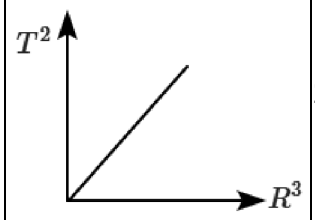
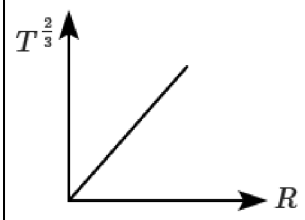
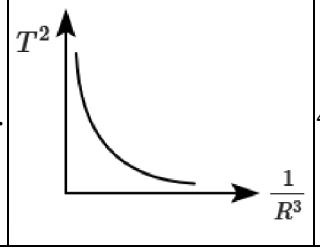
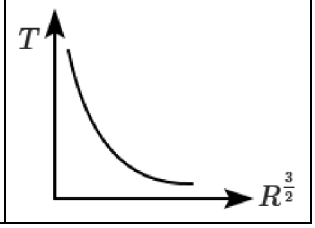
SECTION A

1 T is the time period of revolution of a planet revolving around the sun in an orbit of mean radius R. Identify the incorrect graph.

1. 

2. 

3. 

4. 

2 A planet revolving in elliptical orbit has:

A.	a constant velocity of revolution.
B.	the least velocity when it is nearest to the sun.
C.	its areal velocity directly proportional to its velocity.
D.	its areal velocity inversely proportional to its velocity.
E.	to follow a trajectory such that the areal velocity is constant.

Choose the correct answer from the options given below:

1. (A) only
2. (D) only
3. (C) only
4. (E) only

3 Two planets A and B of equal masses are having their periods of revolution T_A and T_B such that $T_A = 2\,T_B$. These planets are revolving in the circular orbits of radii r_A and r_B respectively. Which of the following would be the correct relationship of their orbits?

1. $2r_A^2 = r_B^2$
2. $r_A^3 = 2r_B^3$
3. $r_A^3 = 4r_B^3$
4. $T_A^2 - T_B^2 = \frac{\pi^2}{GM}\left(r_B^3 - 4r_A^3\right)$

4 Given below are two statements:

Statement I:	The kinetic energy of a planet is maximum when it is closest to the sun.
Statement II:	The time taken by a planet to move from the closest position (perihelion) to the farthest position (aphelion) is larger for a planet that is farther from the sun.

1.	Statement I is incorrect and Statement II is correct.
2.	Both Statement I and Statement II are correct.
3.	Both Statement I and Statement II are incorrect.
4.	Statement I is correct and Statement II is incorrect.

5 A planet of mass m is moving around a star of mass M and radius R in a circular orbit of radius r. The star abruptly shrinks to half its radius without any loss of mass. What change will be there in the orbit of the planet?

1.	the planet will escape from the star.
2.	the radius of the orbit will increase.
3.	the radius of the orbit will decrease.
4.	the radius of the orbit will not change.

6 The law of gravitation states that the gravitational force between two bodies of mass m_1 and m_2 is given by:

$F = \frac{Gm_1m_2}{r^2}$

G (gravitational constant)=7×10^{-11} Nm^2kg^{-2}.

r (distance between the two bodies) in the case of the Earth and Moon=4×10^8 m

m_1 (Earth) $= 6 \times 10^{24}$ kg

m_2 (Moon) $= 7 \times 10^{22}$ kg

What is the gravitational force between the Earth and the Moon?

1. 1.8375×10^{19} N
2. 1.8375×10^{20} N
3. 1.8375×10^{25} N
4. 1.8375×10^{26} N

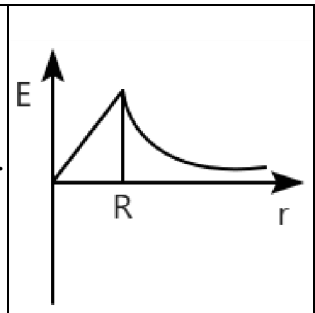
7 An artificial satellite revolves around a planet for which gravitational force (F) varies with the distance r from its centre as $F \propto r^2$. If v_0 is its orbital speed, then:

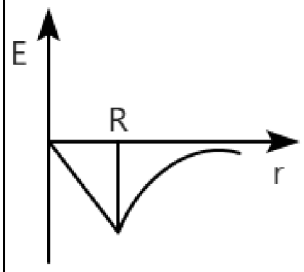
1. $v_0 \propto r^{-1/2}$
2. $v_0 \propto r^{3/2}$
3. $v_0 \propto r^{-3/2}$
4. $v_0 \propto r$

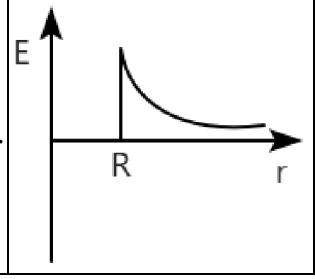
8 Which of the following statements is/are correct?

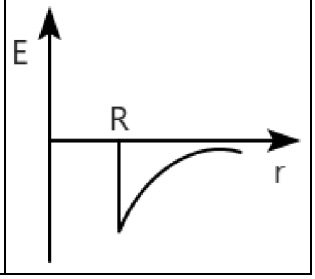
1.	Universal law of gravitation is an assumption or hypothesis.
2.	Universal law of gravitation can be proved.
3.	Universal law of gravitation can be verified.
4.	Both (1) and (3).

9 The variation of intensity of the gravitational field (E) of the moon (having radius R) with distance (r) from the centre of the moon is represented by:

1. 

2. 

3. 

4. 

10 A body weighs 72 N on the surface of the earth. What is the gravitational force on it due to the earth at a height equal to half the radius of the earth from the surface?

1. 72 N
2. 32 N
3. 28 N
4. 16 N

11 The percentage decrease in the weight of a rocket, when it is taken to a height of 32 km above the surface of the earth will be:
(Radius of earth = 6400 km)

1. 1%
2. 3%
3. 4%
4. 0.5%

12 Choose the correct alternative.

1.	Acceleration due to gravity increases with increasing altitude.
2.	Acceleration due to gravity remains unchanged with increasing altitude.
3.	Acceleration due to gravity increases with increasing depth (assume the earth to be a sphere of uniform density).
4.	Acceleration due to gravity decreases with increasing depth (assume the earth to be a sphere of uniform density).

13 Given below are two statements:

Assertion (A):	When a body is raised from the surface of the earth, its potential energy increases.
Reason (R):	Potential energy of a body on the surface of the earth is zero.

1.	Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is true but **(R)** is false.
4.	Both **(A)** and **(R)** are false.

14 An object of mass m is placed at a height R_e from the surface of the earth. What is the increase in potential energy of the object if the height of the object is increased to $2R_e$ from the surface? (R_e : Radius of the earth)

1. $\frac{1}{3}mgR_e$
2. $\frac{1}{6}mgR_e$
3. $\frac{1}{2}mgR_e$
4. $\frac{1}{4}mgR_e$

15 The gravitational potential energy of a particle of mass m increases by mgh, when it is raised through a height h in a uniform gravitational field "g". If a particle of mass m is raised through a height h in the earth's gravitational field (g: the field on the earth's surface) and the increase in gravitational potential energy is U, then:

1.	$U > mgh$
2.	$U < mgh$
3.	$U = mgh$
4.	any of the above may be true depending on the value of h, considered relative to the radius of the earth.

16 The escape velocity of a particle of mass m varies as:
1. m^2
2. m
3. m^0
4. m^{-1}

17 The value of acceleration due to gravity on the surface of a planet is $\left(\frac{1}{6}\right)^{\text{th}}$ that of the earth. The radius of the planet is $\left(\frac{1}{3}\right)^{\text{rd}}$ of earth's radius. What is the escape speed from the surface of the planet?
(Given the escape from the surface of earth is v_e km/s)
1. $\sqrt{\frac{1}{18}}v_e$
2. $\sqrt{\frac{1}{2}}v_e$
3. $\sqrt{\frac{1}{9}}v_e$
4. $\sqrt{\frac{1}{10}}v_e$

SECTION B

18 The radius of a planet is twice the radius of the earth. Both have almost equal average mass densities. If V_P and V_E are escape velocities of the planet and the earth, respectively, then:
1. $V_P = 1.5V_E$
2. $V_P = 2V_E$
3. $V_E = 3V_P$
4. $V_E = 1.5V_P$

19 A comet orbits the sun in a highly elliptical orbit. The comet has a constant:
1. linear speed
2. angular speed
3. angular momentum
4. kinetic energy

20 A planet is orbiting the sun in an elliptical orbit. Let U denote the potential energy and K denote the kinetic energy of the planet at an arbitrary point in the orbit. Choose the correct statement.

1.	$K < \|U\|$ always
2.	$K > \|U\|$ always
3.	$K = \|U\|$ always
4.	$K = \|U\|$ for two positions of the planet in the orbit

21 A satellite of mass M is revolving round the earth in a stationary orbit with time period T. If 10% of mass is detached from the satellite, then its time period will:

1.	remain same
2.	increase by 10%
3.	decrease by 10%
4.	decrease by 20%

22 A body of mass 60 g experiences a gravitational force of 3.0 N when placed at a particular point. The magnitude of the gravitational field intensity at that point is:
1. 180 N/kg
2. 0.05 N/kg
3. 50 N/kg
4. 20 N/kg

23 A planet whose density is double of earth and radius is half of the earth, will produce gravitational field on its surface:(g = acceleration due to gravity at the surface of earth)
1. g
2. $2g$
3. $\frac{g}{2}$
4. $3g$

24 Four particles, each of mass m, are kept at the four corners of a square of side l each. The amount of work done to separate these particles for no interaction between them will be:

1. $\frac{4Gm^2}{l}$
2. $-\frac{Gm^2}{l}(4+\sqrt{2})$
3. $\frac{Gm^2}{l}(4+\sqrt{2})$
4. $\frac{\mathrm{Gm}^2}{l}\left(1+\frac{1}{\sqrt{2}}\right)$

25 An infinite number of bodies, each of mass 2 kg are situated on the $x-$axis at distances $1\ \mathrm{m}, 2\ \mathrm{m}, 4\ \mathrm{m}, 8\ \mathrm{m}, \ldots\ldots$ respectively, from the origin. The resulting gravitational potential due to this system at the origin will be:

1. $-\frac{8}{3}\mathrm{G}$
2. $-\frac{4}{3}\mathrm{G}$
3. $-4\mathrm{G}$
4. $-\mathrm{G}$

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*If above link doesn't work, please go to test link from where you got the pdf and fill OMR from there. After filling the OMR, you would get answers and explanations for the questions in the test.