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TEST SERIES -03

GRAVITATION

MAX. MARKS: 80

SET - A

MULTIPLE CHOICE QUESTIONS -01 MARKS

1. When an object is thrown upward, the force of gravity is
(a) opposite to the direction of motion
(b) in the same direction as the direction of motion
(c) becomes zero at the highest point
(d) increases as it rises up.

2. The weight of a body of mass 5 kg is
(a) 69.0 N (b) 79.0 N (c) 49.0 N (d) 39.0N

3. The value of G was first determined experimentally by
(a) Newton (b) Henry Cavendish
(c) Kepler (d) Galileo

4. Two planets A and B of same mass and same radius are shown in the figure. ρ_1 and ρ_2 are densities of the materials in the planets and $\rho_1 > \rho_2$. If the accelerations due to gravity on the surfaces of the planets A and B are g_A and g_B respectively, then
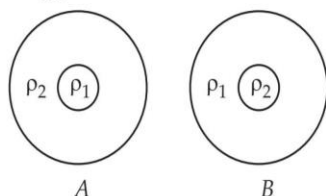

(a) $g_A = g_B$
(b) $g_A < g_B$
(c) $g_A > g_B$
(d) Given information is not sufficient

5. Which of the following statements is/are correct?
I. Mass of an object is the measure of its inertia.
II. Heavier the object smaller is the inertia.
III. The mass of an object is variable.
(a) Only I (b) I and III
(c) II and III (d) I and II

6. If a planet existed whose mass was twice that of Earth and whose radius 3 times greater, how much will a 1 kg mass weigh on the planet?
(a) 25 N (b) 2.17 N (c) 1.1 N (d) 5 N

7. If g_0, g_h and g_d be the acceleration due to gravity at earth's surface, at height h and at a depth d respectively, then
(a) $g_0 > g_h$ and $g_0 > g_d$ (b) $g_0 < g_h$ and $g_0 < g_d$
(c) $g_0 > g_h$ and $g_0 < g_d$ (d) $g_0 < g_h$ and $g_0 > g_d$.

8. A planet moving around sun sweeps out area A_1 in two days, A_2 in three days and A_3 in six days. Then the relation between A_1, A_2 and A_3 is
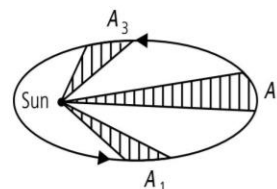
(a) $3A_1 = 2A_2 = A_3$ (b) $2A_1 = 3A_2 = 6A_3$
(c) $3A_1 = 2A_2 = 6A_3$ (d) $6A_1 = 3A_2 = 2A_3$.

9. The mass of a body is increased 4 fold and mass of other body is increased 16 fold. How should the distance between them be changed to keep the same gravitational force between them?
(a) 4 times (b) $\dfrac{1}{4}$ times
(c) 8 times (d) $\dfrac{1}{8}$ times

10. A stone is allowed to fall from the top of a tower 100 m high and at the same time another stone is projected vertically upwards from the ground with a velocity of 25 m/s. Calculate when the two stones will meet.
(a) 4 s (b) 3.6 s (c) 2 s (d) 8 s

11. The mass of a body is measured to be 12 kg on the earth. If it is taken to the moon, its mass will be
(a) 12 kg (b) 6 kg (c) 2 kg (d) 72 kg.

12. A balloon of mass m is rising with an acceleration a. A fraction of its mass is detached from the balloon. Its acceleration will
(a) decrease (b) increase
(c) remain the same (d) none of these

13. In figure, the line that joins a planet to the sun sweeps out areas A_1, A_2, A_3 in times intervals 6 weeks, 3 weeks and 2 weeks respectively. How are A_1, A_2, A_3 related?
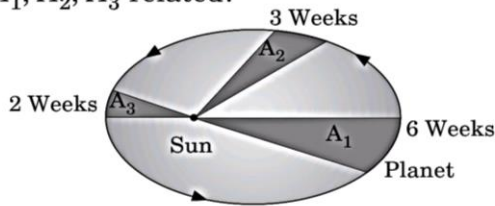
(a) $A_1 = 3A_2 = 2A_3$
(b) $A_1 = 2A_2 = 3A_3$
(c) $2A_1 = A_2 = A_3$
(d) $A_1 = 3A_2 = A_3$

14. If g_e is acceleration due to gravity on earth and g_m is acceleration due to gravity on moon, then
(a) $g_e = g_m$ (b) $g_e < g_m$
(c) $g_e = \dfrac{1}{6}g_m$ (d) $g_e = \dfrac{1}{6}g_m$

15. The unit of $\dfrac{G}{g}$ is

(a) kg m^{-1} (b) kg m^{-2}
(c) m^2 kg^{-1} (d) m kg^{-1}

16. Match the List-I and II and choose correct option below.

List-I		List-II	
(P)	$r^3 = T^2 \times$ constant	1.	$u = 0$
(Q)	$v = gt$	2.	Weight
(R)	$m \times g$	3.	Equation of motion
(S)	$v^2 = u^2 + 2gh$	4.	Kepler's law

(a) P - 4, Q - 1, R - 2, S - 3
(b) P - 4, Q - 2, R - 3, S - 1
(c) P - 2, Q - 4, R - 1, S - 3
(d) P - 1, Q - 4, R - 2, S - 3

17. If the mass of the body on the surface of the earth is 50 kg, its mass at the centre of the earth is
(a) zero   (b) more than 50 kg
(c) less than 50 kg   (d) equal to 50 kg

18. Two identical copper spheres of radius R are in contact with each other. If the gravitational attraction between them is F, find the relation between F and R.
(a) $F \propto R^4$ (b) $F \propto R^{3/2}$
(c) $F \propto R^{-2}$ (d) $F \propto R^{-4}$

19. Relation between mass of body and its weight is

(a) $w = mg$ (b) $w = \dfrac{m}{g}$
(c) $g = m - w$ (d) $w = m + g$

20. Choose the correct statement.
(a) Weight is a vector quantity.
(b) The weight of a body in interplanetary space is maximum.
(c) Weight increases when the bodies go up.
(d) 1 N = 1 kg m s^{-1}

SET -B

ASSERTION AND REASONING -02 MARKS

(a) Both assertion and reason are true, and reason is correct explanation of the assertion.
(b) Both assertion and reason are true, but reason is not the correct explanation of the assertion.
(c) Assertion is true, but reason is false.
(d) Assertion is false, but reason is true.

21. **Assertion :** It is the gravitational force exerted by the sun and the moon on the sea water that causes to the formation of tides in the sea.

Reason : Gravitational force of attraction is a strong force.

22 **Assertion :** The value of acceleration due to gravity changes with the height, depth and shape of the earth.

Reason : Acceleration due to gravity is zero at the centre of the earth.

23 **Assertion :** When distance between two bodies is doubled and also mass of each body is doubled, then the gravitational force between them remains the same.

Reason : According to Newton's law of gravitation, force is directly proportional to the product mass of bodies and inversely proportional to square of the distance between them.

24 **Assertion :** Any two objects in the universe attract each other by a force called gravitational force.
Reason : The force of gravitation exerted by the earth is called gravity.

25 **Assertion :** Universal gravitational constant G is a scalar quantity.
Reason : The value of G is same through out the universe.

SET - C

VERY SHORT ANSWER TYPE QUESTIONS -02 MARKS

1. At what place on the earth's surface is the weight of a body maximum?

2. State the Kepler's third law.

3. Why is G called the universal gravitational constant?

4. What is the ratio of the force of attraction between two bodies kept in air and the same distance apart in water?

5. What is the centripetal force?

6. The weight of a body is 50 N. What is its mass? ($g = 9.8$ m s^{-2})

7. Define universal gravitational constant.

8. Which is more fundamental-mass or weight of a body?

9. Newton's law of gravitation is also called inverse square law. Why is it so called?

10. Suppose gravity of Sun suddenly becomes zero, then in which direction will the Earth begin to move if no other celestial body affects it?

SET - D

SHORT ANSWER TYPE QUESTIONS -03 MARKS

11. Can a body have mass but no weight?

12. Give the difference between g and G.

13. How does the gravitational force between two bodies changes if the distance between them is tripled?

14. Find the ratio between the values of acceleration due to gravity at a height 1 km above and at a depth of 1 km below the earth's surface.
(radius of earth is R)

15. Out of aphelion and perihelion, where is the speed of the earth more and why?

16. When does an object show weightlessness?

17. What is the acceleration of free fall?

18. What is the source of centripetal force that a planet requires to revolve around the sun? On what factors does that force depend?

19. There are two kinds of balances *i.e.*, a beam balance and a spring balance. If both the balances give the same measure of a given body on the surface of the earth, will they give the same measure on the surface of the moon? Explain.

20. Two objects of masses m and $2m$ having the same size are dropped simultaneously from heights h_1 and h_2 respectively. Find out the ratio of time they would take in reaching the ground.