

KOLHAPUR. Preliminary Examination-I

Std. :- 12th Science

Sub : **Physics**

Max. Mark : 70

Date :- 19th Jan 2022

Pages (04)

Time : 3 Hrs

General Instructions:

- 1) The question paper is divided into four sections.
 - i) **Section 'A'**: Q. No. 1 contains 10 multiple choice type of questions carrying 1 mark each.
Q. No. 2 contains 8 very short answer type of questions carrying 1 mark each.
 - ii) **Section 'B'**: Q. No. 3 to Q. No. 14 contains 12 short answer type questions carrying 2 marks each.
 - iii) **Section 'C'**: Q. No 15 to Q. No. 26 contain 12 short answer type questions carrying 3 marks each.
 - iv) **Section 'D'**: Q. No. 27 to Q. No. 31 contain 5 long answer type questions carrying 4 marks each.
- 2) Use of log table is allowed. Use of calculator is not allowed.
- 3) Figure to the right indicate full marks. Start each section on new page.
- 4) For each MCQ's correct answer must be written along with its alphabets.
i.e. a)....., b)....., c)....., d).....
- 5) Only first attempt will be considered for evaluation.
- 6) **Physical constants:**
 - 1) $\mu_0 = 4\pi \times 10^{-7} \text{ Wb/Am}$
 - 2) $g = 9.8 \text{ m/s}^2$
 - 3) $\pi = 3.142$
 - 4) $c = 3 \times 10^8 \text{ m/s}$
 - 5) $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ SI Unit}$
 - 6) $R = 1.097 \times 10^7 / \text{m}$

SECTION – A

Q.1 Select and write the correct answer.

[10]

- i) If the mass of the electron is reduced to half, the Rydberg constant...
 - a) remains unchanged
 - b) becomes double
 - c) becomes half
 - d) becomes one fourth
- ii) For mercury and glass pair if F_c and F_A are cohesive and adhesive forces, then...
 - a) $F_c < F_A$
 - b) $F_c > F_A$
 - c) $F_c = F_A$
 - d) $F_c = F_{A/2}$
- iii) In which of the following process, heat is neither adsorbed nor released by a system?
 - a) isobaric
 - b) isochoric
 - c) isothermal
 - d) adiabatic

- iv) Resistance of ideal voltmeter should be ...
 a) zero
 b) finite
 c) infinite
 d) same as voltmeters which are in use
- v) According to Ampere's law, the line integral of the magnetic induction around a closed path is directly proportional to the enclosed...
 a) charge b) flux c) current d) energy
- vi) Eddy current do not cause...
 a) Damping b) Heating c) sparking d) loss of energy
- vii) If a photon has the same wavelength as the de Broglie wavelength of an electron, they have the same...
 a) velocity b) energy c) moments c) angular momentum
- viii) Two discs of the same material and thickness have radii 0.2 m and 0.6m. Their moments of inertia about the same axes will be in ratio of...
 a) 1 : 81 b) 1 : 27 c) 1 : 9 d) 1 : 3
- ix) If coefficient of absorption $a = 0.72$ and coefficient of reflection $r = 0.24$ then the value of coefficient of transmission t_r is ...
 a) 0.02 b) 0.04 c) 0.4 d) 0.2
- x) Young's double slit experiment is performed in a liquid it is found that the 10th bright band is the liquid lies where the 6th dark fringes lies in air. What is the refractive index of the liquid?
 a) 1.52 b) 1.62 c) 1.82 d) 1.22

Q.2 Answer the following.

[08]

- i) An alternating voltage is given by $e = 6 \sin 314t$. Find peak value of emf.
- ii) A plane wavefront of light of wavelength $5500 \text{ \AA}$ is incident on two slits in a screen perpendicular to the direction of light rays. If the separation of bright fringes on a screen 2m away is 0.2 cm. Find the distance between the slits.
- iii) State dimension of magnetization.
- iv) State zeroth law of thermodynamics.
- v) State at which point during an oscillation the oscillator has zero velocity but positive acceleration?
- vi) Why aperture is in front of conical projection in Ferry's black body?
- vii) If friction is zero, can a vehicle move on the road?
- viii) What is effect on surface tension when temperature of molten copper increases?

SECTION – B

Attempt any Eight of the following.

[16]

- Q.3 Draw neat labeled diagram for full wave rectifier.
- Q.4 The half-life of a nuclear species ${}^N\text{X}$ is 3.3 days. Calculate its decay constant.
- Q.5 A motor cyclist is to undertake horizontal circles inside the cylindrical wall of well of inner radius 4m. coefficient of static friction between tyre and the wall is 0.4. Calculate the minimum speed necessary to perform this stunt ($g=10\text{m/s}^2$)
- Q.6 Define isothermal process? Give its two examples.
- Q.7 A violin string vibrates with fundamental frequency of 440 Hz. What are the frequencies of first and second overtones?
- Q.8 State any two differences between Young's double slit interference pattern and single slit diffraction pattern.
- Q.9 Explain how potentiometer is used as voltage divider.
- Q.10 Obtain expression for magnetic force on a straight wire carrying a current.
- Q.11 State characteristics of series resonance circuit.
- Q.12 A sphere of radius 10cm carries a charge of $1\mu\text{C}$ calculate electric field at a distance of 30 cm from the centre of sphere.
- Q.13 Calculate the energy radiated in one minute by a blackbody of surface area 100 cm^2 when it is maintained at 227°C . (Stefan's constant $\sigma = 5.67 \times 10^{-8}$ SI unit)
- Q.14 Explain why liquid rises in capillary.

SECTION – C

Attempt any Eight of the following.

[24]

- Q.15 State Huygen's principle. Explain construction of spherical wavefront?
- Q.16 Derive an expression for the impedance of an LCR circuit connected to an AC power supply.
- Q.17 Write the Boolean expression with truth table for -
1) OR gate 2) AND gate 3) NAND gate
- Q.18 State the postulates of Bohr's atomic model.
- Q.19 Derive an expression for magnitude of induced emf across conducting rod of length ' l ' which is in translational motion with velocity ' v ' normal to the uniform magnetic field ' B '.

- Q.20** Obtain expression for pressure of ideal gas.
- Q.21** State and prove principle of parallel axes.
- Q.22** Twenty-seven droplets of water each of radius 0.1mm coalesce into a single drop. Find the change in surface energy. Surface tension of water is 0.072 N/m.
- Q.23** One mole of an ideal gas is initially kept in a cylinder with a movable frictionless and massless piston at pressure of 1.0×10^6 Pa, and temperature 27°C . It is then expanded till its volume doubled. How much work is done if the expansion is isobaric?
- Q.24** A search coil having 2000 turns with area 1.5 cm^2 is placed in magnetic field of 0.60T. The coil is moved rapidly out of the field in a time of 0.2 second. Calculate the induced emf across the search coil.
- Q.25** A galvanometer has a resistance of 40Ω and a current of 4 mA is needed for a full-scale deflection. What is the resistance and how it is to be connected to convert galvanometer a) into an ammeter of 0.4 A range, b) into a voltmeter of 0.5 V range.
- Q.26** Consider a closely wound 1000 turn coil having radius of 1m. If a current of 10 A passes through the coil. What will be the magnitude of magnetic field at the center?

SECTION – D

Attempt any Three of following.

[12]

- Q.27** Obtain differential equation of angular S.H.M.
Find the change in length of a Second's pendulum, if the acceleration due to gravity at the place changes from 9.75 m/s^2 to 9.8 m/s^2 .
- Q.28** Derive equation of stationary wave in a stretched string and prove that nodes and antinodes are equally spaced.
- Q.29** Obtain expression for energy stored in a capacitor? State its different forms.
- Q.30** Obtain an expression for orbital magnetic moment of an electron rotating about the nucleus in an atom.
A rod of magnetic material of cross section 0.25 cm^2 is located in 4000 Am^{-1} magnetic field. Magnetic flux passing through the rod is $25 \times 10^{-6} \text{ Wb}$. Find relative permeability of the material.
- Q.31** State Einstein's photoelectric equation. Explain any one characteristic of photoelectric effect. Calculate linear momentum of electron moving with kinetic energy of 100 eV passing through hole of diameter $2 \text{ \AA}$. (mass of electron = $9.1 \times 10^{-31} \text{ kg}$)

* * *