 carbon atoms
	ammonia (tri-hydrous nitride)	 nitrogen atoms
	methane	

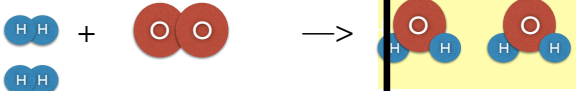
Remember
mon - 1
di - 2
tri - 3

Combustion Equations

hydrogen_(g) + oxygen_(g) → water_(g)

$2H_{2(g)} + O_{2(g)} \rightarrow 2H_2O_{(g)}$

4. Balance the particle diagram first



5. Balance the symbol equation to match

remember a number here means 2 molecules of water

Combustion Equations


1. Word equation with state symbols

carbon_(s) + oxygen_(g) → carbon dioxide_(g)


2. Replace words with symbols

$C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}$

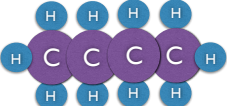
2. Draw the particle diagrams




Now you try, can you use what you have learned to make the word, symbol and particle equations for the combustion these fuels to make carbon dioxide and water.



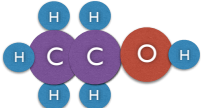
Methane CH₄



Butane C₄H₁₀



Ethene C₂H₄



Ethanol C₂H₅OH

Extension: If there is not enough oxygen remember that the combustion produces carbon monoxide instead.

Can you produce balanced incomplete combustion equations for these fuels as well.

Fuel + Oxygen → Carbon monoxide + water