

JEE MAIN GRAVITATION — PYQS

Max. Marks: 176

Questions: 44

Section A (MCQ) — 39 questions

- Q.1** When one moves from a point 16 km below the earth's surface to a point 16 km above the earth's surface, the change in g is approximately α %. The value of α is _____.

(Take radius of the earth = 6400 km.)

[JEE Main 2026 (Online) 5th April Morning Shift]

- (1) 0.12 (2) 0.25 (3) 0.50 (4) 0.75

Scan or tap for the full solution



- Q.2** A body of mass m is taken from the surface of earth to a height equal to twice the radius of earth (R_e). The increase in potential energy will be _____. (g is acceleration due to gravity at the surface of earth)

[JEE Main 2026 (Online) 5th April Evening Shift]

- (1)
- $\frac{1}{2}mgR_e$
- (2)
- $\frac{3}{4}mgR_e$
-
- (3)
- $\frac{1}{4}mgR_e$
- (4)
- $\frac{2}{3}mgR_e$

Scan or tap for the full solution



- Q.3** The height in terms of radius of the earth (R), at which the acceleration due to gravity becomes $\frac{g}{9}$, where g is acceleration due to gravity on earth's surface, is _____.

[JEE Main 2026 (Online) 4th April Evening Shift]

- (1)
- $\sqrt{3}R$
- (2)
- $2\sqrt{2}R$
-
- (3)
- $2R$
- (4)
- $\frac{4}{9}R$

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- Q.4** A planet (P_1) is moving around the star of mass $2M$ in the orbit of radius R . Another planet (P_2) is moving around another star of mass $4M$ in an orbit of radius $2R$. Ratio of time periods of revolution of P_2 and P_1 is _____.

[JEE Main 2026 (Online) 2nd April Morning Shift]

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

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- Q.5** If a body of mass 1 kg falls on the earth from infinity, it attains velocity (v) and kinetic energy (k) on reaching the surface of earth. The values of v and k respectively are _____.

 (Take radius of earth to be 6400 km and $g = 9.8 \text{ m/s}^2$) [JEE Main 2026 (Online) 2nd April Evening Shift]

- (1) 11.2 km/s;
- $6.27 \times 10^7 \text{ J}$
-
- (2) 11.2 km/s;
- $12.54 \times 10^7 \text{ J}$
-
- (3) 8.8 km/s;
- $6.27 \times 10^7 \text{ J}$
-
- (4) 8.8 km/s;
- $12.54 \times 10^7 \text{ J}$



Solution

- Q.6** Three masses 200 kg, 300 kg and 400 kg are placed at the vertices of an equilateral triangle with sides 20 m. They are rearranged on the vertices of a bigger triangle of side 25 m and with the same centre. The work done in this process is _____ J. (Gravitational constant $G = 6.7 \times 10^{-11} \text{ N m}^2/\text{kg}^2$)

[JEE Main 2026 (Online) 24th January Morning Shift]

- (1)
- 4.77×10^{-7}
- (2)
- 1.74×10^{-7}
-
- (3)
- 9.86×10^{-6}
- (4)
- 2.85×10^{-7}

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- Q.7** The escape velocity from a spherical planet A is 10 km/s. The escape velocity from another planet B whose density and radius are 10% of those of planet A, is _____ m/s.

[JEE Main 2026 (Online) 22nd January Morning Shift]

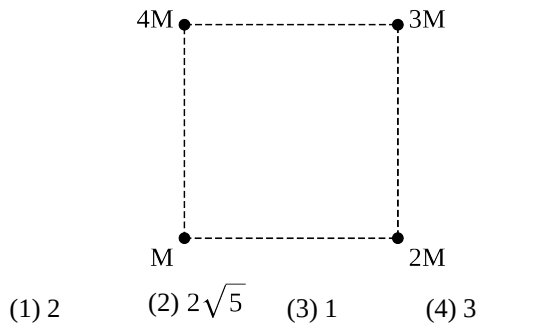
- (1) 1000 (2)
- $200\sqrt{5}$
-
- (3)
- $1000\sqrt{2}$
- (4)
- $100\sqrt{10}$

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- Q.8** Net gravitational force at the center of a square is found to be F_1 when four particles having mass M , $2M$, $3M$ and $4M$ are placed at the four corners of the square as shown in figure and it is F_2 when the positions of $3M$ and $4M$ are interchanged. The ratio $\frac{F_1}{F_2}$ is $\frac{\alpha}{\sqrt{5}}$. The value of α is _____.

[JEE Main 2026 (Online) 22nd January Morning Shift]



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Q.9 Given below are two statements :

Statement-I: A satellite is moving around earth in the orbit very close to the earth surface. The time period of revolution of satellite depends upon the density of earth.

Statement-II: The time period of revolution of the satellite is $T = 2\pi\sqrt{\frac{R_e}{g}}$ (for satellite very close to the earth surface), where R_e is radius of earth and g is acceleration due to gravity.

In the light of the above statements, choose the correct answer from the options given below :

[JEE Main 2026 (Online) 22nd January Evening Shift]

- (1) Statement-I is true but Statement-II is false
- (2) Statement-I is false but Statement-II is true
- (3) Both Statement-I and Statement-II are true
- (4) Both Statement-I and Statement-II are false

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Q.10 Initially a satellite of 100 kg is in a circular orbit of radius $1.5R_E$. This satellite can be moved to a circular orbit of radius $3R_E$ by supplying $\alpha \times 10^6$ J of energy. The value of α is _____.
(Take Radius of Earth $R_E = 6 \times 10^6$ m and $g = 10$ m/s²)

[JEE Main 2026 (Online) 21st January Morning Shift]

- (1) 500 (2) 1000 (3) 100 (4) 150

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Q.11 Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): The radius vector from the Sun to a planet sweeps out equal areas in equal intervals of time and thus areal velocity of planet is constant.

Reason (R): For a central force field the angular momentum is a constant.

In the light of the above statements, choose the most appropriate answer from the options given below:

[JEE Main 2025 (Online) 7th April Evening Shift]

- (1) (A) is not correct but (R) is correct

- (2) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
 (3) Both (A) and (R) are correct and (R) is the correct explanation of (A)
 (4) (A) is correct but (R) is not correct

Scan or tap for the full solution



Q.12 Given below are two statements : one is labelled as **Assertion A** and the other is labelled as **Reason R**
Assertion (A): The kinetic energy needed to project a body of mass m from earth surface to infinity is $\frac{1}{2}mgR$, where R is the radius of earth.

Reason (R): The maximum potential energy of a body is zero when it is projected to infinity from earth surface.

In the light of the above statements, choose the correct answer from the options given below

[JEE Main 2025 (Online) 4th April Morning Shift]

- (1) A is false but R is true
- (2) Both A and R are true and R is the correct explanation of A
- (3) A is true but R is false
- (4) Both A and R are true but R is NOT the correct explanation of A

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Q.13 An object is kept at rest at a distance of $3R$ above the earth's surface where R is earth's radius. The minimum speed with which it must be projected so that it does not return to earth is : (Assume $M =$ mass of earth, $G =$ Universal gravitational constant)

[JEE Main 2025 (Online) 4th April Evening Shift]

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

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Q.14 Earth has mass 8 times and radius 2 times that of a planet. If the escape velocity from the earth is 11.2 km/s, the escape velocity in km/s from the planet will be:

[JEE Main 2025 (Online) 28th January Evening Shift]

- (1) 8.4 (2) 11.2 (3) 5.6 (4) 2.8

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Q.15 A satellite is launched into a circular orbit of radius 'R' around the earth. A second satellite is launched into an orbit of radius $1.03 R$. The time period of revolution of the second satellite is larger than the first one approximately by

[JEE Main 2025 (Online) 24th January Morning Shift]

- (1) 3% (2) 2.5% (3) 4.5% (4) 9%

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Q.16 If a satellite orbiting the Earth is 9 times closer to the Earth than the Moon, what is the time period of rotation of the satellite? Given rotational time period of Moon = 27 days and gravitational attraction between the satellite and the moon is neglected.

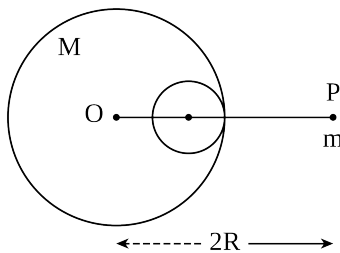
[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 3 days (2) 27 days
(3) 81 days (4) 1 day

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Q.17 A small point of mass m is placed at a distance $2R$ from the centre 'O' of a big uniform solid sphere of mass M and radius R . The gravitational force on 'm' due to M is F_1 . A spherical part of radius $R/3$ is removed from the big sphere as shown in the figure and the gravitational force on m due to remaining part of M is found to be F_2 . The value of ratio $F_1:F_2$ is

[JEE Main 2025 (Online) 22nd January Morning Shift]



- (1) 11 : 10 (2) 12 : 11 (3) 16 : 9 (4) 12 : 9

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Q.18 An astronaut takes a ball of mass m from earth to space. He throws the ball into a circular orbit about earth at an altitude of 318.5 km. From earth's surface to the orbit, the change in total mechanical energy of the ball is $x \frac{GM_e m}{21R_e}$. The value of x is (take $R_e = 6370$ km) :

[JEE Main 2024 (Online) 9th April Morning Shift]

- (1) 12 (2) 11 (3) 9 (4) 10

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Q.19 A satellite of 10^3 kg mass is revolving in circular orbit of radius $2R$. If $\frac{10^4 R}{6}$ J energy is supplied to the satellite, it would revolve in a new circular orbit of radius (use $g = 10 \text{ m/s}^2$, $R =$ radius of earth)

[JEE Main 2024 (Online) 9th April Evening Shift]

- (1) 4R (2) 6R (3) 2.5R (4) 3R

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Q.20 Two planets A and B having masses m_1 and m_2 move around the sun in circular orbits of r_1 and r_2 radii respectively. If angular momentum of A is L and that of B is $3L$, the ratio of time period $\left(\frac{T_A}{T_B}\right)$ is:

[JEE Main 2024 (Online) 8th April Morning Shift]

- (1) $\left(\frac{r_2}{r_1}\right)^{\frac{3}{2}}$ (2) $27\left(\frac{m_1}{m_2}\right)^3$
(3) $\left(\frac{r_1}{r_2}\right)^3$ (4) $\frac{1}{27}\left(\frac{m_2}{m_1}\right)^3$

Scan or tap for the full solution 

Q.21 Two satellites A and B go round a planet in circular orbits having radii $4R$ and R respectively. If the speed of A is $3v$, the speed of B will be :

[JEE Main 2024 (Online) 8th April Evening Shift]

- (1) $6v$ (2) $\frac{4}{3}v$ (3) $3v$ (4) $12v$

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Q.22 To project a body of mass m from earth's surface to infinity, the required kinetic energy is (assume, the radius of earth is R_e , $g =$ acceleration due to gravity on the surface of earth):

[JEE Main 2024 (Online) 6th April Morning Shift]

- (1) $\frac{1}{2}mgR_e$ (2) $4mgR_e$
(3) mgR_e (4) $2mgR_e$


Solution

Q.23 Assuming the earth to be a sphere of uniform mass density, a body weighed 300 N on the surface of earth. How much it would weigh at $R/4$ depth under surface of earth ?

[JEE Main 2024 (Online) 6th April Evening Shift]

- (1) 75 N (2) 375 N (3) 300 N (4) 225 N

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Q.24 A simple pendulum doing small oscillations at a place R height above earth surface has time period of $T_1 = 4$ s. T_2 would be its time period if it is brought to a point which is at a height $2R$ from earth surface. Choose the correct relation [$R =$ radius of earth] :

[JEE Main 2024 (Online) 5th April Morning Shift]

- (1) $3T_1 = 2T_2$ (2) $T_1 = T_2$
(3) $2T_1 = 3T_2$ (4) $2T_1 = T_2$

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Q.25 Match List I with List II :
(Where $a =$ radius of planet orbit, $r =$ radius of planet, $M =$ mass of Sun, $m =$ mass of planet)

LIST I		LIST II	
A.	Kinetic energy of planet	I.	$-GMm/a$

LIST I		LIST II	
B.	Gravitation Potential energy of sun-planet system	II.	$GMm/2a$
C.	Total mechanical energy of planet	III.	$\frac{Gm}{r}$
D.	Escape energy at the surface of planet for unit mass object	IV.	$-GMm/2a$

Choose the correct answer from the options given below : [JEE Main 2024 (Online) 5th April Morning Shift]

- (1) (A)-(II), (B)-(I), (C)-(IV), (D)-(III)
 (2) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)
 (3) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)
 (4) (A)-(I), (B)-(IV), (C)-(II), (D)-(III)

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Q.26 A satellite revolving around a planet in stationary orbit has time period 6 hours. The mass of planet is one-fourth the mass of earth. The radius of orbit of the satellite is :

(Given: Radius of geo-stationary orbit for earth is 4.2×10^4 km)

[JEE Main 2024 (Online) 5th April Evening Shift]

- (1) 1.68×10^5 km (2) 1.4×10^4 km
 (3) 8.4×10^4 km (4) 1.05×10^4 km

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Q.27 A metal wire of uniform mass density having length L and mass M is bent to form a semicircular arc and a particle of mass m is placed at the centre of the arc. The gravitational force on the particle by the wire is : [JEE Main 2024 (Online) 4th April Morning Shift]

- (1) $\frac{GmM\pi^2}{L^2}$ (2) $\frac{GmM\pi}{2L^2}$
 (3) 0 (4) $\frac{2GmM\pi}{L^2}$

Scan or tap for the full solution 

Q.28 A 90 kg body placed at $2R$ distance from surface of earth experiences gravitational pull of :
 (R = Radius of earth, $g = 10 \text{ m s}^{-2}$)

[JEE Main 2024 (Online) 4th April Evening Shift]

- (1) 300 N (2) 225 N (3) 100 N (4) 120 N

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Q.29 Correct formula for height of a satellite from earth's surface is :

[JEE Main 2024 (Online) 4th April Evening Shift]

- (1) $\left(\frac{T^2 R^2 g}{4\pi^2}\right)^{1/3} - R$ (2) $\left(\frac{T^2 R^2 g}{4\pi^2}\right)^{1/2} - R$

$$(3) \left(\frac{T^2 R^2 g}{4\pi^2}\right)^{-1/3} + R \quad (4) \left(\frac{T^2 R^2}{4\pi^2 g}\right)^{1/3} - R$$

Scan or tap for the full solution 

Q.30 If R is the radius of the earth and the acceleration due to gravity on the surface of earth is $g = \pi^2 \text{ m/s}^2$, then the length of the second's pendulum at a height $h = 2R$ from the surface of earth will be :

[JEE Main 2024 (Online) 1st February Morning Shift]

- (1) $\frac{1}{9} \text{ m}$ (2) $\frac{8}{9} \text{ m}$ (3) $\frac{2}{9} \text{ m}$ (4) $\frac{4}{9} \text{ m}$

Scan or tap for the full solution 

Q.31 A light planet is revolving around a massive star in a circular orbit of radius R with a period of revolution T . If the force of attraction between planet and star is proportional to $R^{-3/2}$ then choose the correct option :

[JEE Main 2024 (Online) 1st February Evening Shift]

- (1) $T^2 \propto R^{7/2}$ (2) $T^2 \propto R^3$
 (3) $T^2 \propto R^{5/2}$ (4) $T^2 \propto R^{3/2}$

Scan or tap for the full solution 

Q.32 Four identical particles of mass m are kept at the four corners of a square. If the gravitational force exerted on one of the masses by the other masses is $\left(\frac{2\sqrt{2}+1}{32}\right) \frac{Gm^2}{L^2}$, the length of the sides of the square is

[JEE Main 2024 (Online) 31st January Morning Shift]

- (1) $4L$ (2) $3L$ (3) $2L$ (4) $\frac{L}{2}$

Scan or tap for the full solution 

Q.33 The mass of the moon is $\frac{1}{144}$ times the mass of a planet and its diameter is $\frac{1}{16}$ times the diameter of a planet. If the escape velocity on the planet is v , the escape velocity on the moon will be :

[JEE Main 2024 (Online) 31st January Evening Shift]

- (1) $\frac{v}{4}$ (2) $\frac{v}{6}$ (3) $\frac{v}{12}$ (4) $\frac{v}{3}$

Scan or tap for the full solution 

Q.34 The gravitational potential at a point above the surface of earth is $-5.12 \times 10^7 \text{ J/kg}$ and the acceleration due to gravity at that point is 6.4 m/s^2 . Assume that the mean radius of earth to be 6400 km. The height of this point above the earth's surface is :

[JEE Main 2024 (Online) 30th January Morning Shift]

- (1) 1600 km (2) 1200 km
(3) 540 km (4) 1000 km

Scan or tap for the
full solution



Q.35 Escape velocity of a body from earth is 11.2 km/s. If the radius of a planet be one-third the radius of earth and mass be one-sixth that of earth, the escape velocity from the planet is :

[JEE Main 2024 (Online) 30th January Evening Shift]

- (1) 7.9 km/s (2) 8.4 km/s
(3) 4.2 km/s (4) 11.2 km/s

Scan or tap for the
full solution



Q.36 At what distance above and below the surface of the earth a body will have same weight. (take radius of earth as R.)

[JEE Main 2024 (Online) 29th January Morning Shift]

- (1) $\frac{\sqrt{3R-R}}{2}$ (2) $\frac{R}{2}$
(3) $\frac{\sqrt{5R-R}}{2}$ (4) $\sqrt{5R-R}$

Scan or tap for the
full solution



Q.37 A planet takes 200 days to complete one revolution around the Sun. If the distance of the planet from Sun is reduced to one fourth of the original distance, how many days will it take to complete one revolution :

[JEE Main 2024 (Online) 29th January Evening Shift]

- (1) 20 (2) 50 (3) 100 (4) 25

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full solution



Q.38 The acceleration due to gravity on the surface of earth is g. If the diameter of earth reduces to half of its original value and mass remains constant, then acceleration due to gravity on the surface of earth would be :

[JEE Main 2024 (Online) 27th January Morning Shift]

- (1) g/4 (2) 2g (3) g/2 (4) 4g

Scan or tap for the
full solution



Q.39 Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): The angular speed of the moon in its orbit about the earth is more than the angular speed of the earth in its orbit about the sun.

Reason (R): The moon takes less time to move around the earth than the time taken by the earth to move around the sun.

In the light of the above statements, choose the most appropriate answer from the options given below :

[JEE Main 2024 (Online) 27th January Evening Shift]

- (1) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
(2) (A) is correct but (R) is not correct
(3) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(4) (A) is not correct but (R) is correct

Scan or tap for the
full solution



Section B (Numerical) — 5 questions

Q.40 Three identical spheres of mass m are placed at the vertices of an equilateral triangle of length a. When released, they interact only through gravitational force and collide after a time $T = 4$ seconds. If the sides of the triangle are increased to length 2a and also the masses of the spheres are made 2 m, then they will collide after _____ seconds.

[JEE Main 2025 (Online) 3rd April Morning Shift]

Scan or tap for the
full solution



Q.41 A satellite of mass 1000 kg is launched to revolve around the earth in an orbit at a height of 270 km from the earth's surface. Kinetic energy of the satellite in this orbit is _____ $\times 10^{10}$ J. (Mass of earth = 6×10^{24} kg, Radius of earth = 6.4×10^6 m, Gravitational constant = 6.67×10^{-11} N m² kg⁻²)

[JEE Main 2025 (Online) 2nd April Evening Shift]

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full solution



Q.42 Two planets, A and B are orbiting a common star in circular orbits of radii R_A and R_B , respectively, with $R_B = 2R_A$. The planet B is $4\sqrt{2}$ times more massive than planet A. The ratio $\left(\frac{L_B}{L_A}\right)$ of angular momentum (L_B) of planet B to that of planet A (L_A) is closest to integer _____.

[JEE Main 2025 (Online) 29th January Evening Shift]

Scan or tap for the
full solution



Q.43 Acceleration due to gravity on the surface of earth is 'g'. If the diameter of earth is reduced to one third of its original value and mass remains unchanged, then the acceleration due to gravity on the surface of earth is _____ g.

[JEE Main 2025 (Online) 24th January Evening Shift]

Scan or tap for the
full solution



- Q.44** A satellite of mass $\frac{M}{2}$ is revolving around earth in a circular orbit at a height of $\frac{R}{3}$ from earth surface. The angular momentum of the satellite is $M\sqrt{\frac{GMR}{x}}$. The value of x is _____, where M and R are the mass and radius of earth, respectively. (G is the gravitational constant)

[JEE Main 2025 (Online) 23rd January Evening Shift]

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full solution



ANSWER KEY

Section A (MCQ) — 39 questions

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	2	4	3	2	1	2	4	1	3	2	3
Ques.	12	13	14	15	16	17	18	19	20	21	22
Ans.	1	3	3	3	4	2	2	2	4	1	3
Ques.	23	24	25	26	27	28	29	30	31	32	33
Ans.	4	1	1	4	4	3	1	1	3	1	4
Ques.	34	35	36	37	38	39					
Ans.	1	1	3	4	4	3					

Section B (Numerical) — 5 questions

Ques.	40	41	42	43	44						
Ans.	8	3	8	9	3						