



Ch 10: Gravitation

1. State the universal law of gravitation.

The universal law of gravitation states that every object in the universe attracts every other object with a force called the gravitational force. The force acting between two objects is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centres.

2. What do you mean by free fall?

Earth's gravity attracts each object to its centre. When an object is dropped from a certain height, under the influence of gravitational force it begins to fall to the surface of Earth. Such an object movement is called free fall.

3. What do you mean by acceleration due to gravity?

When an object falls freely from a certain height towards the earth's surface, its velocity keeps changing. This velocity change produces acceleration in the object known as acceleration due to gravity and denoted by 'g'.

The value of the acceleration due to gravity on Earth is, $g = 9.8 \text{ m/s}^2$

4. What are the differences between the mass of an object and its weight?

<i>Mass</i>	<i>Weight</i>
<i>Mass is the quantity of matter contained in the body.</i>	<i>Weight is the force of gravity acting on the body.</i>
<i>It is the measure of inertia of the</i>	<i>It is the measure of gravity.</i>

<i>body.</i>	
<i>It only has magnitude.</i>	<i>It has magnitude as well as direction.</i>
<i>Mass is a constant quantity.</i>	<i>Weight is not a constant quantity. It is different at different places.</i>
<i>Its SI unit is kilogram (kg).</i>	<i>Its SI unit is the same as the SI unit of force, i.e., Newton (N).</i>

- 5. Why is it difficult to hold a school bag having a strap made of a thin and strong string?**

Pressure can be given by the formula,

$$P = F / A$$

Pressure is inversely proportional to the surface area on which the force is acting. The smaller is the surface area, the larger will be the pressure on the surface on which the force is being acted upon. In the case of a thin strap of the school bag, the contact surface area is very less. Hence, the pressure exerted on the shoulder is very high. Therefore, it becomes difficult to hold a school bag with a thin strap.

6. What do you mean by buoyancy?

The liquid exerts an upward force on any object when it is immersed in a liquid or fluid. The tendency of the liquid to exert such an upward force on the object is called buoyancy, and the upward force which is exerted on the object by the liquid is called the buoyant force.

7. Why does an object float or sink when placed on the surface of the water?

If the density of an object is greater than the density of the liquid, it will sink into the liquid. This is due to the buoyant force which is acted by the object is less than the force of gravity.

On the contrary, if the density of the object is less than the density of the liquid, it floats on the liquid's surface. This is because the force that is acting on the object is greater than the force of gravity.

8. You find your mass to be 42 kg on a weighing machine. Is your mass more or less than 42 kg?

A weighing machine measures the body weight and is calibrated to indicate the mass. If we stand on a weighing machine, the weight acts downwards while the upthrust due to air acts upwards. So, our apparent weight becomes less than the true weight. This apparent weight is measured by the weighing machine and therefore the mass indicated is less than the actual mass. So, our actual mass will be more than 42 kg.

9. You have a bag of cotton and an iron bar, each indicating a mass of 100 kg when measured on a weighing machine. One is heavier than other. Can you say which one is heavier and why?

The bag of cotton is heavier than the iron bar. This is because the surface area of the cotton bag is larger than the iron bar. Hence, more buoyant force acts on the bag than that on an iron bar. This makes the cotton bag heavier than its actual value. For this reason, the iron bar and the bag of cotton show the same mass on the weighing machine, but the mass of cotton bag is more than that of the iron bar.

Actual weight = Measured Weight + Buoyant Force