Name: _____

Period: _____

More Density

1.10

Less Dense Objects Float

If two objects are put together, the less dense one will float.

Heavy things don't sink (unless they are denser).

A ship is heavy, but it floats in water because it is less dense.

Light things don't float (unless they are less dense).

A penny is light, but it sinks in water because it is more dense.

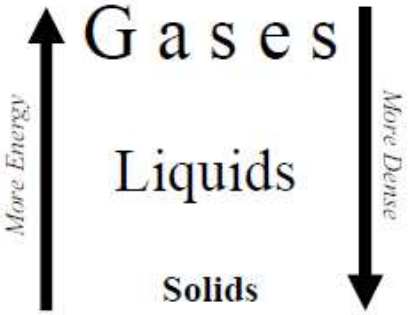
You can tell by the numbers, too. If the object's density < Liquid's density, the object will float.

Ex. 1 Object A: D = 1.56 g/mL
Liquid B: D = 1.2 g/mL
The object sinks! (It is more dense.)

Ex. 2 Object A: D = 0.85 g/mL
Liquid B: D = 1.0 g/mL
The object floats! (It is less dense.)

States of Matter and Density

For the same substance the three states of matter have different energies and different densities.

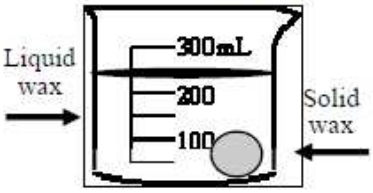


Gases: high energy; low density. Molecules bounce around, spreading out.

Liquids: Medium energy; medium density. Molecules slide around, staying close together.

Solids: Low energy; high density. Molecules are stuck together.

Solids sink in their liquids.



Solids are denser than their liquids.

Density of Water = 1 g/mL

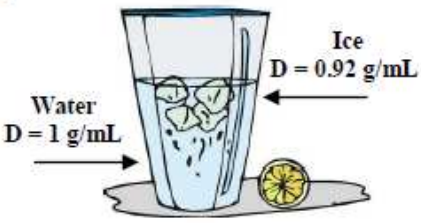
This means that every mL of water = 1 g
OR every gram of water = 1 mL

This makes calculations with water easy.

V_{water} **(in mL)** = m_{water} **(in g)**

Ex. 35 g water = 35 mL
46 mL of water = 46 g

Water: The Exception
Solid water floats in liquid water.



Density of Ice = 0.92 g/mL

Ice is less dense than water. Water is the ONLY substance whose solid floats in its liquid.

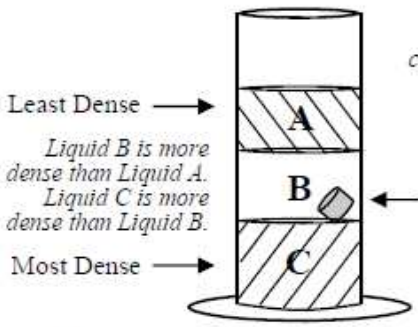
Floating Ice is Important for Life

Floating ice on lakes and ponds insulates fish during cold winters.

The expansion of water freezing breaks down rocks into soil.

Density Columns

When different liquids are put together in a column they separate due to their different densities. If they are put in a different order, they will still end up in the right order.



Liquid B is more dense than Liquid A. Liquid C is more dense than Liquid B.

By putting an object into the column you can estimate its density by where it floats or sinks.

This object has a density greater than liquid B, but less than liquid C.

All sections marked with a ⚛ are considered essential concepts and must be completed to receive full credit on WS.

1. Solids	A. Only solid that floats in its liquid.
2. 1.0 g/mL	B. Tightly packed atoms; very dense.
3. Gases	C. Loose atoms; low density.
4. 0.92 g/mL	D. Density of water.
5. Density Column	E. Separates liquids by density.
6. Liquids	F. Density of ice.
7. Ice	G. Close atoms; medium density.

True or False? If false, correct the statement.

Light things float.

Heavy things sink.

Sinks or Floats in Water?

__ D = 1.2 g/mL
__ Ice
__ D = 0.85 g/mL
__ Styrofoam
__ A rock
__ D = 2.2 g/mL

Circle the one that is more dense.

Liquid wax or solid wax?

Solid water or liquid water?

Liquid iron or solid iron?

Liquid nitrogen or gaseous nitrogen?

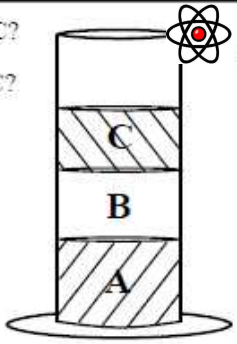
Which liquid is the most dense? A, B, or C?

Which liquid is the least dense? A, B, or C?

Which liquid is which? A, B, or C?
D = 1.35 g/mL = Liquid ___
D = 0.86 g/mL = Liquid ___
D = 1.00 g/mL = Liquid ___

Label the liquid you know.

Draw where ice will float in the column.

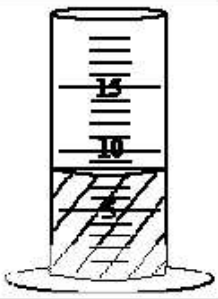


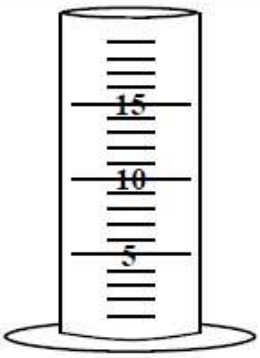
What is the density of water?

If you have 30 grams of water, how many mL of water do you have?

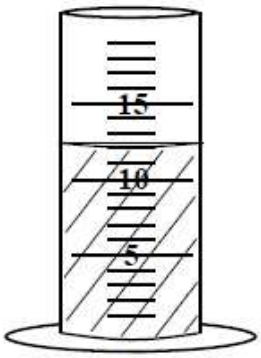
How many grams is 23 mL of water?

How many grams of water is in the graduated cylinder?

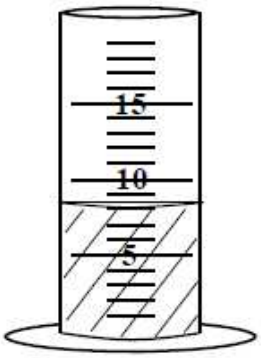




Empty: 12 grams



With Liquid A: 24 grams



With Liquid B: 28 grams

Mass of Liquid A: _____
Volume of Liquid A: _____

Density of Liquid A: _____

Mass of Liquid B: _____
Volume of Liquid B: _____

Density of Liquid B: _____

Which one would float on top?

In the Lab

Mass of empty cylinder: ☐

Fill in the following table for water.

Mass	Volume	Density

From the findings of your data, explain the relationship between grams and milliliters.