Name _____ Teacher _____ Date _____

Grading Pre-Lesson 0.1GL: Measuring the Mass of Solids in Mixtures Worksheet

*This worksheet has "grading" in the title because at this point, students can be held accountable for correct answers. Correct responses to the questions are in **blue bold italics** below.*

Red italics suggest ways to grade student responses by giving them points for correct or partially correct answers. There are 28 points total on this worksheet.

We want to figure out where the **solid** matter in plants comes from. It's hard, though, because there's so much water in and around growing plants—water in the soil, water in the air, water in and moving through the plants. So the soil and the plants and even the water are **mixtures** of water with different solid materials. *How can we figure out the mass of just the solids?*

There are two ways to do this:

- Measure the mass of the solids before you make the mixture.
- Measure the mass of the solids after you take the water out of the mixture.

Let's try some examples.

A. Measuring the mass of solids before you make the mixture

Try this process with three solid materials: a dry sponge, salt, and dry plant gel crystals. For each material:

□ Measure the mass of the dry solid (not including the bowl it is in), and write the mass in the mass percentage table on the next page.
□ Make the mixture by soaking the sponge or gel crystals in water or by dissolving the salt
□ Measure the mass of the solid-water mixture (not including the bowl that it is in), and write that mass in the mass percentage table on the next page.
□ Calculate the percentage of the solid-water mixture that is solid:
(mass of dry solid) ÷ (mass of solid-water mixture) x 100%

B. Measuring the mass of solids after you take the water out of the mixture

Try this process with three solid materials: a carrot, salt water, and Ionic Grow. For each material:

□ Measure the mass of the solid-water mixture and write that mass in the mass percentage table on the next page.
□ Evaporate the water by putting the mixture in a warm oven overnight or by leaving it in a warm place for several days. (It will help to cut the carrot into thin strips.)
□ Measure the mass of the dry solid, and write the mass in the mass percentage table on the next page.
□ Calculate the percentage of the solid-water mixture that is solid:
(mass of dry solid) ÷ (mass of solid-water mixture) x 100%

C. Mass percentage table

1 point for each correctly completed box. Answers will vary.
18 points total

Material	***Mass of dry solid***	***Mass of solid-water mixture***	***Percentage of mixture that is solid***
Dry sponge			
Salt			
Gel crystals			
Carrot			
Salt water			
Ionic Grow			

D. Using percentages to calculate solid mass

If you know the percentage of solid in a mixture, you can figure out the mass of the solid from the mass of the mixture. Try it!

1. Suppose you have a carrot that weighs 100 g. What is the mass of the solid materials in that carrot? Show your calculations below.

11 g *will be the mass of the solid materials. 89% of the mass of a carrot is water; 11% accounts for the solids, and 11% of 100 g = 11 g.*

2 points for correctly calculating the answer and for showing work.

2. Suppose you have 25 g of gel crystals that have been soaked in water. What is the mass of the hydrated gel? Show your calculations below.

The mass of the hydrated gel will be ***1,786 g****. The mass of the solids in hydrated gel is 1.4% of the total mass. 25 g / 1.4% = 1786 g.*

2 points for correctly calculating the answer and for showing work.

3. Suppose you have 4 teaspoons (17 g) of Ionic grow mixture. What is the mass of the solid materials in that mixture? Show your calculations below.

The percentage of dry mass in this liquid mixture is 0.015%. 17 g x 0.00015 = ***0.003 g****.*

2 points for correctly calculating the answer and for showing work.

4. Suppose you add 4 teaspoons (17 g) of Ionic Grow mixture to a jug, and then add enough water so the final volume is 1 gallon (3785 g). What is the percentage of the solid materials in that mixture? Show your calculations below.

0.003 g / (17 + 3785)g = 0.003 g / 3802 g = 0.0000008 = ***0.00008%***

2 points for correctly calculating the answer and for showing work.

5. A package of plant gel crystals (~17 g of solid) absorbs about 1190 g of water mixed with Ionic Grow (see question 4 above). What is the percentage of the solid materials in this mixture? Show your calculations below.

17 + 1190 = 1207 g. 17 g / 1207 g = 0.014 = ***1.4%***
2 points for correctly calculating the answer and for showing work.