UNIVERSAL LAW OF GRAVITATION The universal law of gravitation states that every object in the universe attracts every other object with a force that is directly proportional to product of the masses and inversely proportional to the square of the distance between them. Let two objects A and B of masses m and m lie at a distance d from each other. Let F be the force of attraction between them. According to the universal law of gravitation, the force between the objects is directly proportional to the product of their masses. That is, F is directly proportional to m into m. And the force between the objects is inversely proportional to the square of the distance between them. That is, F is directly proportional to 1 by d square. Combining these two equations we get, F is directly proportional to m into m by d square. That is, F is equal to g into m into m by d square, where g is a constant of proportionality called the universal gravitational constant. By cross multiplying we get, g is equal to F into d square by m into m. The SI unit of g is, nm square kg to the power of minus 2. The value of g. g is equal to 6.673 into 10 to the power of minus 11 nm square kg to the power of minus 2. Importance of the universal law of gravitation. The gravitational force of attraction of the earth binds all terrestrial objects to the earth. The gravitational pull of the sun on the planet keeps them revolving around the sun. The moon revolves around the earth. The gravitational force of earth keeps the atmosphere close to earth. The tides formed by the rising and falling of water level in the oceans are due to the gravitational force of sun and moon on the water.

SUMMARY:

The universal law of gravitation states that every object in the universe attracts every other object with a force (F) that is directly proportional to the product of their masses (m) and inversely proportional to the square of the distance (d) between them. This relationship can be expressed as $F = \frac{G \cdot m_1 \cdot m_2}{d^2}$, where G is the universal gravitational constant, approximately $6.673 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$. This law explains various phenomena, such as why objects fall to Earth, planets revolve around the Sun, the Moon orbits Earth, and tides are influenced by the gravitational pull of the Sun and Moon.

1. What does the universal law of gravitation state?

A) Every object repels every other object in the universe.

B) The force of attraction between two objects is inversely proportional to their masses.

C) Every object in the universe attracts every other object with a force proportional to their masses and inversely proportional to the square of the distance between them.

D) The force between two objects is independent of their masses.

Correct Answer: C) Every object in the universe attracts every other object with a force proportional to their masses and inversely proportional to the square of the distance between them.

---

2. What is the value of the universal gravitational constant (G)?

A) 9.8 m/s29.8 \, \text{m/s}^29.8m/s2

B) 6.673×10−11 Nm2/kg26.673 \times 10^{-11} \, \text{Nm}^2/\text{kg}^26.673×10−11Nm2/kg2

C) 3.14 Nm2/kg23.14 \, \text{Nm}^2/\text{kg}^23.14Nm2/kg2

D) 1.62×10−5 Nm2/kg21.62 \times 10^{-5} \, \text{Nm}^2/\text{kg}^21.62×10−5Nm2/kg2

Correct Answer: B) 6.673×10−11 Nm2/kg26.673 \times 10^{-11} \, \text{Nm}^2/\text{kg}^26.673×10−11Nm2/kg2

---

3. Which of the following is NOT an effect of gravitational force?

A) The planets revolve around the Sun.
B) The Moon orbits around the Earth.
C) The speed of light changes in space.
D) Tides in the ocean are caused by the gravitational pull of the Sun and Moon.
Correct Answer: C) The speed of light changes in space.

---

4. What happens to the gravitational force if the distance between two objects is doubled?

A) It remains the same.
B) It doubles.
C) It decreases by a factor of four.
D) It increases by a factor of four.
Correct Answer: C) It decreases by a factor of four.

Let me know if you need any modifications! 😊