DENSITY PROBLEMS

1) A rock has a volume of 90 ml and a mass of 30g. Find the density.

TO FIND ρ: **MASS DIVIDED BY VOLUME**

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

2) What mass will 100 ml of zinc possess? ρ ZINC = 7.13 g/ml

TO FIND MASS: **MULTIPLY ρ BY VOLUME**

3) Gold has a density of 19.3 g/ml. What volume will 386 g of gold occupy?

TO FIND VOLUME: **MASS DIVIDED BY ρ**

4) A stone occupies 85 ml and has a mass of 25g. Will it float in water?

The density of water is

Since ρ WATER > ρ STONE

5) A garbage bag full of CO_2 occupies 26 L and has a mass of 52g. Will it float in air?

The density of air is

Since ρ AIR < ρ BAG

DENSITY REVIEW

IF YOU ARE TRYING TO FIND:

$\rho = m / V$

$m = \rho \times V$

$V = m / \rho$

Sink/Float:

ρ WATER = 1.00 g/ml

ρ AIR = 1.2 g/L

IN WATER:	ρ WATER > ρ OBJECT	OBJECT FLOATS
	ρ WATER < ρ OBJECT	OBJECT SINKS
IN AIR:	ρ AIR > ρ OBJECT	OBJECT FLOATS
	ρ AIR < ρ OBJECT	OBJECT SINKS

More Density Calculations!!

Name_____

Date_____ Per_____

Calculate the density of each substance. Then find the substance in the table in Think About It 7-6 on page 262 of BC Science 8.

1. A substance has a mass of 144 g and a volume of 600 cm^3. What substance is it?

2. A substance has a mass of 6923 g and a volume of 880 cm^3. What substance is it?

3. A substance has a mass of 725 g and a volume of 575 mL. What substance is it?

4. A substance has a mass of 1220 g and a volume of 90 mL. What substance is it?

5. A substance has a mass of 1771 g and a volume of 820 cm^3. What substance is it?

Name:
Date:
Block:

DENSITY: Practice problems

1. An unknown liquid has a density of 2000 g/L. Could this liquid be water? Explain.

2. A copper bracelet is placed in a graduated cylinder full of water. The water level rises from 15.6 mL to 28.0 mL. The mass of the bracelet is 101.7 g. Is the bracelet made of pure copper? How do you know? Explain.

3. You freeze 92 g of water, and it becomes a cube of ice.
   a. What is the mass of the ice cube? _____
   b. The cube's volume is 100 cm^3. What is its density?_____
   c. Will the ice cube float or sink in water?_____

4. A piece of magnesium has a volume of 20 cm^3 and a mass of 34 g. Calculate its density.

5. Find the mass of 55 cm^3 of lead if its density is 11.5 g/cm^3.

6. An object with a mass of 35 g is placed in a graduated cylinder containing water. If the water level rises from 22 mL to 31 mL, calculate the density of the object.

7. An aquarium has dimensions of 50 cm x 25 cm x 20 cm. Calculate :
   a. The volume of the aquarium in cm^3: _____. In litres: _____
   b. Calculate the mass of alcohol necessary to fill the aquarium : _____
      (density of alcohol = 0.79 g/cm^3)

Assignment

Answer these questions on a separate page in the correct scientific manner including:
a) Equation b) Substitution of values and c) Solution with units.

1. A block has a mass of 100 grams and measures /= 10 cm, w = 10 cm, h = 2 cm. Find its volume and density.

2. A steel cube (iron) has a mass of 78.6 grams and a volume of 10 cm^3.
   a) Calculate the density of the iron cube.

   b) What is the density of iron as given in your Table of Properties?

3. A cube has a mass of 89.5 grams and a volume of 10 cm^3.
   a) Calculate the density of the cube.

   b) Look in the Table of Properties to determine if the cube is aluminum, carbon, copper or gold.

4. Describe in your own words how to determine the density of a regularly shaped block.

5. A stone has a mass of 150 g and causes the water level in a graduated cylinder to rise from 50 mL to 75 mL when placed in it.
   a) Calculate the density of the stone.
   b) Will this stone float or sink in water? Give a reason.

6. A stone displaces 10 mL of water.
   c) What is the volume of the stone (use correct units)?
   d) If the stone has a density of 6 g/cm3, what is the mass of the stone?

7 A piece of volcanic pumice causes the water level in a cylinder to rise from 50 to 60 mL. If the pumice has a mass of 9 grams, what is the density of the pumice?

Name: _____
Date: _____
Period: _____

EXERCISES: DENSITY

Part 1: Answer the following questions. Include a) equation b) substitution c) solution with units.

1- If a piece of wood occupies 75 cm^3 and has a mass of 50 g, what is its density? Will it float on water?

2- A plastic bag filled with gas has a mass of 125 g and a volume of 100 litres. What is its density? Will it float in air?

3- Zinc metal has a density of 7.14 g/cm^3 under normal conditions. If we have 65 cm^3 of zinc, what mass of the metal is present?

4- Gold metal at room conditions has a density of 19.3 g/ cm^3. What mass is contained in 65 cm^3 of gold?

5- Lead has a density of 11.4 g/ cm^3. What volume is occupied by 100 g of lead?

6- Chlorine has a density of 3.17 g/L. What space is occupied by 100 g of chlorine?

7- Ice floats in water. What does this tell us about the density of ice?

8- Helium balloons float in air. What does this tell us about the density of these balloons?

9- Mercury has a density of 13.6 g/mL and lead has a density of 11.4 g/ cm^3. Will lead float or sink in liquid mercury?

Part 2: Density calculations

a) 60 g; 20 mL: D =_____

b) 2 kg; 2000 mL: D =_____

c) 100 g; 75 mL: D =_____

d) 51 g; 30 mL: D =_____

Science 8
BLOCK: _____
DENSITY

Name_____
Partner's name_____
Date_____

FINDING ρ of H_2O BY DIRECT MEASUREMENT

EACH PAIR OF STUDENTS NEEDS: 100 ml graduated cylinder
scientific balance

BALANCE # _____

Mass of empty graduated cylinder: _____ = A

Volume of water in graduated cylinder: _____ = V

Mass of graduated cylinder + water: _____ = B

CALCULATION: Mass of water in graduated cylinder = B — A = _____ = M

Density = $\frac{\text{mass}}{\text{volume}} = \frac{M}{V} = \frac{\text{g}}{\text{ml}} =$ _____ **g /mL**

Note: the density of water is 1.00 g /ml at 25°C (room temperature) and at standard pressure: 101.3 kPa

FINDING ρ of metals BY INDIRECT MEASUREMENT

EACH PAIR OF STUDENTS NEEDS: 100 ml graduated cylinder
scientific balance
1 piece of metal

SAMPLE #1: _____

Mass of metal: _____ = M

Initial Volume of water in graduated cylinder: _____ = A

Volume of metal + water: _____ = B (***"Water Displacement Method"***)

CALCULATION: Volume of metal = B — A= _____ = V

Density = $\frac{\text{mass}}{\text{volume}} = \frac{M}{V} = \frac{\text{g}}{\text{mL}} =$ _____ **g /mL**

DISCUSSION QUESTIONS:

1) Why was our first activity a DIRECT measurement of density?

2) Why was our second activity an INDIRECT measurement of density?

3) What types of matter can have their density determined directly?

4) When will indirect measurements of density ***not*** work?

FINDING ρ of metals BY INDIRECT MEASUREMENT

SAMPLE #2: _____

Mass of metal: _____ = M

Initial Volume of water in graduated cylinder: _____ = A

Volume of metal + water: _____ = B

CALCULATION: Volume of metal = B — A= _____ = V

Density = $\frac{\text{mass}}{\text{volume}} = \frac{M}{V} = \frac{\text{\_\_\_\_\_ g}}{\text{mL}} =$ _____ **g /mL**

SAMPLE #3: _____

Mass of metal: _____ = M

Initial Volume of water in graduated cylinder: _____ = A

Volume of metal + water: _____ = B

CALCULATION: Volume of metal = B — A= _____ = V

Density = $\frac{\text{mass}}{\text{volume}} = \frac{M}{V} = \frac{\text{\_\_\_\_\_ g}}{\text{mL}} =$ _____ **g /mL**

SAMPLE #4: _____

Mass of metal: _____ = M

Initial Volume of water in graduated cylinder: _____ = A

Volume of metal + water: _____ = B

CALCULATION: Volume of metal = B — A= _____ = V

Density = $\frac{\text{mass}}{\text{volume}} = \frac{M}{V} = \frac{\text{\_\_\_\_\_ g}}{\text{mL}} =$ _____ **g /mL**