

## CHAPTER-7 | Gravitation

## QUIZ-01

1. What is the nature of the gravitational force between two point masses?
- Repulsive and central
  - Attractive and non-central
  - Attractive and central
  - Repulsive and non-central (C)

**Explanation:** Gravitational force is always attractive and acts along the line joining the two masses, making it a central force.

2. Which of the following correctly represents Kepler's Third Law?
- $T^2 \propto a$
  - $T^2 \propto a^3$
  - $T \propto a^2$
  - $T^3 \propto a^2$  (B)

**Explanation:** Kepler's third law states that the square of the time period is proportional to the cube of the semi-major axis.

3. What is the value of the universal gravitational constant  $G$ ?
- $9.8 \text{ N} \cdot \text{kg}^{-1} \cdot \text{m}^{-1}$
  - $6.67 \times 10^{-11} \text{ N} \cdot \text{m}^2/\text{kg}^2$
  - $3.00 \times 10^8 \text{ m/s}$
  - $1.6 \times 10^{-19} \text{ C}$  (B)

**Explanation:** The experimentally determined value of  $G$  is  $6.67 \times 10^{-11} \text{ N} \cdot \text{m}^2/\text{kg}^2$ .

4. What is the approximate escape speed from the Earth's surface?
- 7.9 km/s
  - 9.8 km/s
  - 11.2 km/s
  - 12.6 km/s (C)

**Explanation:** Escape speed is the minimum speed required to escape Earth's gravity, about 11.2 km/s.

5. What is the gravitational potential energy between two masses  $m_1$  and  $m_2$  separated by distance  $r$ ?
- $Gm_1m_2/r$
  - $Gm_1m_2 \cdot r$
  - $-Gm_1m_2/r$
  - $-Gm_1m_2 \cdot r^2$  (C)

**Explanation:** Gravitational potential energy is negative and given by  $-Gm_1m_2/r$ .

6. At which point is the acceleration due to gravity maximum?
- At Earth's center
  - At a certain height above surface
  - At Earth's surface
  - Deep inside Earth (C)

**Explanation:** Acceleration due to gravity is maximum at Earth's surface and decreases above or below it.

7. If the distance between two masses is doubled, the gravitational force becomes:
- 2 times
  - 4 times
  - Half
  - One-fourth (D)

**Explanation:** Gravitational force varies inversely with the square of the distance. Doubling distance reduces it to one-fourth.

8. Where is the gravitational force zero inside a uniform spherical shell?
- At the center only
  - Anywhere inside
  - Outside the shell
  - On the surface only (B)

**Explanation:** A point mass placed anywhere inside a uniform spherical shell experiences zero net gravitational force.

9. What is the orbital speed  $v$  of a satellite at height  $h$  from Earth's surface?
- $\sqrt{(GM/(R+h))}$
  - $\sqrt{(gR)}$
  - $\sqrt{(2g(R+h))}$
  - $GMh$  (A)

**Explanation:** Orbital speed is derived from equating gravitational and centripetal forces.

10. What is the total mechanical energy of a satellite in circular orbit of radius  $r$ ?
- $GMm/r$
  - $-GMm/r$
  - $-GMm/2r$
  - $GMm/2r$  (C)

**Explanation:** Total mechanical energy is the sum of kinetic and potential energy, equal to  $-GMm/2r$ .