

Density Drill

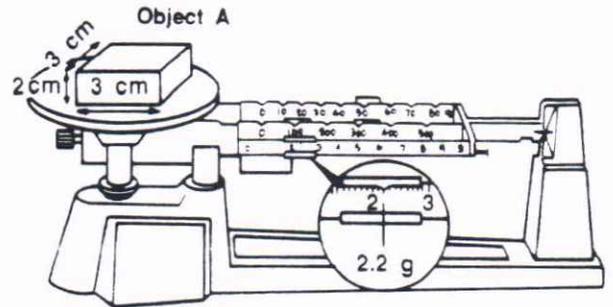
Some objects tend to be “heavy,” while other objects seem “light.” But unless you are comparing the same volume of each object, these descriptions have little value. And that is where the concept of density comes in. For density refers to how much mass an object has in a particular volume. Scientifically, density is described as mass per unit volume, or density = mass/volume. Because mass is measured in grams, and volume is measured in cubic centimeters, the unit for density is grams per cubic centimeter.

If the mass and volume of an object are known, its density can be determined by dividing the volume value into the mass value. Similarly, if the density and mass are known, the object’s volume can be determined by dividing the density value into the mass value. Finally, if an object’s density and volume are known, its mass can be found by multiplying these two values.

You can see how density, mass, and volume are related by doing this activity. In each situation, you are given enough information to determine the unknown value in the formula $D = M/V$.

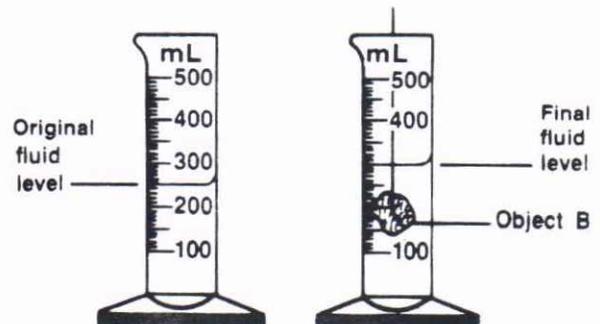
Object A

- The mass of object A, as shown by the positions of the balance riders, is _____ g.
- The volume of object A, as indicated by the given dimensions, is _____ cm^3 .
- Using the formula $D = \frac{M}{V}$, calculate the density of object A. _____ g/cm^3
- If object A is cut into two equal parts, what is the density of one half of A? _____ g/cm^3
 Of the other half? _____ g/cm^3 How does the density of object A compare to the density of half of object A? _____



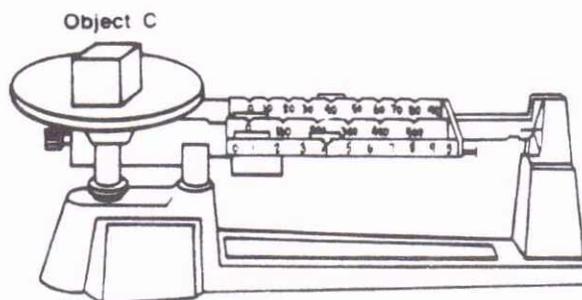
Object B

- The mass of object B has been determined to be 1250 grams.
- The volume of object B, as indicated by the change in fluid level in the cylinder, is _____.
- Using the formula $D = \frac{M}{V}$, calculate the density of object B. _____ g/cm^3



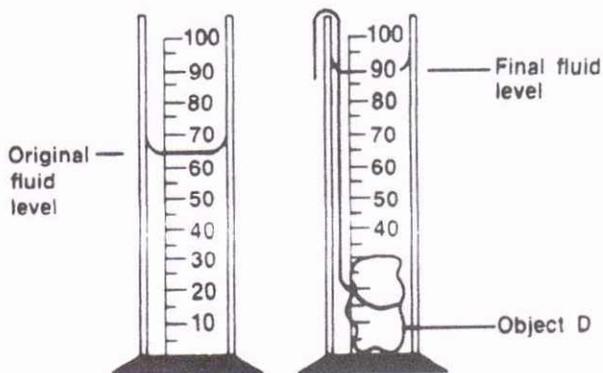
Object C

1. Object C is a perfect cube. The mass of object C, as shown by the position of the balance rider, is _____ g.
2. The density of object C has been determined to be 5.5 g/cm^3 .
3. Using the formula $V = \frac{M}{D}$, calculate the volume of object C. _____ cm^3
4. Since object C is a perfect cube, determine the length of each side of that cube. Hint: The formula for the volume of a cube is $V = L \times W \times H$. Length of any side of cube C = _____ cm.



Object D

1. The density of object D has been determined to be 1.4 g/cm^3 .
2. The volume of object D, as indicated by the change in fluid level in the cylinder, is _____ cm^3 .
3. Using the formula $M = D \times V$, calculate the mass of object D. _____ g



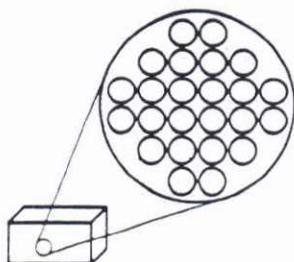
CONCEPT MASTERY

Text Reference: Section 11-20

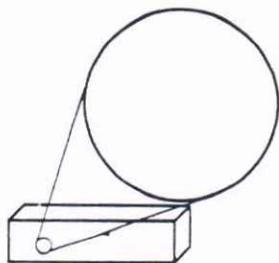
Density

The density of a substance is the mass of a unit volume of that substance. The density of different substances varies according to the type of material. Density changes as the substance undergoes phase changes.

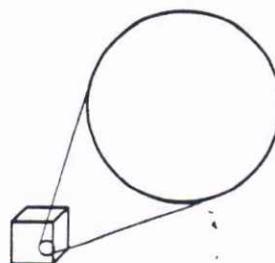
1. Objects A, B, and C are all made of the same substance. Draw the particles *per unit volume* in each object and calculate the density, mass, and volume.



A
 Density = 1.8 g/cm^3
 Mass = 5 g
 Volume = _____

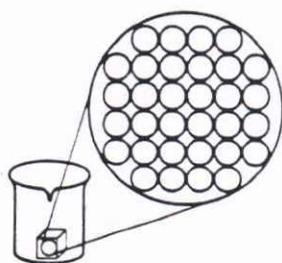


B
 Density = _____
 Mass = _____
 Volume = 5.6 cm^3

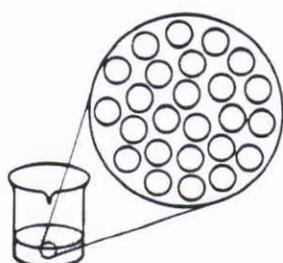


C
 Density = _____
 Mass = _____
 Volume = 1.4 cm^3

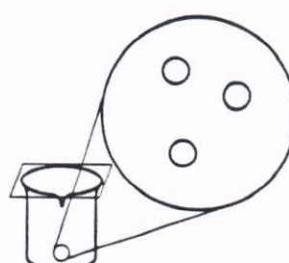
2. Beaker D contains 10 g of substance X. The beaker is heated and the substance changes phase. The circles show the number of particles in a unit volume of the substance in each phase. Estimate the density and mass of each phase, and calculate the volume.



D
 Solid
 Density = 2.2 g/cm^3
 Mass = 10 g
 Volume = _____



E
 Liquid
 Density = _____
 Mass = _____
 Volume = _____



F
 Gas
 Density = _____
 Mass = _____
 Volume = _____

3. *Substance:* Carbon dioxide
Phase: Solid

Phase: Gas

Volume	Mass	Density	Volume	Mass	Density
100 cm ³	156 g	_____	100 cm ³	0.198 g	_____

Ratio of solid density to gas density _____

Name of phase change from solid to gas _____

4. *Substance:* Mercury
Phase: Liquid

Phase: Solid

Volume	Mass	Density	Volume	Mass	Density
10 cm ³	135.9 g	_____	10 cm ³	136.5 g	_____

Ratio of liquid density to solid density _____

Name of phase change from liquid to solid _____

5. *Substance:* Pentane
Phase: Gas

Phase: Liquid

Volume	Mass	Density	Volume	Mass	Density
3800 cm ³	10.7 g	_____	3800 cm ³	2370 g	_____

Ratio of gas density to liquid density _____

Name of phase change from gas to liquid _____