

**SKILLS LAB 2** **LABORATORY INVESTIGATION**

# How to Use a Balance

## ◆ Pre-Lab Discussion

The ability to measure accurately the mass of an object is an important skill in the science laboratory. You can use a triple-beam balance to measure mass. As you can see in Figure 1, the balance has several parts. The pan is the flat surface on which you place the object to be measured. The three beams show the mass of the object. Notice that each beam has a different scale. The scale of the middle beam is from 0–500 grams and measures an object to the nearest 100 grams. The scale of the beam in back is from 0–100 grams and measures an object to the nearest 10 grams. The scale of the beam in front is from 0–10 grams and measures an object to the nearest tenth of a gram.

Notice that each beam carries a weight called a rider. You find the mass of an object by placing it on the pan and moving the riders until the pointer on the right of the balance stays pointed to zero.

There are three ways you can use the triple-beam balance to find mass:

**Method 1. Measure mass directly.**

Place the object on the pan and move the riders until the pointer points to zero. Add up the numbers on the beams where the riders are positioned to find mass.

**Method 2. Find mass by difference.** How could you find the mass of a liquid? First, measure the mass of an empty container that can hold the liquid. Then, measure the combined mass of the container and the liquid. Finally, subtract the mass of the container from the combined mass.

**Method 3. Measure out a chemical substance.** Suppose you need to obtain 50 g of a powdered chemical. How could you do it? First find the mass of a piece of paper or empty container that will hold the chemical. Then, add this amount to the desired mass of the chemical and preset the riders to this number. Finally, add the chemical to the paper a little at a time until the pointer points to zero.

In this investigation, you will learn how to measure accurately the mass of various objects by using the three methods described above.

**1.** What does it mean when the pointer of the balance reads “zero”?

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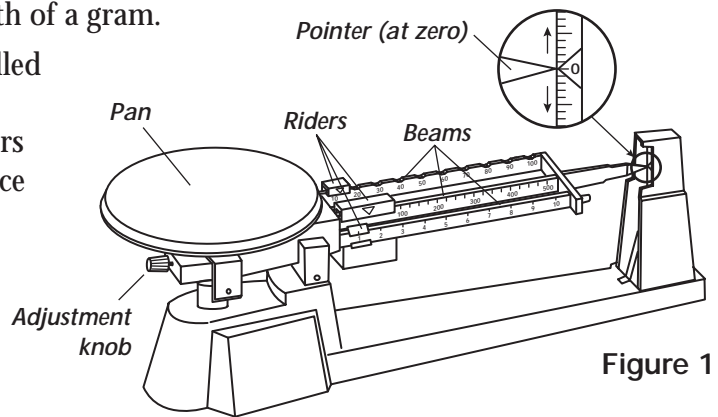


Figure 1

**HOW TO USE A BALANCE** *(continued)*

2. Suppose a rock is balanced on a triple-beam balance. The riders on the three beams point to 60 g, 300 g, and 3.5 g. What is the mass of the rock?
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◆ **Problem**

What is the proper way to use the triple-beam balance to measure the mass of different objects?

◆ **Materials** *(per class)*

triple-beam balance	small scoop
100-mL graduated cylinder	table salt
3 different small, solid objects	200-mL beaker
weighing paper	

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- Safety**
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- Review the safety guidelines in the front of your lab book.*

◆ **Procedure**

Before you measure the mass of any object, be sure that the riders are moved all the way to the left and that the pointer rests on zero. If necessary, slowly turn the adjustment knob until the pointer rests on zero. This is called zeroing the balance.

**Part A: Measuring Mass Directly**

1. Place a small, solid object on the balance pan. The beams will rise and the pointer will point above zero.
2. Move the rider on the middle beam one notch at a time until the pointer drops and stays below zero. Move the rider back one notch.
3. Move the rider on the back beam one notch at a time until the pointer again drops and stays below zero. Move the rider back one notch.
4. Slide the rider along the front beam until the pointer stops at zero. The mass of the object is equal to the sum of the readings on the three beams.
5. Record the mass to the nearest tenth of a gram in Data Table 1.
6. Remove this object and repeat steps 1–5 twice, using two other solid objects.

**Part B: Finding Mass by Difference**

1. Find the mass of an empty 250-mL beaker. Record the mass in Data Table 2.
2. Using the graduated cylinder, obtain 50 mL of water.
3. Pour the water into the beaker and find the mass of the beaker and water. Record the mass in Data Table 2.

**HOW TO USE A BALANCE** *(continued)*

**Part C: Measuring Out a Chemical Substance**

1. Place a piece of weighing paper on the balance pan and find its mass. Record the mass in Data Table 3.
2. Add 5 g to the mass of the weighing paper and move the riders to this number.
3. Obtain a sample of table salt from the teacher. Using the scoop, add a small amount of salt at a time to the paper on the balance until the pointer rests on zero. Record the total mass of the weighing paper and salt in Data Table 3.
4. Dispose of the table salt in the container provided by the teacher.

◆ Observations

Data Table 1

<i>Object</i>	<i>Mass (g)</i>

Data Table 2

<i>Mass of Empty Beaker (g)</i>	<i>Mass of Beaker with 50 mL of Water (g)</i>

Data Table 3

<i>Mass of Weighing Paper (g)</i>	<i>Mass of Weighing Paper and Table Salt (g)</i>

◆ Analyze and Conclude

1. What is the mass of 50 mL of water? How did you find this mass?

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2. Which rider on the balance should always be moved first when finding the mass of an object? Why?

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3. What is the mass of the largest object your balance is able to measure?

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4. What is the mass of the smallest object your balance is able to measure accurately?

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5. After using your balance, how should it always be left?

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## HOW TO USE A BALANCE *(continued)*

### ◆ Critical Thinking and Applications

1. Suppose you did not zero the balance before finding the mass of an object. How might that affect your measurement?

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2. In this lab, you found the mass of 50 mL of water. Calculate the mass of 1 mL of water. (Do not use the balance.)

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3. Describe how you could find the mass of a certain quantity of milk that you poured into a drinking glass.

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4. If you were baking a dessert and the recipe called for 250 g of sugar, how could you use the triple-beam balance to obtain this amount?

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### ◆ More to Explore

Design a balance that finds mass by comparing the mass of a known object to the mass of an unknown object. Study the triple-beam balance used in this activity and think about how you could balance two or more objects. Construct your balance and use it to find the mass of an object. How could you improve your balance?