Block-1 General Physics

Chapter-1

Length and time:

- Measuring small distances

While measuring using a meter rule, one end of the object should be correctly placed next to the start of the meter rule (i.e. 0 cm).

While not starting from zero the measured distance must be subtracted by the original starting distance.

Another method can be done by taking an average, ex: measure the width of 100 sheets and divide the value by 100; this gives the value for the width of one sheet.

- Measuring the volume of an object

If the object is regular then measure the required values and plug them into the volume formula.

If the object is irregular with a density greater than water (sinks in water), fill the measuring cylinder with a known amount of water and then add the object. Record the reading of the water + object and subtract this value by the volume of water.

If the object is regular with a density lesser than water (does not sink in water), fill the measuring cylinder with a known amount of water and a metal block, record this value. Remove the metal block and place the object inside the water and then the metal block on top of it and record this value. Subtract the value with the object by the value without the object.

- Measuring the mass of an object

Digital top pan balance can be used to measure the mass of any object.

DO NOT GET CONFUSED WITH WEIGHT AND MASS: mass is a measurement of the amount of matter something contains, while Weight is the measurement of the pull of gravity on an object.

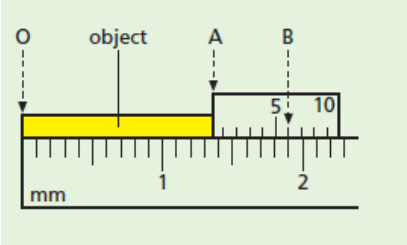
- Measuring time

A stop watch or a ticker timer

To improve the accuracy of the answers, more number of readings has to be taken and the average of all the readings.

For ex: record the time for 10 swings of a pendulum, repeat the experiments five more times. Add all the values and divide it by 10 to get the average.

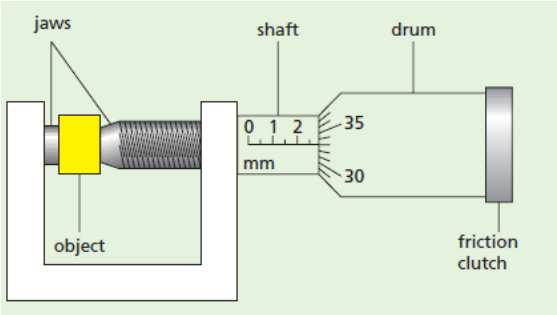
- Vernier Calipers



The object is shaded in yellow color, the distance OA is 1.3cm.

There is a small sliding scale next to the object, check if the line on the sliding scale exactly continues the line from the main scale. The line meets at 0.06cm (basically the sixth line in the sliding scale). Now add both the values 1.3cm+0.06cm= 1.36cm which is the answer.

- Micrometer screw gauge



The shaft has a reading of 2.5mm; the drum has a reading of 0.33mm

The answer is 2.5mm+0.33mm= 2.88mm

Vernier calipers and Micrometer screw gauge are used to measure lengths of small objects, diameters, etc.

Chapter-2

Motion:

- Speed

Average speed= total Distance travelled/ total time taken

Units: Distance= m, time=s, speed= m/s,

- Distance-time graphs

Slope of a line in the graph represents the velocity

A line parallel to x-axis shows the object is not moving

A line with increasing gradient shows that the object is accelerating

- Speed-time graphs

Area under the speed-time graph gives the distance travelled

Slope or gradient of a line in the graph represents the acceleration

A line parallel to the x-axis has a constant speed

A line with an increasing gradient has uniform acceleration

Positive gradient is acceleration, negative gradient is deceleration

- Velocity

Velocity= displacement/ time taken

Distance is the total distance travelled whereas displacement is the shortest distance between the start and the end point.

Units: Displacement=m, time=s, velocity=m/s

- Velocity-time graphs

Area under the velocity-time graph gives the distance travelled

Slope or gradient of a line in the graph represents the acceleration

A line parallel to the x-axis has a uniform velocity

A line with an increasing gradient has uniform acceleration

- Acceleration

When air-resistance is negligible the acceleration is constant or the object falls with uniform acceleration. This is called acceleration of free fall.

The gravitational field varies slightly over the Earth.

When an object is falling the g value is +10m/s^2 and while rising the g value is -10m/s^2

Rate of change of velocity “or” Change in velocity by the time

a= (v-u)/t

Units: v=m/s, u=m/s, t=s, a=m/s^2

- Motion of object

When there is no air resistance both the objects will fall at the same time as the gravitational force attracts both the objects with the same magnitude. Everyone might think an object with greater mass falls faster because it experiences a greater downward pull. This assumption is wrong because, when we use Newton’s second law, the heavier object will exert a greater weight against the motion. Inertia is dependent on weight so inertia increases, because inertia increases force acting against the motion also increases. Therefore both objects will fall at the same time.

When there is air resistance the heavier objects falls before the lighter object, this is because the air resistance against the motion of the objects. As terminal velocity is the final velocity in which the object will fall, the value of the final velocity is greater for the heavier object.

Chapter-3

Forces and motion:

- Weight- mass relationship

Weight acts towards the ground, therefore it is considered as gravitational force

Mass is a measurement of the amount of matter something contains, while Weight is the measurement of the pull of gravity on an object.

When an object has a greater mass the inertia of the object is also greater, this resists the motion of the object. Mass is dependent on inertia, motion is dependent on inertia.

Weight is the force an object exerted due to gravitational field given by F=ma, on earth a=g=9.81m/s^2. Therefore the weight is the effect of gravitational field.

Chapter-4

Density:

- Density

Density= Mass/ Volume

p= m/v

- Volume by displacement

If the object is regular with a density lesser than water (does not sink in water), fill the measuring cylinder with a known amount of water and a metal block, record this value. Remove the metal block and place the object inside the water and then the metal block on top of it and record this value. Subtract the value with the object by the value without the object.

- Mass

Use a balance to measure the mass.

Plug in the values into the formulae to get the density of the object.

- Floating and sinking

When an object has a greater density than the liquid in which it is then the object will sink.

When an object has lesser density compared to the liquid then the object will float.