

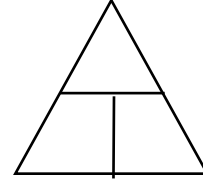
## Density

\_\_\_\_\_ is a \_\_\_\_\_ that can be useful if you have two substances that are similar in appearance and texture and you would like to identify them.

Density = \_\_\_\_\_

Where mass is measured in \_\_\_\_\_ or \_\_\_\_\_  
(1kg= \_\_\_\_\_g)

Where volume is measured in \_\_\_\_\_ or \_\_\_\_\_ or \_\_\_\_\_  
(1mL= \_\_\_\_\_, 1 cm<sup>3</sup> = \_\_\_\_\_ )



### Measuring mass and volume

i) Mass : \_\_\_\_\_

ii) Volume: depends if it's a regular or irregular shape

a) Regular: square or rectangular object, \_\_\_\_\_

*Example:*

b) Irregular: two methods

Graduated Cylinder: Volume of object = final volume - initial volume

*Example:*

Overflow Can:

- 1) Fill can to arm. Let excess water drip out
- 2) Place object in can, collect water that is displaced with graduated cylinder
- 3) Read graduated cylinder for volume

*Example:*

### **Density and particle theory**

- The particle theory states that matter is made up of particles packed together. Some particles can be packed closer than others.
- The same number of particles may take up different volumes depending on how they are packed.

Answer the following questions using the proper format for solving problems.

- 1) A diamond with a volume of  $2 \text{ cm}^3$  has a mass of 7g. What is the density of the diamond?
- 2) a) A metal cube measures  $5\text{cm} \times 3\text{cm} \times 2\text{cm}$ . It has a mass of 642g. Calculate the density of the cube.  
b) Is the cube made of gold? Explain.
- 3) A beaker when empty has a mass of 225 g. When 350 mL of an unknown liquid are poured into the beaker the combined mass is 500 g. What is the density of the liquid?
- 4) You have a graduated cylinder with 20 mL of water in it. You add 250 g of lead weights, and the volume rises to 42 mL. What is the density of lead?
- 5) A rubber stopper has a density of  $1.70 \text{ g/cm}^3$  and a volume of  $75 \text{ cm}^3$ . Calculate the mass of the rubber stopper.
- 6) What is the mass of a steel cube with a volume of  $10 \text{ cm}^3$ ? (Hint: Use the chart above.)
- 7) Cork has a density of  $0.2 \text{ g/cm}^3$ . What is the volume of a piece of cork with a mass of 0.4 g?
- 8) How much space would 100 g of mercury occupy? The density of mercury is  $13.6 \text{ g/cm}^3$ .

Substance	Density (g/ $\text{cm}^3$ )
Air	0.0013
Feathers	0.0025
Oak	0.6
Ice	0.92
Water	1.00
Bricks	1.84
Aluminum	2.70
Steel	7.80
Silver	10.50
Gold	19.30

### **Communication/Application**

- 9) Some objects will float on water, while others will sink. Use the concept of density to explain why wood will float, but steel will sink.
- 10) Many ships are made of steel. Why do steel ships float?
- 11) Around 250 B.C. Archimedes, a Greek mathematician, was asked to determine whether a craftsman had defrauded the King by replacing some of the gold in the royal crown with silver. While thinking one evening in the bathtub, Archimedes made a startling discovery that allowed him to solve the King's problem. Legend has it that he ran naked through the streets shouting "Eureka! Eureka!". Speculate as to how Archimedes figured out how to determine if the crown was made of gold. Be specific.