Royal College- Colombo 07

Grade 12

Third Term Test –2024 (February)

Physics I

$g = 10\ N\ kg^{-1}$ Time : 2 hours

❖ Answer all questions

1) Derrived unit which can be used to measure the linear density is given by,

1) kgm^{-3} 2) $m^3\ kg^{-1}$ 3) kgm^{-1} 4) kgm^{-2} 5) kgm

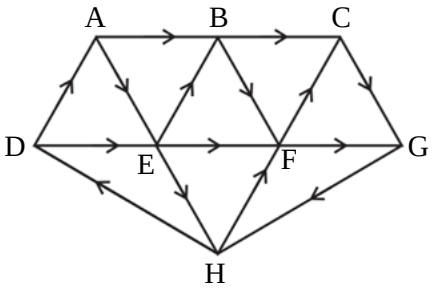
2) The magnitude of an earth quake is represented by "Richter scale". Dimension of Richter scale is given by

1) M 2) L 3) ML^{-1} 4) ML^2T^{-3} 5) No dimensions

3) The dirrections of the given vecter system is shown by arrows. AB = BC = DE = EF. The resultant of this system is not represented by,

1) $6\ \overrightarrow{AB}$ 2) $3\overrightarrow{AC}$ 3) $5\ \overrightarrow{EC}$

4) $2\overrightarrow{DG}$ 5) $6\overrightarrow{BC}$



4) There are 50 threads in 1 cm length in the linear scale and 50 divisions in the circular scale in a given micrometer screw guage. The minimum length that can be measured using this screw guage such that not exceeding 1% percentage error is,

1) 0.5 mm 2) 0.4 mm 3) 2 mm 4) 4 mm 5) 5 mm

5) An object is projected vertically upward from the ground with the velocity of 50 ms^{-1}. At the same time another object is droped from a tall building along the same verticle line. The time taken to collide the objects and the height to the point of collision from the ground is given by,

1) 3 s, 45 m 2) 3 s, 105 m 3) 5 s, 45 m 4) 5 s, 105 m 5) 4 s, 45 m

6) The incorrect statement(s) regarding seismic waves is/are,

A) Body waves have low frequency than surface waves.

B) Primary waves (P waves) can travel through all solid, liquid and gas media.

C) Secondary waves (S waves) can travel through solid(rock) and liquid media.

D) Love waves are longitudinal waves.

1) B, C and D 2) A, C and D 3) A, B and C

4) A, B and D 5) A, B, C and D

7) Both end opened tube is vibrating with first overtone. Following are created at the end and the middle of the tube respectively.

1) Displacement antinode and pressure node.
2) Displacement node and pressure nodes.
3) Pressure antinode and pressure node.
4) Pressure node anddisplacement node.
5) Displacement anti pressure antinodeonode.

8) The gravitational acceleration of the surface of two planets are equal when

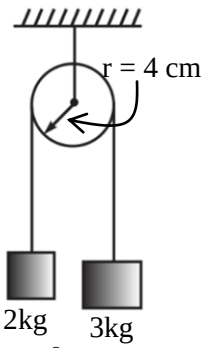
1) the ratioes of masses of the plannets are equal to the ratioes of their radii.
2) the masses of the plannets are equal.
3) the radii of the plannets are equal.
4) the ratioes of masses of the plannets are equal to the ratioes of squre of their radii.
5) the mean densities of the planets are equal.

9) Consider a compound microscope of having two convex lenses of focal lengths 10cm and 5cm. At the normal adjustment, the gap between the two lenses is 30cm. The distance to the eye () from the eye piece is ,

1) 6 cm 2) 10 cm 3) 12 cm 4) 14 cm 5) 15 cm

.

10) Two masses 2 kg and 3 kg are connected by two ends of a light inelastic string passing over a smooth pulley of radius 4 cm. The angular velocity of the pulley and the linear velocity of the 3 kg mass after 4 s that the system was released are given by,



1) 200 rad s^{-1} , 8 ms^{-1} 2) 8 $rads^{-1}$, 200 ms^{-1} 3) 0 $rads^{-1}$, 8 ms^{-1}
4) 8 $rads^{-1}$, 0 ms^{-1} 5) 0 $rads^{-1}$, 0 ms^{-1}

11) The gravitational acceleration of the surface of a micro planet of radius 60 km is 3 ms^{-2}. The escape velocity at the surface of this planet is,

1) 400 ms^{-1} 2) 600 ms^{-1} 3) 800 ms^{-1} 4) 1200 ms^{-1} 5) 3600 ms^{-1}

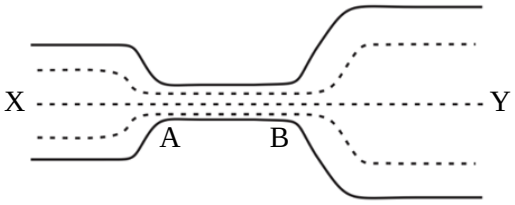
12) Consider the following statements regarding the sound waves.

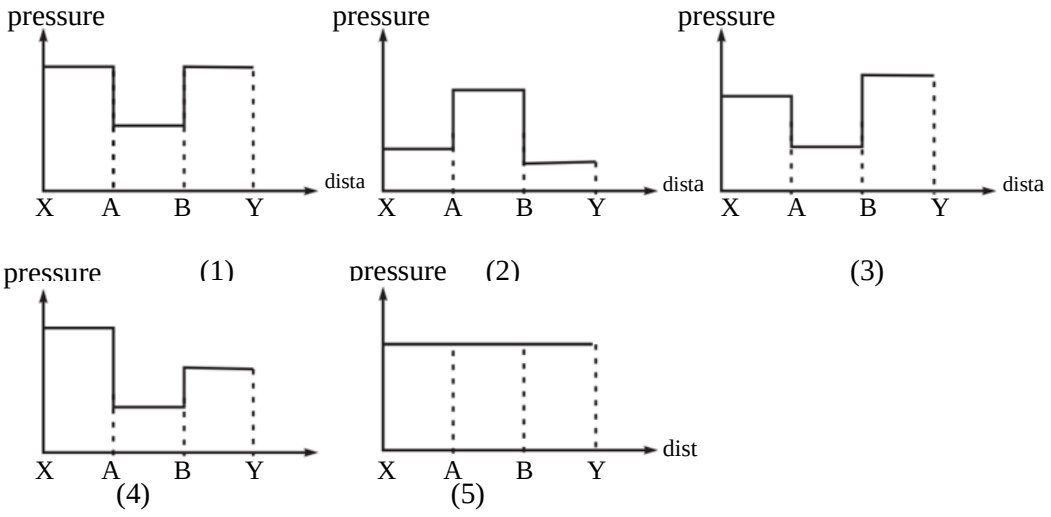
A) Speed of sound waves is depended on its frequency.
B) When the sound waves are propergating, the periodic time will be decreased.
C) The variation of the wave length with frequency is a straight line which goes through the origin.

The **false** statement(s) from above is/are

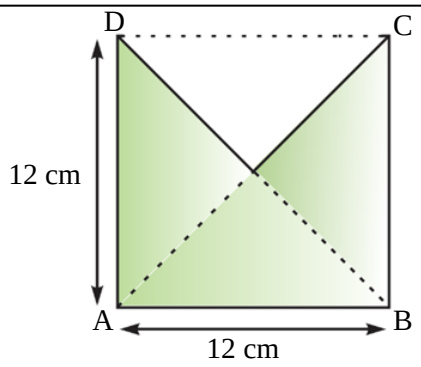
1) A only. 2) B only. 3) B and C only.
4) A and C only. 5) All A,B and C.

13) There is a steady and streamline flow of a non viscous, incompressible liquid from X to Y through the given tube as shown in the figure. The variation of the pressure with the distance measured from X to Y is correctly represented by,





14) A quater part of removed from a square shaped laminar of having 12cm length of each side. The height to the centre of gravity from the side AB is,



1) 3 cm 2) 4 cm 3) $\frac{4}{3}$ cm

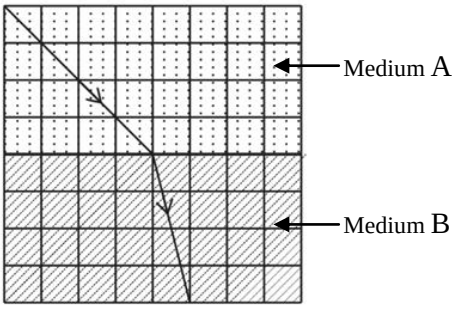
4) $\frac{14}{4}$ cm 5) $\frac{14}{3}$ cm

15) A cricket player strikes a ball of mass m technically to move it for the maximum horizontal displacement . The kinetic energy of the ball at the maximum height of the path is E. The initial velocity and the maximum height of the ball are respectively,

1) $2\sqrt{\frac{E}{m}}, \frac{2E}{mg}$ 2) $\sqrt{\frac{E}{m}}, \frac{E}{2mg}$ 3) $2\sqrt{\frac{E}{2m}}, \frac{2E}{mg}$

4) $\sqrt{\frac{E}{2m}}, \frac{E}{2mg}$ 5) $2\sqrt{\frac{E}{m}}, \frac{E}{mg}$

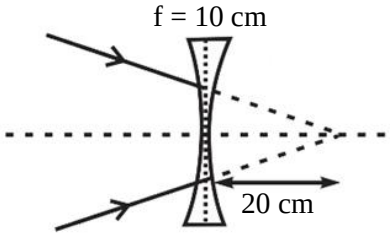
16) The figure shows that a light ray is passing from the medium A to medium B. The figure is drawn according to the scale on a squre sheet. The refractive index of B with respective to the B is given by,



1) $\sqrt{\frac{2}{17}}$ 2) $\sqrt{\frac{17}{2}}$ 3) $\sqrt{\frac{2}{15}}$

4) $\sqrt{\frac{15}{2}}$ 5) $\sqrt{\frac{2}{5}}$

17) A light beam is incident on a concave lens of 10cm focal length as it seems to converge at a point of other side at a20co distance from the lens. The correct statement regarding the object and the image formed by the lens is,



1) The object is real and a real image is formed at opposite side and 20cm away from the lens.
2) The object is real and a virtual image is formed at opposite side and 20cm away from the lens.
3) The object is virtual and a real image is formed at opposite side and 20cm away from the lens.
4) The object is virtual and a virtual image is formed at opposite side and 20cm away from the lens.
5) The object is virtual and a virtual image is formed at the same side and 20cm away from the lens.

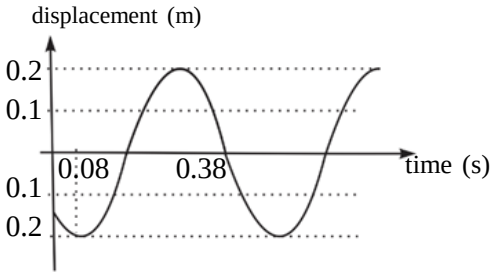
18) Absorption, spontaneous emission and the stimulated emission are the three steps of producing a laser beam from a given material medium. The correct statement(s) regarding these three steps is/are

A) A large number of atoms or molecules in a stable material medium tend to occupythe ground energy states or its nearest neighbouring state is the absorption.
B) The radiation emitted in spontanius emission is coherent.
C) It is compulsory to have more electrons in an upper level than a lower level for emitting a laser beam from spontaneous emission.

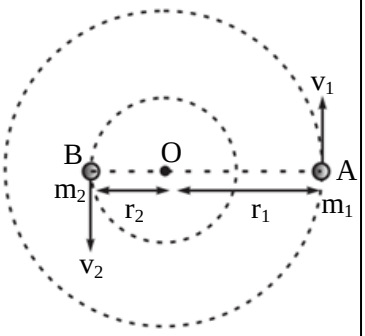
1) A and B 2) B and C 3) A and C
4) All A, B and C 5) All are incorrect.

19) The displacement time graph of a wave is shown in figure. The frequency the wave is given by,

1) 12.5 Hz 2) 10 Hz 3) 5 Hz
4) 3.33 Hz 5) 2.5 Hz



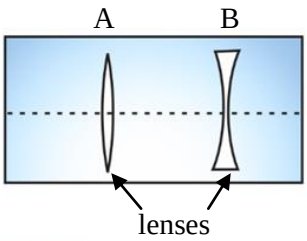
20) Two stars A and B with masses m_1 and m_2 undergoes a circular motion around a point O as $m_1 r_1 = m_2 r_2$ and AOB is always in a straight line due to their mutual gravity as shown in the figure. If velocities of A and B are v_1 and v_2 respectively, the ratio $\frac{v_1}{v_2}$ will be,



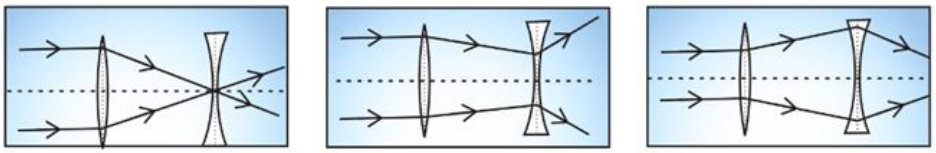
1) $\frac{m_1}{(m_1+m_2)}$ 2) $\frac{(m_1+m_2)}{m_2}$ 3) $\frac{m_2}{(m_1+m_2)}$

4) $\frac{m_1}{m_2}$ 5) $\frac{m_2}{m_1}$

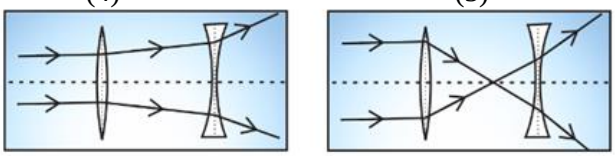
21) A and B are two air lenses which are made in a glass block. The best paths of two parallel rays which are entering to the lens system is given by,



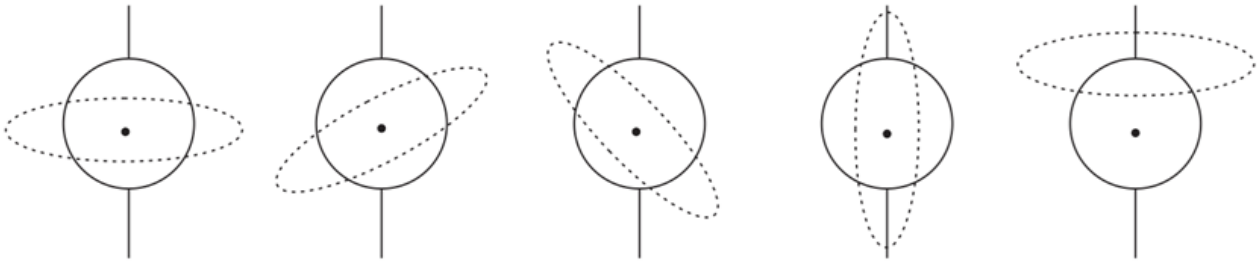
(1) (2) (3)



(4) (5)



22) Select the diagram that cannot be the trajectory of a satellite orbiting the Earth. (Center of Earth is indicated as O)

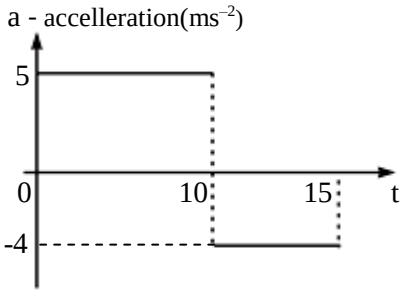


(1) (2) (3) (4) (5)

23) Consider a simple harmonic motion which follows the equation, x = 2 sin (4t). The value of x and t are represented in centi meters and in seconds respectively. The maximum acceleration and the maximum speed of the ossillation in SI units are given by,

1) 32 ms^{-2} and 8 ms^{-1} 2) 3.2 ms^{-2} and 0.8 ms^{-1} 3) 0.32 ms^{-2} and 0.08 ms^{-1}
4) 1.6 ms^{-2} and 0.4 ms^{-1} 5) 0.16 ms^{-2} and 0.04 ms^{-1}

24) The variation of the acceleration(a) of a given object with time (t) is given by the graph. The velocity of the object at t=0 is 10 ms^{-1}.The displacement of the objet after 15 seconds is given by,



1) 350 m 2) 250 m 3) 500 m
4) 550 m 5) 600 m

25) The correct statement /s from following is (are),

A) When the resultant of a coplanar force system is zero and the algybric sum of moments of all the forces about a given point is non zero, the system of force can be reduced to a couple of forces.

B) The centre of gravity of an object should be at a point which is always inside the object.

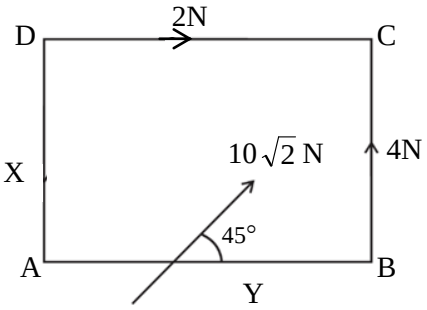
C) When the resultant of a coplanar forces which is acting on an object is zero or the algybric sum of moments of all the forces about a given point is zero, then the object is under equilibrium.

1) A only. 2) A and B only. 3) B and C only.
4) B only. 5) All A, B and C.

26) An object A is released at certain height from the earth and after 2 s another object B is droped from the same point. The time taken from the instance of dropping the object A to have 10m gap between these two objects is,

1) 0.5 s 2) 1.5 s 3) 2 s 4) 2.5 s 5) 3 s

27) There are two forces of 2N and 4N towards the direction of CD and BC respectively. X and Y forces are represented by the sides of AD and AB. The resultant of the given forces is $10\sqrt{2}$ N towards the direction of 45˚ to the AB. The magnitudes and the directions of the forces X and Y are correctly represented by,

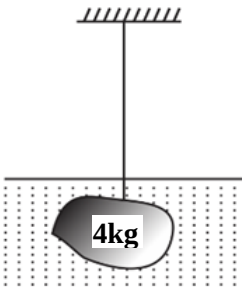


1) 6N towards DA and 8N towards AB.
2) 6N towards AD and 8N towards AB.
3) 4N towards AD 8N towards AB.
4) 6N towards DA and 8N towards BA.
5) 6N towards DA and 4N towards AB.

28) A vehicle of mass 1000 kg is moving with constant velocity along a rough path of having 0.4 dynamic frictional coefficient. The power of the engine of the vehicle is 20 kW. The power required to move the same vehicle along an inclined plane which is 30° inclined to the horizontal is given by, (The resistance force exerted along the inclined plane is same as the horizontal path).

1) 20 kW 2) 25 kW 3) 30 kW 4) 40 kW 5) 45 kW

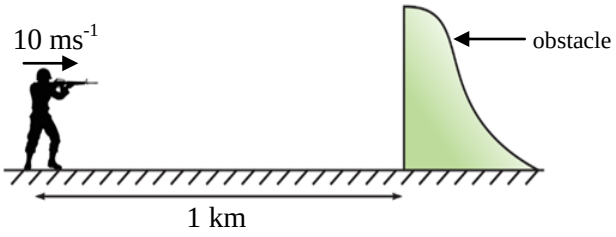
29) An object of mass 4kg is hung by an inextensible light string and submerged in a liquid of 1000 kgm^{-3} density. Tension of the string is 30N. The force exerted on the object by the liquid and its direction is correctly given by,



1) 10 N ↓ 2) 10 N ↑ 3) 20 N ↓ 4) 20 N ↑ 5) 0

30) A soldger is running towards an obstacle with 10 ms^{-1} constant velocity. He released a bulet from his gun when he was at 1km away from the obstacle. The time taken to hear the echo of the shot by the soldger from the instance of he realeased the bullet is,
(The velocity of the sound in air is 340 ms^{-1})

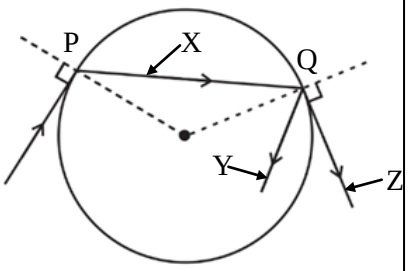
1) 6.1 s 2) 5.8 s 3) 5.7 s
4) 5.2 s 5) 2.9 s



31) An object of mass m is connected to an inelastic light string of length l and it is moving along a horizontal cicular path of radius r under constant angular velocity ω. Consider the following statements,

A) The tension of the string is always larger than mg.
B) The centripetal force applied on the object is is $ml\omega^2$.
C)The angle between the weight of the object(mg) and the tension of the string (T) cannot be 90^0 at all.

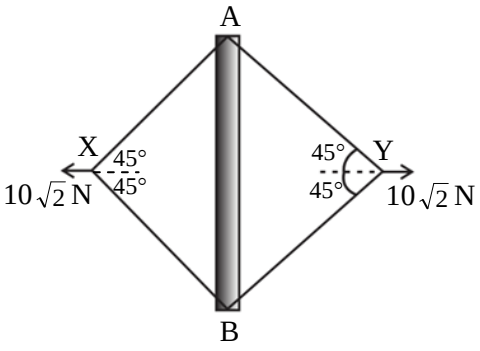
The true statement (s) is/are
1) A only. 2) A and B only. 3) A and C only
4) B and C only. 5) All A,B and C.



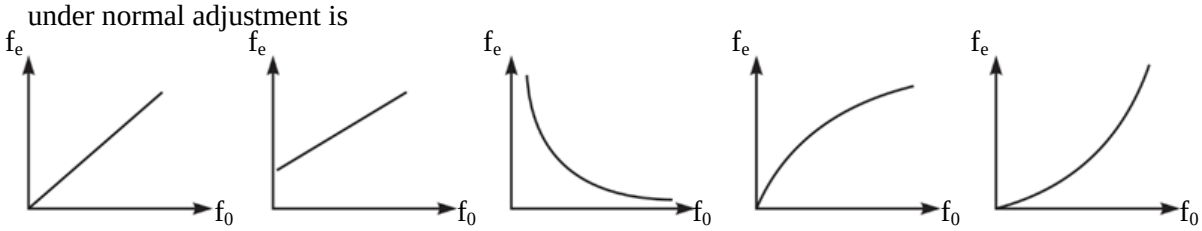
32) The figure shows that a light beam is passing through a glass sphere. Consider the following statements.
A) Intensities of both X and Z beams are equal.
B) Intensity of the beam Z is heigher than that of beam Y.
C) The beam X undergoes total internal reflection at point Q.
The most correct statement is/are,
1) A only. 2) B only. 3) C only. 4) A and B only 5) B and C only.

33) An eye defect can be corrected by wearing a convex lense of having 37.5 cm focal length. The range of vision of the defected eye would be,
1) from 25 cm to 37.5 cm.
2) from 25 cm to 75.0 cm.
3) from 37.5 cm to infinity.
4) from 75. 0 cm to infinity.
5) from 25 cm to infinity.

34) The rod AB is weight less and the strings are inextensible. When the forces which are represented by X and Y are applied on the strings, the rod is subjected to a
1) 10N thrust. 2) $10\sqrt{2}$ N thrust.
3) $10\sqrt{2}$ N tension. 4) 10N tension.
5) $20\sqrt{2}$ N thrust.

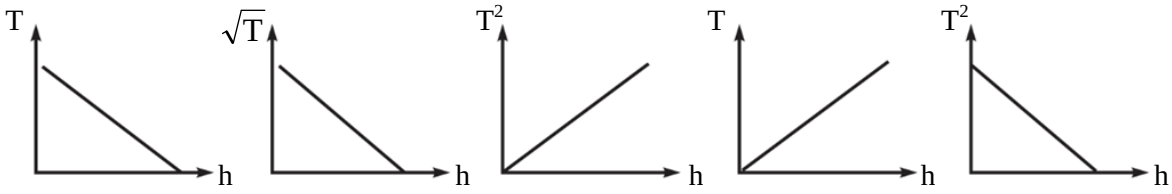


35) The correct variation of the focal length of the eye piece (fe) with the focal length of the objective lens (f_0) while maintaining the costant angular magnification of a given astronomical telescope under normal adjustment is



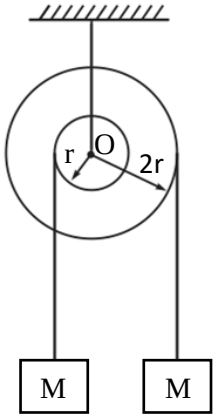
(1) (2) (3) (4) (5)

36) The height from the floor to the ceiling of the school laboratory is H. A simple pendulum is hung at the ceiling. The height to the centre of gravity of the pendulum bob from the floor is measured as '**h**'. A practical is done to determine the gravitational acceleration by variying **h**. The correct **y** axis of the graph which is drawn to determine the gravitational accelleration is given by,



(1) (2) (3) (4) (5)

37) The two pullies of radius r and 2r are free to rotate about the centre O. Two equal masses of each M are hung by two inextensible light strings which are wounded around the pullies as shown in the string. The common moment of inertia of the system is given by $\frac{Mr^2}{2}$. The common initial angular acceleration of the system of two pullies would be,
(g - gravitational acceleration)

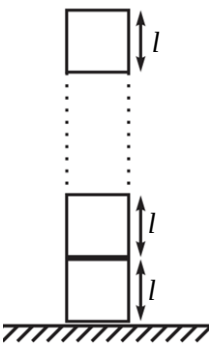


1) $\frac{2g}{r}$ 2) $\frac{g}{7r}$ 3) $\frac{2g}{9r}$ 4) $\frac{2g}{7r}$ 5) $\frac{2g}{11r}$

38) Which one of the following represents the ratio between potential and kinetic energies at a distance of 3/4 A from the equilibrium point in a simple harmonic motion of amplitude A?

1) 7 : 9 2) 9 : 7 3) 7 : 16 4) 16 : 7 5) 3 : 4

39) The amount of work to be done to place *n* umber of identical wooden cubical blocks of side length *l* side length and density ρ as shown in the figure.



1) $\frac{l^4\rho n^2 g}{4}$ 2) $\frac{l^4\rho n^2 g}{3}$ 3) $\frac{l^4\rho n^2 g}{2}$

4) $l^4\rho n^2 g$ 5) $2\,l^4\,\rho n^2 g$

40) Power of two lenses are +5D and -3D. The type and the focal length of the combined lens which is made by combining two given lenses are given by,

	(1)	(2)	(3)	(4)	(5)
Type of lens	concave	concave	convex	concave	convex
Focal length (m)	0.2	0.125	0.125	0.5	0.5

41) The white light is existed with seven colours. Their refractive indexes are reduced when the wave lengths are increasing. The angles of minimum deviations for red, yellow and blue when they are refracting through a glass prism are D_R, D_y and D_B. The correct relationship is given by,

1) $D_R > D_Y > D_B$ 2) $D_R > D_B > D_Y$ 3) $D_R < D_B < D_y$

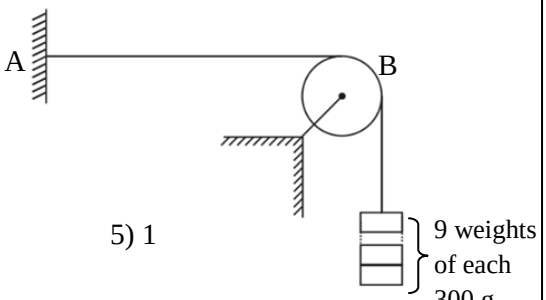
4) $D_R < D_Y < D_B$ 5) $D_R < D_Y < D_B$

42) A hole is made across the diameter of the earth and a particle is droped in to that hole. The diameter of the earth is R and the gravitational acceleration on the earth's surface is g. The periodic time of that particle is given by,

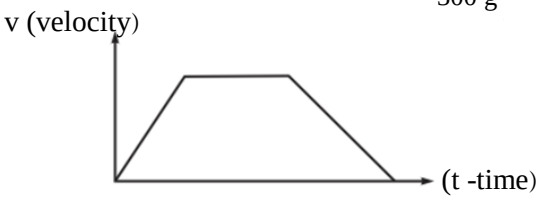
1) $2\pi\sqrt{R/g}$ 2) $2\pi\sqrt{R/2g}$ 3) $2\pi\sqrt{\frac{2R}{g}}$ 4) $2\pi\sqrt{\frac{3R}{g}}$ 5) $2\pi\sqrt{\frac{3R}{2g}}$

43) A tension is supplied to the string AB by hanging nine weights of each 300g. The string is resonated with a tuning fork. The number of weights which should be removed to resonate the string under second overtone is,

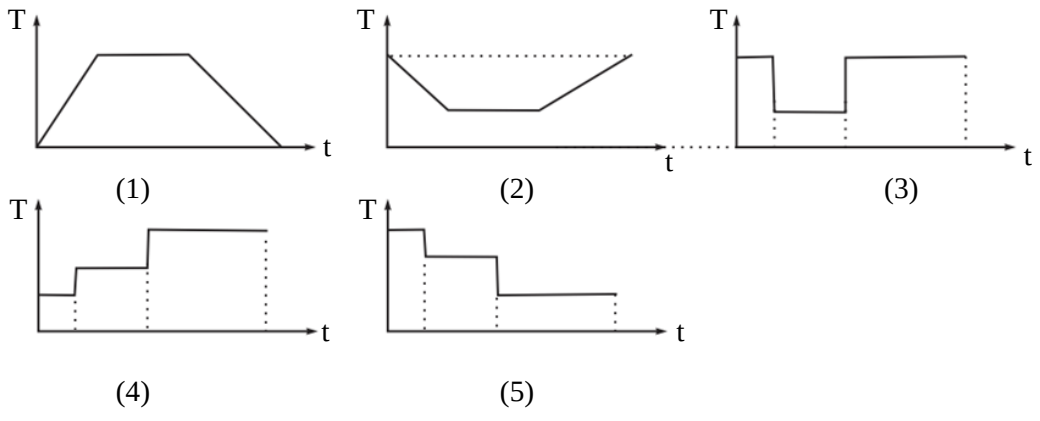
1) 8 2) 6 3) 4 4) 2 5) 1



44) A simple pendulum is suspended at the roof of a lift. The lift is moving vertically upward (↑) according to the graph –I. The variation of the periodic time (T) of the pendulum with time(t) best represented by,



graph –I

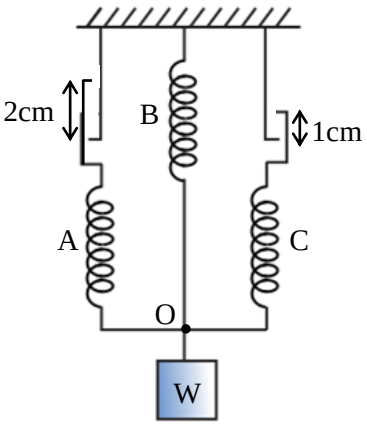


45) The work to be done to orbitalise an object of mass m which is kept at rest on the earth's surface on an orbit of radius r is best represented by, (The mass of the earth is M and the radius of the earth is R)

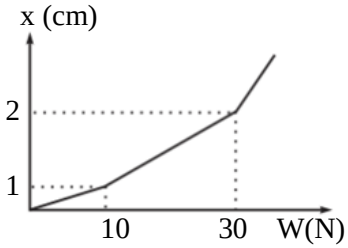
1) $\frac{-GMm}{R}$ 2) $\frac{-GMm}{r}$ 3) $GMm\left[\frac{1}{R}-\frac{1}{2r}\right]$

4) $GMm\left[-\frac{1}{R}+\frac{1}{2r}\right]$ 5) $GMm\left[-\frac{1}{R}-\frac{1}{2r}\right]$

46)

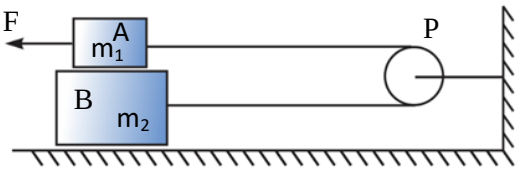


A load W is suspended by a system of three springs A, B and C as shown in the figure. As the load W is gradually increased the vertical displacement(x) at point O varies as shown in the graph. When the value of W is 36 N, the extension of the spring B is,



1) 1 cm 2) 1.5 cm 3) 2 cm 4) 2.2 cm 5) 2.6 cm

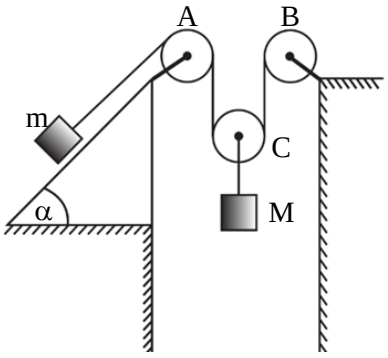
47) A block of mass m_1 is kept on the block of mass m_2 as shown in the figure. The co efficient of friction between each and every surfaces is μ. These two masses are connected to the two ends of the string which goes around the smooth pully P. P is connected to the wall. The magnitude of the force F, which is needed to move the masses m_1 and m_2 is given by,



1) $F = \mu (m_1+ m_2)g$ 2) $F = \mu (2m_1+ m_2)g$ 3) $F = \mu (3m_1+ m_2)g$

4) $F = \mu \times 2g (m_1+ m_2)$ 5) $\mu \times 3g (m_1+ m_2)$

48) The smooth pullys A, B and C are weight less. The string is light and inextensible. Mass m is on an inclined plane which is having α inclination to the horizontal and it is connected to the string. M is hung by the pully C. The acceleration of m when the system is given by,

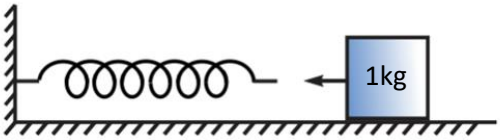


1) $\frac{2Mg+4mg\sin\alpha}{4m+M}$ 2) $\frac{Mg-2mg\sin\alpha}{4m+M}$

3) $\frac{Mg+2mg\sin\alpha}{4m+M}$ 4) $\frac{Mg+4mg\cos\alpha}{4m+M}$

5) $\frac{2Mg-4mg\sin\alpha}{4m+M}$

49) A block of mass 1kg is collided with a massless spring of spring constant 4 Nm^{-1} which is fixed horizontally. The compression of the spring by the block is 1m. The dynamic co-efficient of friction between the block and surface is $\frac{1}{4}$.The velocity of the block just after the collision is,



1) 2 ms^{-1} 2) 3 ms^{-1} 3) 4 ms^{-1} 4) 6 ms^{-1} 5) 8 ms^{-1}

50) A man who is exploring ocean near the earth poles is observing a bird which is flying vertically upward through a glass window. There are a water layer and an ice layer above the window. The thickness and refractive index of each and every layers are marked in the figure. The apperant displacement of the bird with respective to the man is,

1) 1.28m and displaced away.
2) 1.28m and displaced towards.
3) 1.29m and displaced towards.
4) 1.29m displaced away.
5) 3.28 m and displace away.