

Chapter 1

LABORATORY MANUAL

● Mass and Weight 4

Mass is the measure of the amount of matter in an object. Weight is the measure of the force with which one body is attracted toward another body. This force of attraction is called gravity. For example, the moon is attracted toward Earth by Earth's gravity field. Likewise, Earth is attracted toward the moon by the moon's gravity field.

Strategy

You will measure the force of gravity on marbles.

You will deduce the relationship between mass and weight.

Materials

balance

12 glass marbles (large)

meterstick

plastic bottle (with handle)

rubber band (large, wide)

Procedure

1. Cut the rubber band. Attach one end to the handle of the bottle.
2. Measure the mass of the bottle and the attached rubber band in grams and record in Table 4-1. Lift the bottle using the rubber band. Measure the length of the rubber band in centimeters and record.
3. Place three marbles in the bottle. Measure the mass of the bottle with the three marbles in it and record. Lift the bottle. Measure the length of the rubber band in centimeters and record.
4. Add three more marbles to the bottle and measure the mass of the bottle with the six marbles in it. Record in the table. Lift the bottle and measure the length of the rubber band. Record.
5. Add the remaining marbles and measure the mass of the bottle with the twelve marbles in it. Record. Lift the bottle, measure the length of the rubber band, and record.

Data and Observations

Table 4-1

	Mass (g)	Length of the rubber band (cm)
Plastic bottle		
Bottle + 5 marbles		
Bottle + 10 marbles		
Bottle + 15 marbles		
Bottle + 20		
Bottle + 25		
Bottle + 30		
Bottle + 35		
Bottle + 40		

Questions and Conclusions

1. What did the rubber band represent? _____
2. What two objects were attracting each other? _____
3. What happened to the mass of the plastic bottle and its contents as you added marbles?

4. What happened to the length of the rubber band as you added more mass to the plastic bottle?

5. What happened to the force of attraction between Earth and the plastic bottle and its contents?

6. How are mass and weight related? _____

7. If the force of attraction (gravity) on the moon is $1/6$ that of the force on Earth, what would you weigh on the moon if you weighed 42 kilograms, or about 412 N (newtons)? _____

8. If your mass on Earth were 42 kilograms, what would your mass be on the moon? _____

Strategy Check

- _____ Can you measure the force of gravity on marbles?
- _____ Can you state the relationship between mass and weight?