

CODE : A-P223123-M

I Semester Exam 2024-25

4 x 790

Std. : XII

Sub. : PHYSICS

Marks : 70

Date :

Roll No. _____

Time : hrs.

General Instructions :-

1) The question paper is divided into four sections.

1) **Section A :** Q. No. 1 contains **Ten multiple choice** type questions carrying **One mark** each.Q. No. 2 contains **Eight very short answer** type questions carrying **One mark** each.2) **Section B :** Q. No. 3 to Q. No. 14 are **Twelve short answer** type questions carrying **Two marks** each. (Attempt any **Eight** questions.)3) **Section C :** Q. No. 15 to Q. No. 26 are **Twelve short answer** type questions carrying **Three marks** each. (Attempt any **Eight** questions.)4) **Section D :** Q. No. 27 to Q. No. 31 are **Five long answer** type questions carrying **Four marks** each. (Attempt any **Three** questions.)

5) Use the log table is allowed. Use of calculator is not allowed.

6) Figures to right indicate full marks.

7) For each multiple choice type of questions it is mandatory to write the correct answer along with its alphabet : e.g. a) / b) / c) / d)
No marks (s) shall be given if **ONLY** the correct answer or the alphabet of the correct answer is written. Only the first attempt will be considered for evaluation.8) **Physical constants :**

i) $c = 3 \times 10^8 \text{ m/s}$

ii) $h = 6.63 \times 10^{-34} \text{ J.S.}$

iii) $\pi = 3.142$

iv) $g = 9.8 \text{ m/s}^2$

v) $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/\text{N.m}^2$

vi) $\mu_0 = 4\pi \times 10^{-7} \text{ Wb/Am}$

vii) $\sigma = 5.7 \times 10^{-8} \text{ W/m}^2.\text{K}^4$

viii) Real gas constant $R = 8.31 \text{ J mol}^{-1} \text{ K}^{-1}$

ix) $e = 1.6 \times 10^{-19} \text{ C}$

Section - A**Q. 1** **Select and write the correct answer.****10**i) The angular displacement of a particle is 6 sec. on a circle with angular velocity $\frac{\pi}{3}$ rad/sec is _____.a) $\pi \text{ rad}$ b) $2\pi \text{ rad}$ c) $3\pi \text{ rad}$ d) $\frac{\pi}{2} \text{ rad}$ ii) The relation between relative permeability (μ_r) and magnetic susceptibility (χ_m) is _____.a) $\mu_r = 1 - \chi_m$ b) $\mu_r = 1 + \chi_m$ c) $\chi_m = \mu_r + 1$ d) $\chi_m = \mu_r$

iii) When unpolarized light is passed through a polarizer, its intensity _____.

a) decreases b) increases
c) remains unchanged d) depends on the orientation of the polarizer

iv) Accuracy of potentiometer can be easily increased by _____.

a) increasing resistance of wire
b) decreasing resistance of wire
c) increasing the length of wire
d) decreasing the length of wire

- Q. 9 State any two conditions for steady interference pattern.
- Q. 10 The photoelectric work function for a metal is 5 eV. Calculate the threshold frequency for the metal.
- Q. 11 With help of suitable diagram, state the expression for Biot-Savart's law in vector form.
- Q. 12 A telescope has an objective of diameter 2.5 m, what is its angular resolution when it is observed at 5500Å.
- Q. 13 A pipe amplitude of wave is represented by $y = 0.2 \sin 4\pi \left(\frac{t}{0.08} - \frac{x}{0.8} \right)$ in S.I. units. Find
a) wavelength
b) frequency of wave.
- Q. 14 In S.I units, the differential equations of S.H.M is $\frac{d^2x}{dt^2} = -36x$ Find its frequency and period.

Section - C

Attempt any Eight of the following :-

- Q. 15 State Ampere's circuital law. Using Ampere's circuital law obtain an expression for magnetic induction at a point due to a straight conductor carrying current. ✓
- Q. 16 With help of neat, labelled schematic diagram, explain the experimental set-up for photoelectric effect. ✓
- Q. 17 The wave length of two sound waves in air are $\frac{82}{173}$ m and $\frac{82}{171}$ m. They produce 9 beats per second. Calculate the velocity of sound in air.
- Q. 18 A small cyclotron of maximum radius 0.5 m accelerates protons in a 1.7 T magnetic field. Calculate the maximum kinetic energy of protons when they leave the cyclotron.
- Q. 19 Distinguish between Ammeter and Voltmeter. (Any 2 points).
Give one disadvantage of a potentiometer. ✓
- Q. 20 Obtain an expression for orbital magnetic moment of an electron rotating about the nucleus in an atom. ✓
- Q. 21 State and prove principle of parallel axes theorem. ✓
- Q. 22 Derive the laws of reflection of light using Huygen's Theory. ✓
- Q. 23 What is magnetization, magnetic intensity and magnetic susceptibility? ✓
- Q. 24 The wavelength and intensity of incident light is 4000Å and 0.1 W respectively. What is the minimum change in light energy? What is number of incident photons?
- Q. 25 A plane wave front of light of wavelength 5500Å is incident on two slits in a screen perpendicular to the direction of light rays. If the total separation of 10 bright fringes on the screen 2m away is 2 cm. Find the distance between the slits.
- Q. 26 The total energy of a particle of mass 200g, performing S.H.M. is 10^{-2} J. Find its maximum velocity and period, if the amplitude is 7 cm.

Section - D

Attempt any Three of the following :-

- Q. 27** Derive an expression for linear velocity at lowest position, midway position and top most position for a particle revolving in a vertical circle, if it has to just complete circular motion without string slackening at top.
- Q. 28** Define second's pendulum ? Derive formula for length of second's pendulum. A particle performing linear S.H.M has maximum velocity 25 cm/s and maximum acceleration 100 cm/s^2 find period of oscillation.
- Q. 29** State Kirchoff's law of electric network. (both laws)
A resistance of 3Ω is connected in parallel to a galvanometer of resistance 297Ω . Find the fraction of current passing through the galvanometer ?
- Q. 30** Show that only odd harmonics are present in the vibration of an air column in a pipe closed at one end.
- Q. 31** What is diffraction ? Explain its two types.
What must be the ratio of the slit width to the wavelength for a single slit to have the first diffraction minimum at 45° ?
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