



PHYSICS

BOOKS - S CHAND PHYSICS (ENGLISH)

SELF ASSESSMENT PAPER 5

Section A

1. Choose the correct statement

A. Electric bulbs and tubes are based on electromagnetic induction.

B. Computer are based in digital electronics.

C. Lasers make us of principles of thermodynamics.

D. Nuclear reactors are based on nuclear fusion.

Answer:



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2. Figures shown the orientation of two, vectors \vec{u} and \vec{v} in the XY plane.



$$\text{If } \vec{u} = a \vec{i} + b \vec{j} \text{ and}$$

$$\vec{v} = p \vec{i} + q \vec{j}$$

then which of the following is correct ?

A. a and p are positive while b and q are negative.

B. a , p and b are positive while q is negative.

C. a , p and b are positive while q is negative.

D. a , b , p and q are all positive.

Answer:



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3. If $\left| \vec{a} \times \vec{b} \right| = ab$ then the angle between \vec{a} and \vec{b} is

A. 0

B. $\pi/4$

C. $\pi/2$

D. π

Answer:



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4. The kinetic energy of a mass connected to a spring will be maximum in :

- A. Stretched position
- B. Mean position
- C. Compressed position
- D. Motionless position

Answer:



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5. In an adiabatic process

A. Temperature

B. Pressure

C. Heat

D. Temperature and pressure

Answer:



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6. Write the relation between pressure and volume for an adiabatic change in an ideal gas.



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7. Answer the question briefly and the point:

Which type of motion of the molecules is responsible for the internal energy of a monoatomic gas?



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8. What characteristic of a medium determines the speed of longitudinal wave through it ?



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9. How many hours is the periodic time of revolution around the earth of the communication satellite INSAT II B ?



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10. Is whole of the kinetic energy lost in a perfectly inelastic collision ?



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11. A small smooth ball is placed on a smooth circular disc when the disc is rotated the ball falls down. Why ?



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12. What type of the friction arises when an axle rotates in sleeve ?



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Section B

1. What is resonance ? What is resonant frequency ?



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2. Write the formula of the scalar product of two vectors explaining the symbols.



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3. A particle of mass m is revolving in a horizontal circle of radius r under a centripetal force k/r^2 where k is a constant. What is the total energy of the particle ?



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



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5. A spring requires 4 Joule of work to be stretched through 10 cm. Find the spring constant.



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6. A what height above the Earth's surface the acceleration due to gravity will be $\frac{1}{9}$ th of its value at the Earth's surface ? (Radius of Earth is 6400 km)



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7. Determine the volume contraction of a solid copper cube, 10 cm on the edge, when the subjected to a hydraulic pressure of 7.0×10^6

Pa. Bulk modular of the copper = 1.40×10^{11}

Pa.



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8. Write Bernoulli's equation pointing out pressure head and velocity head.



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9. "We supply electric current continuously to an electric heater. But the temperature of the

heater remains constant after some time."

Why ?



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10. The length of a rod of aluminium is 1.0 m and its area of cross-section is 5.0cm^2 , its one end is kept at 250°C and the other end at 50°C . How much heat will flow in the rod in 5.0 minutes ? K or $\text{Al} = 2.0 \times 10^{-1}\text{kJ} / \text{sm}^\circ\text{C}$.

Mention the required conditions.



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11. Human heart, on the average, beat 75 times per minute. Find its frequency and period.



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12. What is a dispersive medium?



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13. The periodic time of a mass suspended by a spring (force constant k) is T . The spring be cut into three equal pieces. If the same mass be suspended from one piece, what will be the periodic time ?



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Section C

1. Explain the formation of standing waves in a string clamped at both ends and discuss the various modes of vibration.



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2. A wire stretched between two rigid supports vibrates in its fundamental mode with a frequency of 45 Hz. The mass of the wire is 3.5×10^{-2} kg and its linear mass density is 4×10^{-2} kg/m. What is

(i) the speed of transverse wave in the wire
and

(ii) the tension in the wire ?



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3. What is meant by relative velocity ? Write an expression for the velocity of A and B particle relative to the other moving with velocities v and v along a straight line.



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4. A block of mass 2 kg is placed on the floor. The coefficient of static friction is 0.4. A force F of 2.5 N is applied on the block, as shown. Calculate the force of friction between the block and the floor. ($g = 9.8 \text{ m/s}^2$).



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5. A body whose moment of inertia is 3 kg m^2 is at rest. It is rotated for 20 seconds with a moment of force 6 N.m. Find the angular

displacement of the body. Also calculate the work done.



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6. To maintain a rotor at uniform angular speed of 200rad/s an engine needs to transmit a torque of 180 Nm . What is the power of the engine required ?



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7. Find the mass of the earth from the following data. The period of lunar orbit around the earth is 27.3 days and radius of the orbit

$$3.9 \times 10^5 \text{ km. } G = 6.67 \times 10^{-11} \text{ Nm}^{-2} \text{ kg}^{-2}.$$



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8. Define the explain bulk modulus of a material write its formula, explaining the significance of minus sign.





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9. Define coefficient of viscosity of a liquid.

Write down its dimensional formula and MKS unit.



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Section D

1. Write Stefan's law, define emissivity of a material. Derive Newton's law of cooling and

plot of a graph between temperature and time.



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2. A falt-bottom kettle placed on a stove is being used to boil water. The area of the bottom is 270cm^2 the thickness is 0.3 cm and the thermal conductivity of the material is $0.5\text{cal} / \text{scm}^\circ\text{C}$. If the amount of steam being produced in the kettle is at the rate of 10 g per minute calculate the difference of

temperature between the inner and outer surfaces of the bottom. The latent heat of steam is $540\text{cal} / \text{gm}$.



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3. What do you understand by work done ?

Write its SI unit. Obtain the relation between Joule and erg



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4. A particle of mass m_o moves with a speed $\frac{C}{2}$. Calculate its mass, momentum, total energy and kinetic energy.



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5. Write and explain law of conservation of linear momentum. Give two examples based on this conservation.



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6. A hammer of mass 1.0kg moving with a speed of 10m/s strikes the head of a nail of negligible mass and drives it 10 cm into a block of wood. Find

(i) the acceleration during impact,

(ii) time interval of impact and

(iii) impulse.



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