

Chapter 10 Gravitation

Question 1 State the Universal law gravitation?

Answer : According to Universal Law of Gravitation every object in universe attracts every other object with a force known as Gravitational force.

It states that

Force F be the force of attraction between two objects P and Q of masses M and m is given by

$$F = G \frac{Mm}{r^2}$$

Here G is the constant known as Universal Gravitational constant and its value is

$$G = 6.673 \times 10^{-11} \text{ Nm}^2 \text{ Kg}^{-2}$$

Question 2. Write the formula to find the magnitude of the gravitational force between the earth and an object on the surface of the earth.

Answer:

Let F be the force of attraction between earth and an object on its surface. Again assume that M_e be the mass of earth and m be the mass of object on the surface of earth. Formula for the magnitude of the gravitational force between the earth and an object on the surface of the earth is given by using Universal Law of Gravitation. So required formula is

$$F = G \frac{M_e m}{r^2}$$

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Question 1: What do you mean by free fall?

Answer : Gravity of earth attracts every object towards its center. When an object is dropped from a certain height , it begins to fall towards Earth's surface under the influence of gravitational force. Such a motion of object is called free fall.

Question 2 : What do you mean by acceleration due to gravity?

Answer : When an object falls freely towards the surface of earth from a certain height, then its velocity changes. This change in velocity produces acceleration in the object which is known as acceleration due to gravity denoted by letter g . The value of acceleration due to gravity is $g = 9.8m/s^2$.

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Question 1 what are the differences between mass of an object and its weight?

Answer.

Mass:-

1. Mass is the quantity of matter contained in the body
2. It is the measure of inertia of the body
3. It is a constant quantity for any object.
4. It is a scalar quantity and only has magnitude
5. SI unit of mass is Kg

Weight:-

1. Weight is the gravitational force acting on the body
2. It is the measure of gravity
3. Weight of an object is not a constant quantity it is different at

different places.

4. It is a vector quantity as it has both magnitude and direction.

5. Its SI unit is N (newton) same as the SI unit of force.

Question 2 . Why is the weight of an object on the moon $(1/6)$ th its weight on the earth?

Answer : Gravity is directly related to mass. The more mass an object has, the more gravitational pull it has.

Now, the moon is significantly smaller than the earth (in fact, it is about the size of the earth's core). Gravity is dependent on the size of the object. Your weight on the moon is $1/6$ of that on earth because the moon has $1/6$ the mass of the earth.

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Question 1. Why is it difficult to hold a school bag having a strap made of a thin and strong string?

Answer: It is difficult to hold a school bag having a thin strap because the pressure on the shoulders is quite large. This is because the pressure is inversely proportional to the surface area on which the force acts. The smaller is the surface area the larger would be the pressure on the surface. In the case of a thin strap, the contact surface area is very small. Hence pressure exerted on the shoulder is very large.

Question 2 .What do you mean by buoyancy?

Answer :The upward force exerted by a liquid on an object that is immersed in it is known as buoyancy.

Question 3. Why does an object float or sink when placed on the surface

of water?

Answer : If the density of an object is more than the density of the liquid then the object would sink this happens because in this case buoyant force that is acting on the object due to liquid is less than the force of gravity acting on the object. If the density of object is less than the density of the liquid , then it floats on the surface of the liquid , this happens because the buoyant force acting on the object is greater than the force of gravity.

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Question 1. You find your mass to be 42 Kg on a weighing machine. Is your more or less than 42 K?

Answer : On a weighing machine mass is measured by comparing the weights. So when you weigh your body an upward force (buoyant force) acts on it which causes machine to show your weight less than the actual weight.

Question 2. You have a bag of cotton and an iron bar, each indicating a mass of 100 Kg when measured on a weighing machine. In reality one is heavier than other. Can you say which one is heavier and why?

Answer : Actual weight of any object is equal to the sum of its measured weight and the buoyant force. The bag of cotton is heavier since it is larger than iron bar, so the buoyant force is larger in case of cotton hence actual weight of cotton bag is more and it is heavier.