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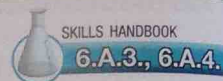
PERFORM AN ACTIVITY

Solubility

In this activity, you will compare the solubility of Epsom salts and table salt in both cold and hot water by preparing saturated solutions and taking careful measurements.

SKILLS MENU

- Questioning
- Hypothesizing
- Predicting
- Planning
- Controlling Variables
- Performing
- Observing
- Analyzing
- Evaluating
- Communicating



Purpose

To explore the relationship between solubility and temperature.

Equipment and Materials

- apron
- eye protection
- large beaker
- glass stirring rod
- thermometer
- graduated cylinder (50 mL)
- beaker (100 mL)
- balance
- 5 mL measuring spoon
- weighing papers
- electric kettle
- water
- ice cubes
- Epsom salts
- table salt



apron



eye protection



large beaker



glass stirring rod



thermometer



graduated cylinder (50 mL)



beaker (100 mL)



balance



measuring spoon



weighing papers



electric kettle



water



ice cubes



Epsom salts



table salt

Procedure

- In your notebook, draw a table similar to Table 1.

Table 1 Analysis of Observations

		Epsom salts in cold water	Epsom salts in hot water	Table salt in cold water	Table salt in hot water
Before adding salt to water	Volume of water (mL)				
	Mass of beaker with water added (g)				
After adding salt to water to form a saturated solution	Mass of beaker with saturated solution (g)				
	Mass of salt added to water (g)				
Temperature of solution (°C)					
Solubility of salt in water at recorded temperature					

- Put on your apron and eye protection.
- Prepare cold water by placing some ice cubes in a glass or beaker of cold tap water and stirring until the water temperature is close to 0 °C.
- Use a graduated cylinder to pour 50 mL of the ice-cold water into a 100 mL beaker.
- Measure the mass of the beaker and water on a balance and record the mass in Table 1.
- Scoop approximately 20 mL of Epsom salts onto a weighing paper.
- Place a small amount of the Epsom salts (enough to fit on the end of a spoon) in the water. Stir until all the crystals have dissolved.

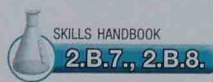
8. Repeat step 7 until some crystals remain at the bottom of the beaker, no matter how thoroughly you stir. The solution is now saturated.
9. Measure the temperature of the saturated solution. Record your observation in Table 1.
10. Measure the mass of the beaker, water, and dissolved Epsom salts using the balance and record in Table 1.
11. Dispose of the solution according to your teacher's instructions. Return any unused Epsom salts to your teacher. Rinse and dry the beaker.
12. Use a graduated cylinder to obtain 50 mL of hot water from the kettle. Pour the hot water into the dry beaker.



Use care when handling containers with hot water.

13. Repeat steps 5 to 11 using the beaker of hot water instead of ice-cold water, and record your observations in Table 1.
14. Repeat steps 3 to 13 using table salt instead of Epsom salts. Record your data in Table 1.

Analyze and Evaluate



- (a) Complete your observations by calculating the mass of Epsom salts and table salt in each case. Record the masses in Table 1. Calculate the solubility of Epsom salts and table salt in cold and hot water.
- (b) How did you find the mass of the salt that dissolved in the water, without measuring the mass of the salt on the balance? What assumption did you make in finding the mass of the salt in this way?
- (c) Compare the solubility that you calculated for Epsom salts in cold water and in hot water. What do you conclude about how the solubility of Epsom salts changes with temperature?

- (d) Compare the solubility that you calculated for table salt in cold water and in hot water. What can you conclude?
- (e) Compare the solubility of Epsom salts with the solubility of table salt in cold water and in hot water.
- (f) What kind of mixture was in the beaker just before you emptied it? Name the components of the mixture.
- (g) How could you improve the accuracy of your measurements in this activity?
- (h) When you compare the solubility of table salt in water with the solubility of Epsom salts in water, the one variable that you are changing is the type of salt. You must control all other variables. Which variables were not controlled very well? How could you control these variables better?

Apply and Extend

- (i) Apply the particle theory to your observations in this activity. Can the particle theory help you to predict the differences that you observed between the solubilities of table salt and Epsom salts? What do you think are some of the problems in using the particle theory to explain solubility?
- (j) Think about the results of your investigations for the solubility of table salt and Epsom salts. Suppose you made a saturated solution of table salt in hot water and then cooled the water down. What do you think might happen? Suppose you made a saturated solution of Epsom salts in hot water and then cooled it. What do you think might happen?

Grade 7 Solubility Investigation

Name: _____

Table 1. Analysis of Observations

		Epsom Salts in Cold Water	Epsom Salts in Warm Water	Table Salt in Cold Water	Table Salt in Warm Water
Before Adding Solute	Volume of Water (mL)				
	Mass of Beaker with Water added (g)				
After Adding Solute to Water to Form a Saturated Solution	Mass of Beaker with Saturated Solution (g)				
	Mass of Salt added to Water (g)				
	Temperature of Solution (°C)				
	Solubility of Solute in Water at Recorded Temperature				

Analyze and Evaluate

1. How did you find the mass of the solute that dissolved in the water, without measuring the mass of the salt on the balance?

2. What assumption did you make in finding the mass of the salt in this way?

3. Compare the solubility that you calculated for Epsom salts in cold water and in hot water.

What do you conclude about how the solubility of Epsom salts changes with temperature?

4. Compare the solubility that you calculated for table salt in cold water and in hot water.

What do you conclude about how the solubility of table salt changes with temperature?

5. Compare the solubility of Epsom salts with the solubility of table salt in cold water and in hot water.

6. What kind of mixture was in the beaker just before you emptied it?

Name the components of the mixture.

7. How could you improve the accuracy of your measurements in this activity?

8. When you compare the solubility of table salt in water with the solubility of Epsom salts in water, the one variable you are changing is the type of salt.

You must control all other variables.

Which variables were not controlled very well?

How could you control these variables better?

Apply and Extend

1. Can the particle theory help you to predict the differences that you observed between the solubilities of table salt and Epsom salts?

What do you think are some of the problems in using the particle theory to explain solubility?

2. Suppose you made a saturated solution of table salt (or Epsom salts) in hot water and then cooled it down ...

What do you think might happen?