

**PAPER CODE = 6478** *LHR-11-2-23*

Note : Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink in the answer-book. Cutting or filling two or more circles will result in zero mark in that question.

1-1	The first demonstration of wave nature of light was provided in 1801 by the experiment of : (A) Huygen (B) Newton (C) Maxwell (D) Thomas Young
2	When a body moves in a circle its linear velocity always : (A) Remains constant (B) Becomes zero (C) Changes (D) Increases
3	The rate of change of momentum of a body falling freely is equal to its : (A) K.E. (B) Weight (C) Power (D) Momentum
4	A heavily damped system has a fairly flat resonance curve in an : (A) Velocity time graph (B) Distance time graph (C) Amplitude frequency graph (D) Amplitude time graph
5	The rotational K.E. of Disc is equal to : (A) $\frac{1}{4}mv^2$ (B) $\frac{1}{2}mv^2$ (C) $\frac{1}{2}I\omega$ (D) $I\omega$
6	Time interval between normal heart beats is : (A) $1 \times 10^{-5} s$ (B) $8 \times 10^1 s$ (C) $1 \times 10^{-2} s$ (D) $8 \times 10^{-1} s$
7	The ratio of $\frac{C_p}{C_v}$ for a diatomic gas is equal to : (A) 1.67 (B) 1.50 (C) 1.40 (D) 1.29
8	A typical rocket eject the burn gases at speeds of over : (A) 400 m / sec (B) 4000 m/sec (C) 8000 m/sec (D) 10000 m/sec
9	Longitudinal waves do not exhibit : (A) Reflection (B) Refraction (C) Polarization (D) Diffraction
10	The branch of Physics which is concerned with ultimate particles of which matter is composed of is called : (A) Atomic Physics (B) Nuclear Physics (C) Plasma Physics (D) Particle Physics
11	Viscosity of air at $30^\circ C$ is : (A) $0.019 \times 10^{-3} Nsm^{-2}$ (B) $0.295 \times 10^{-3} Nsm^{-2}$ (C) $0.510 \times 10^{-3} Nsm^{-2}$ (D) $0.564 \times 10^{-3} Nsm^{-2}$
12	If $\vec{A} = -4\hat{i}$ , $\vec{B} = 6\hat{j}$ then $\vec{A} \cdot \vec{B}$ will be : (A) $24\hat{k}$ (B) 24 (C) Zero (D) $-24\hat{k}$
13	The diameter of the core of multimode step index fibre is : (A) 50 mm (B) 50 $\mu m$ (C) 50 nm (D) 50 Pm
14	Bats navigate and find food by : (A) Microwaves (B) Echo location (C) Electromagnetic waves (D) Matter waves
15	If temperature of a sink of a heat engine is absolute zero, the efficiency of heat engine should be : (A) 100 % (B) 50 % (C) 0 % (D) Infinity
16	Two masses of 1 gm and 4 gm are moving with same K.E. The ratio of their linear momentum are : (A) 1 : 16 (B) 6 : 1 (C) 1 : 2 (D) 4 : 1
17	If the magnitude of scalar and vector product of two vectors are $2\sqrt{3}$ and 2 respectively, the angle between vectors is : (A) $30^\circ$ (B) $45^\circ$ (C) $120^\circ$ (D) $180^\circ$

**SECTION – I** LHR-11-2-23

**2. Write short answers to any EIGHT (8) questions :**

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- (i) Give four conventions for indicating units.
- (ii) What is random error? How it can be eliminated?
- (iii) Why do we find it useful to have two units for the amount of substance, the kilogram and mole?
- (iv) Does a dimensional analysis give any information on constant of proportionality that may appear in an algebraic expression? Explain.
- (v) How would you verify that the dot and cross product become equal in magnitude?
- (vi) If all the components of the vectors  $\vec{A}_1$  and  $\vec{A}_2$  were reversed, how would this alter  $\vec{A}_1 \times \vec{A}_2$ ?
- (vii) Name three different conditions that could make  $\vec{A}_1 \times \vec{A}_2 = \vec{0}$
- (viii) Does a moving object has impulse? Explain your reasoning.
- (ix) A 1500 kg car has its velocity reduced from 20 m/s to 15 m/s in 3.0 second. How large was the average retarding force?
- (x) Define impulse and show that how it is related to linear momentum?
- (xi) Why isolated system is important to conserve linear momentum? Also state law of conservation of momentum.
- (xii) Why fog droplets appear to be suspended in air?

**3. Write short answers to any EIGHT (8) questions :**

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- (i) When a rocket re-enters the atmosphere, its nose cone becomes very hot? Where does this heat energy come from?
- (ii) A boy uses a catapult to throw a stone which accidentally smashes a green house window. List the possible energy changes.
- (iii) State work-energy principle.
- (iv) What is meant by moment of inertia? Explain its significance.
- (v) Explain how many minimum number of geo-stationary satellites are required for global coverage of T.V. transmission?
- (vi) Differentiate between tangential velocity and angular velocity.
- (vii) What happens to the period of simple pendulum, if its length is doubled? What happens if the suspended mass is doubled?
- (viii) What is meant by phase angle? Does it define angle between maximum displacement and the driving force?
- (ix) Differentiate between transverse waves and longitudinal waves.
- (x) What should be the frequency of a simple pendulum whose period is 0.5 seconds at a place where  $g = 9.8 \text{ ms}^{-2}$ ?
- (xi) A wave is produced along a stretched string but some of its particles permanent show zero displacement. What type of wave is it?
- (xii) Explain why sound travels faster in warm air than in cold air?

(Turn Over)



## 4. Write short answers to any SIX (6) questions :

- (i) Under what condition two or more sources of light behave as coherent sources?
- (ii) How would you manage to get more orders of spectra using a diffraction grating?
- (iii) Draw an interference pattern formed with white light.
- (iv) Why would it be advantageous to use blue light with a compound microscope?
- (v) Draw ray diagram of compound microscope and write its total magnification.
- (vi) Is it possible to construct a heat engine that will not expel heat into the atmosphere?
- (vii) Can mechanical energy be converted completely into heat energy? If so give an example.
- (viii) Derive the Charles's law from kinetic theory of gases.
- (ix) What is adiabatic process? Write down its two examples.

## SECTION – II

**Note :** Attempt any THREE questions.

- 5. (a) Define rectangular component. Explain addition of vectors by rectangular components. 5
- (b) Ten bricks, each 6.0 cm thick and mass 1.5 kg lie flat on a table. How much work is required to stack them one on the top of another? 3
- 6. (a) Define projectile motion. Derive the expression for : 5
  - (i) Time of flight and (ii) Height of a projectile.
- (b) What is the least speed at which an aeroplane can execute a vertical loop of 1.0 km radius so that there will be no tendency for the pilot to fall down at the highest point. 3
- 7. (a) Show that pressure exerted by the gas is directly proportional to the average translational kinetic energy of gas molecules. 5
- (b) Water flows through a hose, whose internal diameter is 1 cm at a speed of  $1\text{ms}^{-1}$ . What should be the diameter of the nozzle if the water is to merge at  $21\text{ms}^{-1}$ ? 3
- 8. (a) Describe Doppler's Effect. Derive apparent frequency and discuss its results if : 5
  - (i) Source is moving towards the stationary observer.
  - (ii) Source is moving away from stationary observer.
- (b) Find the amplitude and frequency of an object vibrating at the end of a spring, if the equation for its position, as a function of time is  $X = 0.25 \cos\left(\frac{\pi}{8}t\right)$  3
- 9. (a) Describe the principle, construction and working of Michelson's interferometer. How can you find the wavelength of light used? 5
- (b) A compound microscope has lenses of focal length 1.0 cm and 3.0 cm. An object is placed 1.2 cm from the object lens. If a virtual image is formed, 25 cm from the eye, calculate the separation of the lenses and the magnification of the instrument. 3