

## Volume, Mass and Density

### A Supplementary Activity for Students

#### Part I: Finding the volume of an object

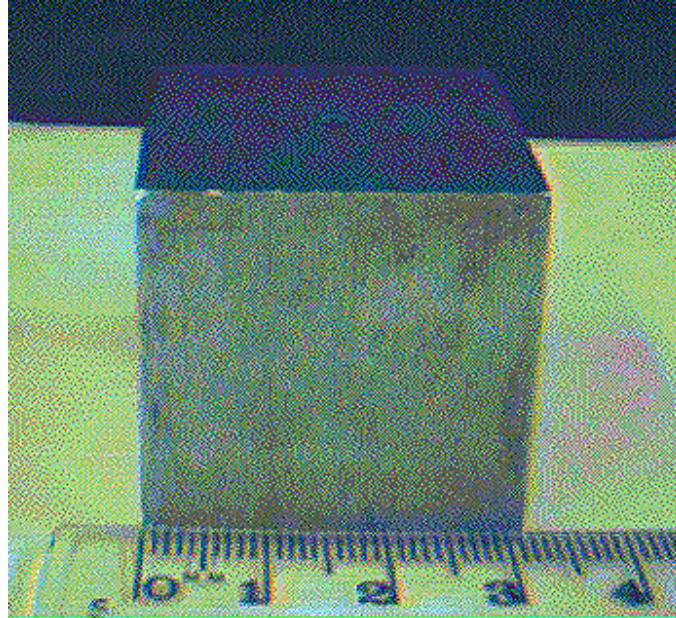
*What will happen when the metal block is slowly lowered into the water?*



Is the volume of water displaced equal to the volume of the object? Let's find out.

The volume of the metal block (cube) can be found using the formula  $V=(\text{side})(\text{side})(\text{side})$ .

*What is the volume of the cube that was lowered into the graduated cylinder? Consider uncertainties.*



*What was the amount of water displaced by the object? Consider uncertainties.*



Before



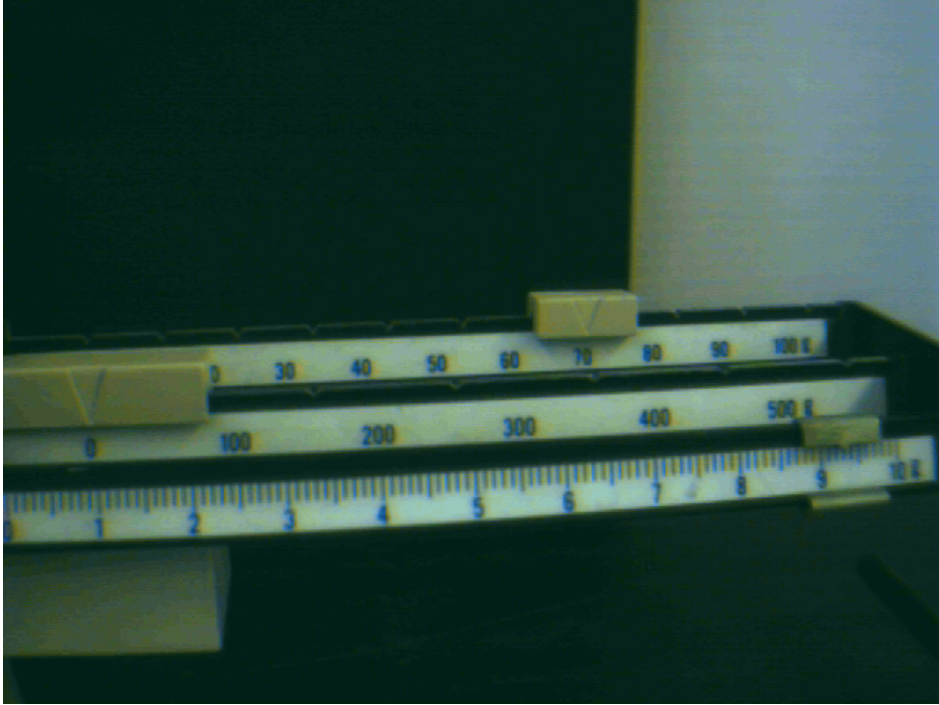
After

*Why are the volumes not exactly the same?*

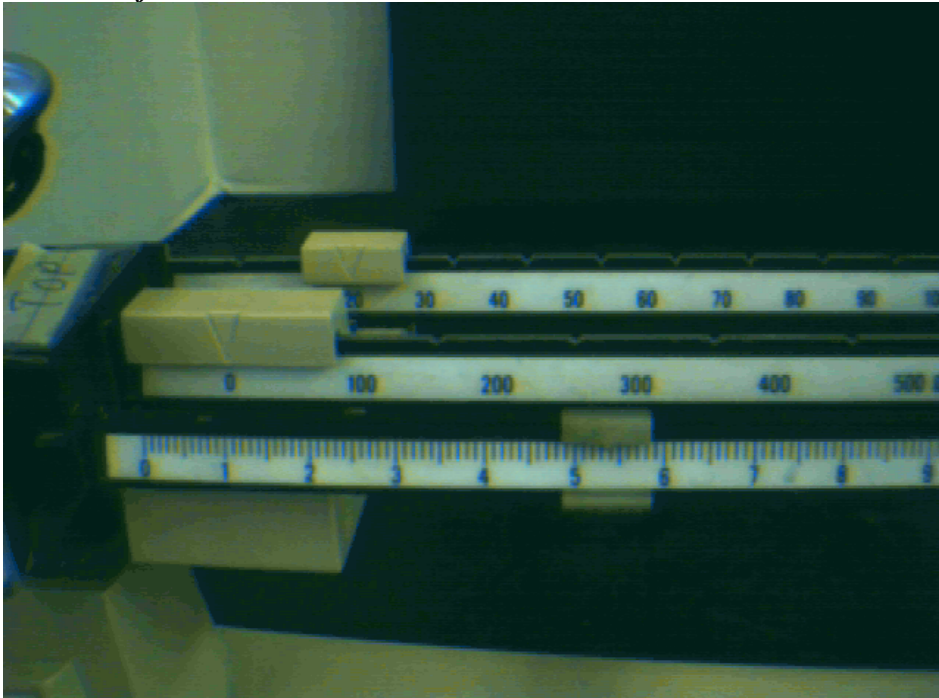
## Part II: Finding the mass of an object.

Mass is the amount of matter an object has. It can be measured using a balance.

*What is the mass of the block that was lowered into the water?*



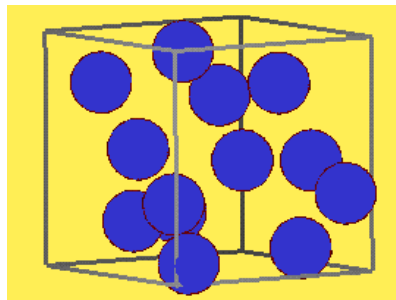
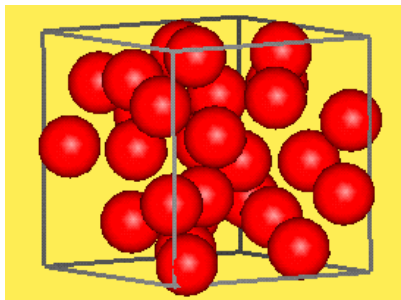
*What is the mass of another block that has the same volume as the metal block?*



*If both objects have the same volume, why does the metal block have more mass?*

### Part III. Finding the density of an object

*Take a look at the two boxes below. Each box has the same volume. If each ball has the same mass, which box would weigh more? Why?*



The box that has more balls has more mass per unit of volume. This property of matter is called density. The density of a material helps to distinguish it from other materials. Since mass is usually expressed in grams and volume in cubic centimeters, density is expressed in grams/cubic centimeter.

We can calculate density using the formula:  $\text{Density} = \text{Mass}/\text{Volume}$ .

*What is the Density of each of the blocks used in experimental part, considering uncertainties?*

Density for some common substances are:

SUBSTANCE	DENSITY ( G/CM <sup>3</sup> )
AIR	0.0013
WOOD (OAK)	0.85
WATER	1.00
ICE	0.93
ALUMINUM	2.7
LEAD	11.3
GOLD	19.3
ETHANOL	0.94
METHANOL	0.79

*Using the above table can you tell what material the two blocks are made of?*

Reference: [http://www.nyu.edu/pages/mathmol/modules/water/density\\_intro.html](http://www.nyu.edu/pages/mathmol/modules/water/density_intro.html)