PHYSICS

BOOKS - S CHAND PHYSICS (ENGLISH)

SAMPLE QUESTION PAPER - 01

Section A

1. Choose the correct alternative (a), (b), (c) or (d) for each of the questions given below :

Which of the following is not a unit of time ?

A. light year

B. ns (nano second)

C. μs (micro second)

D. minutes

Answer: A

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2. Choose the correct alternative (a), (b), (c) or (d) for each of the questions given below :

A copper and a steel wire having same length and diameter are joined end-to-end. When a force is

applied at the end of the wire, the net length of the wire increases by 1 cm. The wires will have :`

A. same stress and same strain

B. different stresses and different strain

C. different stresses and same strain

D. different strains and same stess

Answer: D

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3. Choose the correct alternative (a), (b), (c) or (d) for each of the questions given below :

For an adiabatic change of a perfect gas the relation between pressure and volume is :

A. $PV^{\gamma} = \text{constant}$

B. $P^{\gamma}V = \text{constant}$

C. PV = constant

D. $PV^{\gamma-1} = \text{constant}$

Answer: A

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4. Choose the correct alternative (a), (b), (c) or (d) for each of the questions given below :

Which of the following is approximately the rate of solar energy (in KW) falling per m^2 on the surface area of the earth ?

A. 1

B. 100

C. $0 \cdot 1$

D. $0 \cdot 0001$

Answer: A

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5. Choose the correct alternative (a), (b), (c) or (d) for each of the questions given below :

The distance between successive nodes and anti-nodes is :

A. $\frac{\lambda}{2}$

B. λ

C. $\frac{\lambda}{4}$

D. 2λ

Answer: C

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

Give the dimensions of Boltzmann.s constant.

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

A bullet fired vertically upward falls at the same place after some time. What is the displacement of the bullet?

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

A constant retarding force of 100 N is applied to a body of mass 10 kg moving initially with a speed of 30 ms^{-1}. What is the retardation of the body ?

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

State the Principle of Continuity of fluids.

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

What is the relation between the pressure and the kinetic energy per unit volume of gas ?

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

Give any one essential feature of Carnot.s ideal heat engine.

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

Which physical quantity remains conserved in Simple Harmonic Motion ?

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Section B

1. Round off 3.7846 up to 3 significant figures.

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2. What is absolute error?

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3. Give the limitations of dimensional analysis.

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4. Write an expression for magnitude of the resultant vector . $\vec{R}$. of two vectors $\vec{A}$ and $\vec{B}$ acting at a point. When will this resultant vector . $\vec{R}$. be maximum ?

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5. A box of 50 kg is lifted by a man of mass 60 kg to a height of 50 m. Calculate the work done by the man.

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6. How much mass of water can be lifted by a pump motor of 9.8 kW in one minute to a height of 5 m ?

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7. A shot fired from cannon explodes in air. What will be the changes in the momentum and the kinetic energy ?

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8. Two bodies of masses 0.5 kg and 1 kg are lying in the X-Y plane at points (-1, 2) and (3, 4) respectively. Locate the centre of mass of the system.

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9. Define orbital velocity. Obtain the relation between orbital velocity and acceleration due to gravity g, for a satellite orbiting very close to the surface of the earth.

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10. Define Bulk modulus of elasticity and write an expression in terms of pressure .P., volume .V. and change in volume . ΔV. .

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11. With reference to Elasticity, define the following terms :

1. Stress

2. Strain

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12. What is magnus effect ? Write any one application of this effect.

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13. State the First Law of thermodynamics. Name the physical quantity that remains conserved in this law ?

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14. An electric heater supplies heat to a system of gas at a rate of 150 W. The system performs work at a rate of 50 J/s. At what rate is the internal energy increasing ?

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Section C

1. Calculate the acceleration .a. of the system and the tensions T_1 and T_2 in the strings as shown in figure. (Assume that the table and the pulleys are frictionless and the string is massless and inextensible).

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2. A body of mass 50 kg is hung by a spring balance in a lift. Calculate the reading of the balance when : The lift is ascending with an acceleration of $2m/s^2$.

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3. A body of mass 50 kg is hung by a spring balance in a lift. Calculate the reading of the balance when : The lift is descending with a constant velocity of 2 m/s.

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4. A body of mass 50 kg is hung by a spring balance in a lift. Calculate the reading of the balance when : The lift is ascending with an acceleration of $2m/s^2$.

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5. Derive an equation for displacement of a projectile fired at an angle θ from the ground.

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6. When a cyclist negotiates a circular path of radius .r. with velocity .v., making an angle θ with the vertical, show that $\tan\theta = \frac{v^2}{rg}$.

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7. A fly wheel is rotating at a speed of 160 r.p.m. whose weight is 20 kg and its centre of mass at a

distance of 0.01 m from the axis of rotation. Calculate

:

moment of inertial of the fly wheel.

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8. A fly wheel is rotating at a speed of 160 r.p.m. whose weight is 20 kg and its centre of mass at a distance of 0.01 m from the axis of rotation. Calculate

:

the energy stored in the fly wheel.

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9. Calculate the height to which the water will rise in a capillary tube of 1.5 mm diameter (surface tension of water $= 74 \times 10^{-3} Nm^{-1}$, angle of contact between water and glass $= 0^{\circ}$).

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10. Plot a graph of terminnal velocity versus time.

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11. A soap film is on a rectangular wire ring of size 2 cm $\times$ 3 cm. If the size of the film is changed to 3 cm

$\times$ 3 cm, calculate the work done in this process. (The surface tension of soap solution is $3.0 \times 10^{-2} Nm^{-1}$).

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12. How does the surface tension a liquid vary with increase in temperature ?

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13. Derive Newton's law of cooling to show that the rate of loss of heat from the body is proportional to

the temperature difference between the body and its surroundings.

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14. 16 tuning forks are arranged in the order of decreasing frequency. Any two successive forks gives 5 beats per second when sounded together. If the first tuning fork gives the octave of the last, then determine the frequency of the last fork.

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Section D

1. The distance of the planet Jupiter from the Sun is 5.2 times that of the Earth. Find the period of Jupiter's revolution around the Sun.

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2. Obtain an equation for the period of revolution of an artifical satellite revolving at height .h. from the surface of Earth.

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3. Calculate the area covered per second $\left(m^2 s^{-1}\right)$ by the Moon for one complete revolution round the Earth (distance of Moon from Earth $= 3.845 \times 10^8$ and period of revolution of Moon $= 27\frac{1}{3}$ days).

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4. Obtain an expression for the gravitational potential.

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5. If $\vec{A} = -\hat{i} + 3\hat{j} + 2\hat{k}$ and $\vec{B} = 3\hat{i} + 2\hat{j} + 2\hat{k}$ then find the value of $\vec{A} \times \vec{B}$.

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6. Using the second law of motion show that impulse is equal to the change in momentum.

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7. Calculate the work done when $\vec{F} = \left(-5\hat{i} + 3\hat{j} + 2\hat{k}\right)N$ and $\vec{s} = \left(3\hat{i} - \hat{j} + 2\hat{k}\right)m$ acting in same direction.

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8. Show with the help of a vector diagram that the work done is a scalar product of force and displacement.

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9. Derive an equation for the first mode of vibration of an air column in a closed organ pipe.

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10. What is the phase difference between the incident wave and the reflected wave in the following ?

1. Wave reflected from rigid boundary.

2. Wave reflected from free boundary.

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11. Derive an equation for the first mode of vibration of an air column in an open organ pipe.

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12. State any two characteristics of a plane progressive wave.

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