doubtnut
India's Number 1 Education App

PHYSICS

BOOKS - NEET PREVIOUS YEAR (YEARWISE + CHAPTERWISE)

GRAVITATION

Gravitation

1. The acceleration due to gravity at a height $1km$ above the earth is the same as at a depth

d below the surface of earth. Then :

A. $d = \frac{1}{2} km$

B. $d = 1km$

C. $d = \frac{3}{2} km$

D. $d = 2m$

Answer: D

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2. Two astronauts are floating in gravitational free space after having lost contanct with their spaceship. The two will:

A. keep floating at the same distance between them

B. move towards each other

C. move away from each other

D. will beome stationary

Answer: B

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3. At what height from the surface of earth the gravitation potential and the value of g are $-5.4 \times 10^7 Jkg^{-2}$ and $6.0ms^{-2}$ respectively ? Take the radius of earth as $6400km$:

A. $1600km$

B. $1400km$

C. $2000km$

D. $2600km$

Answer: D

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4. The ratio of escape velocity at earth (v_e) to the escape velocity at a planet (v_y) whose radius and density are twice

A. $1:2\sqrt{2}$

B. $1:4$

C. $1:\sqrt{2}$

D. $1:2$

Answer: A

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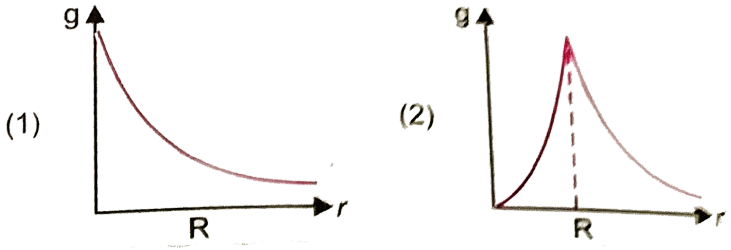
5. The dependence of acceleration due to gravity g on the distance r from the centre of the earth, assumed to be a sphere of radius R of uniform density is as shown in Fig. below:



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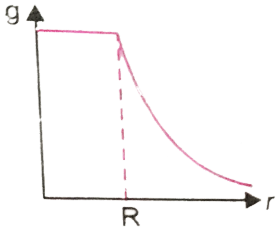

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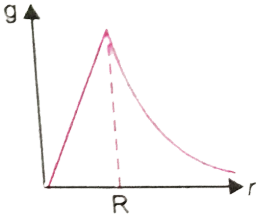
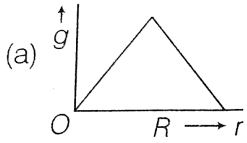


The correct figure is

A.



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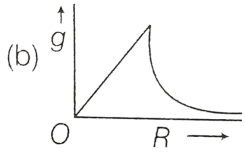

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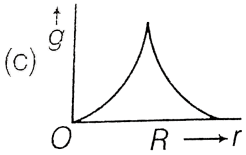
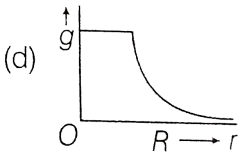


D.



Answer: B

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6. A satellite of mass m is orbiting the earth (of radius R) at a height h from its surface. The total energy of the satellite in terms of g_0, the value of acceleration due to gravity at the earth's surface,

A. $\frac{mg_0R^2}{2(R+h)}$

B. $-\frac{mg_0R^2}{2(R+h)}$

C. $\frac{2mg_0R^2}{R+h}$

D. $-\frac{2mg_0R^2}{R+h}$

Answer: B

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7. Kepler's third law states that square of period revolution (T) of a planet around the sun is proportional to third power of average distance i between sun and planet i.e. $T^2 = Kr^3$

here K is constant

if the mass of sun and planet are M and m respectively then as per Newton's law of gravitational the force of alteaction between them is $F = \frac{GMm}{r^2}$, here G is gravitational constant. The relation between G and K is described as

A. $GK = 4\pi^2$

B. $GMK = 4\pi^2$

C. $K = G$

D. $K = \frac{1}{G}$

Answer: B

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8. Two spherical bodies of mass M and 5M & radii R & 2R respectively are released in free space with initial separation between their centres equal to 12R. If they attract each other due to gravitational force only, then the distance covered by the smallar body just before collision is

A. $2.5R$

B. $4.5R$

C. $7.5R$

D. $1.5R$

Answer: C

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9. A remote-sensing satellite of earth revolves in a circular orbit at a hight of $0.25 \times 10^6 m$ above the surface of earth. If earth's radius is

$6.38 \times 10^6 m$ and $g = 9.8 ms^{-2}$, then the orbital speed of the satellite is

A. $7.76 kms^{-1}$

B. $8.56 kms^{-1}$

C. $9.13 kms^{-1}$

D. $6.67 kms^{-1}$

Answer: A

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10. A satellite S is moving in an elliptical orbit around the earth. The mass of the satellite is very small compared to the mass of the earth.

A. the angular momentum of S about the centre of the earth changes in direction, but its magnitude remains constant

B. the total mechanical energy of S varies periodically with time

C. the linear momentum of S remains constant in magnitude

D. the acceleration of S is always directed towards the centre of the earth

Answer: D

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11. A black hole is an object whose gravitational field is so strong that even light cannot escape from it. To what approximate radius would earth (mass $= 5.98 \times 10^{24} kg$) have to be compresed to be a black hole?

A. $10^{-9}m$

B. $10^{-6}m$

C. $10^{-2}m$

D. $100m$

Answer: C

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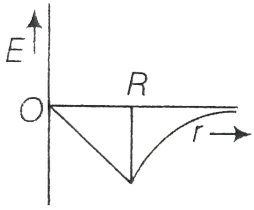
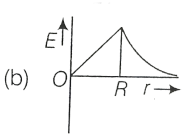
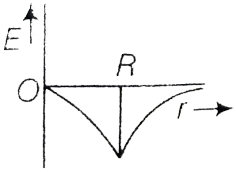
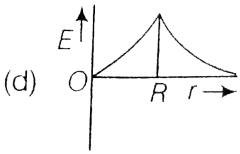
12. Dependence of intensity of gravitational field (E) of earth with distance (r) from centre of earth is correctly represented by

A. 

B. 

C. 

D. 

Answer: A

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13. Infinite number of bodies, each of mass $2kg$, are situated on x-axis at distance $1m, 2m, 4m, 8m.....$ respectively, from the origin. The resulting gravitational potential the to this system at the origing will be

A. $-G$

B. $-\frac{8}{3}G$

C. $-\frac{4}{3}G$

D. $-4G$

Answer: D

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14. The height a which the weight of a body becomes $1/16th$ its weight on the surface of earth (radius R) is

A. $5R$

B. $15R$

C. $3R$

D. $4R$

Answer: C

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15. A compose needle which is allowed to move in a horizontal plane is taken to a geomagnetic pole. It

A. will become rigid showing no movement

B. will stay in any position

C. will stay in North-South direction only

D. will stay in East-West direction only

Answer: C

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16. A spherical planet far out in space has a mass M_0 and diameter D_0. A particle of mass m falling freely near the surface of this planet will experience an accelertion due to gravity which is equal to

A. $4GM_p / D_p^2$

B. GM_pm / D_p^2

C. GM_p / D_p^2

D. $4GM_pm / D_p^2$

Answer: A

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17. A geostationary satellite is orbiting the earth at a height of $5R$ above the surface of the earth, $2R$ being the radius of the earth. The time period of another satellite in hours at a height of $2R$ form the surface of the earth is

A. 5

B. 10

C. $6\sqrt{2}$

D. $6/\sqrt{2}$

Answer: C

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18. A plenet moving along an elliptical orbit is closest to the sun at a distance r_1 and farthest away at a distance of r_2. If v_1 and v_2

are the linear velocities at these points respectively, then the ratio $\frac{v_1}{v_2}$ is

A. r_2 / r_1

B. $(r_2 / r_1)^2$

C. r_1 / r_2

D. $(r_1 / r_2)^2$

Answer: A

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19. A body projected vertically from the earth reaches a height equal to earth's radius before returning to the earth. The power exerted by the gravitational force is greatest.

A. at the instant just before the body hits the earth

B. it remains constant all through

C. at the instant just after the body is projected

D. at the highest position of the body

Answer: A

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20. The radii of circular orbits of two satellite A and B of the earth are $4R$ and R, respectively. If the speed of satellite A is $3v$, then the speed of satellite B will be

A. $3v/4$

B. $6v$

C. $12v$

D. $3v/2$

Answer: B

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21. A particle of mass M is placed at the centre of a uniform spherical shell of equal mass and radius a. Find the gravitational potential at a point P at a distance $\frac{a}{2}$ from the centre.

A. $-\frac{3GM}{a}$

B. $-\frac{2GM}{a}$

C. $-\frac{GM}{a}$

D. $-\frac{4GM}{a}$

Answer: A

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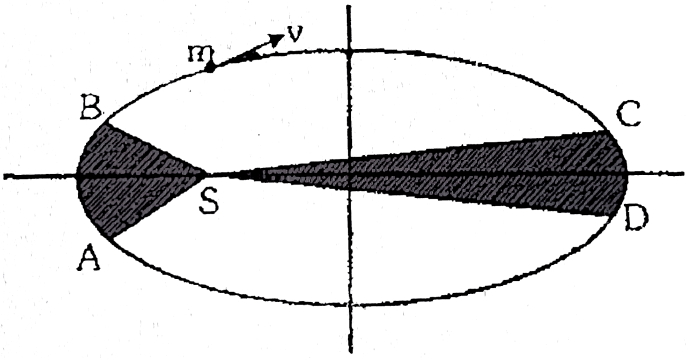

22.

The figure shows elliptical orbit of a planet m about the sun S. the shaded area SCD is twice the shaded area SAB. If t_1 be the time for the planet to move from C to D and t_2 is the time to move from A to B, then:

A. $t_1 > t_2$

B. $t_1 = 4t_2$

C. $t_1 = 2t_2$

D. $t_1 = t_2$

Answer: C

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23. A roller coaster is designed such that riders experience "weightlessness" as they go round the top of a hill whose radius of curvature is $20m$. The speed of the car at the top of the hill is between

A. $14m/s$ and $15m/s$

B. $15m/s$ and $16m/s$

C. $16m/s$ and $17m/s$

D. $13m/s$ and $14m/s$

Answer: A

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24. Two satellites of earth S_1 and S_2 are moving in the same orbit. The mass of S_1 is

four times the mass of S_2. Which one of the following statements is true?

A. The time period of S_1 is four times that of S_2

B. The potential energies of the earth and satellite in the two cases are equal

C. S_1 and S_2 are moving with the same speed

D. The kinetic energies of the two satellites are equal

Answer: C

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25. The earth is assumed to be a sphere of raduis R. A plateform is arranged at a height R from the surface of the fv_e, where v_e is its escape velocity form the surface of the earth. The value of f is

A. $\sqrt{2}$

B. $\frac{1}{\sqrt{2}}$

C. $\frac{1}{3}$

D. $\frac{1}{2}$

Answer: B

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26. For a satellite moving in an orbit around the earth, ratio of kinetic energy to potential energy is

A. 2

B. $1/2$

C. $\frac{1}{\sqrt{2}}$

D. $\sqrt{2}$

Answer: B

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27. Imagine a new planet having the same density as that of earth but 3 times bigger than the earth in size. If the acceleration due

to gravity on the surface of earth is g and that on the new plane is g , then :

A. $g' = 3g$

B. $g' = \frac{g}{g}$

C. $g' = 9g$

D. $g' = 27g$

Answer: C

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28. The density of a newly discovered planet is twice that of earth. The acceleration due to gravity at the surface of the planet is equal to that at the surface of the earth. If the radius of the earth is R, the radius of the planet would be

A. $2R$

B. $4R$

C. $\frac{1}{4}R$

D. $\frac{1}{2}R$

Answer: D

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29. Two sphere of masses m and M are situated in air and the gravitational force between them is F. The space around the masses in now filled with a liquid of specific gravity 3. The gravitational force will now be

A. $\frac{F}{3}$

B. $\frac{F}{9}$

C. $3F$

D. F

Answer: D

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30. The acceleration due to gravity on the planet A is 9 times the acceleration due to gravity on planet B. A man jumps to a height of $2m$ on the surface of A. What is the height of jump by the same person on the planet B?

A. $6m$

B. $\frac{2}{3}m$

C. $\frac{2}{9}m$

D. $18m$

Answer: D

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31. A body of mass m is placed on the earth surface is taken to a height of $h = 3R$, then, change in gravitational potential energy is

A. $\frac{mgh}{R}$

B. $\frac{2}{3}mgR$

C. $\frac{3}{4}mgR$

D. $\frac{mgR}{2}$

Answer: C

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32. A body attains a height equal to the radius of the earth when projected from earth's

surface the velocity of body with which it was projected is

A. $\sqrt{\frac{GM}{R}}$

B. $\sqrt{\frac{2GM}{R}}$

C. $\sqrt{\frac{5}{4}\frac{GM}{R}}$

D. $\sqrt{\frac{3GM}{R}}$

Answer: A

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33. The mass of a planet is six times that of the earth. The radius of the planet is twice that of the earth. It's the escape velocity from the earth is v, then the escape velocity from the planet is:

A. $11.2km/s$

B. $44.8km/s$

C. $22.4km/s$

D. $5.6km/s$

Answer: C

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34. The escape velocity of a sphere of mass m is given by (G= univesal gravitational constant, $M_e =$ mass of the earth and $R_e =$ radius of the earth)

A. $\sqrt{\frac{GM_e}{R_e}}$

B. $\sqrt{\frac{2GM_e}{R_e}}$

C. $\sqrt{\frac{2Gm}{R_e}}$

D. $\frac{GM_e}{R_e^2}$

Answer: B

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35. A rubber ball is dropped from a height of $5m$on a plane, where the acceleration due to gravity is not shown. On bouncing it rises to $1.8m$. The ball loses its velocity on bouncing by a factor of

A. $16/25$

B. $2/5$

C. $3/5$

D. $9/25$

Answer: B

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36. The time of revolution of planet A round the sun is 8 times that of another planet B. The distance of planet A from the sun is how many B from the sun

A. 5

B. 4

C. 3

D. 2

Answer: B

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37. Escape velocity of a body from the surface of earth is 11.2km/sec. from the earth surface. If the mass of earth becomes double of its

present mass and radius becomes half of its present radius then escape velocity will become

A. $44.8km/s$

B. $22.4km/s$

C. $11.2km/s$ (remain unchanged)

D. $5.6km/s$

Answer: B

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38. A ball is dropped from a spacecraft revolving around the earth at a height of $1200km$. What will happen to the ball ? .

A. continue to move with same speed along a straight line tangentially to the satellite at that time

B. continue to move with the same speed along the original orbit of satellite

C. fall down to the earth gradually

D. go far away in space

Answer: B

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39. What will be the formula of the mass in terms of g, R and G ? (R = radius of the earth)

A. $\frac{g^2(R)}{G}$

B. $G\frac{R^2}{g}$

C. $G\frac{R}{g}$

D. $\frac{g\left(R^2\right)}{G}$

Answer: D

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40. The escape velocity from the surface of the earth is V_e. The escape velcotiy from the surface of a planet whose mass and radius are three times those of the earth, will be

A. v_e

B. $3v_e$

C. $9v_e$

D. $\frac{1}{3v_e}$

Answer: A

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41. A satellite A of mass m is at a distance of r from the centre of the earth. Another satellite B of mass 2m is at distance of 2r from the earth's centre. Their time periode are in the ratio of

A. $1:2$

B. $1:16$

C. $1:32$

D. $1:2\sqrt{2}$

Answer: D

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42. The escape velocity for a body projected vertically upwards from the surface of the earth is $11.2kms^{-1}$. If the body is projected in

a direction making an angle 45° with the vertical, the escape velocity will be

A. $11.2 \times 2km/s$

B. $11.2km/s$

C. $\frac{11.2}{\sqrt{2}}km/s$

D. $11.2\sqrt{2}km/s$

Answer: B

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43. The mean radius of earth is R, its angular speed on its own axis is w and the acceleration due to gravity at earth's surface is g. What will be the radius of the orbit of a geostationary satellite

A. $\left(\frac{R^2 g}{\omega^2}\right)^{1/3}$

B. $\left(\frac{Rg}{\omega^2}\right)^{1/3}$

C. $\left(\frac{R^2 \omega^2}{g}\right)^{1/3}$

D. $\left(\frac{R^2 g}{\omega}\right)^{1/3}$

Answer: A

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44. A satellite moves around the earth in a circular orbit with speed v. If m is the mass of the satellite, its total energy is

A. $\frac{3}{4}mv^2$

B. $\frac{1}{2}mv^2$

C. mv^2

D. $-\left(\frac{1}{2}\right)mv^2$

Answer: D

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45. A seconds pendulum is mounted in a rocket. Its period of oscillation decreases when the rocket

A. comes down with uniform accceleration

B. moves round the earth in a geostationaly orbit

C. moves up with a uniform veloctiy

D. moves up with uniform acceleration

Answer: D

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46. A planet is moving in an elliptic orbit. If T, V, E and L stand, respectively, for its kinetic energy, gravitational potential energy, total energy and angular momentum about the centre of force, then

A. T is conserved

B. U is always positive

C. E is always negative

D. L is conserved but direction of vector L changes continuously

Answer: C

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47. The gravitational force between two objects is proportional to $1/R$ (and not as $1/R^2$) where R is separation between them,

then a particle in circular orbit under such a force would have its orbital speed v proportional to

A. $\frac{1}{R^2}$

B. R^0

C. R

D. $\frac{1}{R}$

Answer: B

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48. For a satellite, escape speed is $11kms^{-1}$. If the satellite is launched at an angle of 60° with the vertical, what will be the escape speed?

A. $11km/s$

B. $11\sqrt{3}km/s$

C. $\frac{11}{\sqrt{3}}km/s$

D. $33km/s$

Answer: A

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49. The distance of the two planets from the Sun are $10^{13}m$ and $10^{12}m$, respectively. Find the ratio of time periods and speeds of the two planets.

A. $\frac{1}{\sqrt{10}}$

B. 100

C. $10\sqrt{10}$

D. $\sqrt{10}$

Answer: C

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50. The largest and the shortest distance of the earth from the sun are r_1 and r_2, its distance from the sun when it is at the perpendicular to the major axis of the orbit drawn from the sun

A. $\frac{r_1 + r_2}{4}$

B. $\frac{r_1 + r_2}{r_1 - r_2}$

C. $\frac{2r_1 r_2}{r_1 + r_2}$

D. $\frac{r_1 + r_2}{3}$

Answer: C

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