

Name:

Date:

Class:

Pepper Purification Plan **Shipment “A” Answer Key**

Your Scenario: You are about receive a shipment of 10 grams of metal solutes. They will come to you in a small container, dry and evenly mixed. It is your job to work with your group to write a method to properly extract all the pepper using water to simulate an “acid wash.” You must use the coffee filter to separate the pepper from the water.

1. What shipment of metals did your teacher assign you? Record your answer below.

Shipment A – More sugar

2. What percentage of each metal is in your shipment? Which metal has the largest percentage? What do you think will make that metal dissolve the fastest? Record your answer below.

Sugar – 60%

Salt – 10%

Pepper – 30%

3. Your shipment is coming to you dry. How much water will you need to add to your cup to help the metals dissolve? Will you need that water to be hot? Hint: Use the graph from the slides your teacher showed today in class. Record your answer below.

100 grams of water is the same as 100 mL of water, and 100 mL of water can dissolve up to 165 grams of sugar. Sugar is 60% of this 10-gram shipment, meaning 6 grams of sugar is in the cup. Students can use their math skills to cross-multiply the sugar-water ratio they need:

$$\frac{165 \text{ grams of sugar}}{100 \text{ grams of water}} \quad \times \quad \frac{6 \text{ grams of sugar}}{X \text{ grams of water}}$$

Solving for X leads students to possibly ask for as little as 4 grams of water. They will find in lab that it is a very difficult task to do at room temperature, but that is for them to find out! Anything over 4 grams of water is acceptable for Shipment A.

Reminder, if students need hot water you will need to help them by either filling up their cup with kettle water or microwaving the water.

4. Will you need any tools to help you dissolve the metals? How will you know you have completely dissolved your solutes? Record your answer below.

Answers will vary here based on group preferences.

5. The metals will likely be wet after washing them and filtering. Where will you set your metals to dry overnight, and how will you remember which coffee filter of pepper is yours the next day?

You will need to designate specific areas for students to let their pepper dry overnight that will not be disturbed.

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6. How much pepper can you extract from this shipment of metals? Write your answer in grams below.

All students should be able to extract up to 3 grams of pepper. If in the weigh-in they notice they have more than 3 grams, they may have forgotten to tare the scale to cancel the weight of the coffee filter and/or they have not had all their water evaporate from the pepper yet.

7. **After testing your plan:** When you tried to dissolve your salt and sugar, what went well? What might you change next time? Answer below.

Student answers will vary here. Many will notice that adding more water or even using a larger container may be better ways to dissolve their solutes. They will need that information for the next day's lesson.