Density (laboratory directions)

Name _____
Mod _____ Student number _____
Date _____

Every substance has its own density. Substances are often identified by their density. The formula for determining density is **d = m/v** (density is equal to the mass of a substance divided by the volume of the substance). Therefore in order to determine the density of a particular substance you must know TWO things about the substance, its mass and its volume.

Volume -

1a. Shape is regular ..... (2)
1b. Shape is irregular ..... (4)

2. Measure and record the length (l), width (w), and the depth (d)..... (3)

3. Use the formula V = l X w X d to determine the volume of the object. Answers are in cc, or cm^3..... (7)

4a. Irregular object will fit easily into a graduated cylinder ..... (5)
4b. Object will not fit into graduated cylinder..... (6)

5. Place a known amount of water into the graduate, then gently lower the object into the cylinder. Record the new level from the graduate. Subtract the first reading from the second. Answers may be in mL, cc, or cm^3..... (7)

6. Fill an overflow can with water. Discard the excess water. Place a beaker under the spout. Gently lower the object into the water. Displaced water will be read from a graduated cylinder. This will be the volume of the object. Answers may be in mL, cc, or cm^3..... (7)

Mass -

7. Determine the mass of the object by using the beam balance. Answers will be in grams (g)..... (8)

Density -

8. The formula used for finding the density is D = M / V. (This is to read Density equals Mass divided by Volume) Work the problem. Answers are rounded to the hundredths place. Answers will be in g / ml, g / cc, or g / cm^3.

*** WHEN USING THE CALCULATOR:

ENTER THE MASS NUMBER, THEN DIVISION SIGN, THEN VOLUME NUMBER,THEN THE EQUAL SIGN. (Round off to hundredths place).

Density Problems #2

Name _____
Mod _____ Student Number_____
Date _____

1. A rectangular object is 3.5 cm long, 2.1 cm wide, and 1.0 cm deep. The object has a mass of 4.6 g. What is its density?

2. Find the density of a rectangular block of wood 5.0 cm by 2.0 cm by 2.0 cm if its mass is 5.6 g.

3. What is the density of acid in a car battery if 200 mL of the acid has a mass of 240 g?

4. What is the density of 25 cm^3 of salad oil that has a mass of 23 g?

5. What is the density of a material that has a mass of 32.0 g and a volume of 1.60 cm^3?

6. A rock has a mass of 17.28 g. When it is dropped into a graduated cylinder, the water level rises from 15.3 mL to 26.5 mL. What is the density of the rock?

7. 270 mL of water spills out of a beaker into your shoe. How much did the water weigh?

*8. A rectangular block of stone is 2.0 cm wide, 3.1 cm long, and 5.4 cm deep. The stone has a density of 8.5 g/cm^3. What is the mass of the stone?

*9. A glass beaker has a mass of 140 grams. After some water is added to the beaker, the mass of the beaker and water is 380 grams. Calculate the mass of the water. What is the volume of water in the beaker?

*10. A block of a substance measures 5.32 cm by 6.25 cm by 4.03 cm. The block has a mass of 2.2 kg. What is its density in g/cm^3?

QUIZ - Density (D = M/V)

Name _____
Mod _____ Student Number_____
Date _____

1. A rectangular object is 3.0 cm long, 2.0 cm wide, and 1.5 cm deep. The object has a mass of 50.4 g. What is its density?

answer _____

2. Find the density of a rectangular block of wood 5.0 cm by 3.6 cm by 2.0 cm if its mass is 19.08 g.

answer _____

Densities of Some Substances

Substance	Density (g/cc)	Substance	Density (g/cc)
water	1.0	iron	7.9
sugar	1.6	copper	8.9
aluminum	2.7	lead	11.3

3. 75 mL of water is displaced by a solid object when lowered into a graduated cylinder. The solid weighs 847.5 g. What is its density and of what substance is the object made? (See chart above).

answer _____

name _____

4. A solid bar has a mass of 97.2 g and measures 10 cm by 3 cm by 1.2 cm. What is the density of the solid and of what substance is it made?

answer _____

name _____

5. A marble displaces 3 mL of water when placed into a graduated cylinder. If the graduated cylinder reads 27 mL while the marble is in it, what would the level of water be in the cylinder after the marble was removed?

answer _____

6. A graduated cylinder contains 50 mL of a liquid that weighs 50 g. Find the density and name the liquid.

answer _____

name _____

7. A rock having a mass of 17.28 g is placed in a graduated cylinder containing water. The water level rises from 14.9 mL to 26.9 mL. What is the density of the rock?

answer _____

8. An irregular object is placed in an overflow can containing water. 200 mL of water pours from the spout into a beaker. What is the weight of the water in the beaker?

answer _____

9. 50 mL of cooking oil weighs 31.5 g. What is its density?

answer _____

10. What is the formula for finding density?

answer _____

QUIZ - Solving Density Problems

Name _____
Mod _____ **Student Number** _____
Date _____

Directions: You may use a calculator to work each of the problems below. You are to use the correct units for density, volume and mass with your answers.

Substance	length cm	width cm	depth cm	Volume cm^3	Mass g	density formula m/v = d	density g/cm^3
1.	12.9	10.7	3.2		235.2		
2.	6.4	1.5	0.3		14.8		
3.	13.5	4.6	1.1		478.17		

<u>Circle your answers</u>

4. A rectangular object is 3.0 cm long, 2.0 cm wide, and 1.0 cm deep. The object has a mass of 4.0 g. What is its density?

5. Find the density of a rectangular block of wood 4.0 cm by 3.0 cm by 2.0 cm if its mass is 4.5 g.

6. What is the density of acid in a car battery if 200 mL of the acid has a mass of 240 g?

7. What is the density of 25 cm^3 of salad oil that has a mass of 23 g?

8. What is the density of a material that has a mass of 32.0 g and a volume of 1.60 cm^3?

9. A glass beaker has a mass of 140 grams. After some water is added to the beaker, the mass of the beaker and water is 380 grams. Calculate the mass of the water. What is the volume of water in the beaker?

10. A block of a substance measures 5.32 cm by 6.25 cm by 4.03 cm. The block has a mass of 2.2 kg. What is its density in g/cm^3?

Quiz - Density

Name _____
Mod _____ Student number_____
Date _____

1. The density of a substance is the mass of a certain _____ of it.

2. Density is measured in _____. (What units?)

3. Which of the following materials is more dense than iron?
(water, aluminum, mercury)

4. What is the density of water? _____

5. Which is lightest? a cup of water a cup of alcohol a cup of mercury

6. Which is heavier, 100 g of mercury or 100 g of water? _____

7. A graduated cylinder containing 75 cc of water weighs 190 grams. What is the mass of the water? _____

8. The density of a substance is equal to its _____ divided by its _____.

9. Different liquids have: (a) the same density (b) different densities (c) a density of one gram per cubic centimeter

10. To find the volume of a liquid you would use a _____.

11. 5 cc of a liquid weighs 10 grams. The density of the liquid is _____.

12. A beaker and the mercury in it weighs 50 g. The beaker alone weighs 9.2 g. How many cubic centimeters of mercury are in the beaker? (mercury = 13.6 g/cc)

answer _____

13. A 10 cc block of silver has a mass of 105 grams. If the block were cut in half what would be the density of one of the halves? _____

14. A block measuring 2.5 cm in length, 10 cm in width and 2 cm in depth is placed in a graduate cylinder containing 75 cc of water. What is the volume reading on the graduate after the block has been added to the water?

answer _____

15. An object displaces 35 ml of water when placed in a graduate cylinder. If the object has a mass of 129.5 g, what is its density?

answer _____

EXTRA CREDIT:

A 108 g graduate contains mercury and a 75 g solid object that sinks in the mercury. The total mass is 455 g. The volume reading on the graduate is 25 cc. What is the density of the solid in the mercury?

answer _____

Lab # _____ The Density of Solids

Name _____
Mod _____ Student number _____
Date _____

Purpose: to determine the density of solids by using the formula D=M/V

Materials: graduated cylinder, beaker, overflow can, beam balance, metric ruler, (see chart)

Procedure:

1. Determine the mass and volume for each object listed on the chart. Use the volume formula (V = l x w x d) for objects having a regular shape. For those with an irregular shape use water displacement.

2. Round off all answers to the hundredths place. If time permits repeat the above for a second trial.

Observations:

solid	shape	l	w	d	V_{cc}	mass	m/v	density
marble								
cork								
lead sinker								
light cube								
styrofoam ball								
wooden block								
heavy cube								
rubber stopper								
metal slab								

Follow-up: List the items in the chart in order of increasing density. Least dense items first most dense last.

solid	density	solid	density
1.		6.	
2.		7.	
3.		8.	
4.		9.	
5.			

Follow-up Questions for Density Lab

Name _____
Mod _____ Student Number _____
Date _____

1. Read section Focus 2:7, page 33. What information can be found in table 2-2?

2. What is the density of water? _____

3. Rank the following in order of increasing density: mercury, water, aluminum

4. Define density.

5. What is the formula for determining density?

6. Look at figure 2-10, page 35 in your text. Copy the information next to this figure.

7. What measurements and calculations would you make to find the density of wood in a rectangular block?

8. A student announced that he had made a sample of a new material that had a density of 0.85 g/cc. How large a sample had he made?

9. A block of magnesium has a volume of 10 cc and a mass of 17 g. What is the density of the magnesium? (Show math)

10. A cube of cork measures 1.5 centimeters on a side and has a mass of 1 g.
    a) What is the density of the cork? (Show math)

    b) What would be the mass of 4 cc of the cork? (Show math)

11. Object (A) has a mass of 500 g and a density of 5 g/cc. Object (B) has a mass of 650 g and a density of 6.5 g/cc.
    a) Which object would displace the most water?

    b) Could object (A) and object (B) be made of the same material?

12. A small beaker contains 50 mL of liquid.
    a) If the liquid were mercury, what would be its mass?

    b) If the liquid were water, what would be its mass?

13. In SI, density is measured in what units? In other words, if mass is measured in grams, volume in cubic centimeters, then density is measured in _____

14. Why do ice cubes float in water?

Density

Name _____
Mod _____ **Student Number** _____
Date _____

Density is the mass of one unit volume of a substance. The density of a material may be easily calculated by dividing the mass of a material by its volume.

Substance	length cm	width cm	depth cm	Volume cm^3	Mass g	density formula m/v = d	density g/cm^3
a	12.9	10.7	3.2		235.2		
b	6.4	1.5	0.3		14.8		
c	13.5	4.6	1.1		478.17		
d	1.2	1.2	1.2		129.6		
e	4.79	3.35	2.9		25.0		
f	6.5	5.2	3.1		225.62		
g	11.22	0.5	0.2		2.24		
h	128.05	15.0	0.5		352.13		
i	50.0	1.0	0.5		50.0		
j	111.11	11.1	1.1		1356.6		
k	9.8	4.3	1.2		438.6		
l	9.8	4.3	1.2		129.0		
m	0.5	0.3	0.2		1.9		
n	10.0	1.1	1.0		10.0		

MASS - INTRODUCTION

Name _____
Mod ____ **Student Number** ____
Date _____

READING THE TRIPLE BEAM BALANCE

Materials: triple beam balance, pencil

Directions: Arrange the beam riders according to the amounts shown in the spaces below. Write the total mass in the space provided at the extreme right. (The mass will be equal to the sum of all the riders).

middle beam	last beam	first beam	mass (g)
			_____
200	30	5.2	_____
0	10	6.4	_____
400	0	3.3	_____
500	100	10.0	_____
0	0	9.5	_____
100	50	0.0	_____

Directions: Look at the mass shown on the right. Write in the correct amount that would be shown on each beam of your balance.

middle beam	last beam	first beam	mass (g)
_____	_____	_____	436.2
_____	_____	_____	198.7
_____	_____	_____	205.2
_____	_____	_____	27.2
_____	_____	_____	111.1
_____	_____	_____	539.3
_____	_____	_____	610.0

Science Interactions-Course 1
Science and Society (pp.146-147)

Name _____
Mod ____ Student number _____
Date _____

Metrics for All?

The Metric Conversion Act

1. What is the Metric Conversion Act?

2. How many different systems of measurement are we using in the United States today?

The Metric System Controversy

1. How long have people been trying to get the United States to use the metric system?

2. Why is industry opposed to changing to the metric system?

3 Give three reasons supporting a move to convert to the metric system.

The SI System

1. What does SI mean?

2. Where is SI used?

3. In what ways does SI differ from the English system of measurement?

4. How does SI prove to have an advantage over the English system?

Metric Conversion

1. There are several reasons people are not interested in changing to the metric system. Give one reason not to make the change.

2. We all use the term mile. How many kinds of miles are there? How many types of miles are there? Name them.

Should We Convert?

Knowing what you now have read about the metric system, do you think the government should pass a law requiring that the United States convert completely to SI units by a given time. Would the advantages of adopting the system outweigh the possible disadvantages?

You Try It!

Look at the diagram comparing the SI and the English units. Which SI unit would you use to measure each of the following?

a. a large carton of milk
b. the length of your arm
c. your height
d. distance across Maryland
e. your mass
f. a foot race