PHYSICS 130 LABORATORY EXPERIMENT 8
METER STICK BALANCE

NAME_____ DATE _____SECTION _____
PARTNERS _____ _____ _____

OBJECTIVES

The objective of this experiment to investigate the principle of rotational equilibrium and to studythe concept of "center of gravity."

EQUIPMENT

Vertical rod in stand	Meter stick	Set of 5 g - 500 g masses
Right angle clamp	Three meter stick clamps	
Short rod	Two mass hangers	

NOTE: In this experiment we will speak of forces (weights) measured in grams. Strictlyspeaking, this is not correct. However, converting all mass units to weight units in thisexperiment is inconvenient and not necessary.

PROCEDURE

1. Attach one meter stick clamp near the center of the meter stick and suspend the meter stick from the horizontal support arm. Adjust the position of the clamp until the meter stick balances. This determines the center of gravity, or balance point, of the meter stick. Record your result in centimeters, rounded off to the nearest tenth of a centimeter.

Location of center of gravity _____ cm

2. Use the balance to measure, to the nearest gram, the mass of your three meter clamps.

Clamp #1_____; Clamp #2_____; Clamp #3 _____

3. You can use the fact that the weight of the entire meter stick can be treated as if it were concentrated at the location of the center of gravity to determine the mass of your meter stick. Suspend the meter stick at the 30.0 cm mark. Place a 100 g mass on a 50 g mass hanger and hang them from a clamp on the short end of the meter stick. Adjust the position of this clamp until the meter stick balances. Record this position to the nearest tenth of a centimeter.

Position of masses = _____

4. Using the data obtained in Step 3, calculate the mass of the meter stick. Attach a separate sheet to your report showing all of your calculations for this part and all other parts in this experiment. It is always helpful if a diagram showing all of the forces acting on the meter stick is included with your calculations.

Calculated meter stick mass = _____

Remove all clamps from the meter stick and determine its mass, to the nearest gram, using the mass balance.

Mass of meter stick from balance = _____

Calculate the percent difference between the two masses found for the meter stick.

Percent difference = _____

METER STICK SUPPORTED AT ITS CENTER OF GRA VITY

5. Suppose that the meter stick is supported at its center of gravity. If you hang a 500 g mass on a 50 g mass hanger at the 60.0 cm mark, where should you hang a 200 g mass on a 50 g mass hanger in order to make the meter stick balance'(l/ound your answer to the nearest O. 1 cm. (Note: You will probably learn more from this experiment if you do the calculation before you check your result using trial and error.) Now, determine experimentally the balance position. Record your results to the nearest tenth of a centimeter. If the calculated and experimental positions do not agree within 0.5 cm, seek professional help immediately.

   Calculated position for 200 g mass = _____

   Experimental position of 200 g mass = _____

6. Suppose that the meter stick is still supported at the center of gravity. If you hang a 200 g mass on a 50 g mass hanger at the 65.0 cm mark, what amount of mass should you add to a mass hanger located at the 15.2 cm mark to make the meter stick balance? Check your answer experimentally. Record below both of your answers to the nearest gram and show your calculations on a separate sheet of paper. If the calculated and experimental masses do not agree within 5 g, again seek help.

   Mass found by calculations = _____ Mass found experimentally = _____

METER STICK NOT SUPPORTED AT ITS CENTER OF GRA VITY

7. Suppose that the meter stick is supported at the 40.0 cm mark. If you hang a mass hanger with a 500 g mass at the 22.0 cm mark, calculate where you should hang a 200 g mass on a mass hanger in order to make the meter stick balance? Also, check your answer experimentally and comment on whether the predicted and observed results agree to within 0.5 cm. In this step and the next one, you will need to include the mass of the meter stick.

   Predicted position = _____ Experimental position = _____

   Comments:

8. Suppose that the meter stick is supported at the 25.0 cm mark. If you hang a mass hanger with a 20 g mass at the 43.2 cm mark, what amount of mass should you add to a mass hanger located at the 15.0 cm mark to make the meter stick balance? Also, check your answer experimentally and comment on whether the predicted and observed results agree within 5 g.

   Predicted mass = _____ Experimental mass = _____

   Comments:

QUESTIONS (Attach a separate sheet with your answers)

1. Discuss what is meant by the center of gravity of an object. Why is it this concept useful in solving equilibrium problems?
2. Explain how you would **experimentally** locate the center of gravity of an irregular shaped object.