


Name: \_\_\_\_\_  
 Period: \_\_\_\_\_


**Properties of Matter**

**Hardness** How difficult it is to scratch something.

*A diamond is very hard because you can't scratch it.*




*Soap is easy to scratch, so it is not hard.*




**Brittleness** How easy it is to shatter when dropped or struck.

*Glass is brittle because it will easily shatter if dropped.*

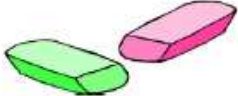


*Wood is not very brittle because it will not shatter if dropped.*




**Elasticity** How much something can bend and return to its original shape.

*Rubber is very elastic because it can stretch without breaking.*




*A pencil is not elastic because it will break if you bend it.*




**Malleability** How easy it is to pound something into thin sheets.

*Gold is very malleable because you can pound it into very thin sheets.*




*Ice is not malleable because it will shatter instead of spread out.*




**Viscosity** How slowly a liquid pours.

*Syrup pours very slowly, so it is very viscous.*




*Water pours quickly, so it is not viscous.*




**Tensile Strength** How hard it is to break something by pulling it.


*Spider webs can be pulled very hard before they break. Spider webs have more tensile strength than steel cables.*



*Tissue paper is easily pulled apart, so it has very little tensile strength.*



**Density** Density is how compact an object is. Density is a measure of how tightly packed the atoms of a substance are. More tightly packed atoms make a denser substance.



*A ping-pong ball and a golf ball are approximately the same size, but the golf ball is heavier, so it is denser.*

If two objects have the same size (volume) the one with more mass is denser.

30 g

10 g

*This one is denser.*

If two objects have the same mass the smaller one (less volume) is denser.

30 g

30 g

*This one is denser.*

Density:  $D = \frac{m}{v}$



in g/mL or g/cm<sup>3</sup>      Mass in grams (g)      Volume in cm<sup>3</sup> or mL

**Density = Mass ÷ Volume**

$D = \frac{m}{v}$  is a formula. Put the number in the correct part of the formula to find density.

*Ex. An 20 gram object has a volume of 5 cm<sup>3</sup>. Find its density.*

**Solution:**  $D = \frac{m}{V} = \frac{20g}{5cm^3} = 4 \frac{g}{cm^3}$

1. Density	a. A measurement of how easily a solid can be pounded into thin sheets 	1. Tensile Strength	A. A unit of volume that equals 1 mL. 
2. Hardness	b. A measurement of the "compactness" of a substance; ratio of mass to volume.	2. viscosity	B. In a formula, what the horizontal line means: ex. the line in: $\frac{m}{v}$
3. Brittleness	c. Measure of a solid's ability to return to its original shape after stretching.	3. $\text{cm}^3$	C. Measure of a fluid's resistance to flow. (How thick a fluid is.)
4. Elasticity	d. A measure of how easily a solid will shatter.	4. g/mL	D. Measure of how hard it is to break something by pulling.
5. Malleability	e. A measure of how easily a solid can be scratched.	5. $\div$	E. Unit of density.



A soccer ball and a bowling ball are approximately the same size.



Which one is more dense?

Why?

When building a bridge, engineers want the bridge cables to have great \_\_\_\_\_.

Glass can be scratched by quartz. Which one is harder?

Lead feels very heavy for its size. It is very \_\_\_\_\_.

Transmission fluid is a very thick oil that flows slowly. Transmission fluid is very \_\_\_\_\_.

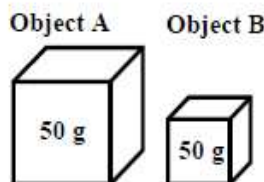
When a fluid gets hotter, do you think it will be more or less viscous? (*Think of warmed-up syrup.*)

When gold is hammered it "squishes". Iron Pyrite is known as "Fool's Gold". It is not \_\_\_\_\_ like gold, but shatter into many pieces when struck by a hammer. Iron Pyrite is \_\_\_\_\_.

A hunter's wood bow stores energy that is given to the arrow. The wood's ability to springs back means it is very \_\_\_\_\_.

Which object is the most dense?

Why?



An object has a volume of  $3.5 \text{ cm}^3$  and a mass of 7 grams. Find the object's density.

If 60 grams of a liquid takes up 120 mL, how dense is the liquid?

**Challenge:** If a substance has a density of  $2.5 \text{ g/cm}^3$ , how much mass will  $50 \text{ cm}^3$  of it have?

In science we describe substances and their various properties. Each substance has many different properties. Fill in the following table, deciding how each property best describes the following substances.

Substance	Dense?	Brittle?	Viscous?	Malleable?	Elastic?	Hard?	Tensile Strength?
Glass	medium	yes	N/A	no	no	yes	high
Rubber							
Ice							
Molasses							
Steel							
Styrofoam							