

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)

S4D-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) 273.16 K (D) 373.16 K
- 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) 1.333 Nm^2 (B) 13.33 Nm^2 (C) 133.3 Nm^2 (D) 1333 Nm^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

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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)