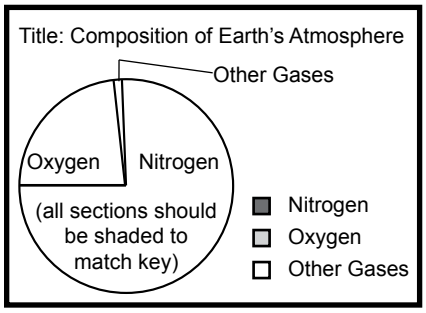
Graphing Gases

Overview:

Students comprehend the composition of Earth's atmosphere by making a pie graph of the principle gases found in Earth's atmosphere, and by calculating the number of specific gas molecules present in a given concentration of atmospheric gases.



Objectives:

The student will:

- make a pie graph of atmospheric data;
- calculate values using percentages; and
- identify the two most prevalent gases in Earth's atmosphere.

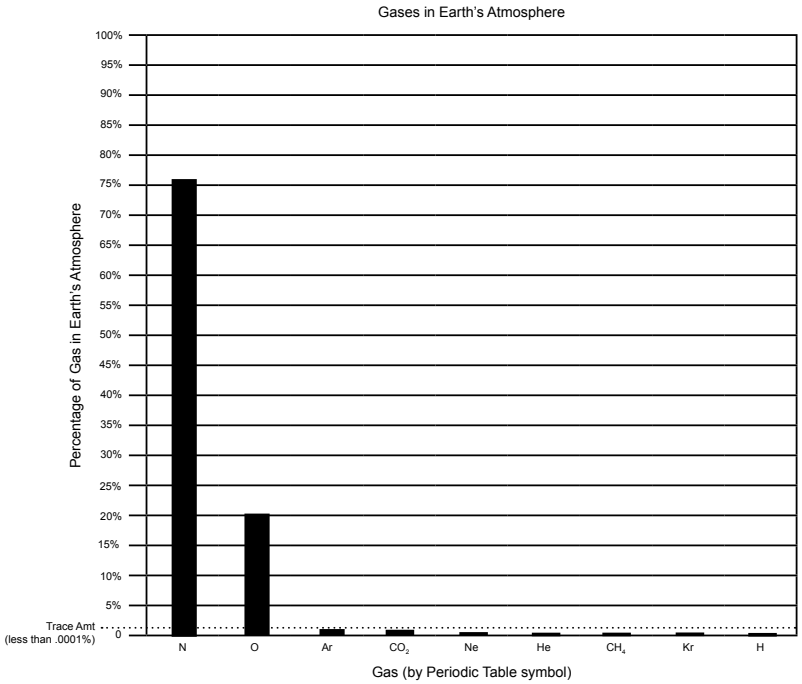
Material:

- Calculators for each student
- Colored pencils
- Periodic Table of Elements poster
- STUDENT WORKSHEET: "Graphing Gases"

Answers to Student Worksheet:

1. *see pie chart, above right*
2. *nitrogen and oxygen*
3. *see table at right*
4. *see bar graph below*

Gas	% of Atmosphere						# of Molecules Per One Million
Nitrogen	78	÷	100	x	1,000,000	=	780,000
Oxygen	21	÷	100	x	1,000,000	=	210,000
Argon	.93	÷	100	x	1,000,000	=	9,300
Carbon Dioxide	.036	÷	100	x	1,000,000	=	360
Neon	.0018	÷	100	x	1,000,000	=	18
Helium	.00052	÷	100	x	1,000,000	=	5.2 or 5
Methane	.00015	÷	100	x	1,000,000	=	1.5 or 2
Krypton	.00011	÷	100	x	1,000,000	=	1.1 or 1
Hydrogen	.00005	÷	100	x	1,000,000	=	0.5 or 1



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Activity Procedure:

1. Explain that when viewed from space, Earth's atmosphere resembles a very thin film of white vapor. This seemingly insubstantial layer protects Earth from the deadly rays of the sun and contains oxygen and other gases that are essential for life. People can live weeks without food, days without water, but only minutes without oxygen. In addition to oxygen, air is made up of several different gases, including nitrogen, argon, carbon dioxide, and a variety of others. These gases are suspended in the atmosphere, along with water vapor and particulates, like smoke and dust.
2. Explain that during this activity, students will make a pie graph of the percentages of oxygen, nitrogen and other gases found in Earth's atmosphere. They will then calculate how many molecules of specific gases are present in a given concentration of atmospheric gases.
3. Distribute colored pencils and the STUDENT WORKSHEET: "Graphing Gases." Review how to construct a pie graph. Ask students to use their colored pencils to draw a pie graph depicting the information in the chart under Question #1 on the worksheet. Remind students to give pie graphs titles and to complete the keys.
4. Distribute calculators. Ask students to answer Question #2, and then calculate how many molecules of each gas are inhaled per one million molecules based on the percent concentration of each gas in the atmosphere. Ask students to complete the data table.
5. For those gases found in low concentrations, like helium, student calculations will result in a decimal amount of molecules per million (such as 5.2 molecules per million). Because it is not possible to have a partial (decimal) amount of a gas, ask students to round their answers to the nearest whole number to better reflect the actual number of molecules in the mix.

Teacher's Note: A trace element is an element in a sample that has a concentration of less than one hundred (100) parts per million atoms.

Extension Question: Ask students what their numbers would look like if the question was written as the percentage concentration of a gas per billion, or trillion molecules.

Name: _____ **Student Worksheet (1 of 2)**

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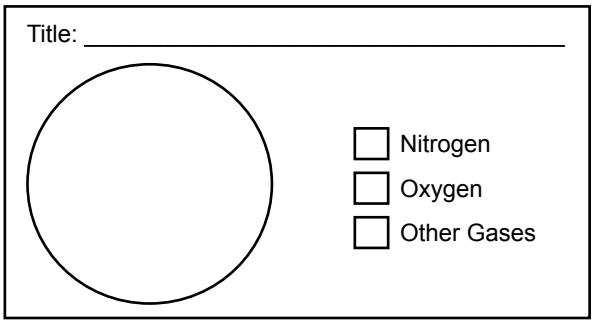
Directions: Earth's atmosphere is made up of a mixture of gases. Answer the questions below to learn about the composition of Earth's atmosphere.

1. Look at the "Composition of Earth's Atmosphere" chart below. Use colored pencils to draw a pie graph of the chart information in the circle provided. Give the graph a title and complete the key.

Composition of Earth's Atmosphere	
Gas	% of Atmosphere
Nitrogen	78%
Oxygen	21%
Other Gases	1%



2. What two gases are most prevalent in Earth's atmosphere?

_____ _____

3. The gases found in Earth's atmosphere are listed in the data table below, along with the percentages of molecules they contribute. Calculate how many molecules of each gas are breathed in for every 1,000,000 molecules of air inhaled. Record results on the data table.

   Example: We inhale 78% nitrogen with every breath we take.

   Convert 78% to its decimal equivalent by dividing by 100. (78 ÷ 100 = .78)

   Multiply .78 by 1,000,000. (.78 x 1,000,000 = 780,000)

   Answer = 780,000 molecules of nitrogen are inhaled in 1,000,000 molecules of air.

Gas	% of Atmosphere						# of Molecules Per One Million
Nitrogen (N)	78	÷	100	x	1,000,000	=	780,000
Oxygen (O)	21	÷	100	x	1,000,000	=	
Argon (Ar)	.93	÷	100	x	1,000,000	=	
Carbon Dioxide (CO_2)	.036	÷	100	x	1,000,000	=	
Neon (Ne)	.0018	÷	100	x	1,000,000	=	
Helium (He)	.00052	÷	100	x	1,000,000	=	
Methane (CH_4)	.00015	÷	100	x	1,000,000	=	
Krypton (Kr)	.00011	÷	100	x	1,000,000	=	
Hydrogen (H)	.00005	÷	100	x	1,000,000	=	

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4. Complete the bar graph below using data from the table above.