

PHYSICS

NEET

CRASH COURSE

GRAVITATION

SMART ACHIEVERS
JEE | NEET | FOUNDATION

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GRAVITATION

- Q.1 The dimensions of G are -
 (1) ML^3T^{-2} (2) $M^{-1}LT^{-2}$ (3) $M^{-1}L^3T^{-2}$ (4) $M^{-1}L^3T^{-2}$
- Q.2 If 'R' is the radius of earth and 'g' the acceleration due to gravity then mass of earth will be :
 (1) $\frac{gR^2}{G}$ (2) $\frac{g^2R}{G}$ (3) $\frac{Rg}{G}$ (4) $\frac{GR^2}{g}$
- Q.3 Which of the following formula is correct- (d is the density of earth)
 (1) $g = \frac{4}{3}\pi Gd$ (2) $g = \frac{4}{3}\pi R G d$
 (3) $g = \frac{4}{3}\frac{\pi d G}{R}$ (4) $g = \frac{4}{3}\frac{\pi d G}{R^2}$
- Q.4 A planet has mass 1/10 of that of earth, while radius is 1/3 that of earth. If a person can throw a stone on earth surface to a height of 90m, then he will be able to throw the stone on that planet to a height
 (1) 90m (2) 40 m (3) 100 m (4) 45 m
- Q.5 A body of mass m rises to height $h = R/5$ from the earth's surface, where R is earth's radius. If g is acceleration due to gravity at earth's surface, the increase in potential energy is
 (1) mg/h (2) $\frac{5}{6}mgh$ (3) $\frac{3}{5}mgh$ (4) $\frac{6}{7}mgh$
- Q.6 Binding energy of earth-moon system can be expressed as :
 (1) $GM_e M_m / 2r$ (2) $-GM_e M_m / r$ (3) $GM_e M_m / r$ (4) $-GM_e M_m / 2r$
- Q.7 Work done in taking a body of mass m from the surface of earth to a height nR above surface of earth will be : (R = radius of earth)
 (1) $mgnR$ (2) $mgR (n/n + 1)$ (3) $mgR \frac{(n+1)}{n}$ (4) $\frac{mgR}{n(n+1)}$
- Q.8 The relation between the escape velocity (v_e) from the earth and the velocity of a satellite (v) orbiting near the earth's surface is
 (1) $v_e = v$ (2) $v_e = v\sqrt{2}$ (3) $v_e = 2v$ (4) $v_e = v/\sqrt{2}$
- Q.9 The escape velocity from a planet is v_0 . The escape velocity from a planet having twice the radius but same density will be -
 (1) $0. v_0$ (2) v_0 (3) $2v_0$ (4) $4v_0$

- Q.10 A satellite is moving in a circular orbit around earth with a speed v . If its mass is m , then its total energy will be -
- (1) $\frac{3}{4}mv^2$ (2) mv^2 (3) $\frac{1}{2}mv^2$ (4) $-\frac{1}{2}mv^2$
- Q.11 The orbital velocity of an artificial satellite in a circular orbit just above the earth's surface is v . For a satellite orbiting at an altitude of half of the earth's radius, the orbital velocity is -
- (1) $\frac{3}{2}v$ (2) $\sqrt{\frac{3}{2}}v$ (3) $\sqrt{\frac{2}{3}}v$ (4) $\frac{2}{3}v$
- Q.12 The velocity of a satellite orbiting near the earth's surface is -
- (1) \sqrt{GR} (2) \sqrt{gR} (3) $\sqrt{\frac{GM}{R^2}}$ (4) $\sqrt{2gR}$
- Q.13 In an artificial satellite a person will have -
- (1) zero mass (2) zero weight (3) some weight (4) infinite weight
- Q.14 An astronaut feels weightlessness because -
- (1) gravity is zero there
 (2) atmosphere is not there
 (3) energy is zero in the chamber of a rocket.
 (4) the fictitious force in rotating frame of reference cancels the effect of weight.
- Q.15 Orbital velocity of INSAT 1-B is nearly -
- (1) 11.2 km/s (2) 7.9 km/s (3) 3.2 km/s (4) 1.8 km/s
- Q.16 According to Kepler the period of revolution of a planet (T) and its mean distance from the sun (r) are related by the equation
- (1) $T^2 r = \text{constant}$ (2) $T^2 r^3 = \text{constant}$
 (3) $T^2 r^{-3} = \text{constant}$ (4) $T r^3 = \text{constant}$
- Q.17 The radii of paths of two planets moving around the sun are R_1 and R_2 and their periods are T_1 and T_2 respectively, T_1/T_2 will be -
- (1) $\left(\frac{R_2}{R_1}\right)^{3/2}$ (2) $\left(\frac{R_1}{R_2}\right)^{3/2}$ (3) $\left(\frac{R_2}{R_1}\right)^{1/2}$ (4) $\left(\frac{R_1}{R_2}\right)^{1/2}$
- Q.18 The potential energy of a body of mass m is $U = ax + by$, the magnitude of acceleration of the body will be-
- (1) $\frac{ab}{m}$ (2) $\left(\frac{a+b}{m}\right)$ (3) $\frac{\sqrt{a^2+b^2}}{m}$ (4) $\frac{a^2+b^2}{m}$

Q.19 The gravitational force on a body inside the surface of the earth varies as r^a , where r is the distance from the center of the earth and a is some constant. If the density of the earth is assumed uniform, then -

- (1) $a = 1$ (2) $a = -1$ (3) $a = 2$ (4) $a = -2$

Q.20 The loss in weight of a body taken from earth's surface to a height h is 1%. The change in weight taken into a mine of depth h will be -

- (1) 1% loss (2) 1% gain (3) 0.5% gain (4) 0.5% loss

Q.21 Assuming earth as a sphere of radius R , the weight of mass 1 kg at a distance $2R$ from the centre of earth is 2.5N. The weight of same mass at a distance $3R$ will be -

- (1) 4.75N (2) 3.75N (3) 2.5N (4) 1.1 N

Q.22 The mass of moon is $\frac{1}{81}$ of the mass of earth and the acceleration due to gravity is $\frac{1}{6}$ th of acceleration due to gravity on earth. The ratio of radii of moon and earth is -

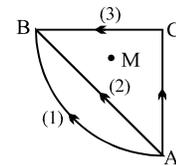
- (1) $6/81$ (2) $4/729$ (3) $\sqrt{2/27}$ (4) $\sqrt{2/48}$

Q.23 A simple pendulum has a time period T_1 when on the earth's surface and T_2 when taken to a height R above the earth's surface, where R is the radius of the earth. The value of $\frac{T_2}{T_1}$ is [JEE 2001]

- (1) 1 (2) $\sqrt{2}$ (3) 4 (4) 2

Q.24 In a region of only gravitational field of mass 'M' a particle is shifted from A to B via three different paths in the figure. The work done in different paths are W_1, W_2, W_3 respectively then

- (1) $W_1 = W_2 = W_3$ (2) $W_1 > W_2 > W_3$
 (3) $W_1 = W_2 > W_3$ (4) $W_1 < W_2 < W_3$



Q.25 Two satellites of same mass m are revolving round the earth E (mass M) in the same orbit of radius r . Rotational directions of the two are opposite therefore, they can collide and stick with each other. Total mechanical energy of the system (both satellites and earths) is - ($m \ll M$)

- (1) $-\frac{GMm}{r}$ (2) $-\frac{2GMm}{r}$ (3) $-\frac{GMm}{2r}$ (4) zero

Q.26 Two particles of masses m and M are initially at infinity and at rest. Both particles move towards each other due to mutual interaction. When the distance between them is d , the relative velocity of approach will be -

- (1) $\left[\frac{2Gd}{M+m}\right]^{1/2}$ (2) $\left[\frac{2G(M+m)}{d}\right]^{1/2}$ (3) $2G\left(\frac{M+m}{d}\right)$ (4) $\frac{2Gd}{(M+m)}$

- Q.27 A missile which missed its target, went into orbit around the earth. The radius of the orbit is four times the radius of the parking orbit of a satellite. The period of the missile as satellite is -
 (1) 2 days (2) 4 days (3) 8 days (4) 16 days
- Q.28 Imagine a light planet revolving around a very massive star in a circular orbit of radius R with a period of revolution T . If the gravitational force of attraction between planet and star is proportional to $R^{-5/2}$, then T^2 is proportional to
 (1) R^3 (2) $R^{7/2}$ (3) $R^{5/2}$ (4) $R^{3/2}$
- Q.29 A satellite is moving with a constant speed ' V ' in a circular orbit about the earth. An object of mass ' m ' is ejected from the satellite such that it just escapes from the gravitational pull of the earth. At the time of its ejection, the kinetic energy of the object is
 (1) $\frac{1}{2}mV^2$ (2) mV^2 (3) $\frac{3}{2}mV^2$ (4) $2mV^2$

Direction for following questions :

- A. Both Assertion and Reason are true, and Reason is the correct explanation of Assertion.
 B. Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
 C. Assertion is true but Reason is false.
 D. Assertion and Reason both are false.

- Q.30 **Assertion :** During orbital motion of planet around the sun work done by the gravitational force of sun is not zero at all points on the orbit.

Reason : Planet is revolving around the sun in elliptical orbit.

- (1) A (2) B (3) C (4) D

- Q.31 **Assertion :** If the force of gravitation is inversely proportional to the distance r rather than r^2 given by Newton, then orbital velocity of the satellite around the earth is independent of r .

Reason : $\frac{GMm}{r} = \frac{mv^2}{r}$ so, $v = \sqrt{GM}$ hence independent of r .

- (1) A (2) B (3) C (4) D

- Q.32 **Assertion :** There is no effect of rotation of earth on acceleration due to gravity at poles.

Reason : Rotation of earth is about polar axis.

- (1) A (2) B (3) C (4) D

- Q.33 **Assertion :** Two different planets have same escape velocity.

Reason : Value of escape velocity is a universal constant.

- (1) A (2) B (3) C (4) D

Q.34 **Assertion** : A planet moves faster, when it is closer to the sun in its orbit and vice versa.

Reason : Orbital velocity of a planet is constant.

(1) A

(2) B

(3) C

(4) D

ANSWER KEY

Q.1	3	Q.2	1	Q.3	2	Q.4	3	Q.5	2
Q.6	1	Q.7	2	Q.8	2	Q.9	3	Q.10	4
Q.11	3	Q.12	2	Q.13	2	Q.14	4	Q.15	3
Q.16	3	Q.17	2	Q.18	3	Q.19	1	Q.20	4
Q.21	4	Q.22	3	Q.23	4	Q.24	1	Q.25	1
Q.26	2	Q.27	3	Q.28	2	Q.29	2	Q.30	1
Q.31	1	Q.32	1	Q.33	4	Q.34	3		