PHYSICS

BOOKS - DISHA PHYSICS (HINGLISH)

GRAVITATION

Physics

1. The radius of a planet is 1/4th of Re and its acc. due to gravity is 2g. What would be the

value of escape velocity on the planet, if escape velocity on earth iv_e

A. $\frac{v_e}{\sqrt{2}}$

B. $v_e\sqrt{2}$

C. $v_e(d)$

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

Answer:

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2. A projectile is fired vertically upwards from the surface of the earth with a velocity Kv_e, where v_e is the escape velocity and $K < 1$.If R is the radius of the earth, the maximum height to which it will rise measured from the centre of the earth will be (neglect air resistance)

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

B. $\frac{R}{K-1}$

C. $\frac{R}{1-K^2}$

D. $\frac{R}{1+K^2}$

Answer:

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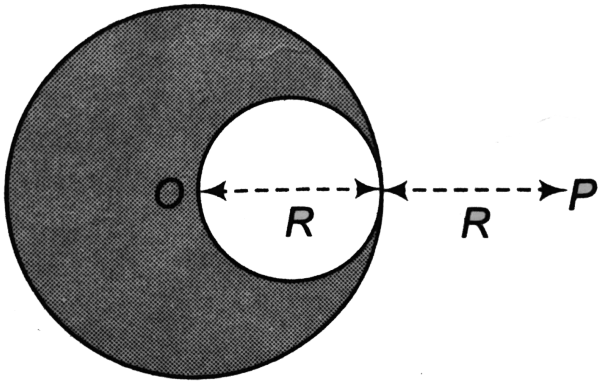
3. A solid sphere of uniform density and radius R applies a gravitational force of attraction equal to F_1 on a particle placed at P, distance $2R$ from the centre O of the sphere. A spherical cavity of radius $R/2$ is now made in the sphere as shown in figure. The particle with cavity now applies a gravitational force F_2 on same particle placed at P. The radio

F_2 / F_1 will be



A. $1/2$

B. 3

C. 7

D. $1/9$

Answer:

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4. 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. $\frac{6}{\sqrt{2}}$

Answer:

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5. 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. $(3/4)mv^2$

B. $(1/2)mv^2$

C. mv^2

D. $-(1/2)mv^2$

Answer:

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6. A mass m is at a distance a from one end of a uniform rod of length l and mass M. Find the

gravitational force on the mass due to the rod.

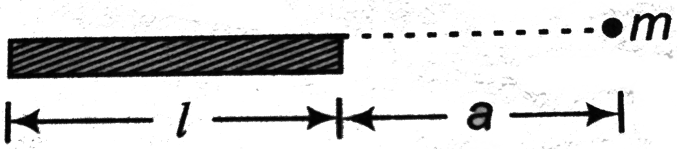

Fig. 13.12

A. $\frac{GMm}{r(r+l)}$

B. $\frac{GM}{r^2}$

C. $Mmr^2 + l$

D. $\left(r^2 + l\right)mM$

Answer:

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7. 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. $1/R^2$

B. R^0

C. R^1

D. $1/R$

Answer:

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8. A satellite of mass m revolves around the earth of radius R at a hight x from its surface. If g is the acceleration due to gravity on the surface of the earth, the orbital speed of the satellite is

A. $\frac{gR^2}{R+X}$

B. $\frac{gR}{R-X}$

C. gx

D. $\left(\frac{gR^2}{R+X}\right)^{1/2}$

Answer:

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9. A body is projected up with a velocity equal to $3/4th$ of the escape velocity from the surface of the earth. The height it reaches is (Radius of the earth is R)

A. $\frac{10R}{9}$

B. $\frac{16R}{7}$

C. $\frac{9R}{8}$

D. $\frac{10R}{3}$

Answer:

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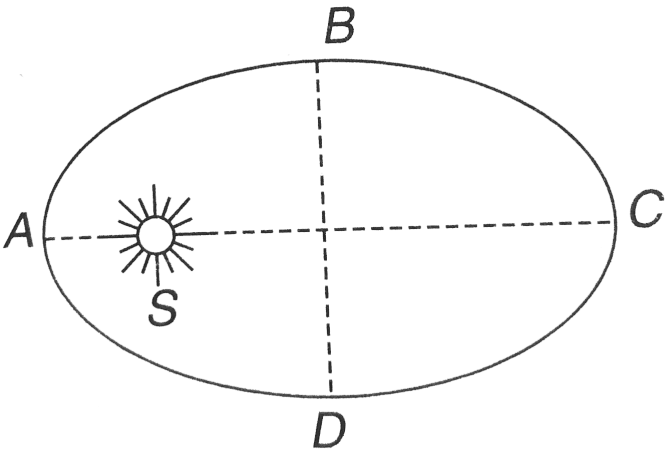
10. A planet is revolving around the sun as shown in elliptical path. The correct option is



A. The time taken in travelling DAB is less than that for BCD

B. The time taken in travelling DAB is greater than that for BCD

C. The time taken in travelling CDA is less than that for AB

D. The time taken in travelling CDA is greater than that for AB

Answer:

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

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

C. $18m$

D. $6m$

Answer:

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12. If suddenly the gravitational force of attraction between earth and satellite

revolving around it becomes zero, then the satellite will

A. continue to move in its orbit with same speed

B. move tangentially to the original orbit with same speed

C. become stationary in its orbi

D. move towards the earth

Answer:

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13. Mass $M = 1$ unit is divided into two parts X and $(1 - X)$. For a given separation the value of X for which the gravitational force between them becomes maximum is

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

B. $\frac{3}{5}$

C. 1

D. 2

Answer:

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14. Potential energy of a satellite having mass m and rotating at a height of $6.4 \times 10^6 m$ from the earth surface is

A. $-mgR_e$

B. $-0.67mgR_e$

C. $-0.5mgR_e$

D. $-0.33mgR_e$

Answer:

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15. If the radius of the earth were to shrink by one percent its mass remaining the same, the acceleration due to greavity on the earth's surface would

A. decrease by 1%

B. decrease by2%

C. decrease by 1%

D. decrease by 2% `

Answer:

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16. Four equal masses (each of mass M) are placed at the corners of a square of side a. The escape velocity of a body from the centre O of the square is

A. $4\sqrt{\frac{2GM}{a}}$

B. $\sqrt{\frac{8\sqrt{2}GM}{a}}$

C. $\frac{4GM}{a}$

D. $\sqrt{\frac{4\sqrt{2}GM}{a}}$

Answer:

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17. If the gravitational force had varied as $r^{-5/2}$ instead of r^{-2}, the potential energy of a particle at a distance 'r' from the centre of the earth would be directly proportional to

A. r^{-1}

B. r^{-2}

C. $r^{-3/2}$

D. $r^{-5/2}$

Answer:

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18. A particle of mass 'm' is kept at rest at a height 3R from the surface of earth, where 'R' is radius of earth and 'M' is mass of earth. The minimum speed with which it should be

projected, so that it does not return back, is (g is acceleration due to gravity on the surface of earth)

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

B. $\left(\frac{GM}{2R}\right)^{1/2}$

C. $\left(\frac{gR}{4}\right)^{1/2}$

D. $\left(\frac{2g}{4}\right)^{1/2}$

Answer:

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19. 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 is (radius of Earth is R)

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

B. $\frac{R}{R-1}$

C. $\frac{R-2}{R}$

D. 1

Answer:

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20. The weight of an object in the coal mine, sea level and at the top of the mountain are W_1, W_2 and W_3 respectively, then

A. $W_1 < W_2 > W_3$

B. $W_1 = W_2 = W_3$

C. $W_1 < W_2 < W_3$

D. $W_1 > W_2 > W_3$

Answer:

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21. The period of moon's rotation around the earth is approx. 29 days. IF moon's mass were 2 fold its present value and all other things remain unchanged, the period of Moon's rotation would be nearly

A. $29\sqrt{2}\text{days}$

B. $29/\sqrt{2}\text{days}$

C. $29 \times 2\text{days}$

D. 29days

Answer:

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

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

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

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

Answer:

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23. The numerical value of the angular velocity of rotation of the earth should be..... Rad/s in order to make the effective acceleration due to gravity equal to zero.

A. Zero

B. $\frac{1}{800}\text{red sec}^{-1}$

C. $\frac{1}{80}\text{red sec}^{-1}$

D. $\frac{1}{8}\text{red sec}^{-1}$

Answer:

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24. A body weighs 72 N on the surface of the earth. What is the gravitational force on it due

to earth at a height equal to half the radius of the earth from the surface

A. $32N$

B. $28N$

C. 16

D. $72N$

Answer:

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25. A body weighs W newton at the surface of the earth. Its weight at a height equal to half the radius of the earth, will be

A. $W/2$

B. $2W/3$

C. $4W/9$

D. $8W/27$

Answer:

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26. A shell of mass M and radius R has point mass m placed at a distance r from its centre. The gravitational potential energy U(r) vs r will be

A. 

B. 

C. 

D. 

Answer:

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27. 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. $(r_1 + r_2)/4$

B. $(r_1 + r_2)/(r_1 - r_2)$

C. $2r_1 + r_2/(r_1 - r_2)$

D. $(r_1 + r_2)/3$

Answer:

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28. 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 conserve

B. V is always positive

C. E is always negative

D. L is conserved but direction of vector L change

Answer:

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

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

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

D. $\sqrt{2}$

Answer:

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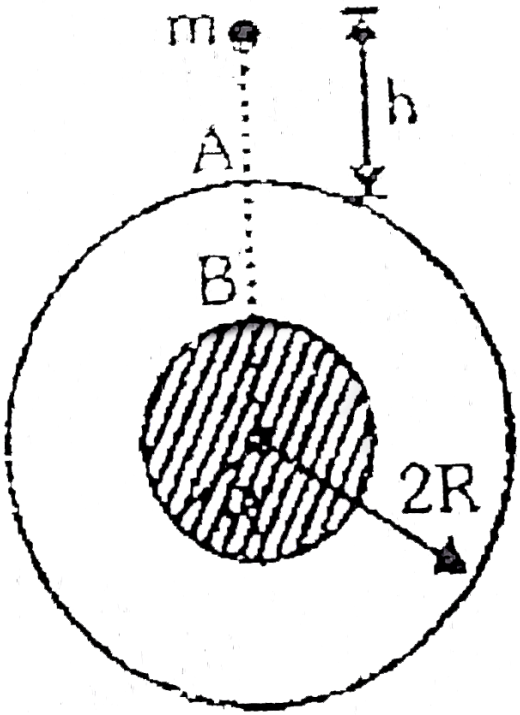

30.

A solid sphere of mass M and radius R is surrounded by a spherical shell of same mass M and radius 2R as shown. A small particle of mass m is released from rest from a height $h(<<R)$ above the shell. There is a hole

inn the shell.

QIn what time will it enter the hole at A

A. $2\sqrt{\frac{hR^2}{GM}}$

B. $\sqrt{\frac{2hR^2}{GM}}$

C. $\sqrt{\frac{hR^2}{GM}}$

D. $\sqrt{\frac{3hR^2}{GM}}$

Answer:

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31. A body starts from rest from a point distant r_0 from the centre of the earth. It reaches the surface of the earth whose radius is R. The velocity acquired by the body is

A. $2GM\left(\frac{1}{R}-\frac{1}{R_o}\right)$

B. $\sqrt{2GM\left(\frac{1}{R_o}-\frac{1}{R}\right)}$

C. $2GM\left(\frac{1}{R}-\frac{1}{R_o}\right)$

D. $2GM\sqrt{\frac{1}{R}-\frac{1}{R_o}}$

Answer:

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32. A satellite of mass M is moving in a circle of radius R under a centripetal force given by `(-K//R^(2)), where k is a constant. Then

A. The kinetic energy of the particle is $\frac{k}{12}R$

B. The total energy of the particle is $\left(-\frac{K}{2R}\right)$

C. The kinetic energy of the particle is

$$\left(-\frac{K}{R}\right)$$

D. The potential energy of the particle

$$\left(\frac{K}{2R}\right)$$

Answer:

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33. The change in the value of g at a height h above the surface of the earth is the same as at a depth d below the surface of earth. When

both d and h are much smaller than the radius of earth, then which one of the following is correct?

A. $d = \frac{3h}{2}$

B. $d = \frac{h}{2}$

C. $d = h$

D. $d = 2h$

Answer:

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34. Two indentical geostationary satellite each of mass m are moving with equal speed v in the same orbit but their sense of rotation brings them on a collision course. What will happen to the debris?

A. fall down

B. move up

C. begin to move from east to west in the same orbit

D. begin to move from west to east in the same orbit

Answer:

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35. A diametrical tunnel is dug across the earth. A ball dropped into the tunnel from one side. The velocity of the ball when it reaches the centre of the earth is [Given: gravitational

potential at the centre of earth $= -3/2(GM/R)]$

A. $\sqrt{R}$

B. $\sqrt{gR}$

C. $\sqrt{2.5gR}$

D. $\sqrt{7.1gR}$

Answer:

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36. A satellite revolves around the earth of radius R in a circular orbit of radius 3R. The percentage increase in energy required to lift it to an orbit of radius 5R i

A. $10\ \%$

B. $20\ \%$

C. $30\ \%$

D. $40\ \%$

Answer:

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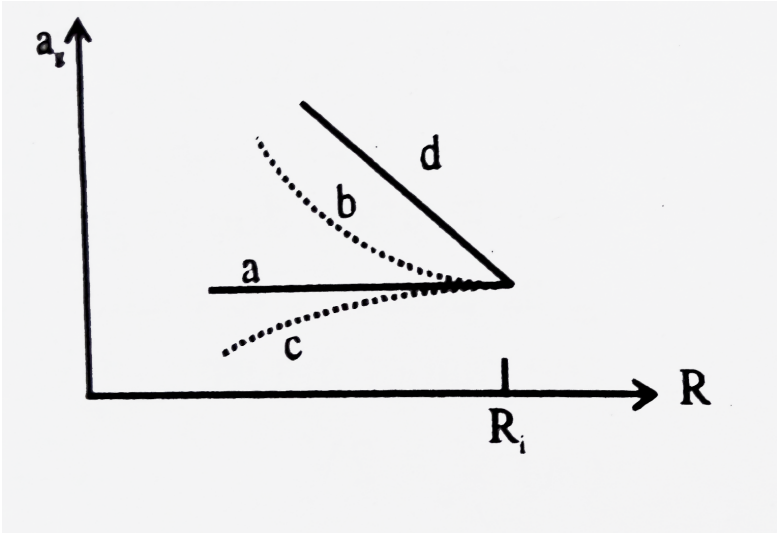
37. A(nonrotating) star collaps onto from an initial radius R_i with its mass remaining unchanged. Which curve in figure best gives the gravitational acceleration a_g on the surface of the star as a function of the radius of the star during the collapse?



A. a

B. b

C. c

D. d

Answer:

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38. if the earth is treated as a sphere of radius Radn mass M, Its angular momentum about the axis of its rotation with period T, is

A. $\frac{\pi MR^3}{T}$

B. $\frac{MR^{2\pi}}{T}$

C. $\frac{2\pi MR^2}{5T}$

D. $\frac{4\pi MR^2}{5T}$

Answer:

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39. A satellite is launched into a circular orbit of radius R around the earth. While a second is lunched into an orbit of radius $1.01R$ The

period of the second satellite is longer than the first one by approximately:

A. $0.5\,\%$

B. $1.0\,\%$

C. $1.0\,\%$

D. $3.0\,\%$

Answer:

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40. A uniform spherical shell gradually shrinks maintainig its shape. The gravitational potential at the centre

A. increases

B. decreases

C. remains constant

D. cannot say

Answer:

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41. The depth at which the value of acceleration due to gravity is $\frac{1}{n}$ times the value at the surface, is (R=radius of the earth)

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

B. $R\left(\frac{n-1}{n}\right)$

C. $\frac{R}{n^2}$

D. $R\left(\frac{n}{n+l}\right)$

Answer:

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42. Radius of moon is $1/4$ times that of earth and mass is 1/81 times that of earth. The point at which gravitational field due to earth becomes equal and opposite to that of moon, is (Distance between centres of earth and moon is 60R, where R is radius of earth

A. 5.75 R from centre of moon

B. 16 R from surface of moon

C. 53 R from centre of earth

D. 54 R from centre of eart

Answer:

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43. What is the minimum energy required to launch a satellite of mass m from the surface of a planet of mass M and radius R in a circular orbit at an altitude of 2R?

A. $\frac{5GmM}{6R}$

B. $\frac{2GmM}{3R}$

C. $\frac{GmM}{2R}$

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

Answer:

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