



Gummy Greenhouse Gases!

Got gumdrops? Then you can build models of molecules. Molecules are tiny structures that make up just about all matter—including you! Molecules themselves are made of atoms, the basic building blocks of matter.

Using just four kinds of atoms as building blocks, you can construct many different types of molecules. In this project, you will build models of some gas molecules. These kinds of gas molecules are part of the air. They are called greenhouse gases. We will explain why later.

For now, get ready for some gummy fun!

You will need:

- Gumdrops, any size, four different colors.

These atoms are usually modeled using **red** for oxygen, **white** for hydrogen, **gray** for carbon, and **blue** for nitrogen. However, some of these colors are mighty hard to find in gumdrops. So use any colors you like. Here's how many you will need of each (but don't forget to get extras for sneaking into your mouth):

Red: 13
White: 7
Gray (or black): 3
Blue: 2

- Round wooden toothpicks
- Construction paper, 1 large sheet (12x18, for example)
- Felt pen or crayons

Here are the colors we used for our gumdrop building block atoms:



Oxygen



Hydrogen








Carbon



Nitrogen

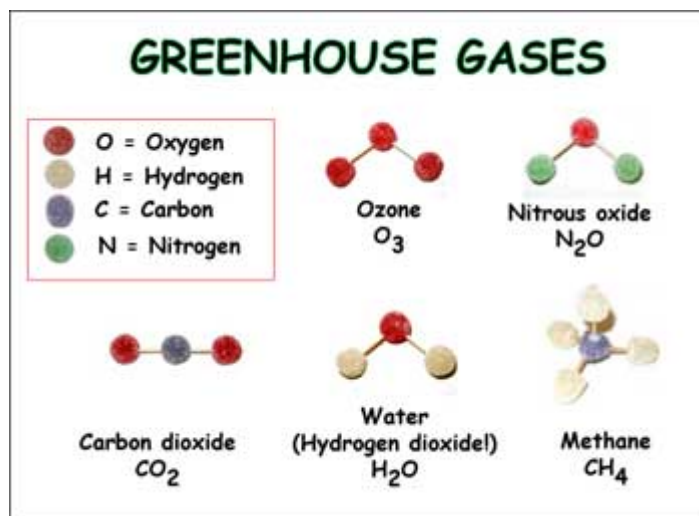
You will make . . .

. . . Gummy Greenhouse Gas models of these gases. Each molecule has a shorthand name, which also gives its recipe, or formula. For example, ozone is also called O_3 , where O stands for an oxygen atom and the little 3 means there are three of them. Here are all the greenhouse gas molecules, their formulas, and a picture of its gumdrop model.

Name of greenhouse gas	Recipe	Shortcut (formula)	Gumdrop model
Ozone	3 oxygen atoms	O ₃	
Nitrous oxide	2 nitrogen atoms and 1 oxygen atom	N ₂ O	
Carbon dioxide	1 carbon and 2 oxygen atoms	CO ₂	
Water vapor	2 hydrogen atoms and 1 oxygen atom	H ₂ O	
Methane	1 carbon atom and 4 hydrogen atoms	CH ₄	

Here's how:

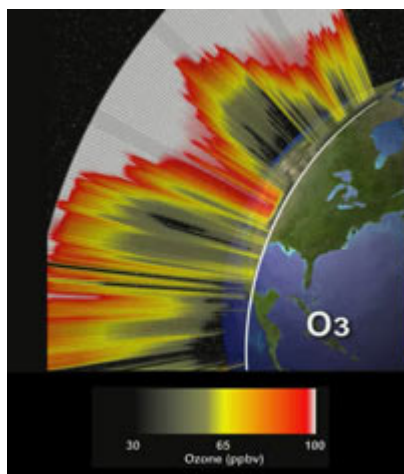
- Break several toothpicks in half. You will need only one-half a toothpick to make each "bond." The bonds are how the atoms are stuck together to make molecules.
- Build each of the greenhouse gas molecules, as shown above.
- Now, take the big piece of construction paper and your crayons or felt pen and label it something like this:



- Place your molecules above their labels.

So, now that you know all your greenhouse gases, you might be wondering . . . why should you care?

A mission to understand . . .



We must understand Earth in order to take care of it and keep it healthy. Gathering information about Earth is part of NASA's mission. NASA launched the **Aura** satellite in 2004 as part of its **Earth Observing System**. Aura has four science instruments aboard. They all study the atmosphere from about 20 miles high down to Earth's surface. One instrument is called **TES**, which is short for **Tropospheric Emission Spectrometer**. The troposphere is the lowest part of the atmosphere. It's down here where we live—and pollute, unfortunately. A spectrometer is an instrument that uses light to identify the chemical composition of matter. The TES mission is particularly interested in ozone and how it is distributed up and down through the different layers of the atmosphere.

As TES passes over Earth's surface, it gathers data that can be made into a profile of the atmosphere, like this one. The profile shows with different colors how much ozone (or other greenhouse gas) is in the atmosphere at different altitudes. In this image, the areas of highest ozone levels are shown in red. Notice that where the red is closest to Earth's surface is near large cities in the U.S. Find out more about TES and ozone on NASA's [greenhouse gas Amazing Fact](#) page.

Adapted from NASA's *The Space Place*