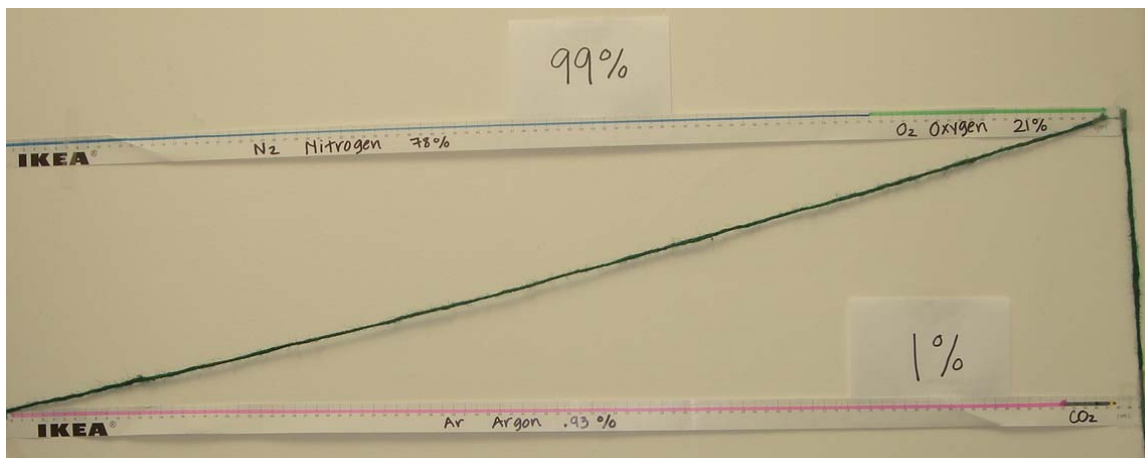


Atmosphere Composition Model



Materials:

per group

2 metric measuring tapes made of paper

Colored markers

Atmosphere composition data

Here is one source of that data:

NASA's Earth Fact Sheet

<http://nssdc.gsfc.nasa.gov/planetary/factsheet/earthfact.html>

To Do and Notice:

1. Use the data to identify the major components of the atmosphere: nitrogen and oxygen.
2. Pick a color to represent the amount of nitrogen in the atmosphere. Use that color to draw line from 0 to 78 on one of the measuring tapes. Notice that this line represents 78 percent - represented by 78 centimeters - of the total length of the measuring tape.
3. Use a new color to represent oxygen. Starting at 78 centimeters, draw a line in the second color that is 21 centimeters long, representing 21 percent of the atmosphere.
4. Notice that these two components make up 99 percent of the atmosphere. We have one centimeter remaining, representing one percent, in which to draw all the other components. Because we cannot fit all of the other components into such a small space, we will change our scale.
5. We will use the second to metric measuring tape to represent this last 1 percent.
6. Let's pause to think about what percent really means. Percent means parts of 100. This second tape represents 1/100 of the earth atmosphere. This metric tape is divided into centimeters and millimeters. Each millimeter represents 1/1000 of the whole. On our new scale, what does each millimeter represent?

$$1/1000 \text{ of } 1/100 = 1/100,000$$

7. The minor components of the atmosphere are not given as percentages, but in units “parts per million” (ppm). How many parts per million are represented in 1 millimeter on our new scaled tape?

$$1/100,000 = 10/1,000,000 \text{ or } 10 \text{ ppm}$$

8. Use the data below to fill in the table of the minor components of the atmosphere.

Minor (ppm): Argon (Ar) - 9340; Carbon Dioxide (CO₂) - 380

Neon (Ne) - 18.18; Helium (He) - 5.24; Methane (CH₄) - 1.7

Krypton (Kr) - 1.14; Hydrogen (H₂) - 0.55

Water is highly variable, typically makes up about 1%

Component	ppm	Parts per 100,000	mm on tape
Argon	9340	934	934

9. Use a separate color for each of the minor components as you add them to the second tape. Note that methane, krypton and hydrogen are present in such small amounts that they cannot be represented on this model.
10. For an additional visual effect, accordion fold the expanded 1 percent so that it fits into the one percent remaining on the first tape. This may help with the visualization of the change of scale.

What’s Going On?

As you can see from the model, nitrogen and oxygen comprise 99 percent of our atmosphere. It is the minor components about which we are concerned with respect to global warming. The greenhouse gases – carbon dioxide, methane, and water vapor – are the main greenhouse gases. We have not included water vapor in our model. The components we have shown have been measured by dry volume – that is, by the number of molecules. Water vapor is highly variable. It may be added to the model as a sliding piece, able to go as high as 4 percent. Measurements this high are found over the ocean, and not over land.