Mass, Weight and Density

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1.3:
Mass and Weight

Definitions:

1) **Mass is defined as the amount of matter in a substance**. It is not a variable that can be subjected to change and is also the property which resists a change in state of motion(inertia)
2) **Weight is the force of gravity which acts upon a body of mass.**

In earth, the force of gravity is roughly 10N. This may differ from planet to planet. Take note that no matter where you are, your mass will remain constant but your weight may change due to changes in strength of the force of gravity.

Law of Conservation of Mass: This law states that mass of reactants and mass of products will remain equal. Hence, no matter if the shape or form of an object changes, its mass remains the same.

1.4:
Density

Density is defined as **mass per unit volume.** It is affected by mass but should not be referred to as 'how heavy an object is.' Take an example of the same volume of cotton and same volume of iron. The same volume of iron will weigh higher as its density is greater in value. Hence, density is:

$$Density(\rho) = \frac{mass}{volume}$$

This means that density is proportional to mass but inversely proportional to volume. To find the density of a liquid or a regular solid, simply obtain its value for mass and dividing by its volume. To find the density of an irregular solid, displacement method is implemented.

Volume for irregular solid:

1) Find mass by using a balance
2) Fill a beaker to a known volume
3) Submerge the solid completely. Take note of new volume
4) Volume of object is the change in volume of the beaker
5) Density is then simply mass divided by volume

Density of an object can help us predict whether objects will float or sink in a body of liquid. Certain objects sink as it is denser and the opposite is true.

Some might question, why ships of huge size and made up of vast amounts of metal is able to float effortlessly. This is due to the presence of air compartments in the bottom of the ship. This causes the overall density of the ship to be less dense to that compared to sea water. Another great example to demonstrate the concept of density is when you are swimming. If you breathe in and try to submerge yourself, your body will naturally tilt in such a way that from your chest and above, it will somehow try to 'float' whereas your lower body will be at the bottom. On the other hand, if you exhale, your body will naturally sink.