PHYSICS

BOOKS - D MUKHERJEE PHYSICS (HINGLISH)

PROPERTIES OF MATTER,FLUIDS

Type 1

1. The rotation of the earth about its axis speeds up such that a man on the equator becomes weightless. In such a situation, what would be the duration of one day ?

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

B. $\frac{1}{2\pi}\sqrt{R/g}$

C. $2\pi\sqrt{Rg}$

D. $\frac{1}{2\pi}\sqrt{Rg}$

Answer: A

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2. Two identical trains A and B move with equal speeds on parallel tracks along the equator. A moves from east to west and B moves from west to east. Which train will exert greater force on the track?

A. A

B. B

C. They will exert equal force.

D. The mass and the speed of each train must be known to reach a conclusion.

Answer: A

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3. A small body of superdense material, whose mass is twice the mass of the earth but whose size is very small compared to the size of the earth, starts form rest at a height $H < < R$ above the earth's surface, and reaches the earth's surface in time t. then t is equal to

A. $\sqrt{2H / g}$

B. $\sqrt{H / g}$

C. $\sqrt{2H / 3g}$

D. $\sqrt{4H / 3g}$

Answer: C

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4. The time period of a simple pendulum of infinte length is

A. infinite

B. $2\pi\sqrt{R/g}$

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

D. $\frac{1}{2\pi}\sqrt{R/g}$

Answer: B

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5. 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. 9R

B. 10 R

C. 99R

D. 100 R

Answer: A

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6. At what height above the earth's surface is the acceleration due to gravity 1% less than its value at the surface ? [R = 6400 km]

A. 16 km

B. 32 km

C. 64 km

D. $32\sqrt{2}km$

Answer: B

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7. Let the acceleration due to gravity be g_1 at a height h above the earth's surface g_2 at a depth d below the earth's surface. If $g_1 = g_2, h < < R$ and $d < < R$ then

A. h = d

B. h = 2d

C. 2h = d

D. it is not possible for g_1 to be equal to g_2

Answer: C

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8. If different planets have the same density but diferent radii then the acceleration due to gravity (g) on the surface of the planet will depend on its radius (R) as

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

B. $g \propto \frac{1}{R}$

C. $g \propto R$

D. $g \propto R^2$

Answer: C

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9. P is a point at a distance r from the centre of a spherical shell of mass M and radius a, where $r < a$. The gravitational potential at P is

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

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

C. $-GM\frac{r}{a^2}$

D. $-GM\left(\frac{a-r}{a^2}\right)$

Answer: B

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10. A particle of mass m is placed inside a spherical shell, away from its centre. The mass of the shell is M.

A. The particle will move towards the centre.

B. The particle will move away from the centre, towards the nearest wall.

C. The particle will move towards the centres if $m < M$, and away from the centre if $m > M$.

D. The particle will remain stationary.

Answer: D

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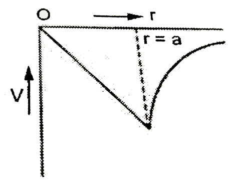
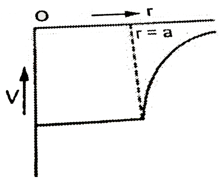
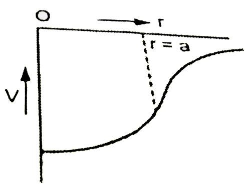
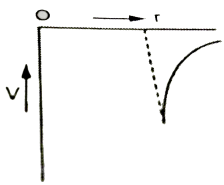
11. P is a point at a distance r from the centre of a solid sphere of radius a. The gravitational potential at P is V. IF V is plotted as a function of r, which is the correct curve ?

A. 

B. 

C. 

D. 

Answer: C

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12. A point P lies on the axis of a fixed ring of mass M and radius a, at a distance a from its centre C. A small particle starts from P and reaches C under gravitational attraction only. Its speed at C will be.

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

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

C. $\sqrt{\frac{2GM}{a}\left(\sqrt{2}-1\right)}$

D. Zero

Answer: B

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13. The escape velocity for a planet is v_e. A tunnel is dug along a diameter of the planet and a small body is dropped into it at the surface. When the body reaches the centre of the planet, its speed will be

A. v_0

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

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

D. zero

Answer: B

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14. If a small part separates from an orbiting satellite, the part will

A. fall to the earth directly

B. move in an spiral and reach the earth after a few rotations

C. continue to move in the same orbit as the satellite

D. move farther away from the earth gradually

Answer: C

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15. A satellite going round the earth in a circular orbit loses some energy due to a collision. Its speed is v and distance from the earth is d.

A. d will increase, v will increase

B. d will increase, v will decrease

C. d will decrease, v will decrease

D. d will decrease, v will increase.

Answer: D

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16. The distance of two satellites from the surface of the earth R and $7R$. There time periods of rotation are in the ratio

A. $1:7$

B. $1:8$

C. $1:49$

D. $1:7^{3/2}$

Answer: B

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17. Inside a satellite orbiting very close to the earth's surface, water does not fall out of a glass when it is inverted. Which of the following is the best explanation for this ?

A. The earth does not exert any force on the watre.

B. The earth's force of attraction on the water is exactly balanced by the created by the satellite's motion.

C. The water and the glass have the same acceleration, equal to g, towards the centre of the earth, and hence there is no relative motion between them.

D. The gravitational attraction between the glass and the water balances the earth's attraction on the water.

Answer: C

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18. If a metal wire is stretched a little beyond its elastic limit (or yield point), and released, it will

A. lose its elastic property completely

B. not contract

C. contract, but its final length will be greater than its initial length

D. contract only up to its length at the elastic limit

Answer: C

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19. A metal wire of length L, area of cross-section A and Young's modulus Y behaves as a spring of spring constant k.

A. $k = YA/L$

B. $k = 2YA/L$

C. $k = YA/2L$

D. $k = YL/A$

Answer: A

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20. One end of a long metallic wire of length (L) is tied to the ceiling. The other end is tied to a massless spring of spring constant . (K.A) mass (m) hangs freely from the free end of the spring. The area of cross- section and the Young's modulus of the wire are (A) and (Y) respectively. If the mass is slightly pulled down and released, it will oscillate with a time period (T) equal to :

A. $2\pi\sqrt{m/k}$

B. $2\pi\sqrt{m(YA+kL)/YAk}$

C. $2\pi\sqrt{mYA/kL}$

D. $2\pi\sqrt{mL/YA}$

Answer: B

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21. A cord of mass m length L, area of cross section A and Young's modulus y is hanging from a ceiling with the help of a rigid support. The elogation developed in the wire due to its own weight is

A. zero

B. $\frac{mgL}{2AY}$

C. $\frac{mgL}{AY}$

D. $\frac{2mgL}{AY}$

Answer: B

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22. A liquid drop at temperature t, isolated from its surroundings, breaks into a number of droplets. The temperature of the droplets will be

A. equal to t

B. greater than t

C. less than t

D. either (a), (b) or (c) depending on the surface tension of the liquid

Answer: C

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23. Two vertical parallel glass plates are partially submerged in water. The distance between the plates is d and the length is l. Assume that the water between the plates does not reach the upper edges of the plates and the wetting is complete. The water will rise to height ($\rho =$ density of water and $\alpha =$ surface tension of water)

A. $p = p_0 - \frac{2S}{d}$

B. $p = p_0 + \frac{2S}{d}$

C. $p = p_0 - \frac{4S}{d}$

D. $p = p_0 + \frac{4S}{d}$

Answer: A

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24. Prove that if two bubbles of radii r_1 and $r_2(r_1 < r_2)$ come in contact with each other then the radius of curvature of the common surface $r = \frac{r_1 r_2}{r_2 - r_1}$

A. $r = \frac{r_1 + r_2}{2}$

B. $r = \frac{r_1 r_2}{r_1 - r_2}$

C. $r = \frac{r_1 r_2}{r_1 + r_2}$

D. $r = \sqrt{r_1 r_2}$

Answer: B

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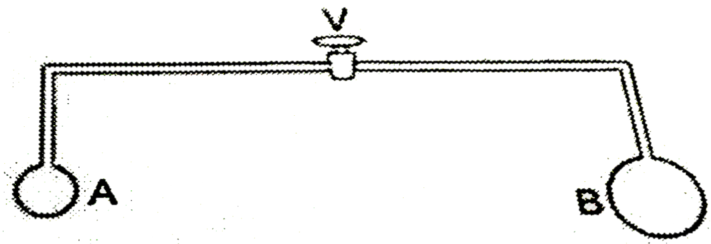
25. 

The value V in the bent tube is initially kept closed. Two soap bubbles A (smaller) and B (larger) are formed at the two open ends of the tube. V is now opened, and air can flow freely between the bubbles.

A. There will be no change in the sizes of the bubbles.

B. The bubbles will become of equal size.

C. A will become smaller and B will become larger.

D. The sizes of the two bubbles will become interchanged.

Answer: C

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26. A liquid of density ρ and coefficient of viscosity η, flows with velocity v through a tube of diameter D. A quantity $R = \frac{\rho v D}{\eta}$ determines whether the flow will be streamlined or turbulent. R has the dimension of

A. velocity

B. acceleration

C. force

D. none of these

Answer: D

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27. A piece of wood floats in water kept in a breaker. IF the beaker moves with a vertical acceleration a, the wood will

A. sink deeper in the liquid if a is upward

B. sink deeper in the liquid if a is downward, with $a < g$

C. com out more from the liquid if a is downward, with $a < g$

D. remain in the same position relative to the water

Answer: D

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28. The weight of a balloon is W_1 when empty and W_2 when filled with air. Both are weighed in air by the same sensitive spring balance and under identical conditions.

A. $W_1 = W_2$, as the weight of air in the balloon is offset by the force of buoyancy on it.

B. $W_2 < W_1$ due to the force of buoyancy acting on the filled balloon.

C. $W_2 > W_1$, as the air inside is at a greater pressure and hence hs greater density than the air outside.

D. $W_2 = W_1 +$ weight of the air inside it.

Answer: C

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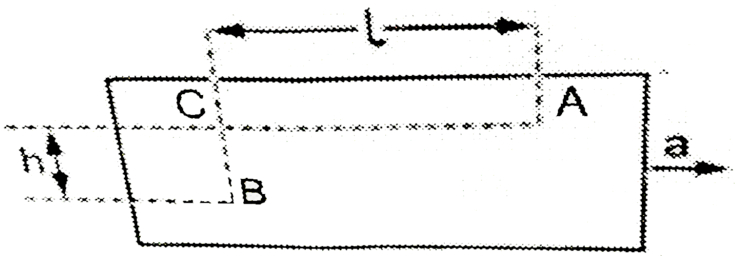
29. 

A sealed tank containing a liquid of density ρ moves with a horizontal acceleration a, as shown in the figure. The difference in pressure between the points A and B is

A. $h\rho g$

B. $l\rho a$

C. $h\rho g - l\rho a$

D. $h\rho g + l\rho a$

Answer: D

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30. A U-tube containing a liquid moves with a horizontal acceleration a along a direction joining the two vertical limbs. The separation between these limbs is d. The difference in their liquid levels is

A. ad / g

B. $2da / g$

C. $da / 2g$

D. $d \tan(a / g)$

Answer: A

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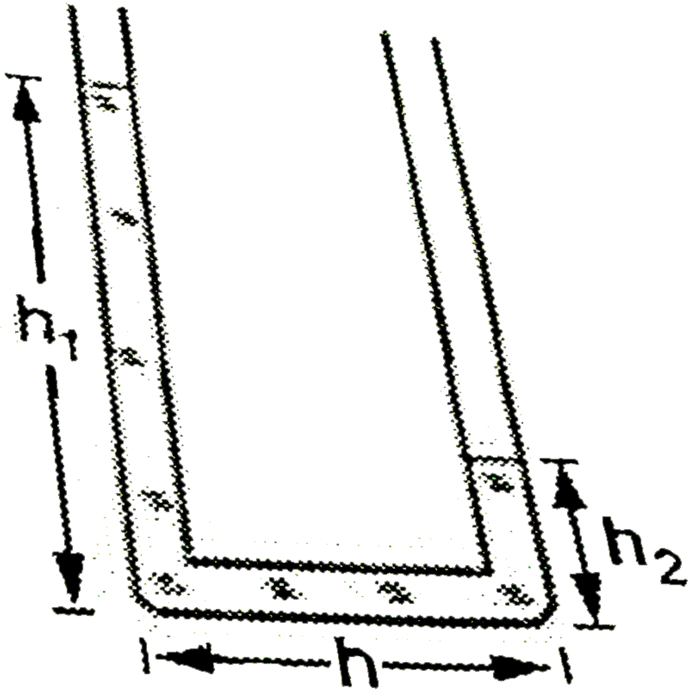
31. The U-tube shown has a uniform cross-section. A liquid is filled in the two arms up to heights h_1 and h_2, and then the liquid is allowed to move. Neglect viscosity and surface tension. When the levels equalize in the two arms, the liquid will



A. be at rest

B. be moving with an acceleration of

$$g\left(\frac{h_1 - h_2}{h_1 + h_2 + h}\right)$$

C. be moving with a velocity of

$$(h_1 - h_2)\sqrt{\frac{g}{2(h_1 + h_2 + h)}}$$

D. exert a net force to the right on the tube

Answer: C

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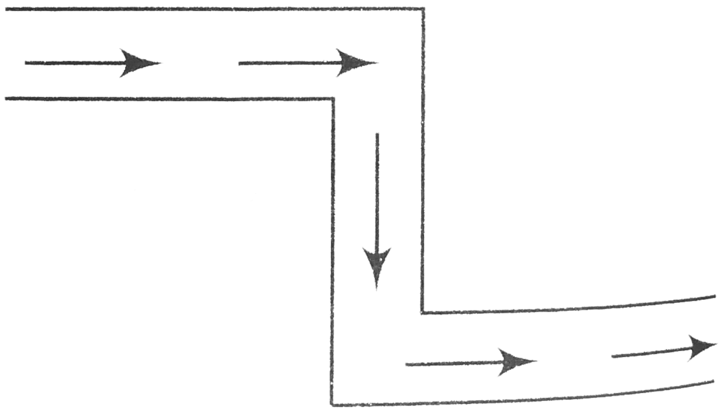
32. The tube shown in figure is of uniform cross-section. Liquid flows through it at a constant speed in the direction shown by arrows. Then the liquid exerts on the tube is:



A. a net force to the right

B. a net force to the left

C. a clockwise torque

D. an anticlockwise torque

Answer: C

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33. Bernoulli's principal (or equation) is a consquence of

A. conservation of energy only

B. conservation of momentum only

C. conservation of angular momentum only

D. more than one of the above

Answer: A

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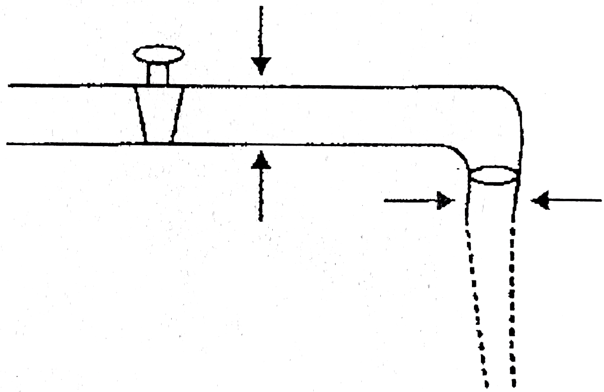
34. 

Water coming out of the mouth of a tap and falling vertically in stream line flow forms a tapering column. i.e., the area of cross-section of the liquid column decreases as it moves down which of the following is the most accurate explanation for this-

A. As the water move down, its speed increases and hence its presence decreases. It is then compressed by the atmosphere.

B. Falling water tries to each a terminal velocity and hence reduces the area of cross-section to balance upward and downward forces.

C. The mass of water flowing past any cross-section must remain constant.

Also, water is almost incompressible. Hence, the rate of volume flow must remain constant. As this is equal to velocity $\times$ area, the decreases as velocity increases.

D. The surface tension causes the exposed surface area of the liquid to decrease continuously.

Answer: C

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35. A cylindrical drum, open at the top, contains 30 litres of water. It drains out through a small opening at the bottom. 10 litres of water comes out in time t_1, the next 10litres in a further time t_2 and the last 10 litres in a further time t_3 Then,

A. $t_1 = t_2 = t_3$

B. $t_1 > t_2 > t_3$

C. $t_1 < t_2 < t_3$

D. $t_2 > t_1 = t_3$

Answer: C

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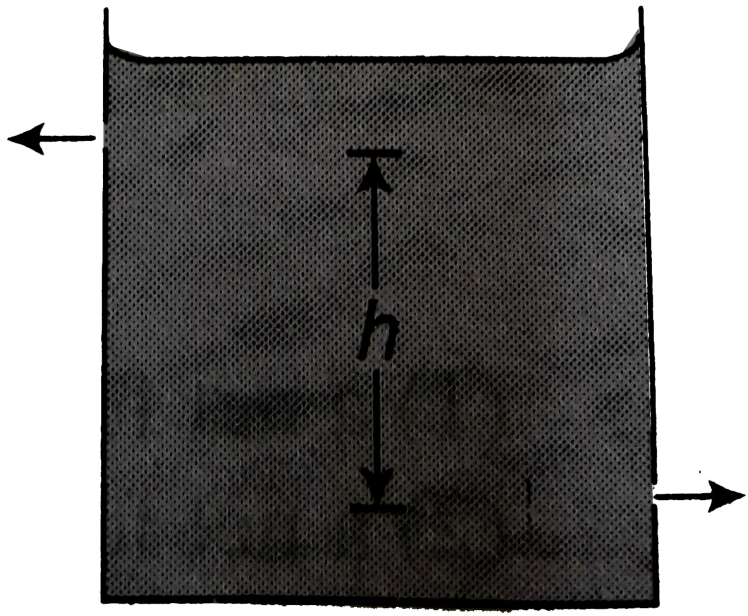
36. There are two identical small holes on the opposite sides of a tank containing a liquid. The tank is open at the top. The difference in height between the two holes is h. As the liquid comes out of the two holes. The tank will experience a net horizontal force proportional to.



A. $\sqrt{h}$

B. h = 2d

C. $h^{3/2}$

D. h^2

Answer: B

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Type 2

1. A n object is weighed at the North Pole by a beam balance and a spring balance, giving reading of W_B and W_S respectively. It is again weighed in the same manner at the equator, giving readings of W_B' and W_S' respectively. Assume that the acceleration due to gravity is the same everywhere and that the balances are sensitive.

A. $W_B = W_S$

B. $W_B' = W_S'$

C. $W_B = W_B'$

D. $W_S' < W_S$

Answer: A::C::D

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2. Let ω be the angular velocity of the earth's rotation about its axis. Assume that the acceleration due to gravity on the earth's surface has the same value at the equator and the poles. An object weighed by a spring balance gives the same reading at the equator as at a height h above the poles $(h < < R)$. The value of h is

A. $\frac{\omega^2 R^2}{g}$

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

C. $\frac{2\omega^2 R^2}{g}$

D. $\frac{\sqrt{Rg}}{\omega}$

Answer: B

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3. Use the assumptions of the previous question. An object weighed by a spring balance at the equator gives the same reading as a taken at a depth d below the earth's surface at a pole $(d < \; < R)$. The value d is

A. $\frac{\omega^2 R^2}{g}$

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

C. $\frac{2\omega^2 R^2}{g}$

D. $\frac{\sqrt{Rg}}{\omega}$

Answer: A

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4. A double star is a system of two stars of masses m and $2m$, rotating about their centre of mass only under their mutual gravitational attraction. If r is the separation between these two stars then their time period of rotation about their centre of mass will be proportional to

A. $l^{3/2}$

B. $l\rho a$

C. $m^{1/2}$

D. $m^{-1/2}$

Answer: A::D

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5. Three point masses are at the corners of an equilateral traingle of side r. Their separations do not change when the system rotates about the centre of the triangle. For this, the time period of rotation must be proportional to

A. $a^{3/2}$

B. a

C. m

D. $m^{-1/2}$

Answer: A::D

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6. For a planet moving around the sun in an elliptical orbit, which of the following quantities remain constant ?

A. The total energy of the sun plus planet system

B. The angular momentum of the planet about the sun

C. The force of attraction between the two

D. The linear momentum of the planet

Answer: A::B

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7. The escape velocity for a planet is v_e. A particle starts from rest at a large distance from the planet, reaches the planet only under gravitational attraction, and passes through a smooth tunnel through its centre. Its speed at the centre of the planet will be

A. v_e

B. $1.5v_e$

C. $\sqrt{1.5}v_e$

D. $2v_e$

Answer: C

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8. The escape velocity for a planet is v_e. A particle is projected from its surface with a speed v. For this particle to move as a satellite around the planet,

A. $\frac{v_e}{2} < v < v_e$

B. $\frac{v_e}{\sqrt{2}} < v < v_e$

C. $v_e < v < \sqrt{2}v_e$

D. $\frac{v}{\sqrt{2}} < v < \frac{v_e}{2}$

Answer: B

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9. If a satellite orbits as close to the earth's surface as possible,

A. its speed is maximum

B. time period of its rotation minimum

C. the total energy of the earth's plus satellite' system is minimum

D. the total energy of the 'earth plus satellite' system is maximum

Answer: A::B::C

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10. For a satellite to orbit around the earth, which of the following must be true?

A. It must be above the equator at some time.

B. It cannot pass over the poles at any time.

C. Its height above the surface cannot exceed 36,000 km.

D. Its period of rotation must be $> 2\pi\sqrt{R/g}$.

Answer: A::D

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11. A satellite close to the earth is in orbit above the equator with a period of rotation of 1.5 hours. If it is above a point P on the equtor at some time, it will be above P again after time ....

A. 1.5 hours

B. 1.6 hours if it is rotating from west to east

C. 24/17 hours if it is rotating from west to east

D. 24/17 hours if it is rotating from east to west

Answer: B::D

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12. A satellite is to be geo-stationary, which of the following are essential conditions?

A. It must always be stationed above the equator.

B. It must rotate from west to east.

C. It must be about 36,000 km above the earth.

D. Its orbit must be circular, and not elliptical.

Answer: A::B::C::D

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13. Two small satellies move in a circular orbits around the earth, at disatnce r and $(r+dr)$ from the centre of the earth. Their time periods of rotation ate T and $T+dT(\Delta r < < r, \Delta T < < T)$. Then

A. $\Delta T = \frac{3}{2}T\frac{\Delta r}{r}$

B. $\Delta T = -\frac{3}{2}T\frac{\Delta r}{r}$

C. $\Delta T = \frac{2}{3} T \frac{\Delta r}{r}$

D. $\Delta T = T \frac{\Delta r}{r}$

Answer: A

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14. Let S be an imaginary closed surface enclosing mass m.Let $d\overrightarrow{S}$ be an element of area on S, the direction of $d\overrightarrow{S}$ being outward from S. Let $\overrightarrow{E}$ be the gravitational intensity at

$\overrightarrow{dS}$. We define $\phi = \phi_s \overrightarrow{E} . \overrightarrow{dS}$, the integration being carried out over the entire surface S.

A. $\phi = -Gm$

B. $\phi = -4\pi Gm$

C. $\phi = -\dfrac{Gm}{4\pi}$

D. No relation of the type (a), (b) or (c) can exist.

Answer: B

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15. A small mass m is moved slowly from the surface of the earth to a height h above the surface. The work done (by an external agent) in doing this is

A. mgh, for all values of h

B. mgh, for $h < < R$

C. $\frac{1}{2}mgR$ for h = R

D. $-\frac{1}{2}mgR$, for h = R

Answer: B::C

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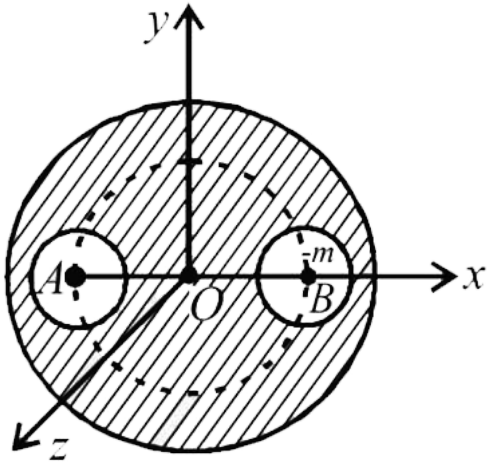
16. A solid sphere of uniform density and radius 4 units is located with its centre at the origin O of coordinates. Two sphere of equal radii 1 unit, with their centres at A(-2,0 ,0) and B(2,0,0) respectively, are taken out of the solid leaving behind spherical cavities as shown if fig Then:



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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17. 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. $F_1 / F_2 = r_1 / r_2$ if $r_1 < R$ and $r_2 < R$

B. $F_1 / F_2 = r_2^2 / r_1^2$, if $r_1 > R$ and $r_2 > R$

C. $F_1 / F_2 = r_1 / r_2$, if $r_1 > R$ and $r_2 > R$

D. $F_1 / F_2 = r_1^2 / r_2^2$, if $r_1 < R$ and $r_2 < R$

Answer: A::B

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18. An elastic metal rod will change its length when it

A. falls vertically under its weight

B. is pulled along its length by a force acting at one end

C. rotates about an axis at one end

D. slides on a rough surface

Answer: B::C

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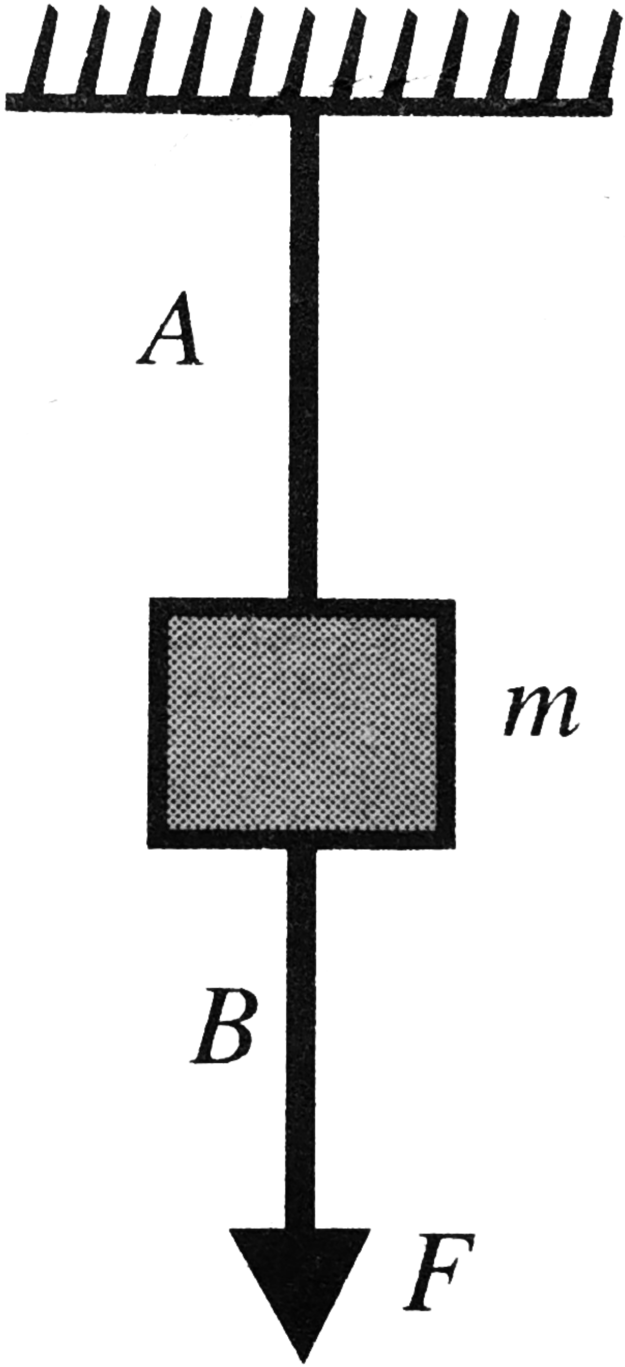
19. The wires A and B shown in Fig. are made of the same material and have radii r_A and r_B, respectively. The block between them has a mass m. When the force F is $mg/3$, one of the wires breaks. Then



A
m
B
F

A. A will break before B if $r_A = r_B$.

B. A will break before B if $r_A < 2r_B$.

C. Either a to B may break if $r_A = 2r_B$.

D. The lengths of A and B must be known to predict which wire will break.

Answer: A::B::C

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20. A body of mass M is attached to the lower end of a metal wire, whose upper end is fixed . The elongation of the wire is l.

A. Loss in gravitational potential energy of M is Mgl.

B. The elastic potential energy stored in the wire is Mgl.

C. The elastic potential energy stored in the wire is $\frac{1}{2}Mgl$.

D. Heat produced is $\frac{1}{2}Mgl$.

Answer: A::C::D

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21. A metal wire of length L, area of cross-section A and young's modulus Y is stretched by a variable force F such that F is always slightly greater than the elastic forces of resistance in the wire. When the elongation of the wire is l

A. the work done by F is $\frac{Yal^2}{2L}$

B. the work done by F is $\frac{Yal^2}{L}$

C. the elastic potential energy stored in the wire is $\frac{Yal^2}{2L}$

D. no heat is produced during the elongation

Answer: A::C::D

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22. n drops of a liquid, each with surface energy E. joining to form a single drop

(a). Some energy will be released in the process

(b). Some energy will be absorbed in the process

(c). The energy released or absorbed will be $E\left(n - n^{2/3}\right)$

(d). the energy released or absorbed will be $nE\left(2^{2/3} - 1\right)$

A. Some energy will be released in the process.

B. Some energy will be absorbed in the process.

C. The energy released or absorbed will be $E\left(n - n^{2/3}\right)$.

D. The energy released or absorbed will be $nE\left[2^{2/3} - 1\right]$.

Answer: A::C

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23. When an air bubble rise from the bottom of a deep lake to a point just below the water surface, the pressure of air inside the bubble

A. is greater than the pressure outside it

B. is less than the pressure outside it

C. increases as the bubble moves up

D. decreases as the bubble moves up

Answer: A::D

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24. When a capillary tube is dipped in a liquid, the liquid rises to a height h in the tube. The free liquid surface inside the tube is hemispherical in shape. The tube is now pushed down so that the height of the tube outside the liquid is less than h. Then

A. The liquid will come out of the tube like in a small fountain.

B. The liquid will ooze out of the tube slowly.

C. The liquid will fill the tube but not come out of its upper end.

D. The free liquid surface inside the tube will not be hemispherical.

Answer: C::D

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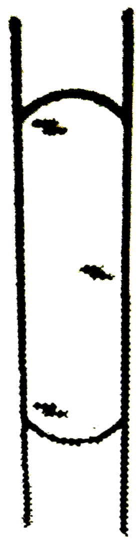
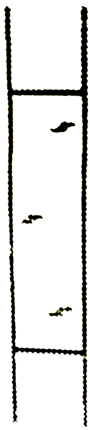
25. A vertical glass capillary tube, open at both ends, contains some water. Which of the following shapes may not be taken by the water in the tube?

A. 

B.



C.

D. 

Answer: D

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26. A spring balance reads W_1 when a ball is suspended from it. A weighing machine reads W_2 when a tank of liquid is kept on it. When the ball is immersed in the liquid, the spring balance reads W_3 and the weighing machine reads W_4. Then, which of the following are not correct?

A. $W_1 > W_3$

B. $W_1 < W_3$

C. $W_2 < W_4$

D. $W_2 > W_4$

Answer: A::C

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27. In the previous question,

A. $W_1 + W_2 = W_3 + W_4$

B. $W_1 + W_3 = W_2 + W_4$

C. $W_1 + W_4 = W_2 + W_3$

D. $W_1 + W_2 + W_3 = W_4$

Answer: A

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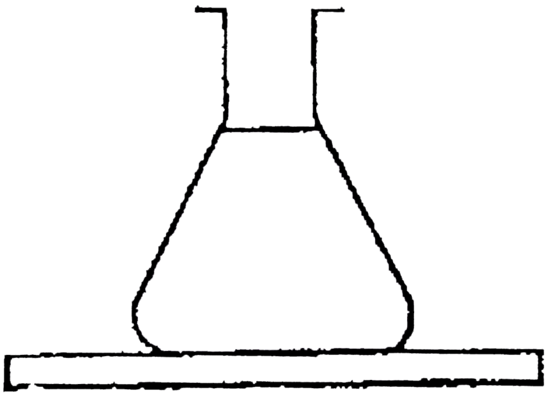

28.

A massless conical flask filled with a liquid is kepth on t a table in a vacuum the force exerted by the liquid on the bse of the flask is W_1. Th force exerted by the flask on the table is W_2

A. $W_1 = W_2$

B. $W_1 > W_2$

C. $W_1 < W_2$

D. The force exerted by the liquid on the walls of the flask is $(W_1 - W_2)$.

Answer: B::D

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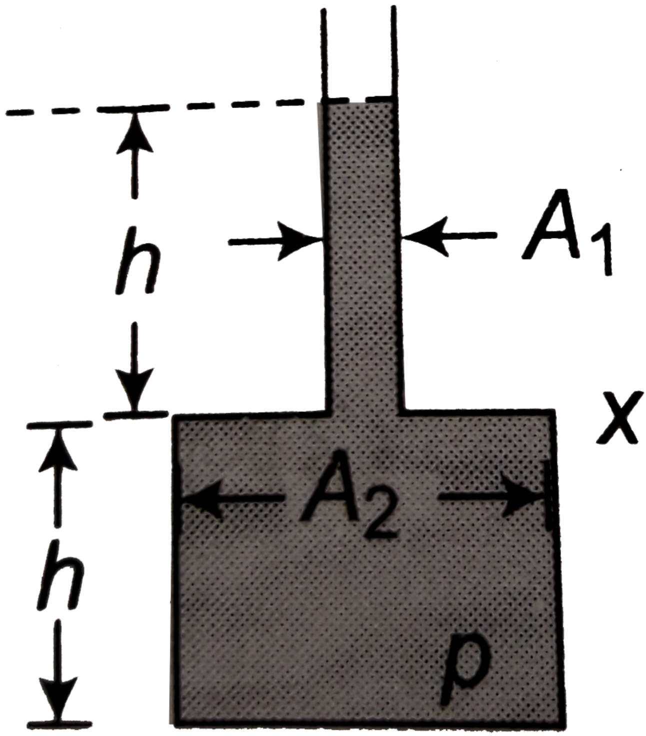
29. The vessel shown in the figure has a two sections of areas of cross-section A_1 and A_2. A liquid of density ρ fills both th sections, up to a height h in each Neglect atmospheric pressure. Choose the wrong option.



A. The pressure at the base of the vessel is

$2h\rho g$.

B. The force exerted by the liquid on the base of the vessel is $2h\rho g A_2$.

C. The weight of the liquid is $< 2h\rho g A_2$.

D. The walls of the vessel at the level X exert a downward force $h\rho g(A_2 - A_1)$ on the liquid.

Answer: A::B::C::D

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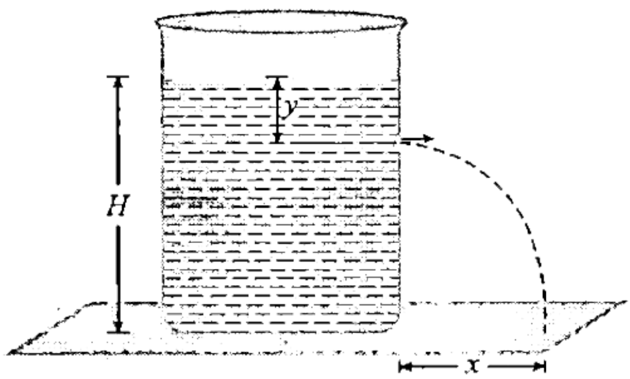
30. A tank, which is open at the top, contains a liquid up to a height H. A small hole is made in the side of the tank at a distance y below the liquid surface. The liquid emerging from the hole lands at a distance x from the tank :



A. If y is increased from zero to H, x will first increase and then decrease.

B. x is maximum for $y = H/2$.

C. The maximum value of x is H.

D. The maximum value of x will depend on the density of the liquid.

Answer: A::B::C

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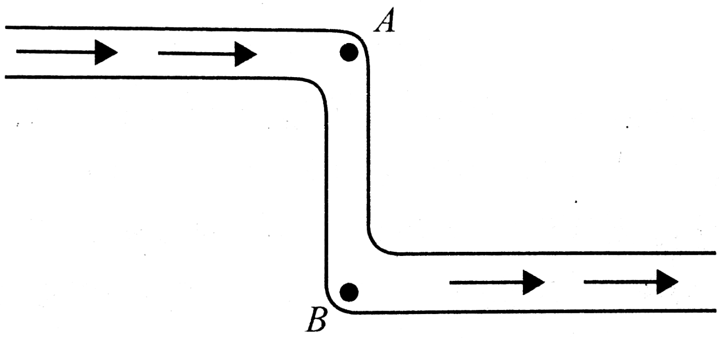
31. In the figure, an ideal liquid flows through the tube, which is of uniform cross section. The liquid has velocities v_A and v_B, and pressures P_A and P_B at the points A and B, respectively. Then



A. $v_A = v_B$

B. $v_B > v_A$

C. $p_A = p_B$

D. $p_B > p_A$

Answer: A::D

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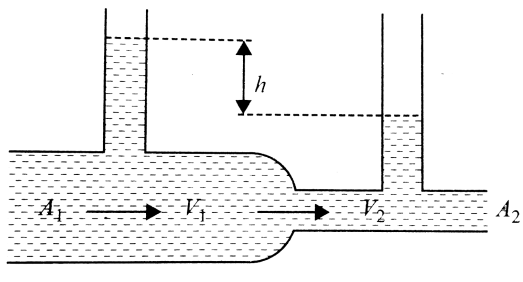
32. A liquid flows through a horizontal tube. The velocities of the liquid in the two sections, which have areas of cross section A_1 and A_2 are v_1 and v_2 respectively. The difference in the levels of the liquid in the two vertical tubes is h. Then



A. The volume of the liquid flowing through the tube in unit time is A_1v_1.

B. $v_2 - v_1 = \sqrt{2gh}$

C. $v_2^2 - v_1^2 = 2gh$

D. The energy per unit mass of the liquid is the same in both sections of the tube.

Answer: A::C::D

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33. A liquid of density ρ comes out with a velocity v from a horizontal tube of area of cross-section A. The reaction force exerted by the liquid on the tube is F. Choose the incorrect option.

A. $F \propto v$

B. $F \propto v^2$

C. $F \propto A$

D. $F \propto \rho$

Answer: B::C::D

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34. A rectangular block of mass m and area of cross-section A floats in a liquid of density ρ. If it is given a small vertical displacement from equilibrium, it undergoes oscillation with a time period T.

(i) $T \propto \sqrt{m}$

(ii) $T \propto \sqrt{\rho}$

(iii) $T \propto \frac{1}{\sqrt{A}}$

(iv) $T \propto \frac{1}{\sqrt{\rho}}$.

A. $T \propto \sqrt{m}$

B. $T \propto \sqrt{\rho}$

C. $T \propto \frac{1}{\sqrt{A}}$

D. $T \propto \frac{1}{\sqrt{\rho}}$

Answer: A::C::D

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35. A vertical $U - tube$ contains a liquid. The total length of the liquid column inside the tube is 1. When the liquid is in equilibrium, the liquid surface in one of the arms of the $U - tube$ is pushed down slightly and released. The entire liquid column will undergo a periodic motion.

A. The motion is not simple harmonic motion.

B. The motion is simple harmonic motion.

C. If it undergoes simple harmonic motion, the time period will be $2\pi\sqrt{l/g}$.

D. If it undergoes simple harmonic motion, the time period will be $2\pi\sqrt{l/2g}$.

Answer: B::D

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