PHYSICS

BOOKS - S CHAND PHYSICS (ENGLISH)

SELF ASSESSMENT PAPER 3

Section A

1. A lift of mass 200 kg is moving upward with an acceleration of $3m/s^2$. If $g = 10m/s^2$ then the tension of string of the lift will be :

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2. If $\vec{A}$ and $\vec{B}$ are two vectors, then the correct relation is :

A. $\vec{A} + \vec{B} = \vec{B} + \vec{A}$

B. $\vec{A} - \vec{B} = \vec{B} - \vec{A}$

C. $\vec{A} \times \vec{B} = \vec{B} \times \vec{A}$

D. None of these.

Answer:

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3. A bullet of mass 40 g moving with a speed of $90ms^{-1}$ enters a heavy wooden block and is stopped after a distance of 60 cm . The average resistive force exerted by the block on the bullet is :

A. 180 N

B. 220 N

C. 270 N

D. 320 N

Answer:

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4. We have a solid sphere and a very thin spheical shell their masses and moments of inertia about a diameter are same. The ratio of their radii will be :

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5. The terminal speed v of a rain water drop in air is :

A. $v = kr\eta$

B. $v = kr^2\eta$

C. $v = kr\eta^2$

D. $v = kr^2/\eta$

Answer:

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6. To develop root pressure , energy is used to

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7. At a constant temperature what is the relation between pressure P density d of an ideal gas ?

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8. (Answer the following questions briefly and to the point :)

Which physical quantity remains conserved in Simple Harmonic Motion ?

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9. Where from does a satellite get centripetal force for moving around its planet ?

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10. Sand is thrown on tracks covered with snow in hilly areas. Why ?

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11. Is a train moving on a circular track, an inertial frame of reference ?

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12. Can a quantity have dimesions, but no unit ?

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Section B

1. A person left on a frictionless surface wants to get away from it. How can he do so ?

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2. Given $\vec{A} \times \vec{B} = \vec{0}$ and $\vec{B} \times \vec{C} = \vec{0}$ Prove that $\vec{A} \times \vec{C} = \vec{0}$

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3. A horse has to pull a cart harder in the initial stange of his motion . Why ?

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4. (a) A small piece of wet cement thrown on a well is glued to the wall. What happens to its initial energy ?

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5. (b) A 10 kg weight is raised to a height of 2.0 m with an acceleration of $1.5m/s^2$. Compute the work done, if $g = 10m/s^2$.

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6. An artifical satellite revolves in its orbit around the earth without using any fuel. But an aeroplane requires fuel to fly at a certain height . Why So ?

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7. A balloon filled with helium does not rise in air indefinitely, but halts after a certain height. Why ?

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8. A vessel contains a mixture of one mole of Oxygen and two moles of Nitrogen at 300 K. The ratio of the average kinetic energy per O_2 molecule to that per N_2 molecule is :

A. $1:1$

B. $1:2$

C. $16:14$

D. $1:4$

Answer:

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9. (a) Water can be poured into a glass - bottle of narrow neck with the help of a glass rod. Why ?

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10. (b) The surface area of a soap- bubble is $2.0 \times 10^{-3} m^2$. How much work will be done in blowing the bubble to twice its surface area . $\left(\text{S.T} = 3 \times 10^{-2} N/m\right)$

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11. The amplitude of a particle executing simple harmonic motion with a frequency of

60 Hz is 0.01 m. Determine the maximum value of the acceleration of the particle.

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12. The frequency of the wave propagating on a string is $20Hz$. What will be the difference in phase of a particle of the string in a time interval of 0.01 s ?

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13. Why is the sound produced in air not heard by a person deep inside the water ?

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Section C

1. (a) Explain the formation of standing waves in an organ pipe closed at one end and discuss the various modes of vibration.

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2. (b) The displacement of a particle executing simple harmonic motion is given by the equation $y = 0.3 \sin 20\pi(t + 0.05)$, where time t is in seconds and displacement y is in meter. Calculate the values of amplitude, time period, initial phase and initial displacement of the particle.

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3. (i) Show dimensionally that the equation of the time period of a simple pendulum of length l. Given relation $T = 2\pi l/g$ is incorrect.

(ii) Find its correct form.

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4. What do you understand by the scalar product of two vectors ? Write the formula, explaining the symbols used.

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5. What do we mean by power and energy ? Given their units .

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6. (a) Show that the velocity of the centre of mass of a moving isolated system remains constant.

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7. (b) Two bodies of masses $10kg$ and 2 kg are moving with velocities $2\hat{i} - 7\hat{j} + 3\hat{k}$ and $-10\hat{i} + 35\hat{j} - 3\hat{k}m/s$ respectively. Find the velocity of the centre of mass.

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8. What do you understand by the limit of elasticity ? State Hooke.s law.

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9. What is Bernoulli.s principle ? Explain one application of it.

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Section D

1. (a) Write law of parallelogram of vector and obtain the expression for the resultant of two vectors acting in two different directions.

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2. (b) A stone is thrown from a bridge at an angle of 30° down with the horizontal with a velocity of 25 m//s . If the stone strikes the water after 2.5 seconds then calculate the height of the bridge from the water surface $\left(g = 9.8m/s^2\right)$.

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3. (a) What is elastic potential energy of a spring ? Obtain the relation for elastic

$P.E.U = \frac{1}{2}kx^2$. Where k is force constant of spring, x is extension or compression produced in the spring.

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4. (b) Two balls each of mass m moving in opposite direction with equal speed v collide head -on with each other . Predict the outcome of the collision assuming it perfectly elastic.

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5. (a) Write Stefan.s law and define emissivity of a material. Derive Newton.s law of cooling and plot a graph between temperature and time.

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6. A child running a temperature of $10^{\circ} F$ is given an antipyrin (i.e. a medicine that lowers fever) which causes an increase in the rate of evaporation of sweat from his body. If the

fever is brought down to $98^{\circ}F$ in 20 min, what is the average rate of extra evaporation caused, by the drug. Assume the evaporation mechanism to be the only way by which heat is lost. The mass of the child is 30 kg. The specific heat of human body is approximately the same as that of water, and latent heat of evaporation of water at that temperature is about $580 cal g^{-1}$.

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