PHYSICS

BOOKS - UNIVERSAL BOOK DEPOT 1960 PHYSICS (HINGLISH)

GRAVITATION

OT

1. Tidal waves in the sea are primarily due to

A. The gravitational effect of the moon on the earth

B. The gravitational effect of the sun on the earth

C. The gravitational effect of venus on the earth

D. The atmospheric effect of the earth itself

Answer: A

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2. If there were a smaller gravitational effect, which of the following forces do you think would alter in some respect

A. Viscous forces

B. Archimedes uplift

C. Electrostatic force

D. None of the above

Answer: B

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3. A satellite of the earth is revolving in a circular orbit with a uniform speed v. If the gravitational force suddenly disappears, the satellite will

A. Continue to move with velocity v along the original orbit

B. Move with a velocity v , tangentially to the original orbit

C. Fall down with increasing velocity

D. Ultimately come to rest somewhere on the original orbit

Answer: B

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4. The atmosphere is held to the earth by

A. Winds

B. Gravity

C. Clouds

D. None of the above

Answer: B

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5. The weight of a body at the centre of the earth is

A. Zero

B. Infinite

C. Same as on the surface of earth

D. None of the above 6

Answer: A

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6. The distance between two objects is doubled. What happens to gravitational force between them ?

A. Is doubled

B. Becomes four times

C. Is reduced to half

D. Is reduced to a quarter

Answer: D

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7. Which of the following is the evidence to show that there must be force acting on earth nd directed towards Sun?

A. Deviation of the falling bodies towards east

B. Revolution of the earth round the sun

C. Phenomenon of day and night

D. Apparent motion of sun round the earth

Answer: B

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8. The gravitational force between two stones of mass 1 kg each separated by a distance of 1 metre in vacuum is

A. Zero

B. 6.675×10^{-5} newton

C. 6.675×10^{-11} newton

D. 6.675×10^{-8} newton

Answer: C

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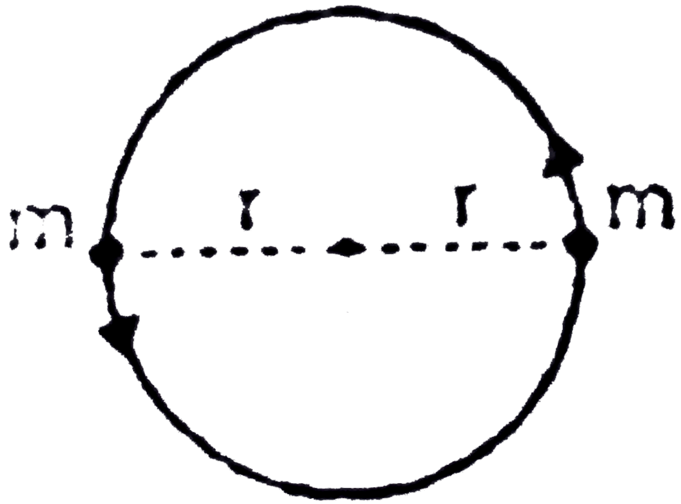
9.



Two particles of equal mass (m) each move in a circle of radius (r) under the action of their mutual gravitational attraction find the speed of each particle.

A. $v = \frac{1}{2R}\sqrt{\frac{1}{GM}}$

B. $v = \sqrt{\frac{Gm}{2R}}$

C. $v = \frac{1}{2}\sqrt{\frac{Gm}{R}}$

D. $v = \sqrt{\frac{4Gm}{R}}$

Answer: C

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10. The earth $(mass = 10^{24} kg)$ revolves round the Sun with an angular velocity $2 \times 10^{-7} rads^{-1}$ in a circular orbit of radius $1.5 \times 10^{8} km$. Find the force exerted by the Sun on the earth (in $\times 10^{21} N$).

A. 18×10^{25}

B. Zero

C. 27×10^{39}

D. 36×10^{21}

Answer: D

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11. Gravitational mass is proportional to gravitational

A. Field

B. Force

C. Intensity

D. All of these

Answer: D

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12. The gravitional force between two point masses m_1 and m_2 at separation r is given by

$$F = k\frac{m_1 m_2}{r^2}$$

The constant k

A. Depends on system of units only

B. Depends on medium between masses only

C. Depends on both (a) and (b)

D. Is independent of both (a) and (b)

Answer: A

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13. The distance between the centres of the Moon and the earth is D. The mass of the earth is 81 times the mass of the Moon. At what distance from the centre of the earth, the gravitational force will be zero?

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

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

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

D. $\frac{9D}{10}$

Answer: D

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14. Who among the following gave first the experimental value of G

A. Cavendish

B. Copernicus

C. Brook Teylor

D. None of these

Answer: A

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15. The mass of the moon is $7.34 \times 10^{22} kg$ and the radius is $1.74 \times 10^{6} m$. The value of gravitation force will be

A. $1.45 N / kg$

B. $1.55 N / kg$

C. $1.75 N / kg$

D. $1.62 N / kg$

Answer: D

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16. A satellite is orbiting around the earth. If both gravitational force and centripetal force on the satellite is F, then, net force acting on the satellite to revolve around the earth is

A. Zero

B. F

C. $F\sqrt{2}$

D. $2F$

Answer: B

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17. Explain the reason of weightlessness inside a satellite.

A. Zero gravity

B. Centre of mass

C. Zero reaction force by satellite surface

D. None

Answer: C

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18. 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: A

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19. The force of gravitation is

A. Repulsive

B. Electrostatic

C. Conservative

D. Non-conservative

Answer: C

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20. The gravitational force of attraction between any two objects does not depend upon

A. Sum of the masses

B. Product of the masses

C. Gravitational constant

D. Distance between the masses

Answer: A

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21. 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. F

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

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

D. $3F$

Answer: A

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22. The atmosphere is held to the earth by

A. Gravity

B. Oxygen between earth and atmosphere

C. Both (a) and (b)

D. None of these

Answer: A

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23. Which of the following statements about the gravitational constant is true

A. It is a force

B. It has no unit

C. It has same value in all systems of units

D. It does not depend on the nature of the medium in which the bodies are kept.

Answer: D

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24. Two identical solid copper spheres of radius R placed in contact with each other. The gravitational attracton between them is proportional to

A. R

B. $R -$

C. R

D. R

Answer: C

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Acceleration Due to Gravity

1. Weightlessness experienced while orbiting the earth in space-ship, is the result of

A. Inertia

B. Acceleration

C. Zero gravity

D. Free fall towards earth

Answer: D

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2. 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. $d = h$

B. $d = 2h$

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

D. $d = h^2$

Answer: B

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3. The time period of a simple pendulum oscillating in a freely falling lift is

A. Zero

B. 2 sec

C. 3 sec

D. Infinite

Answer: D

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4. Two planets have the same average density but their radii are R_1 and R_2. If acceleration due to gravity on these planets be g_1 and g_2 respectively, then

A. $\frac{g_1}{g_2} = \frac{R_1}{R_2}$

B. $\frac{g_1}{g_2} = \frac{R_2}{R_1}$

C. $\frac{g_1}{g_2} = \frac{R_1^2}{R_2^2}$

D. $\frac{g_1}{g_2 =} \frac{R_1^3}{R_2^3}$

Answer: A

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5. An iron ball and a wooden ball of the same radius are released from a height ' h ' in vacuum. The time taken by both of them to reach the ground is

A. Unequal

B. Exactly equal

C. Roughly equal

D. Zero

Answer: B

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6. The correct answer to above question is based on

A. Acceleration due to gravity in vacuum is same irrespective of size and mass of the body

B. Acceleration due to gravity in vacuum depends on the mass of the body

C. There is no acceleration due to gravity in vacuum

D. In vacuum there is resistance offered to the motion of the body and this resistance depends on the mass of the body

Answer: A

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7. When a body is taken from the equator to the poles, its weight

A. Remains constant

B. Increases

C. Decreases

D. Increases at N - pole and decreases at S - pole

Answer: B

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8. A body of mass m is taken to the bottom of a deep mine. Then

A. Its mass increases

B. Its mass decreases

C. Its weight increases

D. Its weight decreases

Answer: D

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9. A body weighs $700 gm$ wt on the surface of the earth. How much will it weigh on the surface of a planet whose mass is $\frac{1}{7}$ and radius is half that of the earth

A. 200 gm wt

B. 400 gm wt

C. 50 gm wt

D. 300 gm wt

Answer: B

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10. In order to find time, the astronaut orbiting in an earth satellite should use

A. A pendulum clock

B. A watch having main spring to keep it going

C. Either a pendulum clock or a watch

D. Neither a pendulum clock nor a watch

Answer: B

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11. 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. GM_0 / D_0^2

B. $4mGM_0 / D_0^2$

C. $4GM_0 / D_0^2$

D. GmM_0 / D_0^2

Answer: C

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12. If the earth stops rotating, the value of ' g ' at the equator will

A. Increase

B. Remain same

C. Decrease

D. None of the above

Answer: A

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13. The mass and diameter of a planet have twice the value of the corresponding parameters of earth. Acceleration due to gravity on the surface of the planet is

A. $9.8m/\sec^2$

B. $4.9m/\sec^2$

C. $980m/\sec^2$

D. $19.6m/\sec^2$

Answer: B

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14. As we go from the equator to the poles, the value of g

A. Remains the same

B. Decreases

C. Increases

D. Decreases upto a latitude of 45°

Answer: C

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15. Force of gravity is least at

A. The equator

B. The poles

C. A point in between equator and any pole

D. None of these

Answer: A

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16. The radius of the earth is $6400km$ and $g = 10m/\sec^2$. In order that a body of $5kg$ weight zero at the equator, the angular speed of the earth is

A. 1/80 radian / sec

B. 1/400 radian / sec

C. 1/800 radian / sec

D. 1/1600 radian / sec

Answer: C

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17. The value of ' g ' at a particular point is $9.8m/s^2$. Suppose the earth suddenly shrinks uniformly to half its present size without losing any mass. The value of ' g ' at the same point (assuming that the distance of the point from the centre of earth does not shrink) will now be

A. $4.9m / \sec^2$

B. $3.1m / \sec^2$

C. $9.8m / \sec^2$

D. $19.6m / \sec^2$

Answer: C

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18. If R is the radius of the earth and g the acceleration due to gravity on the earth's surface, the mean density of the earth is

A. $4\pi G / 3gR$

B. $3\pi R / 4gG$

C. $3g / 4\pi RG$

D. $\pi RG / 12G$

Answer: C

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19. 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: A

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20. The radii of two planets are respectively R_1 and R_2 and their densities are respectively ρ_1 and ρ_2.The ratio of the accelerations due to gravity at their surface is

A. $g_1 : g_2 = \frac{\rho_1}{R_1^2} : \frac{\rho_2}{R_2^2}$

B. $g_1 : g_2 = R_1 R_2 : \rho_1 \rho_2$

C. $g_1 : g_2 = R_1 \rho_2 : R_2 \rho_1$

D. $g_1 : g_2 = R_1 \rho_1 : R_2 \rho_2$

Answer: D

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21. The mass of the earth is 81 times that of the moon and the radius of the earth is 3.5 times that of the moon. The ratio of the acceleration due to gravity at the surface of the moon to that at the surface of the earth is

A. 0.15

B. 0.04

C. 1

D. 6

Answer: A

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22. Spot the wrong statement : The acceleration due to gravity ‘ g ’ decreases if

A. We go down from the surface of the earth towards its centre

B. We go up from the surface of the earth

C. We go from the equator towards the poles on the surface of the earth

D. The rotational velocity of the earth is increased

Answer: C

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23. Which of the following statements is true

A. g is less at the earth's surface than at a height above it or a depth below it

B. g is same at all places on the surface of the earth

C. g has its maximum value at the equator

D. g is greater at the poles than at the equator

Answer: D

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24. A spring balance is graduated on sea level. If a body is weighed with this balance at consecutively increasing heights from earth's surface, the weight indicated by the balance

A. Will go on increasing continuously

B. Will go on decreasing continuously

C. Will remain same

D. Will first increase and then decrease

Answer: B

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25. The value of g on the earth's surface is $980cm/\sec^2$. Its value at a height of 64 km from the earth's surface is

A. $960.40cm/\sec^2$

B. $984.90cm/\sec^2$

C. $982.45cm/\sec^2$

D. $977.55cm/\sec^2$

Answer: A

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26. Choose the correct statement from the following :

Weightlessness of an astronaut moving in a satellite is a situation of

A. Zero g

B. No gravity

C. Zero mass

D. Free fall

Answer: D

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27. If earth were to rotate faster than its present speed, the weight of an object

A. Increase at the equator but remain unchanged at the poles

B. Decrease at the equator but remain unchanged at the poles

C. Remain unchanged at the equator but decrease at the poles

D. Remain unchanged at the equator but increase at the poles

Answer: B

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28. If the earth suddenly shrinks (without changing mass) to half of its present radius, the acceleration due to gravity will be

A. $g/2$

B. $4g$

C. $g/4$

D. $2g$

Answer: B

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29. The moon's radius is $1/4$ that of the earth and its mass $1/80$ times that of the earth. If g represents the acceleration due to gravity on the surface of the earth, that on the surface of the moon is

A. $g/4$

B. $g/5$

C. $g/6$

D. $g/8$

Answer: B

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30. R is the radius of the earth and ω is its angular velocity and g_p is the value of g at the poles. The effective value of g at the latitude $\lambda = 60^\circ$ will be equal to

A. $g_p - \frac{1}{4}R\omega^2$

B. $g_p - \frac{3}{4}R\omega^2$

C. $g_p - R\omega^2$

D. $g_p + \frac{1}{4}R\omega^2$

Answer: A

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31. 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. $R\left(\frac{n}{n+1}\right)$

Answer: B

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32. At what height over the earth's pole, the free fall acceleration decreases by one percent (assume the radius of earth to be 6400 km)

A. 32 km

B. 80 km

C. 1.253 km

D. 64 km

Answer: A

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33. The diameters of two planets are in the ratio 4 : 1 and their mean densities in the ratio 1 : 2. The acceleration due to gravity on the planets will be in ratio

A. $1:2$

B. $2:3$

C. $2:1$

D. $4:1$

Answer: C

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34. At what altitude will the acceleration due to gravity be 25% of that at the earth's surface (given radius of earth is R)?

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

B. R

C. $\frac{3}{8}R$

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

Answer: B

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35. If the angular speed of the earth is doubled, the value of acceleration due to gravity (g) at the north pole

A. Doubles

B. Becomes half

C. Remains same

D. Becomes zero

Answer: C

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36. At the surface of a certain planet acceleration due to gravity is one - quarter of that on earth If a brass ball is transported to this planet , then which one of the following statements is not correct ? .

A. The mass of the brass ball on this planet

is a quarter of its mass as measured on

earth

B. The weight of the brass ball on this planet is a quarter of the weight as measured on earth

C. The brass ball has the same mass on the other planet as on earth

D. The brass ball has the same volume on the other planet as on earth

Answer: A

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37. Weight of 1 kg becomes $1/6$ on moon. If radius of moon is $1.768 \times 10^6 m$, then the mass of moon will be

A. $1.99 \times 10^{30} kg$

B. $7.56 \times 10^{22} kg$

C. $5.98 \times 10^{24} kg$

D. $7.65 \times 10^{22} kg$

Answer: D

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38. Radius of earth is around 6000 km . The weight of body at height of 6000 km from earth surface becomes

A. Half

B. One-fourth

C. One third

D. No change

Answer: B

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39. Let g be the acceleration due to gravity at the earth's surface and K the rotational kinetic energy of the earth. Suppose the earth's radius decreases by 2%. Keeping all other quantities constant, then

A. g decreases by 2% and K decreases by 4%

B. g decreases by 4% and K increases by 2%

C. g increases by 4% and K increases by 4%

D. g decreases by 4% and K increases by 4%

Answer: C

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40. Where will it be profitable to purchase 1 kilogram sugar

A. At poles

B. At equator

C. At 45° latitude

D. At 40° latitude

Answer: B

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41. If the radius of the earth shrinks by 1.5% (mass remaining same) , then the value of acceleration due to gravity changes by

A. 1%

B. 2%

C. 3%

D. 4%

Answer: C

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42. If radius of the earth contracts 2% and its mass remains the same, then weight of the body at the earth surface

A. Will decrease

B. Will increase

C. Will remain the same

D. None of these

Answer: B

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43. If mass of a body is M on the earth surface, then the mass of the same body on the moon surface is

A. M /6

B. Zero

C. M

D. None of these

Answer: C

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44. Mass of moon is $7.34 \times 10^{22} kg$. If the acceleration due gravity on the moon is

$1.4m/s^2$, the radius of the moon is

$(G = 6.667 \times 10^{-11} Nm^2/kg^2)$

A. $0.56 \times 10^4 m$

B. $1.87 \times 10^6 m$

C. $1.92 \times 10^6 m$

D. $1.01 \times 10^8 m$

Answer: B

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45. What should be the velocity of earth due to rotation about its own axis so that the weight at equator become 3/5 of initial value. Radius of earth on equator is 6400 km

A. $7.4 \times 10^{-4} rad/\sec$

B. $6.7 \times 10^{-4} rad/\sec$

C. $7.8 \times 10^{-4} rad/\sec$

D. $8.7 \times 10^{-4} rad/\sec$

Answer: C

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46. Acceleration due to gravity is ‘ g ’ on the surface of the earth. The value of acceleration due to gravity at a height of 32 km above earth’s surface is (Radius of the earth = 6400 km)

A. $0.9g$

B. $0.99g$

C. $0.8g$

D. $1.01g$

Answer: B

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47. At what height from the ground will the value of ' g ' be the same as that in 10 km deep mine below the surface of earth

A. 20 km

B. 10 km

C. 15 km

D. 5 km

Answer: A

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48. If the Earth losses its gravity, then for a body

A. Weight becomes zero, but not the mass

B. Mass becomes zero, but not the weight

C. Both mass and weight become zero

D. Neither mass nor weight become zero

Answer: A

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49. The height of the point vertically above the earth's surface, at which acceleration due to gravtiy becomes 1% of its value at the surface is (Radius of the earth =R)

A. $8R$

B. $9R$

C. $10R$

D. $20R$

Answer: B

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50. An object weights 72 N on earth. Its weight at a height of R /2 from earth is

A. $32N$

B. $56N$

C. $72N$

D. Zero

Answer: A

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51. The angular velocity of the earth with which it has to rotate so that the acceleration due to gravity on 60° latitude becomes zero is

A. $2.5 \times 10^{-3} rad / s$

B. $5.0 \times 10^{-1} rad / s$

C. $10 \times 10^{1} rad / s$

D. $7.8 \times 10^{-2} rad / s$

Answer: A

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52. Assuming earth to be a sphere of a uniform density, what is the value of gravitational acceleration in mine 100km below the earth's surface (Given $R = 6400 km)$

A. $9.66m / s^2$

B. $7.64m / s^2$

C. $5.06m / s$

D. $3.10m / s^2$

Answer: A

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53. If radius of earth is R then the height ' h ' at which value of ' g ' becomes one-fourth is

A. $\frac{R}{4}$

B. $\frac{3R}{4}$

C. R

D. $\frac{R}{8}$

Answer: C

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54. R and r are the radii of the earth and moon respectively. ρ_e and ρ_m are the densities of earth and moon respectively. The ratio of the accelerations due to gravity on the surfaces of earth and moon is

A. $\frac{R}{r}\frac{\rho_e}{\rho_m}$

B. $\frac{r}{R}\frac{\rho_e}{\rho_m}$

C. $\frac{r}{R}\frac{\rho_m}{\rho_e}$

D. $\frac{R}{r}\frac{\rho_e}{\rho_m}$

Answer: A

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55. If the mass of earth is 80 times of that of a planet and diameter is double that of planet and ‘ g ’ on earth is $9.8m/s^2$, then the value of ‘ g ’ on that planet is

A. $4.9m/s^2$

B. $0.98m/s^2$

C. $0.49m/s^2$

D. $49m/s^2$

Answer: C

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56. Assume that the acceleration due to gravity on the surface of the moon is 0.2 times the acceleration due to gravity on the surface of the earth. If R_e is the maximum range of a projectile on the earth's surface, what is the maximum range on the surface of the moon for the same velocity of projection

A. $0.2R_e$

B. $2R_e$

C. $0.5R_e$

D. $5R_e$

Answer: D

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57. What would be the angular speed of earth, so that bodies lying on equator may experience weightlessness ?

(g = $10m/s^2$ and radius of earth = 6400 km)

A. $1.25 \times 10^{-3} rad / \sec$

B. $1.56 \times 10^{-3} rad / \sec$

C. $1.25 \times 10^{-1} rad / \sec$

D. $1.56 rad / \sec$

Answer: A

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58. At what distance from the centre of the earth, the value of acceleration due to gravity g will be half that on the surface (R = radius of earth)

A. $2R$

B. R

C. $1.414R$

D. $0.414R$

Answer: D

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59. If density of earth increased 4 times and its radius become half of what it is, our weight will

A. Be four times its present value

B. Be doubled

C. Remain same

D. Be halved

Answer: B

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60. A man can jump to a height of 1.5 m on a planet A . What is the height he may be able to jump on another planet whose density and radius are, respectively, one-quarter and one-third that of planet A

A. 1.5 m

B. 15 m

C. 18 m

D. 28m

Answer: C

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61. Weight of a body is maximum at

A. Moon

B. Poles of earth

C. Equator of earth

D. Centre of earth

Answer: B

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62. What will be the acceleration due to gravity at height h if h gt gt R . Where R is radius of earth and g is acceleration due to gravity on the surface of earth

A. $\dfrac{g}{\left(1+\frac{h}{R}\right)^{2}}$

B. $g\left(1-\dfrac{2h}{R}\right)$

C. $\dfrac{g}{\left(1-\frac{h}{R}\right)^{2}}$

D. $g\left(1-\dfrac{h}{R}\right)$

Answer: A

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63. The acceleration due to gravity near the surface of a planet of radius R and density d is proportional to

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

B. dR^2

C. dR

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

Answer: C

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64. The acceleration due to gravity is g at a point distant r from the centre of earth of radius R. If $r < R$, then

A. $g \propto r$

B. $g \propto r^2$

C. $g \propto r^{-1}$

D. $g \propto r^{-2}$

Answer: A

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65. 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. $\frac{W}{2}$

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

C. $\frac{4W}{9}$

D. $\frac{8W}{27}$

Answer: C

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66. If the density of the earth is doubled keeping its radius constant then acceleration due to gravity will be $\left(g = 9.8m / s^2\right)$

A. $19.6m / s^2$

B. $9.8m / s^2$

C. $4.9m / s^2$

D. $2.45m / s^2$

Answer: A

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67. Why the value of acceleration due to gravity is more at the poles than at the equator?

A. $g_p < g_e$

B. $g_p = g_e = g$

C. $g_p = g_e < g$

D. $g_p > g_e$

Answer: D

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68. The value of g (acceleration due to gravity) at earth's surface is $10 ms^{-2}$. Its value in ms^{-2} at the centre of the earth which is assumed to be a sphere of radius R metre and uniform mass density is

A. 5

B. 10/ R

C. 10/2 R

D. Zero

Answer: D

Watch Video Solution

69. A research satellite of mass $200kg$ circles the earth in an orbit of average radius $3R/2$, where R is the radius of the earth. Assuming the gravitational pull on the mass of $1kg$ on the earth's surface to be $10N$, the pull on the satellite will be

A. 880 N

B. 889 N

C. 890 N

D. 892 N

Answer: A

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70. Acceleration due to gravity on moon is $1/6$ of the acceleration due to gravity on earth. If the ratio of densities of earth (ρ_e) and moon (ρ_m) is $\left(\frac{\rho_e}{\rho_m}\right) = \frac{5}{3}$ then radius of moon (R_m) in terms of R_e will be

A. $\frac{5}{18} R_e$

B. $\frac{1}{6} R_e$

C. $\frac{3}{18} R_e$

D. $\frac{1}{2\sqrt{3}} R_e$

Answer: A

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71. The acceleration of a body due to the attraction of the earth (radius R) at a distance 2R form the surface of the earth is (g=acceleration due to gravity at the surface of the earth)

A. $\frac{g}{9}$

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

C. $\frac{g}{4}$

D. g

Answer: A

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72. The depth at which the effective value of acceleration due to gravity is $\frac{g}{4}$ is (R=radius of the earth)

A. R

B. $\frac{3R}{4}$

C. $\dfrac{R}{2}$

D. $\dfrac{R}{4}$

Answer: B

Watch Video Solution

73. Weight of a body of a mass m decreases by 1% when it is raised to height h above the earth's surface. If the body is taken to depth h in a mine, change in its weight is

A. 2% decrease

B. 0.5% decrease

C. 1% increase

D. 0.5% increase

Answer: B

Watch Video Solution

74. If both the mass and radius of the earth decrease by 1% the value of

A. Decrease by 1%

B. Increase by 1%

C. Increase by 2%

D. Remain unchanged

Answer: B

Watch Video Solution

75. 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

Watch Video Solution

76. Two planets of radii in the ratio $2:3$ are made from the materials of density in the ratio $3:2$. Then the ratio of acceleration due to gravity g_1 / g_2 at the surface of two planets will be

A. 1

B. 2.25

C. $4/9$

D. 0.12

Answer: A

Watch Video Solution

77. A person will ge more quantity of matter in kg-wt at

A. Poles

B. At latitude of 60°

C. Equator

D. Satellite

Answer: D

Watch Video Solution

78. At what depth below the surface of the earth, acceleration due to gravity g will be half its value 1600km above the surface of the earth

A. $4.2 \times 0^6 m$

B. $3.19 \times 10^6 m$

C. $1.59 \times 10^6 m$

D. None of these

Answer: A

Watch Video Solution

79. What would be the angular speed of earth, so that bodies lying on equator may experience weightlessness ?

(g = $10m/s^2$ and radius of earth = 6400 km)

A. $\frac{1}{800} rad/s$

B. $\frac{1}{400} rad/s$

C. $\frac{1}{600} rad/s$

D. $\frac{1}{100} rad/s$

Answer: A

Watch Video Solution

80. A body weight 500 N on the surface of the earth. How much would it weigh half way below the surface of the earth

A. 125 N

B. 250 N

C. 500 N

D. 1000 N

Answer: B

Watch Video Solution

81. If the density of a small planet is the same as that of earth while the radius of the planet is 0.2 times that of the earth the gravitational on the surface of that planet is :

A. 0.2 g

B. 0.4 g

C. 2 g

D. 4 g

Answer: A

Watch Video Solution

82. Acceleration due to gravity ' g ' for a body of mass ' m ' on earth's surface is proportional to (Radius of earth= R , mass of earth= M

A. GM / R^2

B. m^0

C. mM

D. $1/R^{3/2}$

Answer: A

Watch Video Solution

83. A body has a weight 90 kg on the earth's surface, the mass of the moon is 1/9 that of the earth's mass and its radius is 1/2 that of the earth's radius. On the moon the weight of the body is

A. 45 kg

B. 202.5 kg

C. 90 kg

D. 40 kg

Answer: D

Watch Video Solution

84. If it is assumed that the spinning motion of earth increases, then the weight of a body on equator

A. Decreases

B. Remains constant

C. Increases

D. Becomes more at poles

Answer: A

Watch Video Solution

85. The masses of two planets are in the ratio $1:2$. Their radii are in the ratio $1:2$. The acceleration due to gravity on the planets are in the ratio

A. $1 : 2$

B. $2 : 1$

C. $3 : 5$

D. $5 : 3$

Answer: B

Watch Video Solution

86. If earth is supposed to be sphere of radius R, if g_{30} is value of acceleration due to gravity at latitude of 30° and g at the equator, then value of $g - g_{30^{\circ}}$ is

A. $\frac{1}{4}\omega^2 R$

B. $\frac{3}{4}\omega^2 R$

C. $\omega^2 R$

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

Answer: B

Watch Video Solution

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87. If M is the mass of the earth and R its radius, the ratio of the gravitational acceleration and the gravitational constant is

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

B. $\frac{M}{R^2}$

C. MR^2

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

Answer: B

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Gravitation Potential, Energy and Escape Velocity

1. A body of mass m rises to a height $h = R/5$ from the earth's surface where R is earth's radius. If g is acceleration due to gravity at the earth's surface, the increase in potential energy is

A. mgh

B. $\frac{4}{5}mgh$

C. $\frac{5}{6}mgh$

D. $\frac{6}{7}mgh$

Answer: C

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2. In a gravitational field, at a point where the gravitational potential is zero

A. The gravitational field is necessarily zero

B. The gravitational field is not necessarily zero

C. Nothing can be said definitely about the gravitational field

D. None of these

Answer: A

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3. The gravitational field due to a mass distribution is $E = K / x^3$ in the x - direction. (K is a constant). Taking the gravitational potential to be zero at infinity, its value at a distance x is

A. K / x

B. $k / 2x$

C. K / x^2

D. $K / 2x^2$

Answer: D

Watch Video Solution

4. The mass of the earth is $6 \times 10^{24} kg$ and that of the moon is $7.4 \times 10^{22} kg$. The potential energy of the system is $-7.79 \times 10^{28} J$. The mean distance between the earth and moon is $\left(G = 6.67 \times 10^{-11} Nm^2 kg^{-2}\right)$

A. 3.80×10^{8} meters

B. 3.37×10^{6} meters

C. 7.60×10^{4} meters

D. 1.90×10^2 meters

Answer: A

Watch Video Solution

5. The change in the gravitational potential energy when a body of a mass m is raised to a height nR above the surface of the earth is (here R is the radius of the earth)

A. $mgR\frac{n}{n-1}$

B. $nmgR$

C. $mgR\frac{n^2}{n^2+1}$

D. $mgR\frac{n}{n+1}$

Answer: D

Watch Video Solution

6. The masses and radii of the Earth and the Moon are M_1, R_1 and M_2, R_2 respectively. Their centres are at a distance d apart. The minimum speed with which a particel of mass m should be projected from a point midway between the two centres so as to escape to infinity is ....

A. $2\sqrt{\frac{G}{d}(M_1+M_2)}$

B. $2\sqrt{\frac{2G}{d}(M_1+M_2)}$

C. $2\sqrt{\frac{Gm}{d}(M_1+M_2)}$

D. $2\sqrt{\frac{Gm(M_1+M_2)}{d(R_1+R_2)}}$

Answer: A

Watch Video Solution

7. If mass of the earth is M, radius is R, and gravitational constant is G, then workdone to take $1kg$ mass from earth surface to infinity will be

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

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

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

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

Answer: B

Watch Video Solution

8. A rocket is launched with velocity 10 km / s . If radius of earth is R , then maximum height attained by it will be

A. 2 R

B. 3 R

C. 4 R

D. 5 R

Answer: C

Watch Video Solution

9. There are two bodies of masses 100 kg and 10000 kg separated by a distance 1 m . At what distance from the smaller body, the intensity of gravitational field will be zero

A. $\frac{1}{9}m$

B. $\frac{1}{10}m$

C. $\frac{1}{11}m$

D. $\frac{10}{11}m$

Answer: C

Watch Video Solution

10. What is the intensity of gravitational field of the centre of a spherical shell

A. Gm/r^2

B. g

C. Zero

D. None of these

Answer: C

Watch Video Solution

11. The gravitational potential energy of a body of mass ' m ' at the earth's surface $-mgR_e$. Its gravitational potential energy at a height R_e from the earth's surface will be (Here R_e is the radius of the earth)

A. $2mgR_e$

B. $2mgR_e$

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

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

Answer: D

Watch Video Solution

12. Escape velocity of a body $1kg$ mass on a planet is $100ms^{-1}$. Gravitational potential energy of the body at that planet is

A. $-5000J$

B. $-1000J$

C. $-2400J$

D. $5000J$

Answer: A

Watch Video Solution

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

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

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

D. $\frac{mgR}{4}$

Answer: B

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14. A body of mass m kg starts falling from a point 2R above the earth's surface. Its kinetic energy when its has fallen to a point 'R' above the earth's surface [R-Radius of earth M-mass of earth, G-gravitational constant]

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

B. $\frac{1}{6}\frac{GMm}{R}$

C. $\frac{2}{3}\frac{GMm}{R}$

D. $\frac{1}{3}\frac{GMm}{R}$

Answer: B

Watch Video Solution

15. A body is projected vertically upwards from the surface of a planet of radius R with a velocity equal to half the escape velocity for that planet. The maximum height attained by the body is

A. R /3

B. R /2

C. R /4

D. R /5

Answer: A

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16. Energy required to move a body of mass m from an orbit of radius 2R to 3R is

A. $GMm/3R^2$

B. $GMm/12R^2$

C. $GMm/8R$

D. $GMm/6R$

Answer: D

17. The kinetic energy needed to project a body of mass m from the eath surface (radus R) to infinity is

A. mgR /2

B. 2 mgR

C. mgR

D. mgR /4

Answer: C

Watch Video Solution

18. Radius of orbit of satellite of earth is R. Its kinetic energy is proportional to

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

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

C. R

D. $\frac{1}{R^{3/2}}$

Answer: A

Watch Video Solution

19. In some region, the gravitational field is zero. The gravitational potential in this region

A. Must be variable

B. Must be constant

C. Cannot be zero

D. Must be zero

Answer: B

Watch Video Solution

20. A particle falls towards the earth from inifinity. The velocity with which it reaches the earth is surface is

A. Infinity

B. $\sqrt{2gR}$

C. $2\sqrt{gR}$

D. Zero

Answer: B

Watch Video Solution

21. Gas escapes from the surface of a planet because it acquires an escape velocity. The escape velocity will depend on which of the following factors:

(1) Mass of the planet

(2) Radius of the planet

(3) Mass of the particle escaping

(4) Temperature of the planet

A. I and II

B. II and IV

C. I and IV

D. I, III and IV

Answer: C

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22. v_e and v_p denotes the escape velocity from the earth and another planet having twice the radius and the same mean density as the earth. Then

A. $v_e = v_p$

B. $v_e = v_p / 2$

C. $v_e = 2v_p$

D. $v_e = v_p / 4$

Answer: B

Watch Video Solution

23. The escape velocity of a sphere of mass m is given by

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

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

C. $\sqrt{\frac{2GMm}{R}}$

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

Answer: A

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24. The escape velocity for a rocket from earth is 11.2 km / sec . Its value on a planet where acceleration due to gravity is double that on the earth and diameter of the planet is twice that of earth will be in km / sec

A. 11.2

B. 5.6

C. 22.4

D. 53.6

Answer: C

Watch Video Solution

25. The escape velocity from the earth is $11 km / s$. The escape velocity from a planet having twice the radius and same density as that of the earth is (in km / s)

A. 22 km / sec

B. 11 km / sec

C. 5.5 km / sec

D. 15.5 km / sec

Answer: A

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26. A missile is launched with a velocity less than the escape velocity. The sum of its kinetic and potential energy is

A. Positive

B. Negative

C. Zero

D. May be positive or negative depending upon its initial velocity

Answer: B

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27. If g is the acceleration due to gravity at the earth's surface and r is the radius of the earth, the escape velocity for the body to escape out of earth's gravitational field is

A. gr

B. $\sqrt{2gr}$

C. g/r

D. r / g

Answer: B

Watch Video Solution

28. The escape velocity of a projectile from the earth is approximately

A. 11.2 m / sec

B. 112 km / sec

C. 11.2 km / sec

D. 11200 km / sec

Answer: C

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29. The escape velocity of a body depeds upon mass as

A. m^2

B. m

C. m^0

D. m^{-1}

Answer: C

Watch Video Solution

30. For the moon to cease to remain the earth's satellite, its orbital velocity has to increase by a factor of

A. 2

B. $\sqrt{2}$

C. $1/\sqrt{2}$

D. $\sqrt{3}$

Answer: B

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31. The escape velocity of an object from the earth depends upon the mass of the earth (M), its mean density (ρ), its radius (R) and the gravitational constant (G). Thus the formula for escape velocity is

A. $v = R\sqrt{\frac{8\pi}{G}\rho}$

B. $v = M\sqrt{\frac{8\pi}{G}R}$

C. $v = \sqrt{2GMR}$

D. $v = \sqrt{\frac{2GM}{R^2}}$

Answer: A

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32. Escape velocity on a planet is e v . If radius of the planet remains same and mass becomes

4 times, the escape velocity becomes

A. $4v_e$

B. $2v_e$

C. v_e

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

Answer: B

Watch Video Solution

33. The mass of the earth is 81 times that of the moon and the radius of the earth is 3.5 times that of the moon. The ratio of the escape velocity on the surface of earth to that on the surface of moon will be

A. 0.2

B. 2.57

C. 4.81

D. 0.39

Answer: C

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34. The escape velocity from the surface of earth is V_e. The escape velocity from the surface of a planet whose mass and radius are 3 times those of the earth will be

A. V_e

B. $3v_e$

C. $9V_e$

D. $27V_e$

Answer: A

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35. How much energy will be necessary for making a body of 500 kg escape from the earth

$\left[g = 9.8ms^2, \quad \text{radius of earth} \quad = 6.4 \times 10^6 m\right]$

A. About $9.8 \times 10^6 J$

B. About $6.4 \times 10^8 J$

C. About $3.1 \times 10^{10} J$

D. About $27.4 \times 10^{22} J$

Answer: C

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36. The escape velocity for the earth is 11.2 km / sec . The mass of another planet is 100 times that of the earth and its radius is 4 times that of the earth. The escape velocity for this planet will be

A. 112.0 km / s

B. 5.6 km / s

C. 280.0 km / s

D. 56.0 km / s

Answer: D

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37. The escape velocity of a planet having mass 6 times and radius 2 times as those of the earth is

A. $\sqrt{3}V_e$

B. $3V_e$

C. $\sqrt{2}V_e$

D. $2V_e$

Answer: A

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38. The escape velocity of an object on a planet whose radius is 4 times that of the earth and g value 9 tims that on the earth, in

Kms^{-1}, is

A. 67.2

B. 33.6

C. 16.8

D. 25.2

Answer: A

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39. If the escape velocity on the earth is $11.2 km / s$, its value for a planet having double the radius and 8 times the mass of the earth is ...... (in Km / s)

A. 3.7 km / s

B. 11.2 km / s

C. 22.4 km / s

D. 43.2 km / s

Answer: C

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40. 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. 5.6 km / s

B. 11.2 km / s (remain unchanged)

C. 22.4 km / s

D. 44.8 km / s

Answer: C

Watch Video Solution

41. Given mass of the moon is 1/81 of the mass of the earth and corresponding radius is 1/4 of the earth. If escape velocity on the earth surface is 11.2 km / s , the value of same on the surface of the moon is

A. 0.14 km / s

B. 0.5 km / s

C. 2.5 km / s

D. 5 km / s

Answer: C

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42. The angular velocity of rotation of star (of mass M and radius R) at which the matter start to escape from its equator will be

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

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

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

D. $\sqrt{\frac{2GR}{M}}$

Answer: C

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43. The least velocity required to throw a body away from the surface of a planet so that it may not return is (radius of the planet is $6.4 \times 10^6 m, g = 9.8 m / \sec^2$)

A. $9.8 \times 10^{-3} m / \sec$

B. $12.8 \times 10^3 m / \sec$

C. $9.8 \times 10^3 m / \sec$

D. $11.2 \times 10^3 m / \sec$

Answer: D

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44. How many times is escape velocity (V_e) , of orbital velocity (V_0) for a satellite revolving near earth

A. $\sqrt{2}$ times

B. 2 times

C. 3 times

D. 4 times

Answer: C

Watch Video Solution

45. Escape velocity on earth is 11.2 km/s . What would be the escape velocity on a planet whose mass is 1000 times and radius is 10 times that of earth

A. 112 km/s

B. 11.2 km/s

C. 1.12 km/s

D. 3.7 km/s

Answer: A

Watch Video Solution

46. If the radius of a planet is R and its density is ρ , the escape velocity from its surface will be

A. $v_e \propto \rho R$

B. $v_e \propto \sqrt{\rho} R$

C. $v_e \propto \frac{\sqrt{\rho}}{R}$

D. $v_e \propto \frac{1}{\sqrt{\rho} R}$

Answer: B

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47. Escape velocity on the earth

A. Is less than that on the moon

B. Depends upon the mass of the body

C. Depends upon the direction of projection

D. Depends upon the height from which it is projected

Answer: D

Watch Video Solution

48. If acceleration due to gravity on the surface of a planet is two times that on surface of earth and its radius is double that of earth. Then escape velocity from the surface of that planet in comparison to earth will be

A. 2 v

B. 3 v

C. 4 v

D. None of these

Answer: A

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49. The escape velocity of a rocket launched from the surface of the earth

A. Does not depend on the mass of the rocket

B. Does not depend on the mass of the earth

C. Depends on the mass of the planet towards which it is moving

D. Depends on the mass of the rocket

Answer: A

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50. The ratio of the radii of planets A and B is k_1 and ratio of acceleration due to gravity on them is k_2 . The ratio of escape velocities from them will be

A. $k_1 k_2$

B. $\sqrt{k_1 k_2}$

C. $\sqrt{\frac{k_1}{k_2}}$

D. $\sqrt{\frac{k_2}{k_1}}$

Answer: B

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51. A mass of $6 \times 10^{24} kg$ is to be compressed in a sphere in such a way that the escape velocity from its surface is $3 \times 10^{8} m / s$. Find the radius of the sphere (in mm).

A. 9 km

B. 9 m

C. 9 cm

D. 9 mm

Answer: D

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52. The escape velocity of a body on an imaginary planet which is thrice the radius of the earth and double the mass of the earth is (v_e is the escape velocity of earth)

A. $\sqrt{2/3v_e}$

B. $\sqrt{3/2v_e}$

C. $\sqrt{2}/3v_e$

D. $2/\sqrt{3}v_e$

Answer: A

Watch Video Solution

53. Escape velocity on the surface of earth is 11.2 km/s . Escape velocity from a planet whose mass is the same as that of earth and radius 1/4 that of earth is

A. 2.8 km/s

B. 15.6 km/s

C. 22.4 km/s

D. 44.8 km/s

Answer: C

Watch Video Solution

54. The velocity with which a projectile must be fired so that is escapes earth's gravitation does not depend on:

A. Mass of the earth

B. Mass of the projectile

C. Radius of the projectile's orbit

D. Gravitational constant

Answer: B

Watch Video Solution

55. The radius of a planet is $\frac{1}{4}$ of earth's radius and its acceleration due to gravity is double that of earth's acceleration due to gravity. How many times will the escape velocity at the planet's surface be as compared to its value on earth's surface

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

B. $\sqrt{2}$

C. $2\sqrt{2}$

D. 2

Answer: A

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56. The escape velocity for the earth is v_e. The escape velocity for a planet whose radius is four times and density is nine times that of the earth, is

A. $36v_e$

B. $12v_e$

C. $6v_e$

D. $20v_e$

Answer: B

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57. The escape velocity for a body projected vertically upwards from the surface of earth is 11km/s. If the body is projected at an angle of 45° with the vertical, the escape velocity will be

A. $\frac{11}{\sqrt{2}}$ km/s

B. $11\sqrt{2}$ km/s

C. 22 km/s

D. 11 km/s

Answer: D

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58. If V, R and g denote respectively the escape velocity from the surface of the earth radius of the earth, and acceleration due to gravity, then the correct equation is

A. $V = \sqrt{gR}$

B. $V = \sqrt{\frac{4}{3}gR^3}$

C. $V = R\sqrt{g}$

D. $V = \sqrt{2gR}$

Answer: D

Watch Video Solution

59. The escape velocity for a body of mass $1kg$ from the earth surface is $11.2kms^{-1}$. The escape velocity for a body of mass $100kg$ would be

A. $11.2 \times 10^2 kms^{-1}$

B. $11.2 kms^{-1}$

C. $11.2 \times 10^{-2} kms^{-1}$

D. None of these

Answer: B

Watch Video Solution

60. The acceleration due to gravity on a planet is same as that on earth and its radius is four times that of earth. What will be the value of escape velocity on that planet if it is v_e on earth

A. v_e

B. $2v_e$

C. $4v_e$

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

Answer: B

Watch Video Solution

61. If the radius of a planet is four times that of earth and the value of g is same for both, the escape velocity on the planet will be

A. $11.2km / s$

B. $5.6km / s$

C. $22.4km / s$

D. None

Answer: C

Watch Video Solution

62. If the radius and acceleration due to gravity both are doubled, escape velocity of earth will become

A. 11.2 km/s

B. 22.4 km/s

C. 5.6 km/s

D. 44.8 km/s

Answer: B

Watch Video Solution

63. A planet has twice the radius but the mean density is $\frac{1}{4}$ th as compared to earth. What is the ratio of escape velocity from earth to that from the planet

A. $3:1$

B. $1:2$

C. $1:1$

D. $2:1$

Answer: C

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64. The escape velocity from earth is v_{es}. A body is projected with velocity $2v_{es}$ with what constant velocity will it move in the inter planetary space

A. v_{es}

B. $3v_{es}$

C. $\sqrt{3}v_{es}$

D. $\sqrt{5}v_{es}$

Answer: C

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65. A particle of mass 10g is kept on the surface of a uniform sphere of mass 100 kg and radius 10 cm. Find the work to be done against the gravitational force between them, to take the particle far away from the sphere (you may take $G = 6.67 \times 10^{-11} Nm^2 / kg^2$)

A. $6.67 \times 10^{-9} J$

B. $6.67 \times 10^{-10} J$

C. $13.34 \times 10^{-10} J$

D. $3.33 \times 10^{-10} J$

Answer: B

Watch Video Solution

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

A. 2

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

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

D. $\sqrt{2}$

Answer: B

Watch Video Solution

67. Three particles each of mass m are kept at the vertices of an euilateral triangle of side L.

The gravitational field at the centre due to these particle is

A. Zero

B. $\dfrac{3GM}{L^2}$

C. $\dfrac{9GM}{L^2}$

D. $\dfrac{12}{\sqrt{2}}\dfrac{GM}{L^2}$

Answer: A

Watch Video Solution

68. The value of escape velocity on a certain planet is 2 km/s. Then the value of orbital speed for a satellite orbiting close to its surface is

A. 12 km/s

B. 1 km/s

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

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

Answer: C

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69. Four particles each of mass m are placed at the vertices of a square of side l. the potential at the centre of square is

A. $-\sqrt{32}\frac{GM}{L}$

B. $-\sqrt{64}\frac{GM}{L^2}$

C. zero

D. $\sqrt{32}\frac{GM}{L}$

Answer: A

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70. There are two planets. The ratio of radius of two planets is k but ratio of acceleration due to gravity of both planets is g. What will be the ratio of their escape velocity ?

A. $(kg)^{1/2}$

B. $(kg)^{-1/2}$

C. $(kg)^{2}$

D. $(kg)^{-2}$

Answer: A

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Motion of Satellite

1. If v_e is escape velocity and v_0, is orbital velocity of satellite for orbit close to the earth's surface. Then are related by

A. $v_e = v_o$

B. $\sqrt{2}v_o = v_e$

C. $v_e = v_o / \sqrt{2}$

D. v_e and v_o are not related

Answer: B

Watch Video Solution

2. If r represents the radius of the orbit of a satellite of mass m moving around a planet of mass M , the velocity of the satellite is given by

A. $v^2 = \mathrm{g}\dfrac{M}{R}$

B. $v^2 = \frac{GMm}{R}$

C. $v = \frac{GM}{r}$

D. $v^2 = \frac{GM}{r}$

Answer: D

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3. Select the correct statement from the following

A. The orbital velocity of a satellite increases with the radius of the orbit

B. Escape velocity of a particle from the surface of the earth depends on the speed with which it is fired

C. The time period of a satellite does not depend on the radius of the orbit

D. The orbital velocity is inversely proportional to the square root of the radius of the orbit

Answer: D

Watch Video Solution

4. 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. $\frac{gR^2}{R+h}$

B. gR

C. $\frac{gR}{R+h}$

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

Answer: D

Watch Video Solution

5. Consider a satellite going round the earth in an orbit. Which of the following statements is wrong

A. It is a freely falling body

B. It suffers no acceleration

C. It is moving with a constant speed

D. Its angular momentum remains constant

Answer: B

Watch Video Solution

6. Two satellites of masses of m_1 and $m_2(m_1 > m_2)$ are revolving round the earth in circular orbits of radius r_1 and $r_2(r_1 > r_2)$ respectively. Which of the following statements is true regarding their speeds v_1 and v_2?

A. $v_1 = v_2$

B. $v_1 < v_2$

C. $v_1 > v_2$

D. $\frac{v_1}{r_1} = \frac{v_2}{r_2}$

Answer: B

Watch Video Solution

7. A satellite which is geostationary in a particular orbit is taken to another orbit. Its distance from the centre of earth in new orbit is 2 times that of the earlier orbit. The time period in the second orbit is

A. 4.8 hours

B. $48\sqrt{2}$ hours

C. 24 hours

D. $24\sqrt{2}$ hours

Answer: B

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8. The ratio of the K.E. required to the given to the satellite to escape earth's gravitational field to the K.E. required to be given so that the satellite moves in a circular orbit just above earth atmosphere is

A. One

B. Two

C. Half

D. Infinity

Answer: B

Watch Video Solution

9. An astronaut orbiting the earth in a circular orbit $120 km$ above the surface of earth, gently drops a spoon out of space-ship. The spoon will

A. Fall vertically down to the earth

B. Move towards the moon

C. Will move along with space-ship

D. Will move in an irregular way then fall down to earth

Answer: C

Watch Video Solution

10. The period of a satellite moving in a circular orbit near the surface of a planet is independent of

A. The mass of the planet

B. The radius of the planet

C. The mass of the satellite

D. All the three parameters (a), (b) and (c)

Answer: C

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11. If a satellite is orbiting the earth very close to its surface, then the orbital velocity mainly depends on

A. The mass of the satellite only

B. The radius of the earth only

C. The orbital radius only

D. The mass of the earth only

Answer: B

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12. A relay satellite transmits the television programme from one part of the world to another part continuously because its period

A. Period is greater than the period of rotation of the earth

B. Period is less than the period of rotation of the earth about its axis

C. Period has no relation with the period of the earth about its axis

D. Period is equal to the period of rotation of the earth about its axis

Answer: D

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13. 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. 12 V

B. 6 V

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

D. $\frac{3}{2}V$

Answer: B

Watch Video Solution

14. A geostationary satellite

A. Revolves about the polar axis

B. Has a time period less than that of the near earth satellite

C. Moves faster than a near earth satellite

D. Is stationary in the space

Answer: A

Watch Video Solution

15. A small satellite is revolving near earth's surface. Its orbital velocity will be nearly

A. 8 km / sec

B. 11.2 km / sec

C. 4 km / sec

D. 6 km / sec

Answer: A

Watch Video Solution

16. A satellite revolves around the earth in an elliptical orbit. Its speed is

A. Is the same at all points in the orbit

B. Is greatest when it is closest to the earth

C. Is greatest when it is farthest from the earth

D. Goes on increasing or decreasing continuously depending upon the mass of the satellite

Answer: B

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17. The orbital velocity of an satellite in a circular orbit just above the earth's surface is v. For a satellite orbiting at an altitude of half of the earth's radius, the orbital velocity is

A. $\frac{3}{2}v$

B. $\sqrt{\frac{3}{2}}v$

C. $\sqrt{\frac{2}{3}}v$

D. $\frac{2}{3}v$

Answer: C

Watch Video Solution

18. In a satellite if the time of revolution is T, then kinetic energy is proportional to

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

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

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

D. $T^{-2/3}$

Answer: D

Watch Video Solution

19. If the height of a satellite from the earth is negligible in comparison to the radius of the earth R , the orbital velocity of the satellite is

A. gR

B. $g/R2$

C. $\sqrt{g/R}$

D. $\sqrt{gR}$

Answer: D

Watch Video Solution

20. Choose the correct statement from the following : The radius of the orbit of a geostationary satellite depends upon

A. Mass of the satellite, its time period and the gravitational constant

B. Mass of the satellite, mass of the earth and the gravitational constant

C. Mass of the earth, mass of the satellite, time period of the satellite and the gravitational constant

D. Mass of the earth, time period of the satellite and the gravitational constant

Answer: D

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21. Which of the following statement is correct about satellites?

A. A satellite cannot move in a stable orbit in a plane passing through the earth's centre

B. Geostationary satellites are launched in the equatorial plane

C. We can use just one geostationary satellite for global communication around the globe

D. The speed of a satellite increases with an increase in the radius of its orbit

Answer: D

Watch Video Solution

22. A satellite is moving around the earth's with speed v in a circular orbit of radius r. If the orbit radius is decreases by 1% , its speed will

A. Increase by 1%

B. Increase by 0.5%

C. Decrease by 1%

D. Decrease by 0.5%

Answer: B

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23. Orbital velocity of an artificial satellite does not depend upon

A. Mass of the earth

B. Mass of the satellite

C. Radius of the earth

D. Acceleration due to gravity

Answer: B

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24. The time period of a geostationary satellite is

A. 24 hours

B. 12 hours

C. 365 days

D. One month

Answer: A

Watch Video Solution

25. The orbital speed for an earth satellite near the surface of the earth is $7km/\sec$. If the radius of the orbit is 4 times the radius of the earth, the orbital speed would be

A. 3.5 km / s

B. 7 km / s

C. 72 km / s

D. 14 km / s

Answer: A

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26. Two identical satellite are at R and $7R$ away from earth surface, the wrong statement is (R=radius of earth)

A. Ratio of total energy will be 4

B. Ratio of kinetic energies will be 4

C. Ratio of potential energies will be 4

D. Ratio of total energy will be 4 but ratio of potential and kinetic energies will be 2

Answer: D

Watch Video Solution

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

A. n km/s

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

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

D. 33 km/s

Answer: A

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28. The mean radius of the earth is R, its angular speed on its own axis is ω and the acceleration due to gravity at earth's surface is g. The cube of the radius of the orbit of a geo-stationary satellite will be

A. $R^2 g / \omega$

B. $R^2\omega^2/g$

C. Rg/ω

D. R^2g/ω^2

Answer: D

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29. Which one of the following statements regarding artificial satellite of the earth is incorrect

A. The orbital velocity depends on the mass of the satellite

B. A minimum velocity of 8 km / sec is required by a satellite to orbit quite close to the earth

C. The period of revolution is large if the radius of its orbit is large

D. The height of a geostationary satellite is about 36000 km from earth

Answer: A

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

A. It will continue to move with velocity v along the original orbit of spacecraft

B. It will move with the same speed tangentially to the spacecraft

C. It will fall down to the earth gradually

D. It will go very far in the space

Answer: A

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31. A satellite whose mass is M , is revolving in circular orbit of radius r around the earth. Time of revolution of satellite is

A. $T \propto \frac{r^5}{GM}$

B. $T \propto \sqrt{\frac{r^3}{GM}}$

C. $T \propto \sqrt{\dfrac{r}{GM^2/3}}$

D. $T \propto \sqrt{\dfrac{r^3}{GM^1/4}}$

Answer: B

Watch Video Solution

32. An artificial satellite is placed into a circular orbit around earth at such a height that it always remains above a definite place on the surface of earth. Its height from the surface of earth is

A. 6400 km

B. 4800 km

C. 32000 km

D. 36000 km

Answer: D

Watch Video Solution

33. The weight of an astronaut, in an artificial satellite revolving around the earth, is

A. Zero

B. Equal to that on the earth

C. More than that on the earth

D. Less than that on the earth

Answer: A

Watch Video Solution

34. In the following four periods

(i) Time of revolution of a satellite just above the earth's surface (T_{st})

(ii) Period of oscillation of mass inside the tunnel bored along the diameter of the earth (T_{ma})

(iii) Period of simple pendulam having a length equal to the earth's raduis in a unifrom field of $9.8N/kg(T_{sp})$

(iv) Period of an infinite length simple pendulam in the earth's real gravitational field (T_{is})

A. Time of revolution of a satellite just above the earth’s surface (T_{st})

B. Period of oscillation of mass inside the tunnel bored along the diameter of the earth (T_{ma})

C. Period of simple pendulum having a length equal to the earth's radius in a uniform field of 9.8 N/kg (T_{sp})

D. Period of an infinite length simple pendulum in the earth's real gravitational field (T_{is})

Answer: C

Watch Video Solution

35. The periodic time of a communication satellite is

A. 6 hours

B. 12 hours

C. 18 hours

D. 24 hours

Answer: D

Watch Video Solution

36. The orbital speed of an artificial satellite very close to the surface of the earth is V_o. Then the orbital speed of another artificial satellite at a height equal to three times the radius of the earth is

A. $4V_o$

B. $2V_o$

C. $0.5V_o$

D. $4V_o$

Answer: C

Watch Video Solution

37. Which of the following statements is correct in respect of a geostationary satellite

A. It moves in a plane containing the Greenwich meridian

B. It moves in a plane perpendicular to the celestial equatorial plane

C. Its height above the earth's surface is about the same as the radius of the earth

D. Its height above the earth's surface is about six times the radius of the earth

Answer: D

View Text Solution

38. The height of a geo-stationary satellite above the centre of the earth is (in KM)

A. 6400

B. 12800

C. 36000

D. 42000

Answer: D

Watch Video Solution

39. If Gravitational constant is decreasing in time, what will remain unchanged in case of a satellite orbiting around earth

A. Time period

B. Orbiting radius

C. Tangential velocity

D. Angular velocity

Answer: C

Watch Video Solution

40. Periodic time of a satellite revolving above Earth's surface at a height equal to R, radius of Earth, is : [g is acceleration due to gravity at Earth's surface]

A. $2\pi\sqrt{\frac{2R}{g}}$

B. $4\sqrt{2}\pi\sqrt{\frac{R}{g}}$

C. $2\pi\sqrt{\frac{R}{g}}$

D. $8\pi\sqrt{\frac{R}{g}}$

Answer: B

Watch Video Solution

41. Given raduis of earth $'R'$ and length of a day $'T'$ the height of a geostationary satellite is [G-Gravitational constant M-mass of earth]

A. $\left(\frac{4\pi^2 GM}{T^2}\right)^{1/3}$

B. $\left(\frac{4\pi GM}{R^2}\right)^{1/3} - R$

C. $\left(\frac{GMT^2}{4\pi^2}\right)^{1/3} - R$

D. $\left(\frac{GMT^2}{4\pi^2}\right)^{1/3} + R$

Answer: C

Watch Video Solution

42. A geostationary satellite is orbiting the earth at a height of 6R above the surface of the earth, where R is the radius of the earth. The time period of another satellite at a height of 2.5 R from the surface of the earth is ...... hours.

A. 10 hr

B. $(6/\sqrt{2})hr$

C. $6hr$

D. $6\sqrt{2}hr$

Answer: D

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43. The distance between centre of the earth and moon is 384000 km . If the mass of the earth is $6 \times 10^{24} kg$ and $G = 6.66 \times 10^{-11} Nm^2 / kg^2$. The speed of the moon is nearly

A. 1km/sec

B. 4 km/sec

C. 8 km/sec

D. 11.2 km/sec

Answer: A

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44. 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. 0.7

B. 1.0

C. 1.5

D. 3

Answer: D

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45. Where can a geostationary satellite be installed

A. Over any city on the equator

B. Over the north or south pole

C. At height R above earth

D. At the surface of earth

Answer: A

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46. Distance of geostationary satellite from the surface of earth radius $(R_e = 6400 km)$ in terms of R_e is

A. $13.76 R_e$

B. $10.76 R_e$

C. $6.56 R_e$

D. $2.56 R_e$

Answer: C

View Text Solution

47. A satellite is to revolve around the earth in a circle of radius 8000 km. With what speed should this satellite be projected into orbit? What will be the time period?

Take g at the surface $= 9.8ms^{-2}$ and radius of the earth =6400 km.

A. 3 km /s

B. 16 km /s

C. 7.15 km /s

D. 8 km /s

Answer: C

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48. Two satellite A and B , ratio of masses $3:1$ are in circular orbits of radii r and 4 r . Then ratio of total mechanical energy of A to B is

A. $1:3$

B. $3:1$

C. $3:4$

D. $12:1$

Answer: D

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49. The orbital velocity of a planet revolving close to earth's surface is

A. $\sqrt{2gR}$

B. $\sqrt{gR}$

C. $\sqrt{\frac{2g}{R}}$

D. $\sqrt{\frac{g}{R}}$

Answer: B

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50. 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: B

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51. 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. $-\frac{1}{2}Mv^2$

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

C. $\frac{3}{2}Mv^2$

D. Mv^2

Answer: A

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52. A satellite with kinetic energy E_k is revolving round the earth in a circular orbit. How much more kinetic energy should be given to it so that it may just escape into outer space

A. E_k

B. $2E_k$

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

D. $3E_k$

Answer: A

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53. 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. $-0.5mgR_e$

B. $-mgR_e$

C. $-2mgR_e$

D. $-4mgR_e$

Answer: A

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54. When a satellite going around the earth in a circular orbit of radius r and speed v loses some of its energy, then

A. r and v both with increase

B. r and v both will decrease

C. r will decrease and v will increase

D. r will decrease and v will decrease

Answer: C

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55. The mean radius of the orbit of a satellite is 4 times as great as that of the parking orbit of the earth. Then its period of revolution around the earth is

A. 4 days

B. 8 days

C. 16 days

D. 32 days

Answer: B

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56. Which is constant for a satellite in orbit

A. Velocity

B. Angular momentum

C. Potential energy

D. Acceleration

Answer: B

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57. If satellite is shifted towards the earth. Then time period of satellite will be

A. Increase

B. Decrease

C. Unchanged

D. Nothing can be said

Answer: B

Watch Video Solution

58. Which of the following quantities does not depend upon the orbital radius of the satellite

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

B. $\frac{T^2}{R}$

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

D. $\frac{T^2}{R^3}$

Answer: D

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59. The time period of a satellite of earth is 5 hours. If the separation between the centre of earth and the satellite is increased to 4 times the previous value, the new time period will become-

A. 20 hours

B. 10 hours

C. 80 hours

D. 40 hours

Answer: D

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60. A satellite moves round the earth in a circular orbit of radius R making one revolution per day. A second satellite moving in a circular orbit, moves round the earth once in 8 days. The radius of the orbit of the second satellite is

A. 8 R

B. 4 R

C. 2 R

D. R

Answer: B

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61. A person sitting in a chair in a satellite feels weightless because

A. The earth does not attract the objects in a satellite

B. The normal force by the chair on the person balances the earth's attraction

C. The normal force is zero

D. The person in satellite is not accelerated

Answer: C

Watch Video Solution

62. 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. $\frac{3v}{2}$

B. $\frac{4v}{2}$

C. $6v$

D. $12v$

Answer: C

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63. If $g \propto \frac{1}{R^3}$ (instead of $\frac{1}{R^2}$), then the relation between time period of a satellite near earth's surface and radius R will be

A. $T^2 \propto R^3$

B. $T \propto R^2$

C. $T^2 \propto R$

D. $T \propto R$

Answer: B

Watch Video Solution

64. To an astronaut is a spcaceship, the sky appears

A. Black

B. White

C. Green

D. Blue

Answer: A

Watch Video Solution

65. A geostationary satellite is revolving around the earth. To make it escape from gravitational field of earth, is velocity must be increased

A. $100\ \%$

B. $41.4\ \%$

C. $50\ \%$

D. $59.6\ \%$

Answer: B

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66. A satellite moves in a circle around the earth. The radius of this circle is equal to one half of the radius of the moon's orbit. The satellite completes one revolution is :

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

B. $\frac{2}{3}$ lunar month

C. $2^{-3/2}$ lunar month

D. $2^{3/2}$ lunar month

Answer: C

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67. A satellite of mass m is placed at a distance r from the centre of earth (mass M). The mechanical energy of the satellite is

A. $-\frac{GMm}{r}$

B. $\frac{GMm}{r}$

C. $\frac{GMm}{2r}$

D. $-\frac{GMm}{2r}$

Answer: D

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Kepler's Laws of Planetary Motion

1. The distance of Neptune and Saturn from the Sun are respectively 10^{13} and 10^{12} meters and their periodic times are respectively T_n and T_s. If their orbits are circular, then the value of T_n / T_s is

A. $\sqrt{100}$

B. 100

C. $10\sqrt{10}$

D. $1/\sqrt{10}$

Answer: C

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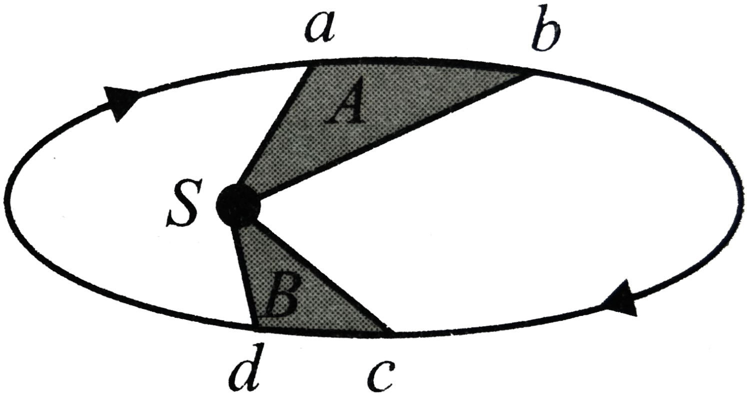
2. Figure shows the motion of a planet around the Sun S in an elliptical orbit with the Sun at the focus. The shaded areas A and B are also shown in the figure which can be assumed to be equal. If t_1 and t_2 represent the time taken for the planet to move from a to b and c to d, respectively then



A. $t_1 < t_2$

B. $t_1 > t_2$

C. $t_1 = t_2$

D. $t_1 \leq t_2$

Answer: C

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3. The period of a satellite in a circular orbit of radius R is T, the period of another satellite in a circular orbit of radius $4R$ is

A. 4 T

B. $T/4$

C. $8T$

D. $T/8$

Answer: C

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4. Orbit of a planet around a star is

A. A circle

B. An ellipse

C. A parabola

D. A straight line

Answer: B

Watch Video Solution

5. If a body describes a circular motion under inverse square field, the time taken to complete one revolution T is related to the radius of the circular orbit as

A. $T \propto r$

B. $T \propto r^2$

C. $T^2 \propto r^3$

D. $T \propto r^4$

Answer: C

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6. If the earth is at one-fourth of its present distance from the sun, the duration of the year would be

A. Half the present year

B. One-eighth the present year

C. One-fourth the present year

D. One-sixth the present year

Answer: B

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7. The earth revolves about the sun in an elliptical orbit with mean radius $9.3 \times 10^7 m$ in a period of 1 year. Assuming that there are no outside influences

A. The earth's kinetic energy remains constant

B. The earth's angular momentum remains constant

C. The earth's potential energy remains constant

D. All are correct

Answer: B

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8. Venus looks brighter than other planets because

A. It is heavier than other planets

B. It has higher density than other planets

C. It is closer to the earth than other planets

D. It has no atmosphere

Answer: C

Watch Video Solution

9. A planet moves around the sun. at a given point P, it is closest from the sun at a distance d_1, and has a speed V_1. At another point Q, when it is farthest from the sun at a distance d_2, its speed will be

A. $\frac{d_1^2 v_1}{d_2^2}$

B. $\frac{d_2 v_1}{d_1}$

C. $\frac{d_1 v_1}{d_2}$

D. $\frac{d_2^2 v_1}{d_1^2}$

Answer: C

Watch Video Solution

10. The orbital speed of Jupiter is

A. Greater than the orbital speed of earth

B. Less than the orbital speed of earth

C. Equal to the orbital speed of earth

D. Zero

Answer: B

Watch Video Solution

11. Two planets move around the sun. The periodic times and the mean radii of the orbits are T_1, T_2 and $r_1 r_2$ respectively. The ratio T_1 / T_2 is equal to

A. $(r_1 / r_2)^{1/2}$

B. r_2 / r_1

C. $(r_1 / r_2)^2$

D. $(r_1 / r_2)^{3/2}$

Answer: D

Watch Video Solution

12. According to Kepler's second law, the radius vector to a planet from the Sun sweeps out equal areas in equal intervals of time. This law is a consequence of the conservation of ______________.

A. Energy

B. Angular momentum

C. Linear momentum

D. None of these

Answer: B

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13. 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

Watch Video Solution

14. The rotation period of an earth satellite close to the surface of the earth is 83 minutes. The time period of another earth satellite in an orbit at a distance of three earth radii from its surface will be

A. 83 minutes

B. $83 \times \sqrt{8}$ minutes

C. 664 minutes

D. 249 minutes

Answer: C

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15. A satellite of mass m is in a circular orbit of radius r round the Earth. Calculate its angular momentum with respect to the centre of the orbit in terms of the mass M of the Earth and G.

A. $m\sqrt{GMR_0}$

B. $M\sqrt{GmR_0}$

C. $m\sqrt{\dfrac{GM}{R_0}}$

D. $M\sqrt{\dfrac{GM}{R_0}}$

Answer: A

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16. According to Kepler, the period of revolution of a planet (T) and its mean distance from the sun (r) are related by the equation

A. $T^3 r^3 =$ constant

B. $T^2 r^{-3} =$ constant

C. $Tr^3 =$ constant

D. $T^2 r =$ constant

Answer: B

Watch Video Solution

17. A planet revolves around sum whose mean distance is 1.588 times the mean distance between earth and sun. The revolution time of planet will be

A. 1.25 years

B. 1.59 years

C. 0.89 years

D. 2 years

Answer: D

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18. 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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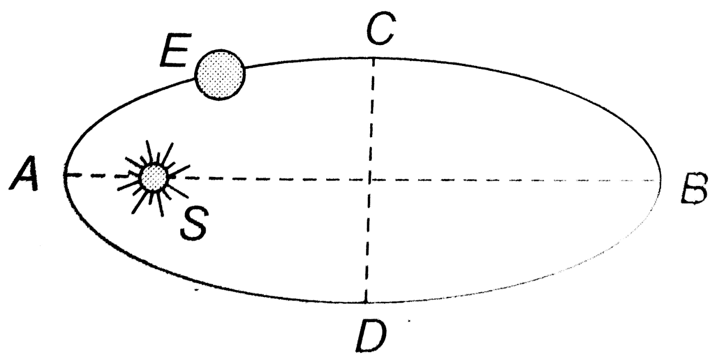
19. The earth E moves in an elliptical orbit with the sun S at one of the foci as shown in figure. Its speed of motion will be maximum at the point



A. C

B. A

C. B

D. D

Answer: B

Watch Video Solution

20. 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. 2

B. 3

C. 4

D. 5

Answer: C

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21. If the radius of earth's orbit is made 1/4, the duration of an year will become

A. 8 times

B. 4 times

C. 1/8 times

D. 1/4 times

Answer: C

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22. The motion of planets in the solar system is an exmaple of the conservation of

A. Conservation of energy

B. Conservation of linear momentum

C. Conservation of angular momentum

D. None of these

Answer: C

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23. If mass of a satellite is doubled and time period remain constant the ratio of orbit in the two cases will be

A. $1:2$

B. $1:1$

C. $1:3$

D. None of these

Answer: B

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24. The earth revolves round the sun in one year. If the distance between them becomes double, the new period of revolution will be

A. $1/2$ year

B. $2\sqrt{2}$ years

C. 4 years

D. 8 years

Answer: B

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25. Kepler discovered

A. Laws of motion

B. Laws of rotational motion

C. Laws of planetory motion

D. Laws of curvilinear motion

Answer: C

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26. In the solar system, which is conserved

A. Total Energy

B. K.E.

C. Angular Velocity

D. Linear Momentum

Answer: A

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27. The maximum and minimum distance of a comet form the sun are $8 \times 10^{12} m$ and $1.6 \times 10^{12} m$. If its velocity when nearest to the sun is $60 m / s$, what will be its velocity in m/s when it is farthest

A. 12

B. 60

C. 112

D. 6

Answer: A

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28. A body revolved around the sun 27 times faster then the earth what is the ratio of their radii

A. $1/3$

B. $1/9$

C. $1/27$

D. $1/4$

Answer: B

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

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

C. 29×2 days

D. 29 days

Answer: D

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30. Two planets at mean distance d_1 and d_2 from the sun and their frequencies are n and n respectively then

A. $n_1^2 d_1^2 = n_2 d_2^2$

B. $n_2^2 d_2^3 = n_1^2 = n_1^2 d_1^3$

C. $n_1 d_1^2 = n_2 d_2^2$

D. $n_1^2 d_1 = n_2^2 d_2$

Answer: B

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31. Which of the following astronomer first proposed that sun is static and earth rounds sun

A. Copernicus

B. Kepler

C. Galileo

D. None

Answer: A

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32. The distance of a planet from the sun is 5 times the distance between the earth and the sun. The time period of the planet is

A. $5^{3/2}$ years

B. $5^{2/3}$ years

C. $5^{1/3}$ years

D. $5^{1/2}$ years

Answer: A

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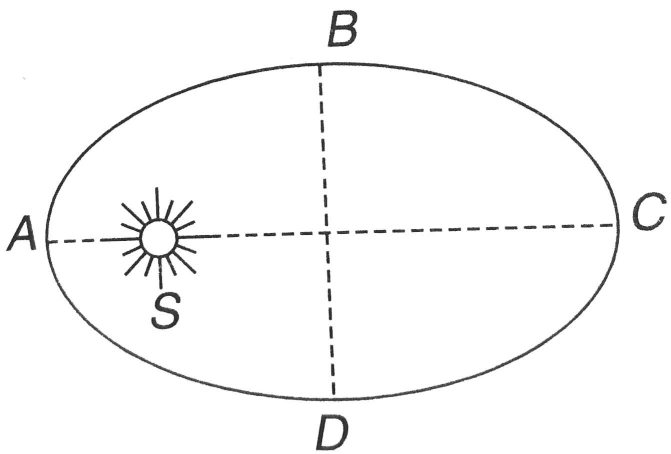
33. A planet is revolving around the sun as shown in elliptical path. The correct option is



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 ABC

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

Answer: A

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34. In the previous question, the orbit velocity of the planet will be miniumu at

A. A

B. B

C. C

D. D

Answer: C

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35. The radius of orbit of a planet is two times that of the earth. The time period of planet is

A. 4.2 years

B. 2.8 years

C. 5.6 years

D. 8.4 years

Answer: B

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36. The orbital angular momentum of a satellite revolving at a distance r from the centre is L . If the distance is increased to 16 r, then the new angular momentum will be

A. $16L$

B. $64L$

C. $\frac{L}{4}$

D. $4L$

Answer: D

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37. According to Kepler's law the time period of a satellite varies with its radius as

A. $T^2 \propto R^3$

B. $T^3 \propto R^2$

C. $T^2 \propto (1/R^3)$

D. $T^3 \propto (1/R^2)$

Answer: A

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38. In planetary motion the areal velocity of possition vector of a planet depends of angular velocity (ω) and the distance of the planet from sun (r). If so the correct relation for areal velocity is

A. $\frac{dA}{dt} \propto \omega r$

B. $\frac{dA}{dt} \propto \omega^2 r$

C. $\frac{dA}{dt} \propto \omega r^2$

D. $\frac{dA}{dt} \propto \sqrt{\omega r}$

Answer: C

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39. The ratio of the distances of two planets from the sun is 1.38. The ratio of their period of revolution around the sun is

A. 1.38

B. $1.38^{3/2}$

C. $1.38^{1/2}$

D. 1.38^{3}

Answer: B

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40. Kepler's second law is a consequence of

A. Work energy theorem

B. Conservation of linear momentum

C. Conservation of angular momentum

D. Conservation of energy

Answer: C

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41. In an elliptical orbit under gravitational force, in general

A. Tangential velocity is constant

B. Angular velocity is constant

C. Radial velocity is constant

D. Areal velocity is constant

Answer: D

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42. If a new planet is discovered rotating around Sun with the orbital radius double that of earth, then what will be its time period (in earth's days)

A. 1032

B. 1023

C. 1024

D. 1043

Answer: A

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43. Suppose the law of gravitational attraction suddenly changes and becomes an inverse cube law i.e. $F \propto 1/r^3$, but still remaining a central force. Then

A. Keplers law of areas still holds

B. Keplers law of period still holds

C. Keplers law of areas and period still hold

D. Neither the law of areas, nor the law of period still holds

Answer: D

View Text Solution

44. What does not change in the field of central force

A. Potential energy

B. Kinetic energy

C. Linear momentum

D. Angular momentum

Answer: D

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45. The eccentricity of the earth's orbit is 0.0167, the ratio of its maximum speed in its orbit to its minimum speed is

A. 2.507

B. 1.033

C. 8.324

D. 1.000

Answer: B

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46. What is the mass of the planet that has a satellite whose time period is T and orbital radius is r?

A. $4\pi^2R^3G^{-1}T^{-2}$

B. $8\pi^2R^3G^{-1}T^{-2}$

C. $12\pi^2R^3G^{-1}T^{-2}$

D. $16\pi^2R^3G^{-1}T^{-2}$

Answer: A

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47. If the orbital velocity of a planet is given by $v = G^a M^b R^c$ then find the value of a, b and c ?

A. $a = 1/3, b = 1/3, c = -1/3$

B. $a = 1/2, b = 1/2, c = -1/2$

C. $a = 1/2, b = -1/2, c = 1/2$

D. $a = 1/2, b = -1/2, c = -1/2$

Answer: B

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48. Hubble's law states that the velocity with which milky way is moving away from the earth is proportional to

A. Square of the distance of the milky way from the earth

B. Distance of milky way from the earth

C. Mass of the milky way

D. Product of the mass of the milky way and its distance from the earth

Answer: B

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49. Two satellite are revolving around the earth with velocities v_1 and v_2 and in radii r_1 and $r_2 (r_1 > r_2)$ respectively. Then

A. Square of the distance of the milky way from the earth

B. Distance of milky way from the earth

C. Mass of the milky way

D. Product of the mass of the milky way and its distance from the earth

Answer: C

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50. The condition for a uniform spherical mass m of a radius r to be a black hole is [G =gravitational constant and g=acceleration due to gravity]

A. $(2Gm/r)^{1/2} < c$

B. $(2Gm/r)^{1/2} = c$

C. $(2Gm/r)^{1/2} \geq c$

D. $(gm/r)^{1/2} \geq c$

Answer: C

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51. Earth is revolving around the sun if the distance of the Earth from the Sun is reduced to 1/4th of the present distance then the present day length reduced by

A. $\frac{1}{4}$

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

C. $\frac{1}{8}$

D. $\frac{1}{6}$

Answer: C

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CT

1. Imagine a light planet revolving around a very massive star in a circular orbit of radius R with a period of revolution T. if the gravitational force of attraction between the planet and the star is proportational to $R^{-5/2}$, then

(a) T^2 is proportional to R^2

(b) T^2 is proportional to $R^{7/2}$

(c) T^2 is proportional to $R^{3/3}$

(d) T^2 is proportional to $R^{3.75}$.

A. R^3

B. $R^{7/2}$

C. $R^{5/2}$

D. $R^{3/2}$

Answer: B

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2. The magnitude of the gravitational field at distance r_1 and r_2 from the centre of a uniform sphere of radius R and mass M are F_1 and F_2 respectively. Then:

A. $\dfrac{F_1}{F_2} = \dfrac{r_1}{r_2}$ if $r_1 < R$ and $r_2 < R$

B. $\dfrac{F_1}{F_2} = \dfrac{r_1^2}{r_2^2}$ if $r_1 > R$ and $r_2 > R$

C. $\dfrac{F_1}{F_2} = \dfrac{r_1}{r_2}$ if $r_1 > R$ and $r_2 > R$

D. $\dfrac{F_1}{F_2} = \dfrac{r_2^2}{r_1^2}$ if $r_1 < R$ and $r_2 < R$

Answer: A::B

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

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

C. The total mechanical energy of S varies periodically with time

D. The linear momentum of S remains constant in magnitude

Answer: A

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4. Mass M is split into two parts m and $(M-m)$, which are then separated by a certain distance. What is the ratio of (m/M)

which maximises the gravitational force between the parts ?

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

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

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

D. $\frac{1}{5}$

Answer: B

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5. Suppose the gravitational force varies inversely as the n^{th} power of distance. Then the time period of a planet in circular orbit of radius R around the sun will be proportional to-

A. $R^{\left(\frac{n+1}{2}\right)}$

B. $R^{\left(\frac{n-1}{2}\right)}$

C. R^{n}

D. $R^{\left(\frac{n+2}{2}\right)}$

Answer: A

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6. If the radius of the earth were to shrink by 1% its mass remaining the same, the acceleration due to gravity on the earth's surface would

A. Decrease by 2%

B. Remain unchanged

C. Increase by 2%

D. Increase by 1%

Answer: C

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7. The radius and mass of earth are increased by 0.5%. Which of the following statements are true at the surface of the earth

A. g will increase

B. g will decrease

C. Escape velocity will remain unchanged

D. Potential energy will remain unchanged

Answer: B::C::D

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8. Calculate that imaginary angular velocity of the Earth for which effective acceleration due to gravity at the equator becomes zero. In this condition, find the length (in hours) of a day? Radius of Earth $= 6400 km. \ g = 10 ms^{-2}$.

A. $0 rad \sec^{-1}$

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

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

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

Answer: B

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9. A simple pendulam has time period T_1 when on the earth's surface and T_2 when taken to a height R above the earth's surface where R is the radius of the earth. The value of $\frac{T_2}{T_1}$ is-

A. 1

B. $\sqrt{2}$

C. 4

D. 2

Answer: D

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10. A body of mass m is taken from earth surface to the height h equal to radius of earth, the increase in potential energy will be

A. mgR

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

C. $2mgR$

D. $\frac{1}{4}mgR$

Answer: B

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11. An artificial satellite moving in a circular orbit around the earth has a total energy E_0. Its potential energy is

A. $-E_0$

B. $1.5E_0$

C. $2E_0$

D. E_0

Answer: C

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12. A rocket is launched vertically from the surface of earth with an initial velocity v. How far above the surface of earth it will go?

Neglect the air resistance.

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

B. $R\left(\frac{gR}{2V^2}-1\right)$

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

D. $R\left(\frac{2gR}{V^2}-1\right)$

Answer: C

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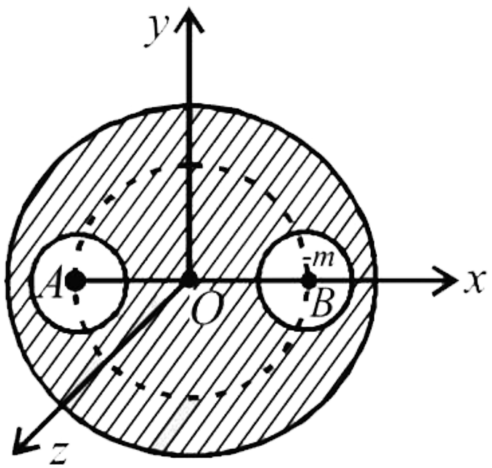
13. A solid sphere of uniform density and radius 4 units is located with its centre at the origin O of coordinates. Two sphere of equal radii 1 unit, with their centres at A(-2,0 ,0) and B(2,0,0) respectively, are taken out of the solid leaving behind spherical cavities as shown if fig Then:



A. The gravitational force due to this object at the origin is zero

B. The gravitational force at the point B (2, 0, 0) is zero

C. The gravitational potential is the same at all points of the circle $y^2 + z^2 = 36$

D. The gravitational potential is the same at all points on the circle $y^2 + z^2 = 4$

Answer: A::C::D

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14. Two bodies of masses m_1 and m_2 are initially at rest at infinite distance apart. They are then allowed to move towards each other under mutual gravitational attraction. Their relative velocity of approach at a separation distance r between them is.

A. $\left[2G\frac{(m_1 - m_2)}{r}\right]^{1/2}$

B. $\left[\frac{2G}{r}(m_1 + m_2)\right]^{1/2}$

C. $\left[\frac{r}{2G(m_1 m_2)}\right]^{1/2}$

D. $\left[\frac{2G}{r}m_1m_2\right]^{1/2}$

Answer: B

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15. A projectile is projectile with velocity kv_e in vertically upward direction from the ground into the space (v_e is escape velocity and $k < 1$). If air resistance is considered to be negligible then the maximum height from the centre of earth to which it can go, will be : (R =raduis of earth)

A. $\dfrac{R}{k^2+1}$

B. $\dfrac{R}{k^2-1}$

C. $\dfrac{R}{1-k^2}$

D. $\dfrac{R}{k+2}$

Answer: C

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16. A satellite is launched into a circular orbit of radius R around the earth. A second satellite is launched into an orbit of radius (1.01) R. The period of the second satellite is larger than the first one by approximately

A. $0.5\,\%$

B. $1.0\,\%$

C. $1.5\,\%$

D. $3.0\,\%$

Answer: C

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17. If the distance between the earth and the sun were half its present value, the number of days in a year would have been

A. 64.5

B. 129

C. 182.5

D. 730

Answer: B

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18. A geostationary satellite orbits around the earth in a circular orbit of radius 36,000 km. then the time period of a spy satellite orbiting a few hundred km (600 km) above the earth's surface (R=6400 km) will approximately be

A. 1/2 h

B. 1 h

C. 2 h

D. 4 h

Answer: C

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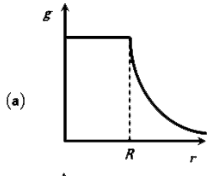
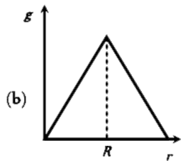
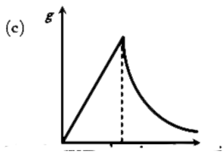
GQ

1. Assuming the earth to have a constant density, point out which of the following curves show the variation of acceleration due to gravity from the centre of earth to the points far away from the surface of earth

A. 

B. 

C. 

D. 

Answer: C

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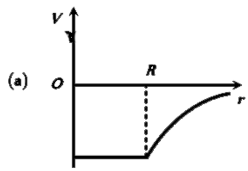
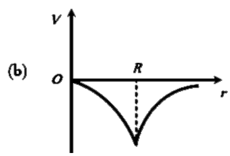
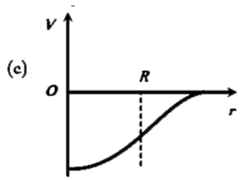
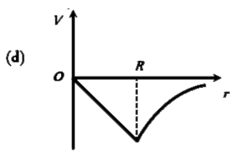
2. The diagram showing the variation of gravitational potential of earth with distance from the centre of earth is

A. 

B. 

C. 

D. 

Answer: C

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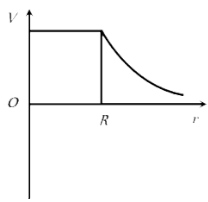
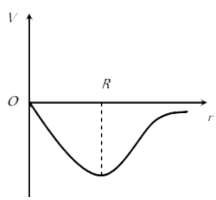
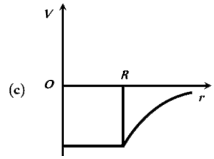
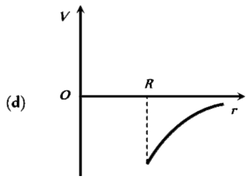
3. By which curve will the variation of gravitational potential of a hollow sphere of radius R with distance be depicted ?

A. 

B. 

C. 

D. 

Answer: C

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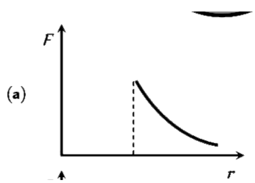
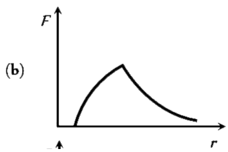
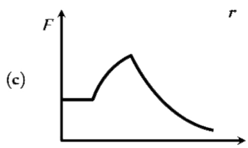
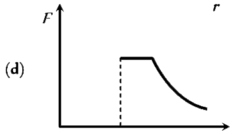
4. A cavity of radius $R/2$ is made inside a solid sphere of radius R. The centre of the cavity is located at a distance $R/2$ from the centre of the sphere. The gravitational force on a particle of a mass $'m'$ at a distance $R/2$ from the centre of the sphere on the line joining both the centres of sphere and cavity is (opposite to the centre of cavity). [Here $g = GM/R^2$, where M is the mass of the solide sphere]

A. 

B. 

C. 

D. 

Answer: B

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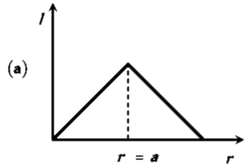
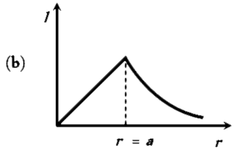
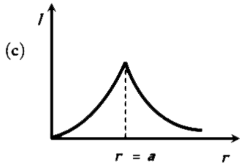
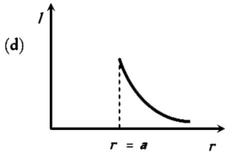
5. Which one of the following plots represents the variation of the gravitational field on a particle with distance r due to a thin spherical shell of raduis R? (r is measured from the centre of the spherical shell).

A. 

B. 

C. 

D. 

Answer: D

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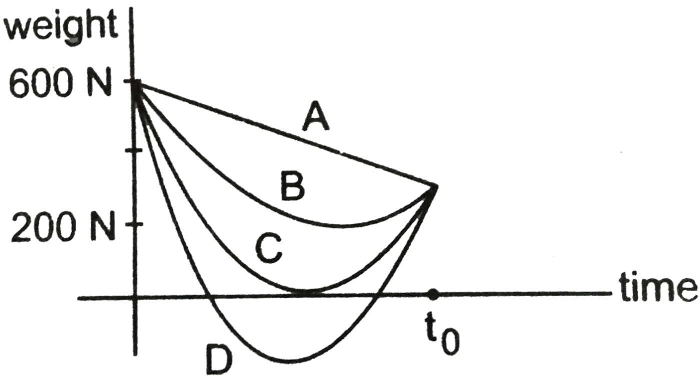
6. Suppose the acceleration due to gravity at earth's surface is $10 ms^{-2}$ and at the surface of Mars it is $4.0 ms^{-2}$. A passenger goes from the to the mars in a spaceship with a constant velocity. Neglect all other object in sky. Which part of figure best represent the weight (net gravitational force) of the passenger as a function of time?



A. A

B. B

C. C

D. D

Answer: C

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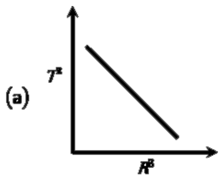
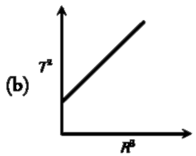
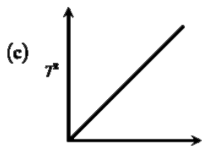
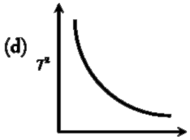
7. Which of the following graphs represents the motion of the planet moving about the Sun. T is the periode of revolution and r is the average distance (from centre to centre) between the sun and the planet

A. 

B. 

C. 

D. 

Answer: C

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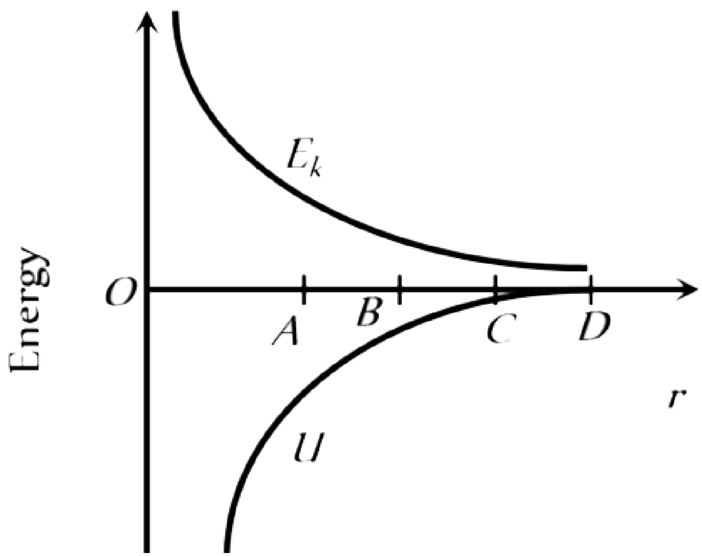
8. The curves for potential energy (U) and kinetic energy (E_k) of a two particle system are shown in figure. At what points the system will be bound?



A. Only at point D

B. Only at point A

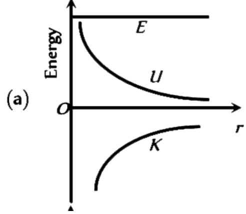
C. At point D and A

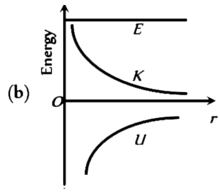
D. At points A , B and C

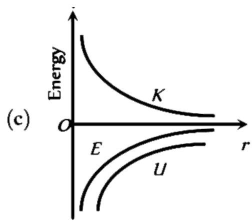
Answer: D

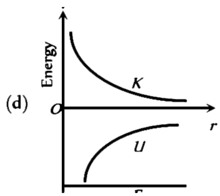
Watch Video Solution

9. The correct graph representing the variation of total energy (E_t), kinetic energy (E_k) and potential energy (U) of a satellite with its distance form the centre of earth is ?

A. 

B. 

C. 

D. 

Answer: C

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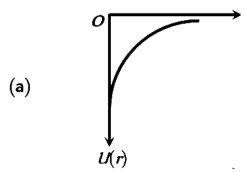
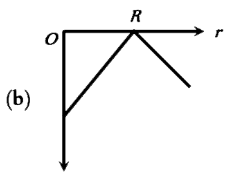
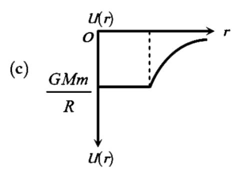
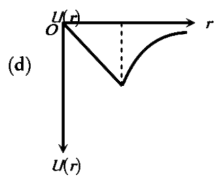
10. A shell of mass M and radius R has point mass m placed at a distance r from its centre. The gravitational potential energy U(r) vs r will be

A. 

B. 

C. 

D. 

Answer: C

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Assertion and Reasons

1. Statement I: The smaller the orbit of a planet around the Sun, the shorter is the time it takes to complete.

Statement II: According to Kepler's third law of planetary motion, square of time period is proportional to cube of mean distance from Sun.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

2. Statement -1: Gravitational force between two particles is negligibly small compared to the electrical force.

Statement-2 :The electrical force is experienced by charged particles only.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

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3. Statement-1 :The universal gravitational constant is same as acceleration due to gravity.

Statement-2 :Gravitional constant and acceleration due to gravity have different dimensional formula

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: D

Watch Video Solution

4. Assertion: The value of acceleration due to gravity does not depends upon mass of the body on which force is applied.

Reason: Acceleration due to gravity is a constant quantity.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of

the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

Watch Video Solution

5. Assertion : If a pendulum falls freely, then its time period becomes infinite.

Reason : Free falling body has acceleration, equal to 'g'.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

6. Statement I: If the earth suddenly stops rotating about its axis, then the acceleration due to gravity will become the same at all the places.

Statement II: The value of acceleration due to gravity is independent of rotation of the earth.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

Watch Video Solution

7. Assertion : The difference in g at the poles and the equator of the earth is directly proportional to the square of its angular velocity.

Reason : The value of g is minimum at the equator and maximum at poles.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

Watch Video Solution

8. Assertion: There is no effect of rotation of a earth on acceleration due to gravity at poles.

Reason : Rotation of earth is about polar axis.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

9. Assertion : A force act upon the earth revolving in a circular orbit about the sun. Hence work should be done on the earth.

Reason : The necessary centripetal force for circular motion of earth comes from the gravitational force between earth and sun.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

Watch Video Solution

10. Assertion: The ratio of intertial mass to gravitational mass is equal to one.

Reason: The inertial mass and gravitational mass of a body are equivalent.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

11. Assertion : Gravitational potential of earth at every place on it is negative.

Reason : Every body on earth is bound by the attraction of earth.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

12. Assertion : Even when orbit of a satellite is elliptical, its plane of rotation passes through the centre of earth.

Reason: According to law of conservation of angular momentum plane of rotation of satellite always remin same.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

13. Assertion : A planet moves faster, when it is closer to the sun in its orbit and vice versa.

Reason : Orbital velocity in orbital of planet is constant.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

Watch Video Solution

14. Assertion : Orbital velocity of a satellite is greater than its escape velocity.

Reason : Orbit of a satellite is within the gravitational field of earth whereas escaping is beyond the gravitational field of earth.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

Watch Video Solution

15. Assertion: if an earth satellite moves to a lower orbit, there is some dissipation of energy but the satellite speed increases.

Reason: The speed of satellite is a constant quantity.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

Watch Video Solution

16. Assertion : Earth has an atmosphere but the moon does not.

Reason : Moon is very small in comparison to earth.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

Watch Video Solution

17. Assertion: The time period of geostationary satellite is 24 hrs.

Reason: Geostationary satellite must have the same time period as the time taken by the earth to complete on revolution about its axis.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

Watch Video Solution

18. Assertion : The principle of superposition is not valid for gravitational force.

Reason : Gravitational force is a conservative force.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

Watch Video Solution

19. Assertion: Two different planets have same escape velocity.

Reason: Value of escape velocity is a universal constant.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of

the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: D

Watch Video Solution

20. Assertion: The time period of revolution of a satellite close to surface of earth is smaller then that revolving away from surface of earth.

Reason: The square of time period of revolution of a satellite is directely proportioanl to cube of its orbital radius.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

21. Assertion: When distance between bodies is doubled and also mass of each body is also doubled, gravitational force between them remains the same.

Reason: According to Neweton's law

gravitational, force is directely proportional to mass of bodies and inversely proportional to square of distance between them.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

22. Assertion: Generally the path of projectile form the earth is parabolic but it is elliptical for projection going to a very large height.

Reason: The path of projectile is independent of the gravitational force of earth.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

Watch Video Solution

23. Assertion: A body becomes weightless at the centre of earth.

Reason: As the distance form centre of earth decreases, acceleration due to gravity increases.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

Watch Video Solution

24. Statement-1: Space rockets are usually launched in the equatorial line from west to east.

Statement-2: The acceleration due to gravity is minimum at the equator.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of

the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

Watch Video Solution

25. Assertion : The binding energy of a satellite does not depend upon the mass of the satellite.

Reason : Binding energy is the negative value of total energy of satellite.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

Watch Video Solution

26. Assertion : We can not move even a finger without disturbing all the stars.

Reason : Every body in this universe attracts every other body with a force which is unversely proportional to the square of distance between them.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

27. Assertion : If earth were a hollow sphere, gravitational field intensity at any point inside the earth would be zero.

Reason : Net force on a body inside the sphere is zero.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

28. Assertion : For a satellite revolving very near to earth's surface the time period of revolution is given by 1 hour 24 minutes.

Reason : The period of revolution of a satellite depends only upon its height above the earth's surface.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

29. Assertion: A person sitting in an artificial satellite revolving around the earth feels weightless.

Reason: There is no gravitational force on the satellite.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of

the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: C

Watch Video Solution

30. Assertion : The speed of satellite always remains constant in an orbit.

Reason : The speed of a satellite depends on its path.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If assertion is false but reason is true.

Answer: D

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31. Assertion: The speed of revolution of an artificial satellite revoving very near the earth is $8kms^{-1}$.

Reason: Orbital velocity of a satellite, becomes independent of height near earth.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

Watch Video Solution

32. Assertion : Gravitational field is zero both at centre and infinity.

Reason : The dimensions of gravitational field is $[LT^{-2}]$

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: B

Watch Video Solution

33. Assertion: For the plantes orbiting around the sun, angular speed, linear speed, K.E. changes with time, but angular momentum remains constant.

Reason: No torque is acting on the rotating planet. So its angular momentum is constant.

A. If both assertion and reason are true and the reason is the correct explanation of the assertion.

B. If both assertion and reason are true but reason is not the correct explanation of the assertion.

C. If assertion is true but reason is false.

D. If the assertion and reason both are false.

Answer: A

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SET

1. Two identical spheres are placed in contact with each other. The force of gravitation between the spheres will be proportional to (

R = radius of each sphere)

A. R

B. R^2

C. R^4

D. None of these

Answer: C

Watch Video Solution

2. Suppose that the force of earth's gravity suddenly disappears, choose the correct answer out of the following statements

A. The weight of the body will become zero but mass remains the same

B. The mass of the body will become zero but the weight remains the same

C. Both the mass and weight will be the same

D. Mass and weight will remain the same

Answer: A

Watch Video Solution

3. An earth satellite is moved from one stable circular orbit to another larger and stable circular orbit. The following quantities increases for the satellite as a result of this change

A. Gravitational force

B. Gravitational P.E.

C. Linear orbital speed

D. Centripetal acceleration

Answer: B

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4. Two planets revolve round the sun with frequencies N_1 and N_2 revolutions per year. If their average orbital radii be R_1 and R_2 respectively, then R_1 / R_2 is equal to

A. $(N_1 / N_2)^{3/2}$

B. $(N_2 / N_1)^{3/2}$

C. $(N_1 / N_2)^{2/3}$

D. $(N_2 / N_1)^{2/3}$

Answer: D

Watch Video Solution

5. There is no atomosphere on moon because

A. It is closer to the earth

B. It revolves round the earth

C. It gets light from the sun

D. The escape velocity of gas molecules is lesser than their root mean square velocity here

Answer: D

Watch Video Solution

6. Two heavenly bodies $s_1 \& s_2$ not far off from each other, revolve in orbit

A. Around their common centre of mass

B. Which are arbitrary

C. With S_1 fixed and S_2 moving round S_1

D. With S_2 fixed and S_1 moving round S_2

Answer: A

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7. The mass of the moon is about 1.2% of the mass of the earth. Compared to the gravitational force the earth exerts on the moon, the gravitational force the moon exerts on earth

A. Is the same

B. Is smaller

C. Is greater

D. Varies with its phase

Answer: A

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8. A clock S is based on oscillations of a spring and clock P is based on pendulum motion, both clocks run at the same rate on Earth. On a planet having the same mass, but twice the radius that of the earth

A. S will run faster than P

B. P will run faster than S

C. They will both run at the same rate as on the earth

D. None of these

Answer: B

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9. Consider earth to be a homogeneous sphere. Scientist A goes deep down in a mine and Scientist B goes high up in a balloon. The gravitational field measured by

A. A goes on decreasing and that by B goes on increasing

B. B goes on decreasing and that by A goes on increasing

C. Each decreases at the same rate

D. Each decreases at different rates

Answer: D

Watch Video Solution

10. The mass of the moon is $\frac{1}{81}$ of the earth but the gravitational pull is $\frac{1}{6}$ of the earth. It is due to the fact that

A. The radius of the moon is $\frac{81}{6}$ of the earth

B. The radius of the earth is $\frac{9}{\sqrt{6}}$ of the moon

C. Moon is the satellite of the earth

D. None of the above

Answer: B

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11. A weight is suspended from the ceiling of a lift by a spring balance. When the lift is stationary the spring balance reads W . If the lift suddenly falls freely under gravity, the reading on the spring balance will be

A. W

B. $2W$

C. $W/2$

D. 0

Answer: D

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12. If a planet consits of a satellite whose mass and radius were both half that of the earth, the acceleration due to gravity at its surface would be (g on earth=$9.8m/\sec^2$)

A. $4.9m/\sec^2$

B. $8.9m/\sec^2$

C. $19.6m/\sec^2$

D. $29.4m/\sec^2$

Answer: C

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13. At a given place where acceleration due to gravity is 'g' $m/\sec^2$, a sphere of lead of density $'dkg/m^3$ is gently released in a column of liquid of density $'\rho' kg/m^3$. If $d > \rho$, the sphere will

A. Fall vertically with an acceleration $'g' m/\sec^2$

B. Fall vertically with no acceleration

C. Fall vertically with an acceleration $g\left(\frac{d-\rho}{d}\right)$

D. Fall vertically with an acceleration $g\left(\frac{\rho}{d}\right)$

Answer: C

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14. g_e and g_p denote the acceleration due to gravity on the surface of the earth and another planet whose mass and radius are twice as that of earth. Then

A. $g_p = g_e$

B. $g_p = g_e / 2$

C. $g_p = 2g_e$

D. $g_p = g_e / 4$

Answer: B

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15. If the value of g at the surface of the earth is $9.8m/\sec^2$, then the value of g at a place 480 km above the surface of the earth will be (Radius of the earth is 6400 km)

A. $8.4m/\sec^2$

B. $9.8m/\sec^2$

C. $7.2m/\sec^2$

D. $4.2m/\sec^2$

Answer: A

Watch Video Solution

16. The acceleration due to gravity about the earth's surface would be half of its value on the surface of the earth at an altitude of (R = 4000 mile)

A. 1200 mile

B. 2000 mile

C. 1600 mile

D. 4000 mile

Answer: C

Watch Video Solution

17. A pendulum clock is set to give correct time at the sea level. This clock is moved to hill station at an altitude of 2500 m above the sea level. In order to keep correct time of the hill station, the length of the pendulum

A. Has to be reduced

B. Has to be increased

C. Needs no adjustment

D. Needs no adjustment but its mass has to be increased

Answer: A

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18. At some point the gravitational potential and also the gravitational field due to earth is zero. The point is

A. On earth's surface

B. Below earth's surface

C. At a height R_e from earth's surface ($R_e =$ radius of the earth)

D. At infinity

Answer: D

Watch Video Solution

19. A body falls freely under gravity. Its speed is v when it has lost an amount U of the gravitational energy. Then its mass is

A. $\frac{Ug}{v^2}$

B. $\frac{U^2}{g}$

C. $\frac{2U}{v^2}$

D. $2Ugv^2$

Answer: C

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20. The ratio of the radius of the earth to that of moon is 10. The ratio of acceleration due to gravity on the earth and on the moon is 6. What is the ratio (in intergral value) of the escape velocity from the earth's surface to that from the moon?

A. 10

B. 6

C. Nearly 8

D. 1.66

Answer: C

Watch Video Solution

21. Escape velocity from the moon surface is less than that on the earth surface, because

A. Moon has no atmosphere while the earth has

B. Radius of moon is less than that of the earth

C. Moon is nearer to the sun

D. Moon is attracted by other planets

Answer: B

Watch Video Solution

22. Ratio of the radius of a planet A to that of planet B is r. The ratio of acceleration due to gravity for the two planets is x. The ratio of the escape velocities from the two planets is

A. xr

B. $\sqrt{\frac{r}{x}}$

C. $\sqrt{rx}$

D. $\sqrt{\frac{x}{r}}$

Answer: C

Watch Video Solution

23. Time period of revolution of a nearest satellite around a planet of radius R is T .

Period of revolution around another planet, whose radius is 3R but having same density is

A. T

B. $3T$

C. $9T$

D. $3\sqrt{3}T$

Answer: A

Watch Video Solution

24. The maximum possible velocity of a satellite orbiting round the earth in a stable orbit is

A. $\sqrt{2R_e g}$

B. $\sqrt{R_e g}$

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

D. Infinite

Answer: B

Watch Video Solution

25. An astronaut. inside an earth satellite, experiences weightlessness because

A. Zero at that place

B. Is balanced by the force of attraction due to moon

C. Equal to the centripetal force

D. Non-effective due to particular design of the satellite

Answer: C

Watch Video Solution

26. Two identical satellites A and B are circulating round the earth at the height of R and 2 R respectively, (where R is radius of the earth). The ratio of kinetic energy of A to that of B is

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

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

C. 2

D. $\frac{3}{2}$

Answer: C

Watch Video Solution

27. The mean radius of the earth's orbit round the sun is 1.5×10^{11} . The mean radius of the orbit of mercury round the sun is $6 \times 10^{10} m$. The mercury will rotate around the sun in

A. A year

B. Nearly 4 years

C. Nearly $\frac{1}{4}$ year

D. 2.5 years

Answer: C

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