Name _____ Date: _____ Section: _____ 7/2017

Laboratory Skills Activity 03-15

Reading a Balance

Objective: Identify the parts of a balance scale and read a balance scale to determine the mass of an object.

The mass of an object can be measured using a laboratory balance. The unit that is used to measure mass is the gram (g). Many different kinds of balances are used in the laboratory. All balances will have a platform or pan where the objects are placed. Some scales will have more than one platform. The second platform is used with standard masses. Balance scales may have one, two, three or four beams.

Part A The Anatomy of a Balance Scale

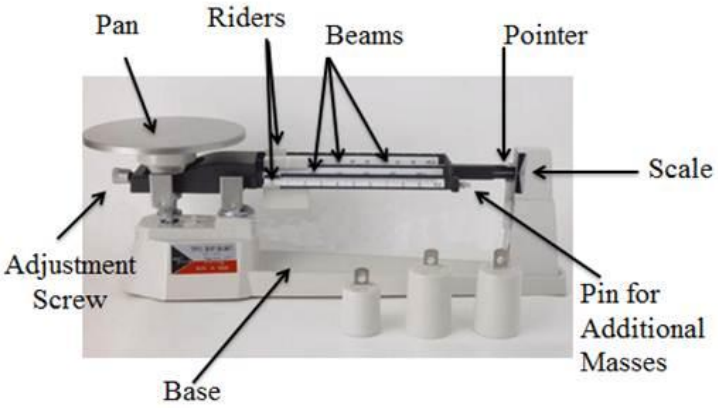


Figure 1.

1. Study the main parts of the triple beam balance scale shown in *Figure 1*.
2. Notice the pointer and scale on the balance. All balances have some type of pointer and scale. The scale is uncalibrated. The center of the scale is called the zero point. Before using a balance, you need to adjust the balance so that the pointer is at the zero point. When the pointer is at the zero position, the balance is calibrated.
3. Label the parts of the hanging pan balance in *Figure 2*.

_____ 1. _____ 5.

_____ 2. _____ 6.

_____ 3. _____ 7.

_____ 4.

Figure 2.

4. How many beams does the balance in ***Figure 1*** have? _____

How many beams does the balance in ***Figure 2*** have? _____

_____ 5. Sometimes scales are named by the number of beams they contain. What would be the best name for scale in ***Figure 1***?

a. single-beam balance
b. double-beam balance
c. triple-beam balance
d. quadruple-beam balance

Part B How to read a balance

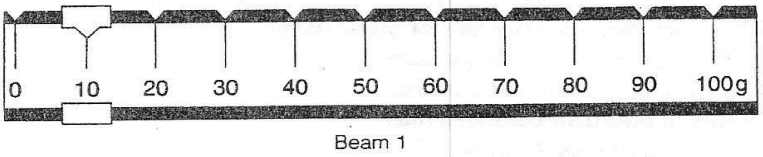
Each beam on a laboratory balance represents a different number line. Look at the beams in Figure 3. Beam 1 has notches at the top so that the rider will sit at specific 10-gram points along the beam. Beam 2 has 1-gram markings on the numbered lines along its entire smooth top edge. The rider can be moved smoothly along Beam 2 until the scale is balanced. In between the numbered lines are additional lines that represent the decigrams. Centigrams are determined by estimating the amount of white space in between the unnumbered lines on this scale.

6. How much mass **can be** measured on the scale of Beam 1?

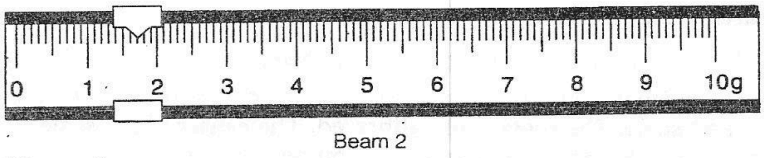
_____

7. What ***unit*** of measurement is used on the scale?

_____



Beam 1



Beam 2

Figure 3

8. How much mass **can be** measured on the scale for Beam 2? _____

9. What ***unit*** of measurement is used on the scale? _____

10. The sum of all of the riders indicates the mass of the object. What is the mass of the object indicated by the scale containing both of the beams in *Figure 3*? _____

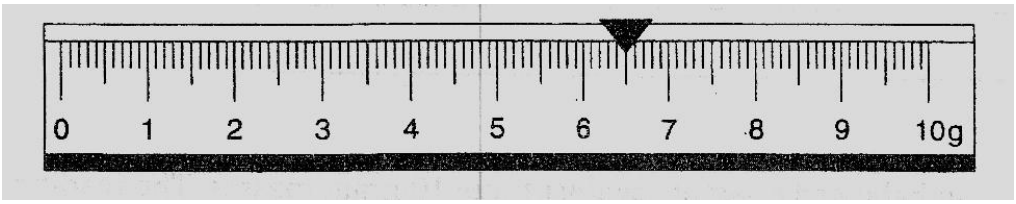


Figure 4.

Look at the beam in *Figure 4*. Notice that the rider is pointing to the right of the number 6. Count the number of black lines to the right of the 6. Black lines on this scale represent decigrams. Notice that the rider is pointing directly at this division and that there is no additional white space. The white space on this scale represents centigrams.

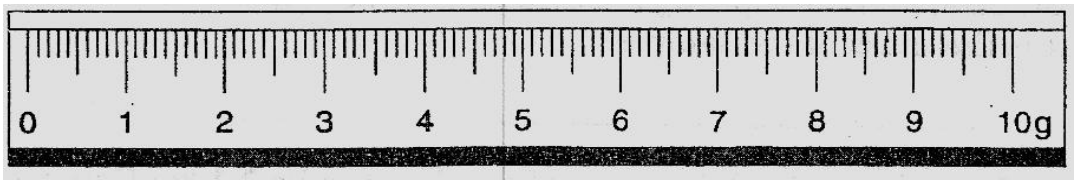
11. How many black lines (decigrams) after the 6 did you count? _____

12. Estimate the white space (centigrams) by mentally dividing the area into tenths. If the rider is exactly on a decigram line, indicate that there are no centigrams by putting a zero in the centigram placeholder.

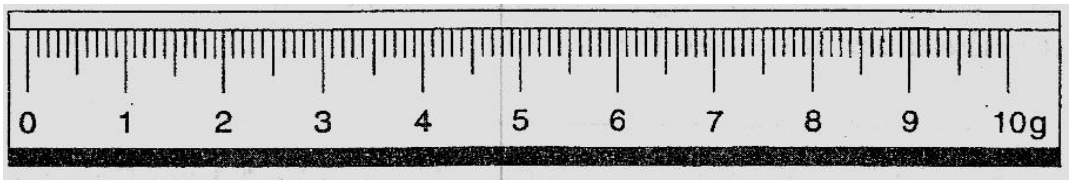
13. How would you write the mass measurement in Figure 4? _____

Directions: On the following beams, draw in a rider at the mass given.

14) 8.30 g



15) 5.85 g



16) 9.30 g

This scale measures in milligrams. Draw a rider at:

17) 0.565 g

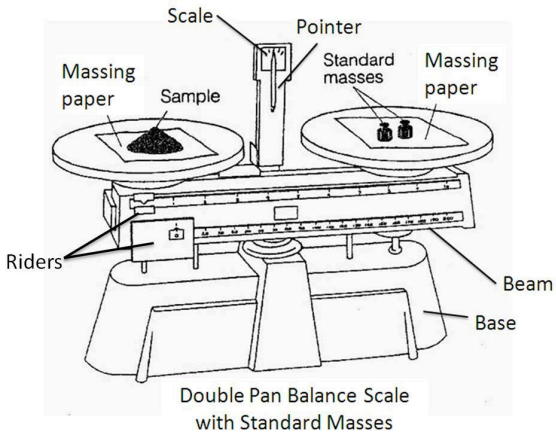
Part C Using Standard Masses

One way to measure mass of an object is to balance it against standard masses. Scientists have agreed to use the kilogram as the standard unit against which all masses are to be determined. The world's standard for the kilogram is a special cylinder made of platinum and iridium that is kept in Paris, France. The small standard masses used in laboratories are all based on this mass.

Balance scales that have two pans use one for the unknown object's mass and the other for the standard masses. Some double pan balance scales will have a beam across the front to balance with decigrams, centigrams, and with some scales even milligrams.

When massing chemicals on any kind of balance scale, be sure to protect the scale by using massing paper or a massing boat to contain the chemical. This will keep the chemical from corroding the pan surface. It will also help keep from getting the scale dirty causing calibration problems.

Figure 5.



Double Pan Balance Scale with Standard Masses

To measure an object's mass using standard masses, the pointer of the balance must start at the zero point. Look at *Figure 5*. The unknown sample to be measured is placed on the left-hand pan. The right-hand pan holds the standard masses. The standard masses are added gently to the pan until the balance begins to tip to the right. Then, the smallest mass is removed. The riders on the beam are adjusted until the pointer reaches the zero point, and then the mass can be determined. The object's mass is equal to the sum of the standard masses and the readings on the beam.

18) How many 10-gram standard masses would it take to balance a 1-kilogram object? _____

19) Notice that the sample being massed is placed on massing paper so that it does not touch the pan. Why is there also massing paper on the pan with the standard masses when they aren't going to spill or corrode the pan of the scale?

_____

20) Suppose you balanced a sample against three 10-gram masses and the reading on the beam is 7.85 g. What is the mass of your sample? _____

21) Suppose you have determined the mass of an object to be 2.1 kg on another scale. Could someone use only the following standard masses to find the mass of the object: 1 g, 2 g, 5 g, 10 g, 20 g, 50 g, 100 g, 200 g, 500 g, and 1 kg? Why or Why not?

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