

Name \_\_\_\_\_

## Solution Shapes



"Think safety- protect yourself"

Goggles are required during this investigation.  
 Always use care with boiling water!  
 20 Mule Team Borax® contains sodium tetraborate  
 decahydrate.  
 Avoid contact with eyes.  
 Do not swallow.

**Question:** What will happen to a pipe cleaner when it is soaked in hot water and 20 Mule Team Borax®?

**Background Information:** Solutions are special kinds of mixtures. In a solution one substance (called the **solute**\*) **dissolves** in another material (called the **solvent**\*). We describe the amount of solute in a solution as its **concentration**. Three ways of describing concentration are:

- **Saturated**
- **Unsaturated**
- **Supersaturated**

Solutions are **homogeneous** mixtures. The solute spreads evenly throughout the solvent when it is dissolved. The materials in a solution can be any **phase of matter**\*. **Sugar water** is a solution of a solid dissolved in a liquid. **Air** is a solution of gases dissolved in each other. **Alloys** are solutions of metals dissolved in each other. Water usually has some **air dissolved in it**. When materials dissolve, they do not change into a different kind of matter. Dissolving is a **physical change**.

**Supersaturated** means that a solution is holding more **solute** than can be **dissolved** at that temperature. You could say it is more than **saturated**. To make a supersaturated solution, dissolve a lot of solute at a high temperature, then cool the solution. The extra solute will stay dissolved. It now holds more than you could dissolve at the current temperature. Supersaturated solutions are unstable. If you add more solute to a supersaturated solution, the extra solute will cause part of the dissolved solute to **crystallize**. Then your solution will only be saturated.

20 Mule Team Borax® is a natural laundry booster and a multi-purpose household cleaner. It is also used in many different situations to reduce and control odors. It does not contain phosphates or chlorine.

**Hypothesis:** I think the pipe cleaner will

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when soaked in hot water and 20 Mule Team Borax® because

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**Materials:**

Beaker	Spoon	Scissors
String	Graduated cylinder	250 mL boiling water
Pencil	Pipe cleaner	40 MI Borax
Masking tape		

**Procedure:**

1. Bend the pipe cleaner into a shape that you like (star, heart, circle) . Twist the top of the pipe cleaner together to close the shape. Make sure that your shape fits inside the beaker.
2. Use masking tape to label a beaker with your name.
3. Tie a few centimeters of string to the pipe cleaner. Tie the other end of the string to a pencil, so that the shape will hang from the pencil and dangle inside the beaker. Place the shape inside the beaker to make sure that it hangs free and does not rest on the bottom of the beaker.
4. Take the shape out of the beaker.
5. Get boiling water from the teacher. **BE VERY CAREFUL NOT TO SPILL THE BOILING WATER!!!**
6. Add 40 mL of the 20 Mule Team Borax® to the water in the beaker and stir with the spoon until the borax is a **supersaturated** solution.
7. Record the time in the data chart and record observations.
8. Hang the shape in the beaker and wait at least 30 minutes.
9. After 30 minutes, carefully lift the shape out of the hot water/borax solution and record your observations.
10. Leave the shape in the water/borax solution overnight.
11. After 24 hours, carefully lift the shape out of the water/borax solution and record your observations.

**Data:**

<b>Pipe Cleaner shape in Borax and Water Solution</b>		
<b>Time (min.)</b>	<b>Fact Observations</b>	<b>Opinion Observations</b>
<b>Start</b> _____	Touch- TOO HOT TO TOUCH! Sight- Smell-	
<b>30 min.</b>	Touch- Sight- Smell-	
<b>24 hours</b>	Touch- Sight- Smell-	

**Data Analysis:** Explain what happened to the pipe cleaner over a period of 24 hours. What did time have to do with the changes you observed?

**Questions:**

Define each of the following:

Mixture –

Solution –

Solute –

Solvent –

Dissolve –

Saturated –

Supersaturated –

Homogeneous –

Concentration –

**Conclusions:**

1. Explain what happened to the solution of borax and water over a period of time.

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2. What do you think would happen if you took the pipe cleaner that soaked in the Borax/water solution and left it in the water for another 24 hours? **Explain your answer.**

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