Name _____ Date _____ Period _____

WEIGHT AND THE FORCE OF GRAVITY

BACKGROUND: There is a difference between mass and weight. The mass of an object is defined as the amount of matter it contains. The weight of an object is determined by the force of gravity on its mass. You have used a triple-beam balance to measure mass.

To measure weight, a spring balance is used. Because weight is the downward force that results from the pull of gravity on an object, when a weight is attached to a spring the downward force will stretch the spring. The greater the weight of the object, the more the spring stretches.

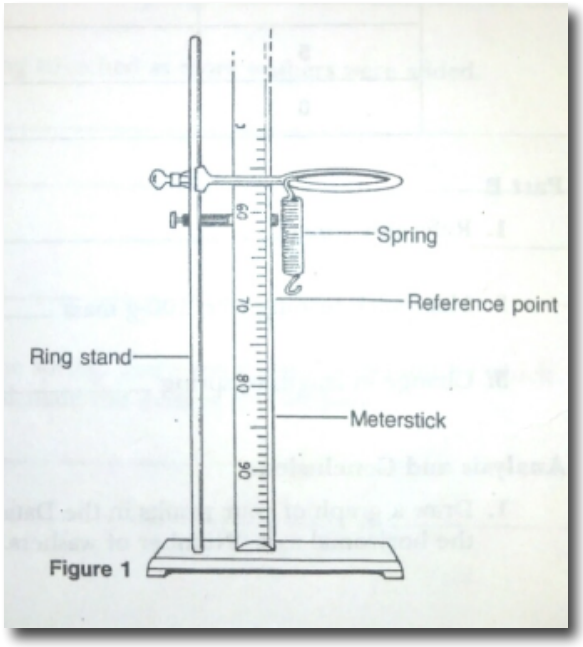
If known masses are attached to a spring, the amount f stretch (weight) caused by difference masses can be determined.

In this investigation you will measure how much a spring stretches as weight is applied to it. You will then determine the relationship between mass and weight.

PROBLEM: How can a spring be used to measure the force of a known weight?

MATERIALS:

- Ring stand
- Large ring
- Meter stick
- Clamp
- Spring
- 15 Washers
- 2 Large paper clips (washer hooks)
- 100-g mass



PROCEDURE

PART A:

1. Attach the ring to the ring stand and hand the spring from it.
2. Clamp the meter stick to the ring stand so that the 100-cm mark is resting on the table top and the spring is close to, but not touching, the meter stick. Attach the washer hook to the bottom of the spring. See Figure 1.

3. Note the number on the meter stick, to the nearest tenth of a centimeter, that is just even with the bottom of the spring. This number will be your reference point. Record this number in the Data Table.
4. Attach five washers to the washer hook and note the number on the meter stick that is just even with the bottom of the spring now. Record this number in the Data Table.
5. Repeat step 4 with 10 washers and then 15 washers added to the hook.
6. Remove the washers *five at a time* until no washers remain. Each time you remove five washers, note the number on the meter stick that is just even with the bottom of the spring. Record.

PART B:

1. Note the reference point again. Record in the Observations for Part B.
2. Hang a 100-g mass from the spring and note the number on the meter stick that is just even with the bottom of the spring. Record this number in Observations for Part B.

OBSERVATIONS:

PART A

DATA TABLE

Number of Washers	Reading of Meter Stick	Change in Length of Spring
0		
5		
10		
15		
10		
5		
0		

PART B

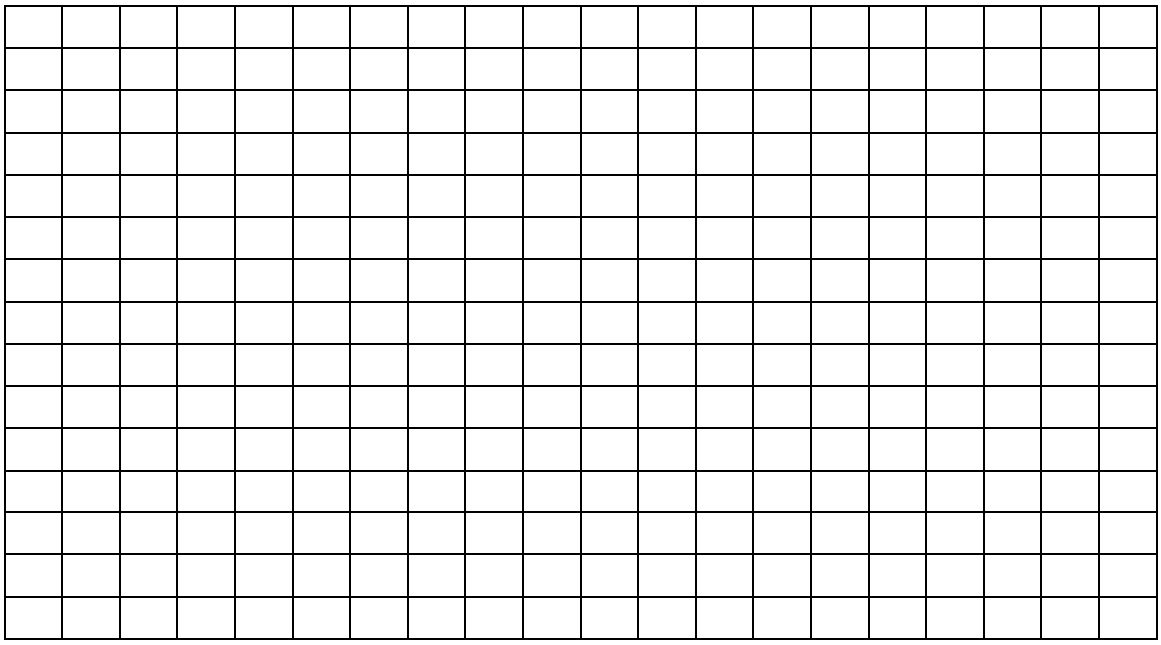
1. Reference point _____ cm.

2. Meter stick reading with 100-g mass _____

3. Change in length of spring _____

ANALYSIS/CONCLUSIONS:

1. Draw a graph of your results in the Data Table. Label the vertical axis "Stretch (cm)" and the horizontal axis "Number of washers."



2. How much did the length of the spring change as each group of five washers was added?

   _____

3. How much did the length of the spring change as each group of five washers was removed?

   _____

4. How do your answers to questions 2 and 3 compares? _____

Explain: _____

_____

_____

_____

5. How does the shape of your graph illustrate your answers to questions 2 and 3?

_____

_____

_____

CRITICAL THINKING AND APPLICATION:

1. What force acts on the objects you attached to the spring? _____

2. In terms of forces, explain why the spring stretched as more washers were added.

_____

_____

_____

_____

3. In Part B you added a known mass to the spring. Since you know the amount by which this known mass stretched the spring, calculate the mass of five washers.

_____

What is the mass of one washer? _____

4. Why do spring balances vary in accuracy? _____

_____

_____

5. How is the maximum capacity of a spring balance determined?

_____

_____