PHYSICS

BOOKS - MODERN PUBLICATION PHYSICS (KANNADA ENGLISH)

UNIT TEST PAPER NO. 3

Mcq

1. A particle is vibrating in simple harmonic motion with an amplitude of 4 cm. At what

displacement from the equilibrium position is its energy potentil and half kinetic ?

A. $\sqrt{2}$ cm

B. 1 cm

C. $2\sqrt{2}$ cm

D. 3 cm

Answer: C

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2. A simple harmonic oscillator has an amplitude A and time period T. The time required by it to travel from $x = A$ to $x = A/2$ is :

A. $\frac{T}{6}$

B. $\frac{T}{4}$

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

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

Answer: A

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3. Under constant temperature, graph between P and $1/V$ is a :

A. parabola

B. straight line

C. hyperbola

D. circle.

Answer: B

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4. A perfect gas at $27^\circ C$ is heated at constant pressure to $327^\circ C$. If original volume of gas $27^\circ C$ is V then volume at $327^\circ C$ is :

A. V

B. 2 V

C. 3 V

D. $V/2$

Answer: B

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5. Two rain drops falling through air have radii in te ratio $1:2$. They will have terminal velocity in the ratio :

A. $4:1$

B. $2:1$

C. $1:4$

D. $1:2$

Answer: C

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6. A simple penduulum of length l is suspended from the roof of a train which moves in a horizontal direction with an acceleration a. Then the time period T is given by :

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

B. $2\pi\sqrt{\frac{l}{\sqrt{a^2+g^2}}}$

C. $2\pi\sqrt{\frac{l}{8+a}}$

D. $2\pi\sqrt{\frac{l}{g-a}}$

Answer: B

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7. Two satellites A and B revolve round a planet in coplanar orbits in the same direction their periods are 1 hour and 8 hours respectively. The orbital radius of A is 10^4 km the speed of B relative to A when they are closet is :

A. $10^4\pi$ km/h

B. $2 \times 10^4\pi$ km/h

C. $\frac{10^4\pi}{2}$ km/h

D. $4 \times 10^4\pi$ km/h

Answer: A

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8. If the gravitational force varies inversely as the nth power of the distance then, the time period T of a satellite revolving in a circular orbit round the earth at distance r is proportional to :

A. $(r)^{\frac{n+1}{2}}$

B. $(r)^{\frac{n-1}{2}}$

C. $\frac{1}{\sqrt{r^{n-1}}}$

D. $\frac{1}{\sqrt{r^{n+1}}}$

Answer: A

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9. Two simple pendulums of lengths 0.5 m and 2 m respectively are given small linear displacements in one direction at the same

time. They will again be in phase when the pendulum of shorter length has completed :

A. 5

B. 3

C. 1

D. 2

Answer: D

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10. Water rises to a height of 10 cm in a capillary tube and mercury falls to a depth of 3.5 cm in the same capillary tube. If the density of the mercury is 13.6 gm/cc. and its angle of contact is 135° and density of water is 1 gm/cc. and its angle of contact is 0°, then the ratio of surface tension of the two liquids is $(\cos 135^\circ = 0.7)$.

A. $1:14$

B. $1:5$

C. $5:34$

D. $5:27$

Answer: C

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11. A hollow metal sphere is filled with water and is hung by a long thread. It is made to oscillate. If water slowly flows through a small hole in the bottom, how wll the period of oscillation be affected ?

A. the period will go on decreasing till the sphere is empty

B. the period will go on increasing till the sphere is empty

C. the period will remain unchanged throughout

D. the period will first increase, then it will decrease till it is empty and the period will be finally the same as when the sphere was full of water.

Answer: D

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12. Two small drops of mercury, each of radius R coalesce to form a single large drop. The ratio of the total surface energies before and after the change is :

A. $1:2^{\frac{1}{3}}$

B. $2:1$

C. $2^{\frac{1}{3}}:1$

D. $1:2$

Answer: C

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13. A bird of mass 1.23 kg is able to hover by imparting a downward velocity 10 m/s uniformly to air of density ρ $\mathrm{kg/m^3}$ over an effective area 0.1 $\mathrm{m^2}$. If the acceleration due to gravity is 10 $\mathrm{m/s^2}$, then the magnitude of ρ in $\mathrm{kg/m^3}$ is :

A. 0.0123

B. 1.23

C. 0.123

D. 1.32

Answer: B

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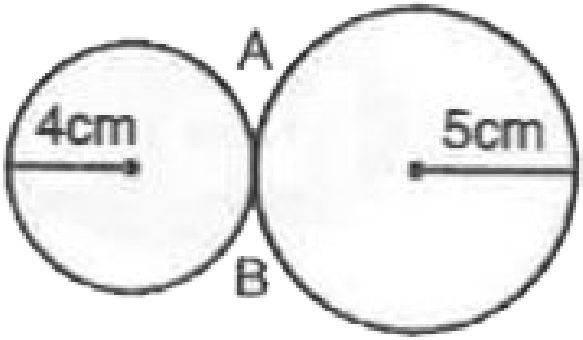
14. Two soap bubbles of radii r_1 and r_2 equal to 4 cm and 5 cm respectively are touching each other over a commonsurface AB (shown

in fig.) Its radius will be :



A. 4 cm

B. 5 cm

C. 4.5 cm

D. 20 cm.

Answer: D

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15. The mean distance between the atoms of iron is 3×10^{-10} m and interatomic force constant for iron is 7 N/m. The Young's modulus of elasticity for iron is :

A. $2.33 \times 10^{5} \ \mathrm{N/m^2}$

B. $2.33 \times 10^{9} \ \mathrm{N/m^2}$

C. $23.3 \times 10^{10} \ \mathrm{N/m^2}$

D. $2.33 \times 10^{10} \ \mathrm{N/m^2}$.

Answer: D

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16. Two bodies of masses 10^3 kg and 10^5 kg are separated by 1 km. At what distance from the smaller the intensity of gravitation will be zero ?

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

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

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

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

Answer: C

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17. A sample of oxygen at N.T.P. has volume V and a sample of hydrogen at N.T.P. has volume 4V. Both the gases are mixed and the mixture is maintained at N.T.P.If the speed of sound in hydrogen at N.T.P. is 1270 m/s, that in the mixture will be :

A. 317 m/s

B. 635 m/s

C. 830 m/s

D. 950 m/s

Answer: B

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18. A star shrinks suddenly and its density increases 10 times its original value. The acceleration due to gravity increases by a factor of :

A. 10^{-9}

B. 10^{-6}

C. 10^{6}

D. 10^{9}

Answer: C

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19. Two satellites A and B of the same mass are revolving around the earth in concentric orbits such that the distance of B from the

centre of earth is thrice as compared to the distance of A from the centre. The ratio of centripetal force acting on B as compared to A is :

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

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

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

D. 3

Answer: A

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20. The diameter of a brass rod is 4 mm and Young's modulus of brass is $9 \times 10^{10} \ \mathrm{N/m^2}$. The force required to stretch by $0.1\ \%$ of its length is :

A. 36 N

B. $144\pi \times 10^3 N$

C. $360\pi N$

D. $36\pi \times 10^5$ N.

Answer: C

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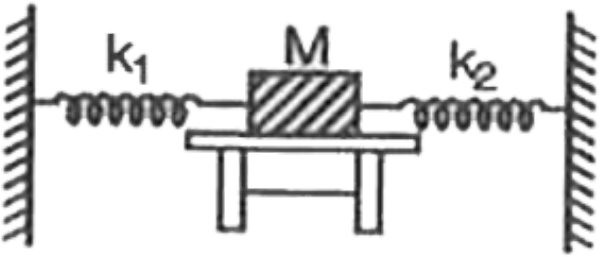
21. A block of mass M is placed on a smooth table. Its two sides are attached to fixed walls by means of collinear horizontal springs of spring constants k_1 and $k_2 (k_1 > k_2)$ as shown in the Figure. The block is made to oscillate horizontally along the line of the two springs.

The frequency of its oscillation is :



A. $\frac{1}{2\pi}\left(\frac{k_1+k_2}{M}\right)^{\frac{1}{2}}$

B. $\frac{1}{2\pi}\left(\frac{k_1-k_2}{M}\right) \wedge \left(\frac{1}{2}\right)$

C. $\frac{1}{2\pi}\left(\frac{M}{k_1+k_2}\right)^{\frac{1}{2}}$

D. $\frac{1}{2\pi}\left(\frac{M}{k_1-k_2}\right)^{\frac{1}{2}}$.

Answer: A

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22. Three particles are projected vertically upwards from a point from the surface of earth with velocities

$v_1 = \sqrt{\frac{2}{3}gR}, v_2\sqrt{gR}$ and $v_3\sqrt{\frac{4}{3}gR.}$

If $h_1 h_2 h_3$ are the respective maximum heights reached then $h_1 : h_2 : h_3$ is given by :

A. 1:2:3`

B. $2:3:4$

C. $1:2:4$

D. $1:3:5$

Answer: B

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23. Three identical objects each of mass M move along circle of radius R under the action of their mutual gravitational attraction, the speed of each is :

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

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

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

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

Answer: C

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24. If a simple harmonic oscillator has got a displacement of 0.02 m and acceleration equal

to $2.0\ \mathrm{ms}^{-2}$ at any time, the angular frequency of the oscillator is equal to :

A. $10\ \mathrm{rad\,s}^{-1}$

B. $0.1\ \mathrm{rad\,s}^{-1}$

C. $100\ \mathrm{rad\,s}^{-1}$

D. $\sqrt{10}\ \mathrm{rad\,s}^{-1}$

Answer: A

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25. If g is the acceleration due to gravity on the earth's surface, the gain in the potential energy of an object of mass m raised from the surface of earth to the radius R of the earth is :

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

B. $2 \ \ \mathrm{mg\,R}$

C. $\mathrm{mg\,R}$

D. $\frac{1}{4} \ \ \mathrm{mg\,R.}$

Answer: A

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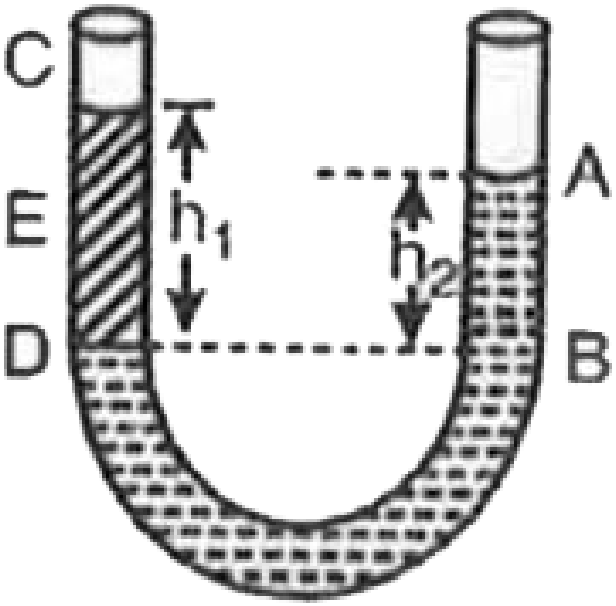
26. In a U-tube experiment, a colmn AB of water is balanced by a column CD of paraffin. The relative density of paraffinn is :



A. $\frac{h(2)}{h_1}$

B. $\frac{h_1}{h_2}$

C. $\frac{h_2 - h_1}{h_1}$

D. $\frac{h_2}{h_1 + h_2}$.

Answer: A

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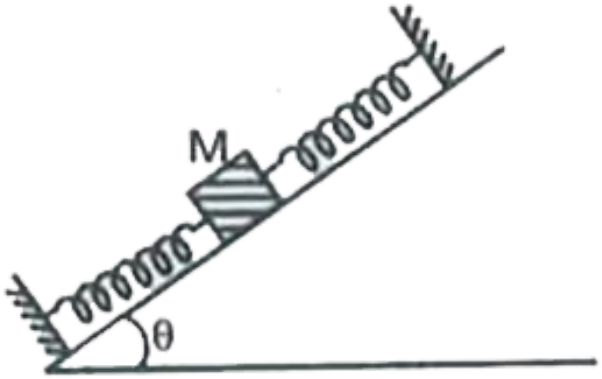
27. On a smooth inclined plane, a body of mass M is attached between two springs. The other ends of the springs are fixed to firm supports.

If each spring has force constant K, the period of oscillation of the body (assuming the springs as massless) is :



A. $2\pi(M/2K)^{1/2}$

B. $2\pi(2M/K)^{1/2}$

C. $2\pi(\mathrm{Mg}\ \sin\theta/2K)$

D. $2\pi(2\mathrm{Mg}/K)^{1/2}$

Answer: A

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28. A gravitational field due to a mass distribution is $E - K/r^3$ 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

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29. A particle of mass m is executing S.H.M. about the origin along x-axis. The P.E. $U(x) = kx^3$, where k is +ve constant. If the amplitude of oscillation is 'a', then time period T is proportional to :

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

B. $\sqrt{a}$

C. $a^{3/2}$

D. independent of a.

Answer: D

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30. Pressure inside two soap bubbles is 1.01 and 1.02 atmosphere. Ratio between their volume is :

A. $102:101$

B. $(102)^3:(101)^3$

C. $8:1$

D. $2:1$

Answer: B

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31. The velocity of the small ball of mass M and density d_1 when dropped in a container filled with glycerine becomes constant after

sometimes. If the density of glycerine is d_2, the viscous force acting on the ball is :

A. $mg(1 - d_2/d_1)$

B. $\mathrm{mg}\ \ d_1/d_2$

C. $\mathrm{mg}\ \ (d_1 - d_2)$

D. $\mathrm{mg}\ \ d_1 d_2.$

Answer: A

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32. A body of uniform cross-sectional area floats in a liquid of density thrice its value. The portion of exposed height will be :

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

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

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

D. $1/3$

Answer: A

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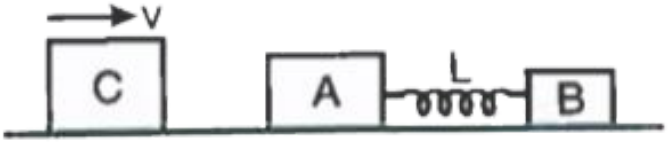
33. Two blocks A and B each of mass m are connected by a massless spring of natural length L and spring constant K. The blocks are initially resting on a smooth horizontal floor with the spring at its natural length, as shown in figure below. A third identical bloack C, also of mass m, moves on the floor with a speed v along the line joining A and B, and collides with A. Then :



A. the kinetic energy of the A-B system, at maximum compression of the spring, is zero

B. the kinetic energy of the A-B system, at maximum compression of the spring, is $mv^2/4$

C. the maximum compression of the spring is $v\sqrt{m/K}$

D. the maximum compression of the spring is $v\sqrt{m/2K}$.

Answer: D

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34. The radius of earth is 6400 km and that of mars is 3200 km the mass of earth is 10 times the mass of mars. An object weights 200 N on the surface of earth. Its weight on the surface of Mars is :

A. 8 N

B. 20 N

C. 40 N

D. 80 N

Answer: D

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