

UNIT- 6 SELF ASSESSMENT QUESTIONS:

Q1: What will be the effect on gravitational pull between two objects if medium between them is changed?

ANS:

Changing the medium between two objects has **no effect** on the gravitational pull between them. Gravitational force depends only on:

gravitational pull $\propto m_1 m_2$ and gravitational pull $\propto \frac{1}{r^2}$

Q2: Which force causes the moon to move in orbit around earth?

ANS:

The **gravitational force** exerted by the **Earth on the Moon** causes the Moon to move in orbit around the Earth.

This gravitational force acts as the **centripetal force**, pulling the Moon toward Earth and keeping it in its orbit.

Q3: Why weight of an object is different at different planets?

ANS:

The weight of an object is different on different planets because **each planet has a different gravitational pull**.

Weight depends on:

$$W = mg$$

The **mass** of the object remains the same everywhere, but the value of **g** changes from planet to planet because planets have different **masses** and **sizes**. So, the object's weight changes on different planets.

Q4: What is the actual value of 'g' near the surface of Earth?

ANS:

The actual value of acceleration due to gravity, **g**, near the surface of Earth is approximately:

$$g = 9.8 \text{ m/s}^2$$

or equivalently:

$$g = 9.8 \text{ N/kg}$$

Q5: The strength of gravity on the Moon is 1.6 N kg. If an astronaut's mass is 80kg on Earth, what would it be on the Moon?

ANS:

The astronaut's mass on the Moon would still be 80 kg.

Mass does not change with location.

If the question asks for weight on the Moon, then:

$$W=mg=80 \times 1.6=128 \text{ N}$$

Q6: If you go on a diet and lose weight, will you also lose mass? Explain.

ANS:

Yes. If you go on a diet and lose weight, you also usually lose **mass**.

Mass is the amount of matter in your body, measured in **kg** .

Weight is the force of gravity on your mass:

$$W = mg$$

When you diet, your body may lose fat and other tissue, so the amount of matter in your body decreases. That means your **mass decreases** , and because weight depends on mass, your **weight also decreases** .

Q7: What will be the value of acceleration due to gravity on the surface of earth if its radius reduces to half?

ANS:

If the **mass of Earth remains the same** and its **radius becomes half** , then acceleration due to gravity becomes **4 times** its original value.

$$g = \frac{GM}{R^2}$$

$$g' = \frac{GM}{\left(\frac{R}{2}\right)^2}$$

$$g' = \frac{GM}{\frac{R^2}{4}}$$

$$g' = \frac{GM}{R^2} \times 4$$

$$g' = g \times 4$$

$$g' = 4g$$

$$g' = 4 \times 9.8 = 39.2 \text{ m/s}^2$$

So, the new value of g would be **39.2 m/s²** .

Q8: What will be acceleration due to gravity on the surface of earth if its mass reduces by 25%?

ANS:

If the **radius of Earth remains the same** , then:

$$g = \frac{GM}{R^2}$$

If Earth's mass reduces by **25%** , the new mass becomes **75%** of the original or 0.75 M:

$$g' = \frac{G(0.75M)}{R^2}$$

$$g' = 0.75 \times \frac{GM}{R^2}$$

$$g' = 0.75 \times g$$

$$g' = 0.75 \times 9.8 = 7.35 \text{ m/s}^2$$

So, the new acceleration due to gravity would be **7.35 m/s²**

Q9: What will be the mass of a planet whose radius is 20% of the radius of earth?

ANS:

The **mass cannot be determined from radius alone** .

A planet's mass depends on both its **size (radius)** and its **density** :

$$M = \rho V$$
$$M = \rho \left(\frac{4}{3} \pi R^3 \right)$$

if we assume the planet has the same density as Earth , then:

$$M_p = \frac{4}{3} \pi \rho (0.2 R)^3$$
$$M_p = (0.008) \frac{4}{3} \pi \rho R^3$$
$$M_p = (0.008)M$$

So its mass would be **0.008 times the mass of Earth , or 0.8% of Earth's mass**

Q10: Write down any four uses of artificial satellites.

ANS:

- 1 **Communication** — for TV broadcasts, telephone calls, internet, and radio signals.
- 2 **Weather forecasting** — to observe clouds, storms, cyclones, and rainfall.
- 3 **Navigation** — for GPS and locating positions on Earth.
- 4 **Disaster management** — to track floods, earthquakes, wildfires, and cyclones.
- 5 **Scientific research** — to study space, planets, stars, and Earth's atmosphere.

Q11: What is Geostationary orbit?

ANS:

A **geostationary orbit** is an orbit in which a satellite appears to remain **fixed over one point on Earth's equator** .

This happens because the satellite:

orbits Earth in the **same direction** as Earth's rotation,

has the same time period as Earth's rotation, about **24 hours** ,

is placed above the **equator** ,

is at a height of about **35,786 km** above Earth's surface.

Geostationary satellites are commonly used for **communication, TV broadcasting, and weather monitoring**.

Q12: Why the two satellites of different masses have same speed in the same orbit?

ANS:

Two satellites of different masses have the same speed in the same orbit because orbital speed does not depend on the satellite's mass .

$$v = \sqrt{\frac{GM}{R}}$$

So the speed depends only on:

M = mass of Earth , r = radius of the orbit from Earth's center

It does **not** depend on the satellite's mass. Therefore, two satellites in the **same orbit** have the **same orbital speed** .