

Name: _____ Date: _____ Class: _____

Composition of Ocean Water:

Constructing a Graphic Model

Ocean water, as the term suggests, is made up mostly of water. There are, however, other important ingredients dissolved in the water. In this activity you will construct a graphic model that illustrates the composition of sea water. All you will need to do this activity is a protractor and a pencil.

Solid material that is dissolved in ocean water is referred to as salts. Salts make up about 3.5% of the mass of ocean water. The following chart lists the major dissolved salts that are present in ocean water and identifies the number of grams of each salt contained in 100 grams of water.

Dissolved Salts		Approximate Mass (in grams per 100 g of ocean water)
Sodium chloride	NaCl	2.72
Magnesium chloride	MgCl ₂	0.38
Magnesium sulfate	MgSO ₄	0.17
Calcium sulfate	CaSO ₄	0.13
Potassium sulfate	K ₂ SO ₄	0.08
Calcium carbonate	CaCO ₃	0.01
Magnesium bromide	MgBr ₂	0.008

Procedure:

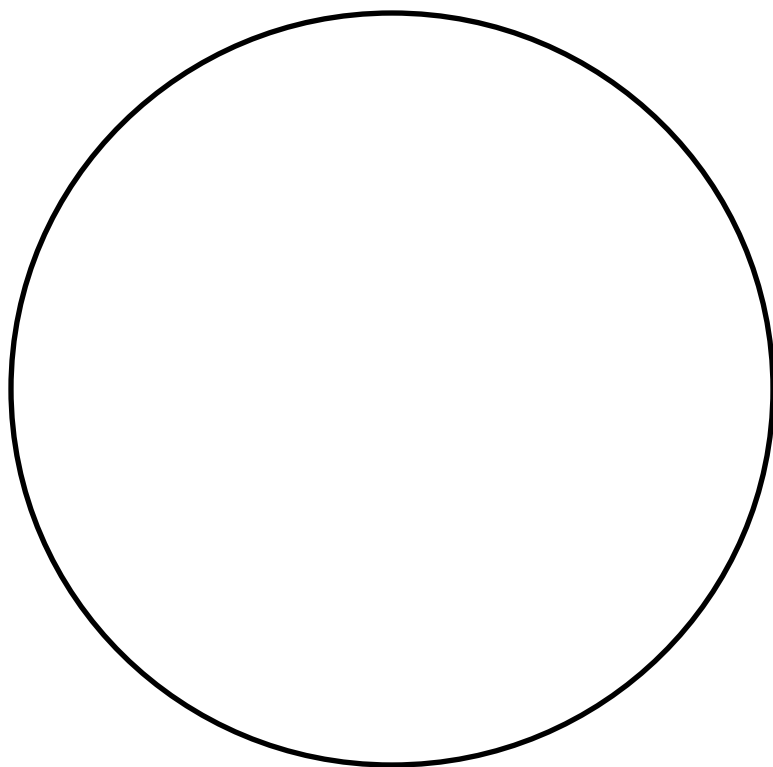
1. Use the following equation and the information contained in the chart to calculate the percentage that each dissolved salt represents of the total mass of dissolved salts found in sea water. Enter your data in the appropriate space provided in the Data Table.

Percentage of the total

$$\text{mass of dissolved salts} = \frac{\text{Mass of dissolved salts (grams)}}{3.5 \text{ grams}} \times 100$$

Dissolved Salt	% of Total Mass of Dissolved Salts	Number of Degrees on Circle Graph
Sodium chloride NaCl		
Magnesium chloride MgCl ₂		
Magnesium sulfate MgSO ₂		
Calcium sulfate CaSO ₄		
Potassium sulfate K ₂ SO ₄		
Calcium carbonate CaCO ₃		
Magnesium bromide MgBr ₂		

- In the graphic model you will construct, 360° on the circle graph will equal 100% of the composition of dissolved salts in ocean water. **Therefore, 1 % of dissolved salts will equal 3.6° on your graph.** Convert each of the percentage values you calculated in the previous step to the appropriate number of degrees and enter your data in the spaces provided on the Data Table.
- Using your protractor and the information from the Data Table, construct a graph in the circle that illustrates the composition of dissolved solids in ocean water. Label each section of the graph.



Analyze and Conclude:

1. Ocean water is actually about 96.5% water.
 - A. If you were going to construct a circle graph to illustrate the composition of sea water, how many degrees on the graph would be needed to represent water?
 - B. On such a graph, how many degrees would be needed to represent the total of all of the dissolved salts contained in ocean water?
2. If erosion continues to carry more and more dissolved salts into the oceans, after many thousands of years, how would you expect the composition of sea water to be different from how it is today?
3. Many animals that live in the ocean use some types of dissolved salts to build their shells. What would happen to the composition of ocean water if these animals were to decrease drastically in number?

ANSWER KEY

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Constructing a Graphic Model

Ocean water, as the term suggests, is made up mostly of water. There are, however, other important ingredients dissolved in the water. In this activity you will construct a graphic model that illustrates the composition of sea water. All you will need to do this activity is a protractor and a pencil.

Solid material that is dissolved in ocean water is referred to as salts. Salts make up about 3.5% of the mass of ocean water. The following chart lists the major dissolved salts that are present in ocean water and identifies the number of grams of each salt contained in 100 grams of water.

Dissolved Salts		Approximate Mass (in grams per 100 g of ocean water)
Sodium chloride	NaCl	2.72
Magnesium chloride	MgCl ₂	0.38
Magnesium sulfate	MgSO ₄	0.17
Calcium sulfate	CaSO ₄	0.13
Potassium sulfate	K ₂ SO ₄	0.08
Calcium carbonate	CaCO ₃	0.01
Magnesium bromide	MgBr ₂	0.008

Procedure:

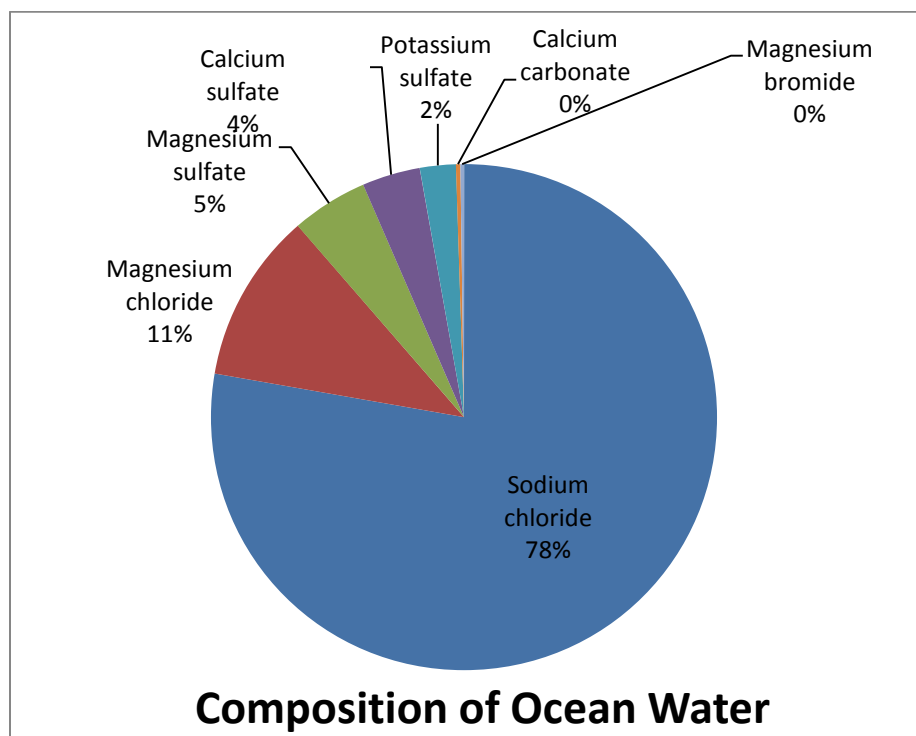
1. Use the following equation and the information contained in the chart to calculate the percentage that each dissolved salt represents of the total mass of dissolved salts found in sea water. Enter your data in the appropriate space provided in the Data Table.

Percentage of the total

$$\text{mass of dissolved salts} = \frac{\text{Mass of dissolved salts (grams)}}{3.5 \text{ grams}} \times 100$$

Dissolved Salt		% of Total Mass of Dissolved Salts	Number of Degrees on Circle Graph
Sodium chloride	NaCl	77.7 %	279.7 °
Magnesium chloride	MgCl ₂	10.9 %	39.2 °
Magnesium sulfate	MgSO ₂	4.9 %	17.6 °
Calcium sulfate	CaSO ₄	3.7 %	13.3 °
Potassium sulfate	K ₂ SO ₄	2.3 %	8.3 °
Calcium carbonate	CaCO ₃	0.3 %	1.1 °
Magnesium bromide	MgBr ₂	0.2 %	0.7 °

- In the graphic model you will construct, 360° on the circle graph will equal 100% of the composition of dissolved salts in ocean water. **Therefore, 1 % of dissolved salts will equal 3.6° on your graph.** Convert each of the percentage values you calculated in the previous step to the appropriate number of degrees and enter your data in the spaces provided on the Data Table.
- Using your protractor and the information from the Data Table, construct a graph in the circle that illustrates the composition of dissolved solids in ocean water. Label each section of the graph.



Analyze and Conclude:

1. Ocean water is actually about 96.5% water.
 - A. If you were going to construct a circle graph to illustrate the composition of sea water, how many degrees on the graph would be needed to represent water?
➤ **347.4°**
 - B. On such a graph, how many degrees would be needed to represent the total of all of the dissolved salts contained in ocean water?
➤ **12.6°**
2. If erosion continues to carry more and more dissolved salts into the oceans, after many thousands of years, how would you expect the composition of sea water to be different from how it is today?
➤ **There will be greater concentration of salts**
3. Many animals that live in the ocean use some types of dissolved salts to build their shells. What would happen to the composition of ocean water if these animals were to decrease drastically in number?
➤ **Without animals to use the dissolved salts, the amount of dissolved salts in ocean water would increase.**