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Preliminary Examination (2025-26)
Standard - XII

Subject : Physics

Marks : 70

Date : 05.01.2026

Time : 8.15 am to 11.15 am

General Instructions

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 contain Twelve short answer type of questions carrying two marks each. (Attempt any eight)
- 3) Section C: Q.No 15 to Q.No. 26 contain Twelve short answer type of questions carrying three marks each.(Attempt any eight)
- 4) Section D: Q.No.27 to Q.No. 31 contain Five long answer type of questions carrying Four marks each. (Attempt any Three)
- 5) Use of log table is allowed. Use of calculator is not allowed.
- 6) Figures to the right indicate full marks.
- 7) For multiple choice type questions only the first attempt will be considered for evaluation.
- 8) Physical constants
 - i) Mass of electron $m = 9.1 \times 10^{-31} \text{kg}$
 - ii) $\epsilon_0 = 8.85 \times 10^{-12} \text{C}^2 / \text{Nm}^2$
 - iii) $\pi = 3.142$
 - iv) Charge on electron $e = 1.6 \times 10^{-19} \text{C}$
 - v) $\mu_0 = 4\pi \times 10^{-7} \text{Wb} / \text{Am}$
 - vi) Planck's constant $h = 6.63 \times 10^{-34} \text{J.s}$
 - vii) Speed of light $c = 3 \times 10^8 \text{m/s}$
 - viii) $g = 9.8 \text{m/s}^2$
 - ix) Rydberg's constant $R_H = 1.097 \times 10^7 \text{m}^{-1}$
 - x) Stefan's constant $\sigma = 5.67 \times 10^{-8} \text{Jm}^{-2}\text{s}^{-1}\text{K}^{-4}$

SECTION A

Q.1 Select and write the correct answer for the following multiple choice type of questions. (10)

- i) The angle of contact for a liquid which wets the surface of a solid is _____.
a) zero b) acute c) obtuse d) 90°
- ii) In which thermodynamic process, change in internal energy ΔU , heat supplied Q and work done in the expansion W are all non-zero?
a) Isothermal b) Isochoric c) Isobaric d) Adiabatic
- iii) Which of the following phenomenon proves that light is a transverse wave?
a) Polarization b) Reflection c) Diffraction d) Interference
- iv) Electric field of an isolated charged metallic sphere at any interior point is _____.
a) one b) infinite c) proportional to field d) zero
- v) The resistance of an ideal voltmeter is _____.
a) infinite b) very low c) large d) zero
- vi) The energy possessed by a magnetic dipole when placed along the direction of the field is _____.
a) maximum b) zero c) minimum d) unaffected
- vii) The self inductance associated with coil is independent of _____.
a) current b) induced voltage c) time d) resistance of a coil
- viii) A flywheel of mass 50kg and radius of gyration about its axis of rotation is 0.6m. It is acted upon by a constant torque of 18Nm. If flywheel is at rest initially, what will be its angular velocity at $t = 8\text{sec}$?
a) 36 rad/s b) 4 rad/s c) 8 rad/s d) 18 rad/s
- ix) An athermanous metal plate has the coefficient of absorption 0.65. Its coefficient of reflection is _____.
a) 0.35 b) zero c) 0.45 d) 0.55
- x) An open pipe and closed pipe are in resonance with a tuning fork. The ratio of their lengths in first overtone is (open to closed pipe) _____.
a) $\frac{2}{3}$ b) $\frac{3}{4}$ c) $\frac{3}{2}$ d) $\frac{4}{3}$

Q.2 Answer the following questions. (8)

- i) What is net cohesive force acting on a water molecule completely inside a liquid?
- ii) What is adiabatic process?
- iii) What is Fraunhofer's diffraction?
- iv) Write the value of force on a closed circuit in a magnetic field?
- v) What is the power factor in LCR series circuit?

- vi) Name the device which convert solar energy into electrical energy using solar cells?
- vii) If the magnitude of torque is equal to the magnetic dipole moment and the axis of magnet is perpendicular to the field, then what is the magnitude of magnetic induction?
- viii) In hydrogen atom, radius of the smallest orbit of the electron is a_0 , then what will be the radius of the third orbit?

SECTION B

Attempt any eight questions of the following.

(16)

- Q.3** Distinguish between centripetal and centrifugal force. (any two)
- Q.4** State any two conditions for a steady interference pattern.
- Q.5** State formula for:
 - a) Inductive reactance
 - b) Capacitive reactance.
- Q.6** State
 - a) Stefan-Boltzmann law of radiation
 - b) Wien's Displacement law
- Q.7** Write the Boolean expression and truth table for EX-OR Gate.
- Q.8** Derive an expression for 'Half life Time' of a radioactive material using the law of Radioactive Decay.
- Q.9** Show that the bob of a simple pendulum performs linear S.H.M for small amplitude.
- Q.10** The mutual inductance (M) of the two coils is given as $1.5H$. The self inductances of the coil are : $L_1 = 5H$, $L_2 = 4H$. Find the coefficient of coupling between the coils.
- Q.11** A steel ball with radius 0.3 mm is falling with velocity of 2m/s at a time t , through a tube filled with glycerin having coefficient of viscosity 0.833 Ns/m^2 . Determine viscous force acting on the steel ball at that time.
- Q.12** Efficiency of a carnot cycle is 75% . If temperature of the hot reservoir is 727°C , calculate the temperature of the cold reservoir.
- Q.13** Find the distance between two successive nodes in a stationary wave on a string vibrating with frequency 64 Hz . The velocity of progressive wave that resulted in the stationary wave is 48m/s .
- Q.14** An electric dipole consists of two opposite charges each of magnitude $1\mu\text{C}$ separated by 2 cm . The dipole is placed in an external electric field of 10^5 N/C . Find the maximum torque exerted by the field on the dipole.

SECTION C

Attempt any EIGHT questions of the following.

(24)

- Q.15** What is isothermal process? Obtain an expression for work done by a gas in an isothermal process.
- Q.16** Explain the working of moving coil galvanometer (MCG) with the help of neat labelled diagram.
- Q.17** Derive an expression for excess pressure inside a liquid drop. Draw necessary diagram.

- Q.18** With the help of neat circuit diagram explain how a potentiometer is used to compare the emf of two cells by connecting the cells individually.
- Q.19** Obtain an expression for equivalent capacity for combination of three capacitors connected in series.
- Q.20** Show that all harmonics are present on a stretched string between two rigid supports.
- Q.21** Obtain an expression for orbital magnetic moment of an electron revolving around the nucleus of an atom.
- Q.22** Calculate the longest wavelength of Balmer series for H-atom. [$R_H = 1.097 \times 10^7 \text{ m}^{-1}$]
- Q.23** A student weighing 45 kg, is running with a speed of 8 km/hr on a footpath 2 m wide. Calculate de Broglie's wavelength of student. ($h = 6.63 \times 10^{-34} \text{ Js}$)
- Q.24** A magnetic needle placed in uniform magnetic field has magnetic moment of $2 \times 10^{-2} \text{ Am}^2$ and moment of inertia of $7.2 \times 10^{-7} \text{ kgm}^2$. It performs 10 complete oscillations in 10 sec. What is the magnitude of the magnetic field.
- Q.25** A light bulb is rated 100 W for 220 V, AC supply of 50 Hz. Calculate
- 1) resistance of the bulb.
 - 2) the rms current through the bulb.
- Q.26** In a double slit arrangement the slits are separated by a distance equal to 100 times the wavelength of the light passing through the slits.
- 1) What is the angular separation between the central maximum and an adjacent maximum?
 - 2) What is the distance between these maxima on a screen 50 cm from the slits?

SECTION D

Attempt any THREE questions of the following.

(12)

- Q.27** Derive an expression for a pressure exerted by a gas on the basis of kinetic theory of gases.
- Q.28** State and prove theorem of parallel axes.
- Q.29** a) Draw a neat labelled diagram of photocell.
 b) An aircraft of wing span of 60m flies horizontally in earth's magnetic field of $6 \times 10^{-5} \text{ T}$ at a speed of 500 m/s. Calculate the emf induced between the tips of wings of aircraft.
- Q.30** a) State Faraday's first and second law of Electromagnetic induction.
 b) An unknown resistance is placed in the left gap and resistance of 50 is placed in the right gap of a meter bridge. The null point is obtained at 40 cm from the left end. Determine the unknown resistance.
- Q.31** a) Write any two advantages of LED
 b) A circular coil of wire is made up of 200 turns, each of radius 10cm. If a current of 0.5 A passes through it. What will be the magnetic field at the centre of the coil.

