

CBSE Test Paper 05
Chapter 10 Gravitation

1. Two objects of different masses falling freely near the surface of the moon would **(1)**
 - a. have different acceleration
 - b. have same velocities at any instant
 - c. undergo a change in their inertia
 - d. experience forces of same magnitude

2. A body at rest having uniform acceleration is **(1)**
 - a. possible only near the SUN
 - b. any body thrown vertically up against gravity
 - c. can be released only on the moon
 - d. non-existing

3. While performing an experiment a solid was immersed fully in water and it was observed that the solid has suffered an apparent loss in its weight. This apparent loss in weight of the solid must be equal to the: **(1)**
 - a. weight of water displaced by the solid
 - b. weight of the solid in water
 - c. weight of the solid in air
 - d. weight of water filled in the vessel

4. Statement A: A person will weight more in Ooty than in Delhi,
Statement B: Mass is measured by pan balance and weight is measured by spring balance.
Which of the two statements is true? **(1)**
 - a. both A and B
 - b. neither A nor B
 - c. statement B
 - d. statement A

5. Statement A: Mass of a body is a fundamental property
Statement B: Weight is a fundamental property..

Which of the two statements is true? **(1)**

- a. statement A
- b. neither A nor B
- c. both A and B
- d. statement B

6. Two masses m and M are kept at a distance r . The ratio of the force exerted on m due to M and that of M due to m is equal to **(1)**

- a. m/M
- b. Mr/M
- c. M/m
- d. 1:1

7. Calculate the mass of the Earth. given radius of the Earth is $6.4 \times 10^6 m$. **(1)**

- a. $5.5 \times 10^{24} \text{kg}$
- b. $6.9 \times 10^{23} \text{kg}$
- c. $6 \times 10^{24} \text{kg}$
- d. $7.5 \times 10^{24} \text{kg}$

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8. Which force causes things to fall towards the earth? **(1)**

9. In what direction does the buoyant force on an object immersed in a liquid act? **(1)**

10. You find your mass to be 42 kg on a weighing machine. Is your mass more or less than 42 kg? **(1)**

11. Define density and relative density? **(3)**

12. A cylindrical block of wood of height 4.2 m and mass 100 Kg floats vertically in water. The relative density of wood is 0.8 m/v **(3)**

- i. What height of the block will be seen above the water?
- ii. If block of lead of mass 10 kg is placed, what height of the block will be seen above

water?

13. A bag of sugar weighs W at some place on the equator. If this bag is taken to Antarctica, will it weigh same, more or less? Give a reason for your answer. **(3)**
14. 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? **(3)**
15. What are the differences between the mass of the object and its weight? **(5)**

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Answers

1. b. have same velocities at any instant

Explanation: Object of different masses falling freely near the surface of the moon would have the same velocities at any instant because they will have same acceleration due to gravity.

2. b. any body thrown vertically up against gravity

Explanation: When an object is thrown vertically upwards at the maximum height the velocity is going to be zero, however acceleration is not zero. If there is no velocity, there can not be acceleration.

3. a. weight of water displaced by the solid

Explanation: Weight loss = upthrust. So, app. weight = $W_{\text{air}} - W_{\text{lost}}$

4. c. statement B

Explanation: Value of g decreases as we move at higher altitude, so 'g' is less at Ooty than Delhi. Weight will be less in Ooty than Delhi. Mass is measured by pan of beam balance and weight is measured by spring balance.

5. a. statement A

Explanation: Mass of a body always remains same. Mass is independent of other factors. Hence mass is a fundamental property. On the other hand weight of the body is the force by which it is attracted by earth that depends upon value of 'g'. So, weight is not a fundamental factor.

6. d. 1:1

Explanation: Gravitational force between two bodies $F = G \frac{Mm}{r^2}$. The value of force exerted on m due to M will be equal to that of M due to m. so, the ratio will be 1:1.

7. c. 6×10^{24} kg

Explanation: $g = \frac{GM}{r^2}$

$$M = \frac{gr^2}{G} = \frac{9.8 \times (6.4 \times 10^6)^2}{6.67 \times 10^{-11}} = 6 \times 10^{27} \text{ m} = 6 \times 10^{24} \text{ Km}$$

8. Gravitational force.
9. An object immersed in a liquid experiences buoyance force In the upward direction only.
10. When we weigh our body, an upward force on it. The upward force is the buoyant force. As a result the body gets pushed slightly upwards, causing the weighing machine to show the value less than the actual value.
11. Density of a substance is defined as the mass of the unit volume of the substance. Its units are Kg/m^3 .

Relative Density of a substance is the ratio of the density of the substance to the density of water.

$$\text{Relative Density of substance} = \frac{\text{Density of substance}}{\text{Density of water}}$$

Relative density has no unit.

12. i.
$$\frac{\text{The Density of the floating body}}{\text{Density of fluid in which it floats}} = \frac{\text{Height immersed}}{\text{Total height}}$$

$$\frac{0.8}{1.0} = \frac{h}{4.2}$$

$$h = 4.2 \times 0.8 = 3.36\text{m}$$

ii. Mass of the block of wood = 100 Kg

Mass of water displaced = 100 Kg

Mass of lead placed on the block of wood = 10 Kg

Total mass of the block of wood + weight placed on it = 110 Kg

Mass of water now displaced = 110 Kg

When 100 Kg of water was displaced, 3.36 m was submerged

When 110 Kg of water is to be displaced,

$$\frac{110 \times 3.36}{100} \text{ m will be submerged.}$$

$$= 3.696 \text{ m will be submerged.}$$

$$\text{Height seen above water} = 4.2 - 3.696$$

$$= 0.504 \text{ m}$$

13. The bag of sugar will weigh more at Antarctica i.e. the poles.

Reason: The polar radius of the earth is less than the equatorial radius of the earth.

The acceleration due to gravity is inversely proportional to the square of the radius of the earth. Hence, its value at the poles is greater than its value at the equator. Thus a

body weighs more at the poles than at the equator. Since weight is the product of mass and acceleration due to gravity, therefore the bag of sugar will weigh more at Antarctica.

14. The bag of cotton is heavier since volume of cotton bag is greater than iron bar, so the upthrust is larger in case of cotton. so the weighing machine indicates a smaller mass for cotton bag than its actual mass.

15.

Mass	Weight
Mass is a property of matter. The mass of an object is the same everywhere,	Weight depends on the effect of gravity. Weight varies according to location.
Mass can never be zero.	Weight can be zero if no gravity acts upon an object, as in space.
Mass does not change according to location.	Weight increases or decreases with higher or lower gravity.
Mass is a scalar quantity. It has magnitude.	Weight is a vector quantity. It has magnitude and is directed toward the center of the Earth or other gravity well.
Mass may be measured using an ordinary balance.	Weight is measured using a spring balance.
Mass usually is measured in grams and kilograms.	Weight often is measured in newtons, a unit of force.