

Density:

measures how tightly matter is packed

| Mass per unit volume

- $\rho = \frac{m}{V}$ OR $D = \frac{m}{V}$

- Units: g/cm^3

Also, recall $\text{mL} = \text{cm}^3$

| Everything has a unique density

| Determines whether something will “float or sink” in anything else

| Concept Application

| You are at Chuck E. Cheese’s, playing in the ball pit, when someone tosses a skee-ball into the pit.

- Will the skee-ball probably end up on the top or the bottom, and why?
- What about a beach ball that’s big but weighs more than a typical ball pit ball?

| Sample Problems

A ball has a mass of 10g and a volume of 5cm^3

$$\rho = \frac{m}{V} = \quad = \quad$$

A block has a density of 3 g/cm^3 and a volume of 10 cm^3 . Find its mass.

| Values to know

| ρ of water = 1 g/cm^3

(At STP - Standard Temperature and Pressure)

(@ 4°C and sea level)

| ρ of air = $.0012 \text{ g/cm}^3$ (STP)

|

1. What is the mass of 1L of water?
2. Will a block with a density of 1.3 g/cm^3 float or sink in water?
3. What is the density of an item with a volume of 30mL and a mass of 15g?
4. How can materials such as steel or concrete with a relatively high density be made to float in water?

| Demonstrations

— Equal volume set

— Equal mass set

| Practice 1

| A rock displaces 450 mL when measured with a graduated cylinder. Its mass is 425g.

| What is its density?

| Will it float in water?

| Practice 2

| Find the density of a cube measuring 2cm on each side with a mass of 10g

| Will it float in water?

| Practice 3

What is the density of a sample of aluminum that has a mass of 8.4g and a volume of 3.1 cm^3 ?

| Algebra Practice

| Some problems will require you to know more algebra.

- Isolating the denominator
- Dividing by a fraction

| Isolate the Denominator

| $X = \frac{Y}{Z}$ Rearrange this so Z = is
by itself on one side of the “ = “

| You will see with more practice that X and Z can trade places in a situation like this...

| Divide by a fraction

| Try these out:

$$\frac{4}{\frac{1}{2}} \quad \text{and} \quad \frac{X}{(Y/Z)}$$

| The rule: Dividing by a fraction is the same as multiplying by its reciprocal

- (reciprocal means the fraction upside-down)

| Algebra Trouble

| Aluminum has a density of 2.7 g/cm³

| Find the volume of a piece of aluminum with mass = 11.5g

| Challenge (group work)

| Find the mass of 350 mL of water

| Challenge (group work)

| A triangular tent is 100cm tall, 120 cm wide, and 250cm long.

— Determine its volume.

|

Super bonus challenge (finish at home and turn in tomorrow) (this will be online too!)

Find the volume of a pencil with radius 0.25cm and length 30cm.

What is the largest mass it could have and still float in water?

Calculate the density of an object that has a length of 23.5 mm, a width of 2.59 cm, and a height of 44.7 mm with a mass of 1234 g. WATCH UNITS