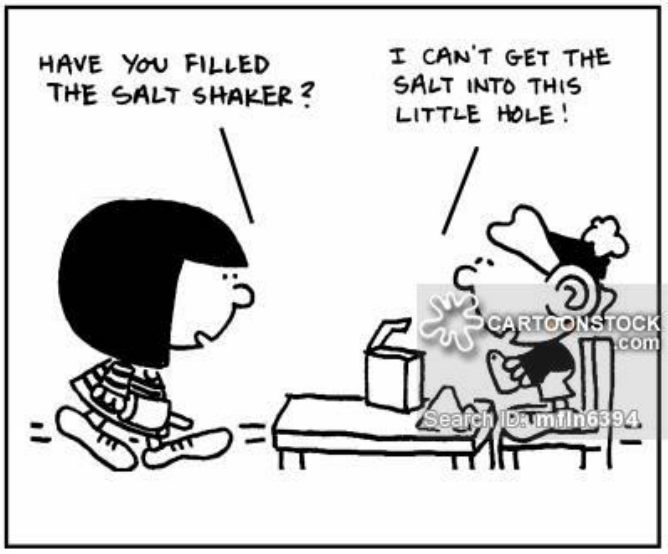
Mystery Crystal Lab /25

Name: _____

Partner(s): _____



In this activity you will carefully make observations of four known crystals and one unknown crystal.

Question:

If you are given an unknown crystal, which is chemically the same as one of the four known crystals but looks different. Can the unknown crystal be identified by testing other physical properties?

Safety:

- **Never taste** or eat anything in the science room.
- Wash your hands and equipment thoroughly before and after completing this activity
- Goggles must be worn at all times

Materials:

- Pickling Salt
- Calcium Carbonate
- Sodium Acetate
- Sugar
- Unknown
- 5 100 ml beakers
- Black Paper (5 pieces)
- Magnifying glass
- Dissecting Microscope
- Masking tape
- Pen
- Scoopula
- Scale
- Mortar and Pestle
- Graduated Cylinder

Procedure:

Part 1:

1) Label five corners of a piece of black construction paper with the name of the 5 crystals.

2) Place very small samples (a few crystals) of Pickling salt, Calcium Carbonate, Sodium Acetate, sugar, and the unknown on black slips of paper.

3) Use a magnifier to look carefully at each type of crystal.

4) Describe some characteristics of each crystal in the chart on the following page. Include any similarities and differences you notice about them.

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Observations (4 marks):

Pickling Salt	Calcium Carbonate	Sodium Acetate	Sugar	Unknown

Questions (3 marks):

1. What similarities do you notice between the unknown and any of the known crystals?

_____

_____

_____

2. Based on your observations, what do you think the identity of the unknown might be?

_____

3. How certain are you that your guess is correct?

_____

What's next?

The appearance test gave you some information about the crystals, but probably not enough to identify the unknown for sure. So, you will need to conduct a few other tests. One test could be to crush each type of crystal to see if the unknown breaks in a way that is similar to one of the known crystals. You may also try dissolving each of the crystals in water. Maybe the unknown will dissolve as much as one of the known crystals does. In the next few activities you will help design these types of tests as you try to discover the identity of the unknown.

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Crush Test (3 marks):

What are 3 things you should do to make sure that you crush each crystal with the same amount of force so that the test is fair?

I. _____

II. _____

III. _____

Procedure:

Part 3:

1) Place a very small sample of each crystal in the mortar and crush using your pestle according to your guidelines above. Place back on black paper to examine.

2) Make sure you clean the mortar and pestle thoroughly between each crush cycle to avoid contamination.

3) Use a magnifier to look carefully at each type of crystal

Observations, Questions and Interpretations (3 marks):

1) Can you single out a crystal that is definitely *not* the unknown? Briefly explain your answer.

_____

2) Which crystal or crystals might be the unknown? Briefly explain your answer.

_____

_____

3) Do you have enough information from this crushing test to say that you know the identity of the unknown for sure? Briefly explain your answer.

_____

_____

_____

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Solubility Test

Scientists use the word *solubility* when they are talking about the amount that a substance dissolves. Solubility is a characteristic property of a substance. Different substances are going to be more or less soluble than others. This means that you could use a solubility test to notice differences in each of the crystals and to identify the unknown. If the amount of the unknown left in the cup is about the same as the amount left in a cup by another crystal, then it's reasonable to conclude that the unknown is that crystal.

The plan (4 marks):

1) How could you conduct a solubility test to compare how well Pickling Salt, Calcium Carbonate, Sodium Acetate, sugar, and the unknown dissolve in water? Write a simple plan below.

_____

_____

_____

_____

_____

2) List the variables you would need to control.

_____

_____

_____

_____

_____

Now… if you had a mini Schaub siting on your shoulder, he would probably say…. "how are you measuring the amount of crystal to dissolve? Should you use volume (spoon) or mass (scale)? Does it even matter?" If you are not sure speak to regular sized Schaub.

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Procedure:

Part 4:

Here's the deal… you most likely came up with a great procedure above. Read mine below and make any adjustments to you own that you may think are necessary. If you suddenly realize yours might not work, use mine. If you think mine is terrible. Use yours.

1) Place 5 mL of tap water into 5 empty 100 mL beakers. Make sure the temperature is the same for every beaker (This should happen naturally).

2) Measure out 0.5 grams of each crystal onto the black sheets of paper. Match up each pair of beakers so that each of crystal is near its corresponding beaker of water. Pour the weighed amount of each crystal into its cup of water at approximately the same time.

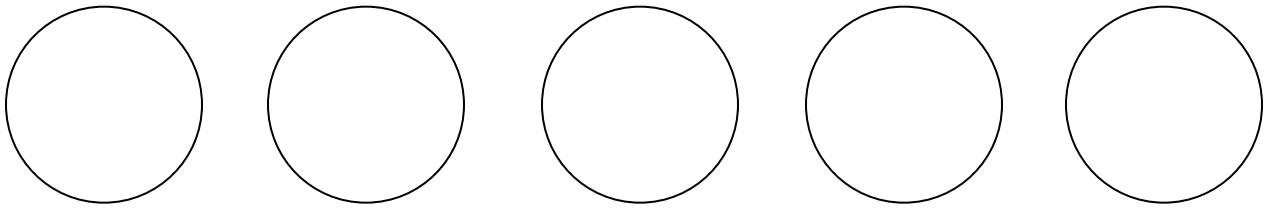
3) With the help of your lab partners, swirl each cup at the same time and in the same way for 5 seconds. Compare the amount of crystal left behind in each cup. Swirl again for 5 seconds and observe. Swirl again for 5 seconds and make your final observations.

4) Slowly and carefully pour the solution from each clear plastic cup down the sink. Try not to let any undissolved crystal go. Compare the amount of crystal remaining in each beaker.

Clean each beaker with water and dry it.

Observations, Questions and Interpretations (6 marks):

1) Draw your observations. Try to show the difference in the amount of crystal remaining in each beaker.



Pickling Salt Calcium Carbonate Sodium Acetate Sugar Unknown

2) Based on the amount of crystal remaining in each cup, which crystals could possibly be the unknown?

_____

3) Which crystals are probably *not* the unknown? _____

4) With all the information you have so far (magnify test, crush test and solubility test), what do you believe to be the identity of the unknown? _____ Explain why:

_____

_____

Is your workstation clean before you head back to class? (2 marks)