PHYSICS

BOOKS - S CHAND PHYSICS (ENGLISH)

SELF ASSESSMENT PAPER 4

Section A Choose The Correct Alternative

1. Two cars of masses m_1 and m_2 are moving in circles od radii r_1 and r_2. Their speeds are such that they complete one revolution in the same time. The ratio of their angular speed is :

A. $m_1 : m_2$

B. $r_1 : r_2$

C. $1 : 1$

D. $m_1 r_1 : m_2 r_2$

Answer:

2. The following particles are moving with the same velocity. Which particle has maximum momentum ?

A. β particle

B. proton

C. α particle

D. neutron

Answer:

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3. If a particle is displaced by a diastance $2\hat{i} + 3\hat{j} + 5\hat{k}$ m by applying a force $5\hat{i} + 2\hat{j} + 3\hat{k}$ N, then work done

A. 31 J

B. 20J

C. 60 J

D. 70 J

Answer:

4. If force F is applied on a body and it moves with a velocity v, the power will be

A. F/v

B. $F \times v$

C. F/v^2

D. $F \times v^2$

Answer:

5. The dimensional formula for modulus of rigidity is

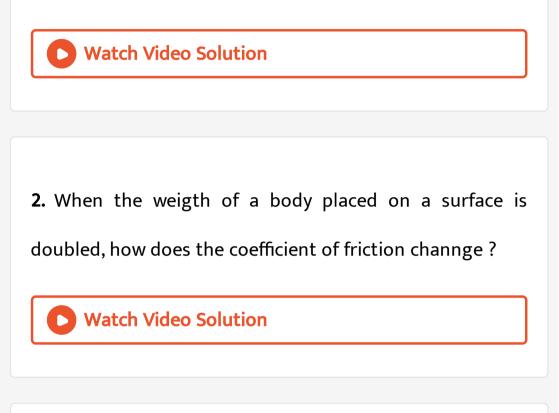A. $[ML^{-1}T^{-2}]$

B. $[MLT^{-1}]$

C. $[MLT^{-2}]$

D. $[ML^{-1}L^{-1}]$

Answer:

Section A

1. Why does the electric fan continue to rotate for some time after the current is switched off ?

2. When the weigth of a body placed on a surface is doubled, how does the coefficient of friction channge ?
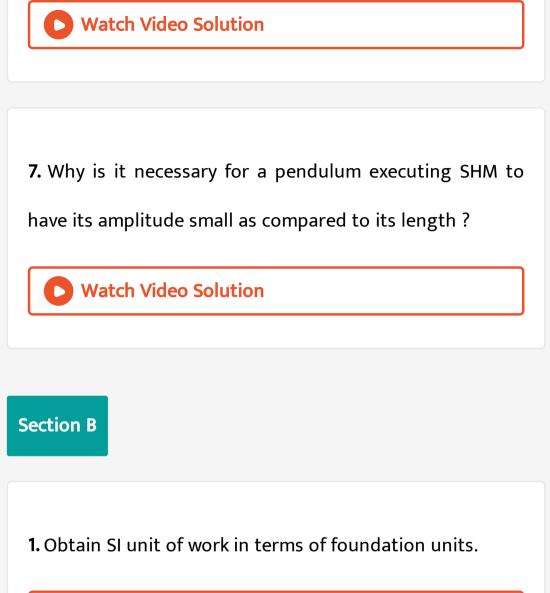
3. Write the formula of centripetal acceleration of a particle moving on a circular path in terms of the angular velocity.

4. In which motion momentum change but kinetic energy does not ?

5. Can two streamlines in a flowing liquid cross each other ?

6. Antiseptic solution used to wash cuts and wounds in the body have surface tension lower than water. What is its advantages ?

7. Why is it necessary for a pendulum executing SHM to have its amplitude small as compared to its length ?

Section B

1. Obtain SI unit of work in terms of foundation units.

2. Two bodies of masses M and m are allowed to fall from the same height. It the resistance for each be the same, then, will both the bodies reach the earth simultaneously ?
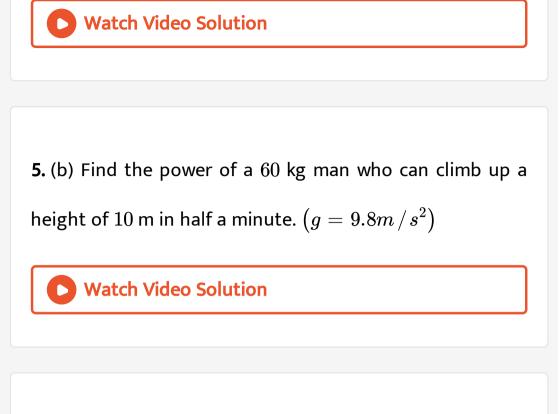
3. Distinguish between sliding friction and rolling friction.

4. (a) Two protons are brought towards each other. Will the potential energy of the system decrease or increase ? If a proton and an electron be bought nearer, then ?

5. (b) Find the power of a 60 kg man who can climb up a height of 10 m in half a minute. $\left(g = 9.8m/s^2\right)$
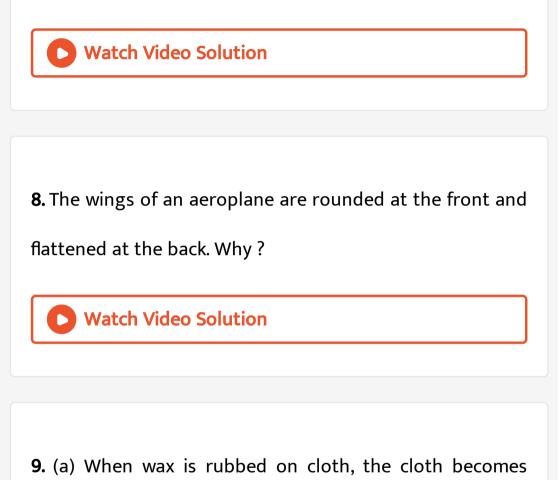
6. Explain the concept of torque. Write its unit and dimensions.

7. A material beaks up under a stress of $20 \times 10^5 N/m^2$. If the density of the material is $2.5 \times 10^3 kg/m^3$, calculate

the length of a wire made of this material, which on hanging may break under its own weight. $\left(g = 9.8m/s^2\right)$

8. The wings of an aeroplane are rounded at the front and flattened at the back. Why ?

9. (a) When wax is rubbed on cloth, the cloth becomes water proof. Explain why ?

10. A mecury drop of radius 1 cm is sprayed into 10^5 droplets of equal size. Calculate the increase in surface energy if surface tension of mercury is $35 \times 10^{-3} N/m$.

11. For an oscillating pendulum

What is the direction of acceleration of the bob at

(a) The mean position ? The end point ?

(b) Is the tension is the string constant throughout the oscillation ? If not, when is it

(i) The least ?

(ii) The greatest ?

12. "The shape of a pulse getr distorted during propagation in a dispersive medium." Why?

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13. The frequency of the first overtone of a closed organ pipe is the same as that of the first overtone of an open pipe. What is the ratio between their lengths ?

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Section C

1. (a) Taking equation of a palne progressive wave as $y = a\sin.\dfrac{2\pi}{\gamma}(vt - x)$. Write down the expression for the paticle velocity. Show that the particle veloity at a point

= wave velocity × slope of the displacement curve at the point

.

2. (b) Write the equation of a progressive wave propagating along the positive x-direction, whose amplitude is 5 cm, frequency 250 Hz and velocity $500ms^{-1}$.

3. A 10 g bullet is fried at a plank od wood with a speed of $200m/s$. After passing through the plank which is 1.0 m thick the speed of the bullet reduces to $100m/s$. Find the average resistance offered by the plank.

4. Find the scalar and vector products of two vectors $\vec{A} = \left(3\hat{i} - 4\hat{j} + 5\hat{k}\right)$ and $\vec{B} = \left(-2\hat{i} + \hat{j} - 3\hat{k}\right)$.

5. Explain the meaning of kinetic energy. With examples obtain an expression for the kinetic energy of a body moving with a uniform velocity.

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6. Obtain a formula for the variation of 'g' below the surface of earth. Hence show that 'g' vanishes at the centre of earth.

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7. If the earth were a perfect sphere of radius $6.37 \times 10^6 m$, rotating about its axis with a period of 1 day

$\left(= 8.64 \times 10^6 s \right)$, how much would the acceleration due to gravity differ from the poles to the equator.

8. What is an ideal (or perfect) gas ? Under what condition of pressure and temperature can a gas be assumed as an ideal gas ? Determine the gas constant for one gram molecule of a gas.

9. An oxygen cylinder having volumn 30 litre shows a initial gauge pressure 15 atm and temperature $27° C$. Some oxygen is taken out from the cylinder, so that the gauge

pressure comes down to 11 atm and temperature comes down to $17°C$. What amount of gas was taken out from the cylinder ?

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1. (a) Write a equation of motion in different states and derive the relation :

$$s = u + \frac{1}{2}a(2t - 1)$$

Where, s is the distance covered in t^{th} second, u is initial velocity and a is uniform acceleration.

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2. A rocket which is sent to establish a satellite in its orbit acquires a velocity of $2.9 \times 10^4 \, km/h$ in 2.05 minutes.

(i) Determine its average acceleration in km/h^2

(ii) if it has enough fuel to go on for an hour with the same acceleration, then how much velocity will it attain ? Assume that its initial velocity was zero

(iii) How much distance will it travel in this hour ?

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3. (a) Write rules of friction. Friction force decreases in ball bearings because balls are spherical. Does it mean frictional force depend upon area ? Explain.

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4. A bullet of mass 10 g is fired horizontally into a 4 kg wooden block resting on a horizontal surface. The coefficient of kinetic friction between the block and the surface is 0.25. The bullet is embadded the block and the combination moves a distance of 20 m before coming to rest. Find the speed of the bullet just before striking the block. $\left(g = 10m/s^2\right)$

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5. (a) What is meant by the principle of continuity ? Show that velocity of a liquid is inversely proportional to the area of cross-section of a pipe or tube.

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6. Water is flowing continuously from a tap having an internal diameter 8×10^{-3} m. The water velocity as it leaves the tap is $0.4 ms^{-1}$. The diameter of the water stream at a distance 2×10^{-1} m below the tap is close to