

Time Allowed:- 20 minutes

PAPER CODE 2471

Maximum Marks:- 17

Note:- You have four choices for each objective type question as A, B, C and D. The choice which you think is correct; fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Write PAPER CODE, which is printed on this question paper, on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

- 1) The percentage of uncertainty for V and I is 2% and 6% respectively. Hence, total uncertainty in the value of $R = \frac{V}{I}$ is
(A) 8% (B) $\frac{1}{3}\%$ (C) 3% (D) 4%
- 2) How many years are there in 1 Second?
(A) $3.15 \times 10^{+7}$ years (B) 3.1×10^{-8} years (C) 3.15×10^{16} years (D) 3.1×10^{-6} years
- 3) A vector of 10N making an angle of 60° with y-axis. Its x-component is equal to
(A) 7 N (B) 5 N (C) 8.66 N (D) 10 N
- 4) When a massive body collides with a body of negligible mass. What is the final velocity of massive body if its initial velocity is 5 m/s
(A) 10 m/s (B) 15 m/s (C) 20 m/s (D) Information is not enough
- 5) Which of the following can be possessed by a moving object
(A) Force (B) Momentum (C) Impulse (D) Power
- 6) The formula $W = \vec{F} \cdot \vec{d}$ have two restrictions. Pick the correct one
(A) \vec{F} can vary but \vec{d} must be in circle (B) \vec{F} can vary but \vec{d} must be in straight line (C) \vec{F} is constant and average but \vec{d} is in straight line (D) \vec{F} is constant and average but \vec{d} can be curved
- 7) $\theta, \omega, \alpha, \tau, L$ all these five parameters can have the same direction only if
(A) Torque should be applied externally (B) Angular momentum 'L' is not fixed (C) Angular velocity ' ω ' is decreased (D) Angular velocity ' ω ' is increased
- 8) Centripetal force is acted along
(A) Straight line (B) Curved line (C) Circular path (D) Elliptical path
- 9) Bernoulli's theorem can be reduced to
(A) Torricelli's theorem but not to venturi's relation (B) Both Torricelli's theorem and venturi's relation (C) Venturi's relation but not to Torricelli's theorem (D) This equation can not be reduced
- 10) What is the equation of the phase for a vibrating body in a circle, when initial phase is 270°
(A) $x_0 \sin \omega t$ (B) $x_0 \cos \omega t$ (C) $-x_0 \sin \omega t$ (D) $-x_0 \cos \omega t$
- 11) How speed of sound varies with temperature.
(A) $v \propto \frac{1}{T}$ (B) $v \propto \frac{1}{\sqrt{T}}$ (C) $v \propto T$ (D) $v \propto \sqrt{T}$
- 12) At which angle, we get more orders of spectra in diffraction
(A) 45° (B) 90° (C) 60° (D) 30°
- 13) If a gas is maintained at 8000 N/m^2 in a container with piston having area 0.10 m^2 . If the gas expands and piston is pushed up through a distance of 10 cm then the work done by the gas is
(A) 8000 J (B) 400 J (C) 40 J (D) 80 J
- 14) For diatomic gas $C_v = \frac{5R}{2}$, therefore " γ " for this gas is
(A) $\frac{7}{5}$ (B) $\frac{5}{7}$ (C) 7.5 (D) 5.7

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SGD-1-24 -- (2) --

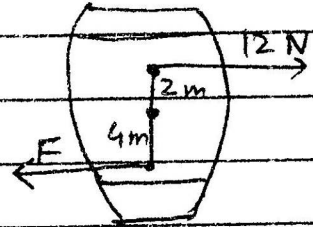
15- For rotational equilibrium, the value of force in the following figure is

a) 12 N

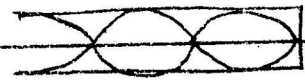
b) 4 N

c) 2 N

d) 6 N



16- In the organ pipe shown in the figure how the frequency



a) $f_5 = 5 f_1$

b) $f_9 = 9 f_1$

c) $f_3 = 3 f_1$

d) $f_7 = 7 f_1$

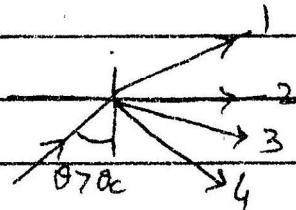
17- If a light ray is incident with an angle higher than critical angle, then the predicted ray of light after incidence

a) light ray follows path 1

b) light ray follows path 2

c) light ray follows path 3

d) light ray follows path 4



Time Allowed: 2.40 hours Section ----- I

Maximum Marks: 68

2. Answer briefly any Eight parts from the followings:-

8 × 2 = 16

- (i) Why do we find it useful to have two units for the amount of substance kilogram and the mole?
- (ii) Write the dimensions of pressure and density (iii) What are supplementary units? Define only one unit.
- (iv) Add the following masses given in kg upto appropriate precision. 2.189 , 0.089 , 11.8 and 5.32?
- (v) Under what circumstances would a vector have components that are equal in magnitude?
- (vi) What is the unit vector in the direction of the vector $\vec{A} = 4\hat{i} + 3\hat{j}$?
- (vii) Is it possible to add a vector quantity to a scalar quantity? Explain.
- (viii) What is ballistic missile? Define its trajectory.
- (ix) Show that the area between the velocity time graph is numerically equal to the distance covered by the object.
- (x) Motion with constant velocity is a special case of motion with constant acceleration. Is this statement true? Discuss.
- (xi) Calculate the work done in kilo joules in lifting a mass of 10 kg through a vertical height of 10 m.
- (xii) Differentiate between geyser and aquifer.

3. Answer briefly any Eight parts from the followings:-

8 × 2 = 16

- (i) Why does a diver change his body positions before and after diving in the pool?
- (ii) Show that orbital angular momentum, $L_o = mvr$
- (iii) State the direction of the following vectors in simple situations; angular momentum and angular velocity.
- (iv) Prove that $a_T = r\alpha$ where, a_T = tangential acceleration, r = radius of circle, α = angular acceleration.
- (v) Why does droplets appear to be suspended in air? (vi) What is meant by drag force?
- (vii) Name two characteristics of simple harmonic motion.
- (viii) Describe some common phenomena in which resonance plays an important role.
- (ix) Define the phenomenon of resonance. (x) Prove that $v = f\lambda$
- (xi) Explain why sound travels faster in warm air than in cold air? (xii) Explain the terms (a) trough (b) Antinode

4. Answer briefly any Six parts from the followings:-

6 × 2 = 12

- (i) How is the distance between interference fringes affected by the separation between the slits of Young's experiment? Can fringes disappear?
- (ii) Write two steps of Huygen's principle. What is its importance.
- (iii) How would you distinguish between un-polarized and plane-polarized lights?
- (iv) How you can increase the resolving power of a telescope?
- (v) How the power is lost in optical fibre through dispersion? Explain.
- (vi) A telescope is made of an objective of focal length 30 cm and an eye piece of 5 cm, both convex lenses. Find the angular magnification.
- (vii) Give an example of a process in which no heat is transferred to or from the system but the temperature of the system changes.
- (viii) How "Human Metabolism" provides an example of energy conservation and satisfies the first law of thermodynamics.
- (ix) What is Boltzman Constant. Calculate its numerical value.

Note: Attempt any three questions.

Section ----- II

(8 × 3 = 24)

5. (a) Define and explain the term torque. Derive expression for torque due to force acting on a rigid body.
(b) Prove that for angles of projection, which exceed or fall short of 45° by equal amounts, the ranges are equal.
6. (a) Discuss interconversion of Potential energy and Kinetic energy.
(b) A stationary wave is established in a string which is 120 cm long and fixed at both ends. The string vibrates in four segments, at a frequency of 120 Hz. Determine its wavelength and the fundamental frequency.
7. (a) What is the simple pendulum. Show that the motion of a simple pendulum is simple harmonic. Also derive expression for its time period and frequency.
(b) A gramophone record turntable accelerates from rest to an angular velocity of $45.0 \text{ rev min}^{-1}$ in 1.60 s. What is its average angular acceleration.
8. (a) Define molar specific heat of gas. Also prove $C_p - C_v = R$
(b) Water flows through a hose, whose internal diameter is 1cm at a speed of 1 ms^{-1} . What should be the diameter of the nozzle if the water is to emerge at 21 ms^{-1} .
9. (a) Describe the working of compound microscope, derive an expression for magnifying power and write the formula of length of compound microscope.
(b) X-rays of wavelength 0.150 nm are observed to undergo a first order reflection at a Bragg angle of 13.3° from a quartz (SiO_2) crystal. What is the interplanar spacing of the reflecting planes in the crystal?

Warning:- Please write your Roll No. in the space provided and sign. Roll No-----

Part - I

(Session 2020-22 to 2023-25)

Sig. of Student -----

Physics (Objective)

SGD-2-24 (Group II)

Paper (I)

Time Allowed:- 20 minutes

PAPER CODE 2478

Maximum Marks:- 17

Note:- You have four choices for each objective type question as A, B, C and D. The choice which you think is correct; fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Write PAPER CODE, which is printed on this question paper, on the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

- 1) In multimode step index fibre, the diameter of the core is
(A) $20\mu\text{m}$ (B) $30\mu\text{m}$ (C) $40\mu\text{m}$ (D) $50\mu\text{m}$
- 2) What remains constant in adiabatic process
(A) Pressure (B) Volume (C) Temperature (D) Entropy
- 3) Triple point of water is
(A) 273.16°C (B) 273.16°F (C) 273.16K (D) 373.16K
- 4) Significant figures in 0.00567 are
(A) 2 (B) 3 (C) 4 (D) 5
- 5) One light year is equal to
(A) $9 \times 10^{12}\text{m}$ (B) $9 \times 10^{13}\text{m}$ (C) $9 \times 10^{14}\text{m}$ (D) $9 \times 10^{15}\text{m}$
- 6) If the magnitude of $\vec{A} \cdot \vec{B} = \frac{1}{2}AB$ then the angle between \vec{A} and \vec{B} is
(A) 30° (B) 45° (C) 60° (D) 90°
- 7) The dimensions of torque are
(A) $[M^{-1}LT]$ (B) $[ML^{-1}T]$ (C) $[M^2LT^{-2}]$ (D) $[ML^2T^{-2}]$
- 8) When a body moves with constant acceleration, The velocity time graph is
(A) Hyperbola (B) Parabola (C) Curve (D) Straight line
- 9) Which hurt you maximum when the time of collision is
(A) 1 Sec (B) $\frac{1}{10}$ Sec (C) $\frac{1}{100}$ Sec (D) $\frac{1}{1000}$ Sec
- 10) The value of escape velocity is maximum for
(A) Earth (B) Moon (C) Jupiter (D) Mercury
- 11) A body of 1kg moving up with $a = g$ then its apparent weight is
(A) 9.8 N (B) 98 N (C) 9.6 N (D) 0.98 N
- 12) The moment of inertia of a ring is equal to
(A) $\frac{1}{2}mr^2$ (B) mr^2 (C) $\frac{2}{5}mr^2$ (D) $\frac{1}{4}mr^2$
- 13) One Torr is equal to
(A) 1.333Nm^2 (B) 13.33Nm^2 (C) 133.3Nm^2 (D) 1333Nm^2
- 14) By increasing mass of the object four times attached to a spring time period will become
(A) Twice (B) Thrice (C) Four times (D) Six times
- 15) The speed of sound in air at 30°C is approximately equal to
(A) 332 m/s (B) 335 m/s (C) 340 m/s (D) 350 m/s
- 16) The distance covered by wave in 1 second is
(A) Wavelength (B) Wave number (C) Wave speed (D) Frequency
- 17) Longitudinal waves do not exhibit
(A) Polarization (B) Diffraction (C) Reflection (D) Refraction

1131 - 1124 - 15000 (4)

1124 Warning:- Please, do not write anything on this question paper except your Roll No.

Physics (Subjective) Group (II) (Session 2020-22 to 2023-25) Paper (I)

Time Allowed: 2.40 hours Section ----- I (Inter Part - I) Maximum Marks: 68

2. Answer briefly any Eight parts from the followings:- $8 \times 2 = 16$

- (i) What are the three main frontiers of Physics. *SGD-2-24*
- (ii) Write two steps which are involved in the measurement of a base quantity.
- (iii) Show that the famous "Einstein equation" $E = mc^2$ is dimensionally consistent.
- (iv) Give the drawbacks to use the period of a pendulum as a time standard.
- (v) How would you explain "arbitrary direction" for a null vector obtained from east and west directed two equal in magnitude vectors.
- (vi) The vector sum of three equal in magnitudes vectors gives a zero resultant. What can be the orientation of the vectors.
- (vii) If one of the rectangular components of a vector is not zero, can its magnitude be zero? Explain
- (viii) How do you find out the height of a tower by using one of the equation of motion. Write all steps you take for measurement.
- (ix) Derive a formula for range of the projectile.
- (x) Why two projectiles fired with different initial horizontal velocities take same time to reach ground?
- (xi) What do you understand by the term "escape velocity". Give the value of escape velocity for Earth.
- (xii) Calculate the work done in kilo joules in lifting a mass of 10 kg through a vertical height of 10 m.

3. Answer briefly any Eight parts from the followings:- $8 \times 2 = 16$

- (i) A person is standing near a fast moving train. Is there any danger that he will fall towards it.
- (ii) Differentiate between systolic and diastolic pressure. Are these values varies with age.
- (iii) What do you mean by term weightlessness in satellite.
- (iv) What is moment of inertia? Explain its significance.
- (v) A disc and a hoop starts moving down from top of an inclined plane at the same time which will have great speed on reaching bottom.
- (vi) Why an object, orbiting the earth, is said to be freely falling, use your explanation to describe why objects appear weightless under certain circumstances.
- (vii) What are the values of velocity of a vibrating mass-spring system at its mean and extreme point.
- (viii) What should be the length of a simple pendulum whose time period is 1.0 sec. What does effect on length if time period is doubled.
- (ix) Describe phenomenon of tuning a radio. (x) How beats are useful in tuning musical instrument.
- (xi) Is it possible for two identical waves travelling in same direction, will give rise to stationary waves
- (xii) In an organ pipe, closed at one end, how does harmonic varies with length of air coulumn.

4. Answer briefly any Six parts from the followings:- $6 \times 2 = 12$

- (i) Differentiate between spherical and plane wave front. (ii) Can visible light produce interference fringes?
- (iii) How would you manage to get more orders of spectra using a diffraction grating?
- (iv) How a piece of paper is used to see a print clearly?
- (v) Why would it be advantageous to use blue light with a compound microscope?
- (vi) How light signal is transmitted through the optical fibre?
- (vii) Why does the pressure of a gas in a car tyre increase when it is driven through some distance?
- (viii) Why specific heat at constant pressure is greater than specific heat at constant volume?
- (ix) How can efficiency of Carnot Engine be increased?

Note: Attempt any three questions. Section ----- II $(8 \times 3 = 24)$

5. (a) Define elastic collision. Show that for elastic collision, relative speed of approach is equal to relative speed of separation.
- (b) Find the projection of vector $\vec{A} = 2\hat{i} - 8\hat{j} + \hat{k}$ in the direction of the vector $\vec{B} = 3\hat{i} - 4\hat{j} - 12\hat{k}$
6. (a) Define escape velocity. Prove that $v_{esc} = \sqrt{2gR}$ and also find out its value.
- (b) Find the temperature at which the velocity of sound in air is two times its velocity at 10°C .
7. (a) What is meant by geostationary orbit? Derive formula for its radius.
- (b) A simple pendulum is 50.0 cm long. What will be its frequency of vibration at a place where, $g = 9.8 \text{ ms}^{-2}$.
8. (a) What is Carnot engine. Explain its working and calculate its efficiency.
- (b) Certain globular protein particle has a density of 1246 kgm^{-3} . It falls through pure water ($\eta = 8.0 \times 10^{-4} \text{ kgm}^{-1} \text{ s}^{-1}$) with a terminal speed of 3.0 cmh^{-1} . Find the radius of the particle.
9. (a) Explain the diffraction of X-rays by crystals.
- (b) A glass light pipe in air will totally internally reflect a light ray if its angle of incidence is at least 39° . What is the minimum angle for total internal reflection if pipe is in water? (Refractive Index of water = 1.33)