PHYSICS

BOOKS - SARAS PUBLICATION

GRAVITATION

Example

1. Assuming the sun to have a spherical outer surface of radiating like a black body at temperature $t^{\circ}C$, the power received by a

unit surface,(normal to the incident rays) at a distance R from the centre of the sun is

A. $r^2\sigma(t+273)^4/R^2$

B. $4\pi r^2\sigma t^4/R^2$

C. $r^2\sigma(t+273)^4/4\pi R^2$

D. $16\pi^2 r^2\sigma t^4/R^2$

Answer:

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2. A shell of mass 200 gm is ejected from a gun of mass 4 kg by an explosion that generates 1.05 kJ of energy. Calculate the initial velocity of the shell

A. $100ms^{-1}$

B. $80ms^{-1}$

C. $40ms^{-1}$

D. $120ms^{-1}$

Answer:

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3. A body of mass 1 kg is thrown upwards with a velocity $20ms^{-1}$. It momentarily comes to rest after attaining a height of 18 m. How much energy is lost due to air friction ? (Take $g = 10ms^{-2}$)

A. 30J

B. 40J

C. 10J

D. 20J

Answer:

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4. A particle has an initial velocity $3\hat{i} + 4\hat{j}$ and an acceleration of $0.4\hat{i} + 0.3\hat{j}$. It's speed after 10s is

A. 7 units

B. $7\sqrt{2}units$

C. 8.5 units

D. 10 units

Answer:

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5. A particle moves a distance x in time t according to equation $x = (t+5)^{-1}$ the acceleration of the particle is proportional to:

A. $(velocity)^{3/2}$

B. $(dis\tan ce)^{2}$

C. $(dis\tan ce)^{-2}$

D. $(velocity)2/3$

Answer:

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6. A man of 50 kg mass is standing in a gravity free space at a height of 10 .m above the floor.- He throws a stone of 0.5 kg.mass downwards with a speed $2m/s$. When the.stone reaches the floor,the distance of the man above the floor will be

A. 9.9 m

B. 10.1 m

C. 10 m

D. 20 m

Answer:

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7. A person of mass 60 kg is inside a lift of mass 940kg and presses the button one control panel .The lift start moving upwarsds

with an acceleration $1.0m/s^2$. If $g = 10ms^{-2}$

the tension in the supporting cable is

A. 1200 N

B. 8600 N

C. 9680 N

D. 11000 N

Answer:

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

A. At the instant just after the body is projected

B. At the highest position of the body

C. At the instant just before the body hits the earth

D. It remains constant all through

Answer:

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9. A particle moves in a circle of radius 5 cm with constant speed and time period $0.2\pi S$ .The acceleration of the particle is

A. $5m/s^2$

B. $15m/s^2$

C. $25m/s^2$

D. $36m/s^2$

Answer:

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10. A planet moving along an elliptical orbit is closest to the Sun at distance r_1 and farthest away at a distance of r_2. If v_1 and v_2 are linear speeds at these points respectively. Then the ratio $\frac{v_1}{v_2}$ is

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

B. $\left[\frac{r_1}{r_2}\right]^2$

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

D. $\left[\frac{r_2}{r_1}\right]^2$

Answer:

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11. A body is moving with velocity $30m/s$ towards east .After 10 seconds its velocity becomes$40m/s$ towards north .The average acceleration of the body is

A. $5m/s^2$

B. $1m/s^2$

C. $7m/s^2$

D. $\sqrt{7}m/s^2$

Answer:

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

A. 15R

B. 3R

C. 4R

D. 5R

Answer:

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13. A geostationary satellite is orbiting the earth at a height of 5R above the surface of the earth, R being the radius of the earth. Find

the time period of another satellite at a height of 2R from the surface of the earth.

A. 10

B. $6\sqrt{2}$

C. $6/\sqrt{2}$

D. 5

Answer:

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14. A spherical planet has a mass M_p and diameter D_p. A particle of mass m falling freely near the surface of this planet will experience an acceleration due to gravity, equal to:

A. $GM \pm / D_p^2$

B. GMp / D_p^2

C. $4GM \pm / D_p^2$

D. $4GMp / D_p^2$

Answer:

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15. When a biconvex lens of glass having refractive index 1.47 is dipped in a liquid, it acts as a plane sheet of glass . This implies that the liquid must have refractive index

A. less than one

B. greater than that of glass

C. less than that of glass

D. equal to that of glass

Answer:

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16. An infinite number of bodies, each of mass 2 kg, are situated on at distance 1m, 2m, 4m, 8m from the origin. What will be the resultant gravitational potential due to this system at the origin.

A. $-G$

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

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

D. $-4G$

Answer:

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17. Calculate the ratio of radii of gyration of a circular ring and dise of the same radius with respect to the axis passing through their centres and perpendicular to their planes.

A. $\sqrt{2}:1$

B. $1:\sqrt{2}$

C. $3:2$

D. $2:1$

Answer:

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18. A planet has the radius twice that of earth and has same density as that of earth. If V_p and V_e are the escape velocities for the

planet and earth, then which of the following correct relation is:

A. $V_E = 1.5V_P$

B. $V_P = 1.5V_E$

C. $V_P = 2V_E$

D. $V_E = 3V_P$

Answer:

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19. 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. $\left[\frac{GM}{R}\right]^{\frac{1}{2}}$

B. $\left[\frac{GM}{2R}\right]^{\frac{1}{2}}$

C. $\left[\frac{gR}{4}\right]^{\frac{1}{2}}$

D. $\frac{\left[\frac{2g}{R}\right]^1}{2}$

Answer:

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20. The ratio of the acceleration for a solid sphere (mass m and radius R) rolling down an incline of angle θ without slipping and slipping down the incline without rolling is,

A. $5:7$

B. $2:3$

C. $2:5$

D. $7:5$

Answer:

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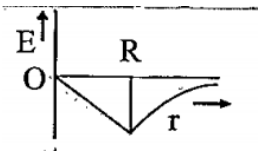
21. Dependence of intensity of gravitational field (E) of earth with distance (r) from centre of earth is correctly represented by

A.



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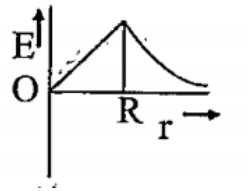

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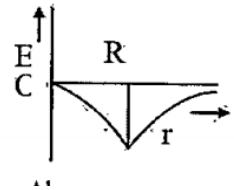

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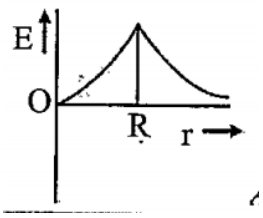

Answer:

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22. A remote- sensing satellite of earth revolves in a circular orbit at a height of $0.25 \times 10^6 m$ above the surface of earth.If

earth 's radius is $6.38 \times 10^6 ms^{-2}$ then the orbital speed of the satellite is

A. $6.67 kms^{-1}$

B. $7.76 kms^{-1}$

C. $8.56 kms^{-1}$

D. $9.13 kms^{-1}$

Answer:

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23. In double slit experiment ,the two slits are lmm apart and the screen is placed I m away. A monochromatic ligth of wavelength 500 nm is used .What will be the width of each slit for obtaining ten maxima of double within the central maxima of single slit pattern?

A. $0.1mm$

B. $0.5mm$

C. $0.02mm$

D. $0.2mm$

Answer:

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24. Kepler's third law states that square of period of revolution (T)of a period around the sun is proportional to third power of average distance r between sun and planet i.e . $T^2 = Kr^3$, hence K is constant .If the masses of sun and planet are M and m respectively then as per Newton 's law of gravitation force of attraction between them is $F = \frac{GMm}{r^2}$

here G is gravitational between G and K is described as :

A. $GMK = 4\pi^2$

B. $K = G$

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

D. $GK = 4\pi^2$

Answer:

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

A. $4.5R$

B. $7.5R$

C. $1.5R$

D. $2.5R$

Answer:

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26. At what height from the surface of Earth the gravitational potential and the value of g are $-5.4 \times 10^7 J \quad kg^{-1}$ and $6.0 ms^{-2}$ respectively? Take the radius of the Earth as 6400 km.

A. 2000km

B. 2600km

C. 1600km

D. 1400km

Answer:

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27. The ratio of escape velocity at earth (v_e) to the escape velocity at a planet (v_p) whose radius and mean density are twice as that of earth is :

A. $1:\sqrt{2}$

B. $1:2$

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

D. $1:4$

Answer:

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28. Plank's constant (h), speed of light in vacuum (c) and Newton's gravitational constant (G) are taken as three fundamental

constants.

Which of the following combinations of these has the dimensions of length?

A. $\sqrt{\frac{hc}{G}}$

B. $\sqrt{\frac{Gc}{h^3/2}}$

C. $\sqrt{\frac{hG}{c3/2}}$

D. $\sqrt{\frac{hG}{c5/2}}$

Answer:

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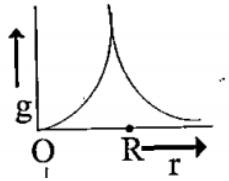
29. Starting from the centre of the earth having radius R, the variation of g (acceleration due to gravity) is shown by :

A.



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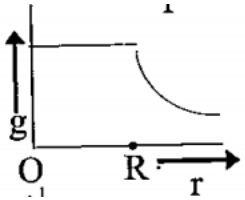

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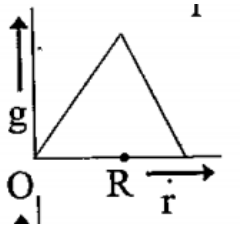

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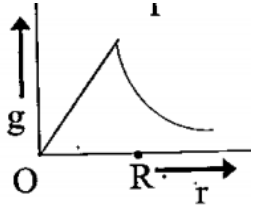

Answer:

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30. A satellite of mass m is orbiting the earth (of radius R) at a height h from its surface. T he total energy of the satellite in terms of g_0 ,the value of acceleration due to gravity at the earth 's surface ,is

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

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

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

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

Answer:

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31. The ratio of resolving powers of an optical microscope for two wavelengths $\lambda_1 = 4000\overset{\circ}{A}$ and $\lambda_2 = 6000\overset{\circ}{A}$ is

A. $9:4$

B. $3:2$

C. $16:81$

D. $8:27$

Answer:

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32. A physical quantity of the dimensions of length that can be formed out of c, G and $\frac{e^2}{4\pi\varepsilon_0}$ is [c is velocity of ligth ,G is universal constant of gravitation and e is charge]

A. $\frac{1}{c^2}\left[G\frac{e^2}{4\pi\varepsilon_0}\right]^{1/2}$

B. $\frac{1}{c^2}\left[G\frac{e^2}{4\pi\varepsilon_0}\right]^{-1/2}$

C. $\frac{1}{c}G\frac{e^2}{4\pi\varepsilon_0}$

D. $c^2\left[G\frac{e^2}{4\pi\varepsilon_0}\right]^{1/2}$

Answer:

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33. The acceleration due to gravity at a height 1 km above the earth is the same sa at depth d below the surface of earth . Then

A. $d = 1km$

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

C. $d = 2km$

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

Answer:

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34. Two astronauts are floating in gravitation free space after having lost contact with their spaceship . The two will

A. move towards each other

B. move away from each other

C. will become stationary

D. keep floating at the same distance between them

Answer:

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