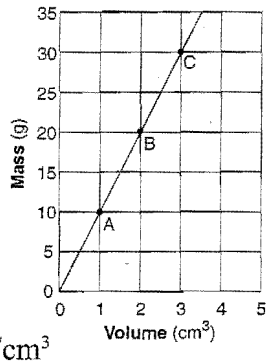
1. A rock sample has a mass of 16 grams and a volume of 8 cubic centimeters. When the rock is cut in half, what is the volume and density of each piece?

   (1) 8 cm^3 and 0.5 g/cm^3
   (2) 8 cm^3 and 1.0 g/cm^3
   (3) 4 cm^3 and 2.0 g/cm^3
   (4) 4 cm^3 and 4.0 g/cm^3 1_____

2. The graph below shows the relationship between mass and volume for three samples, *A*, *B*, and *C*, of a given material. What is the density of this material?



   (1) 1.0 g/cm^3
   (2) 5.0 g/cm^3
   (3) 10.0 g/cm^3
   (4) 20.0 g/cm^3 2_____

Note: Question 3 has only three choices.

3. As air on the surface of Earth warms, the density of the air

   (1) decreases
   (2) increases
   (3) remains the same 3_____

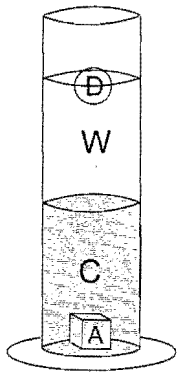
4. If the mass of a spinel crystal is 9.5 grams, what is the volume of this spinel crystal?

Table 1

Gemstone Mineral	Composition	Hardness	Average Density (g/cm^3)
emerald	$Be_3Al_2(Si_6O_{18})$	7.5–8	2.7
sapphire	Al_2O_3	9	4.0
spinel	$MgAl_2O_4$	8	3.8
zircon	$ZrSiO_4$	7.5	4.7

   (1) 0.4 cm^3
   (2) 2.5 cm^3
   (3) 5.7 cm^3
   (4) 36.1 cm^3 4_____

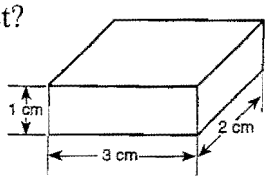
5. Liquid *W* was added to the graduated cylinder containing liquid *C*. Objects *A* and *D* were then dropped into the cylinder. Which statement is correct?



   (1) Liquid *W* is denser than liquid *C* and object *D*.
   (2) Liquid *C* is denser than liquid *W* and object *A*.
   (3) Liquid *C* is less dense than object *A*, but more dense than liquid *W* and object *D*.
   (4) Object *A* is denser than liquid *C*, but not as dense as liquid *W* and object *D*. 5_____

6. The diagram below represents a solid object with a density of 3 grams per cubic centimeter. What is the mass of this object?

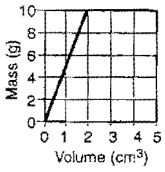
(1) 0.5 g
(2) 2 g
(3) 18 g
(4) 36 g

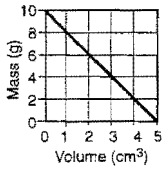


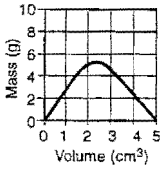
(Not drawn to scale)

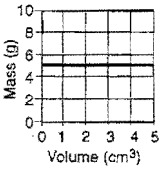
6 _____

7. Which graph best represents the relationship between mass and volume of a material that has a density of 5 grams per cubic centimeter?

(1)


(3)


(2)


(4)


7 _____

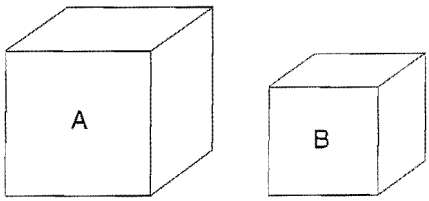
Note: Question 8 has only three choices.

8. When a substance is compressed the density would

(1) increase
(2) decrease
(3) remains the same

8 _____

Base your answers to question 9 on the diagrams below. The diagrams represent two different solid, uniform materials cut into cubes *A* and *B*.



Mass of A = 320 g
Volume of A = 64 cm³

Density of B = 3 g/cm³
Volume of B = 27 cm³

(Not drawn to scale)

9. *a*) What is the density of cube *A*?

(1) 0.2 g/cm³
(2) 5.0 g/cm³
(3) 12.8 g/cm³
(4) 64.0 g/cm³

a _____

b) What is the mass of cube *B*?

(1) 3 g (3) 27 g
(2) 9 g (4) 81 g

b _____

Note: Question *c* has only three choices.

c) Assume cube *B* was broken into many irregularly shaped pieces. Compared to the density of the entire cube, the density of one of the pieces would be

(1) less
(2) greater
(3) the same

c _____

10. Explain how heat would change the density of a parcel of air.

_____

_____

Name Teacher Period Date

CHAPTER 1—LAB 1: DENSITY OF GRANITE

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

Introduction

The density of a material determines how heavy it feels. Dense substances have a large amount of matter packed into a relatively small volume. We can therefore define density as the concentration of matter.

Density is a mathematical relationship. It is the ratio of mass to volume. Density can be calculated by dividing the mass of an object by its volume. Density also determines the ability of a substance to sink or float in water. Dense materials, such as lead and rock, sink. Materials of low density, such as air and balsa wood, float. Any object that is less dense than the fluid (liquid or gas) in which it is resting will float. Any object that is more dense than the fluid in which it is resting will sink.

Solid objects made of the same material usually have the same density. If the object is cut into pieces, or if a larger or a smaller sample is selected, the density will remain constant.

Objective

To determine the density of several pieces of granite, and compare your results with the accepted value.

Materials

3 pieces of granite of different sizes

Procedure

1. Obtain a single piece of granite. (It can be any size.)
2. Measure mass and volume of your piece of granite. Use these values to calculate its density. (Use the formula already given.)
3. Return the first piece of granite. Repeat the procedure with two different-sized samples of the granite.

Relative Size	Mass (grams)	Volume (cm^3)	Density (g/cm^3)
Small			
Medium			
Large			
		Total of Densities	
		Average Density	

Name Teacher Period Date

The accepted value for the density of granite is 2.7 g/cm^3. Calculate the percent deviation of your average density. Show your work here.

Wrap-Up

1. What are the most common metric units of density?

   _____

2. How does the size of the sample affect the density?

   _____

3. No matter how much granite you have, the density should always be approximately

   _____

4. Define density:

   _____

5. Why does ice float in water?

   _____

6. Of the six measurements you made, which do you think is the least accurate. Explain your choice. (Remember the percent deviation calculation above.)

   _____

   _____