

## XII - PHYSICS

Time Allowed : 3-00 Hrs.

Maximum Marks: 70

## Part - I

15 x 1 = 15

- I. Choose the correct answer:
- An electric field  $\vec{E} = 10 \times \hat{i}$  exists in a certain region of space. Then the potential difference  $V = V_0 - V_A$ , where  $V_0$  is the potential at the origin and  $V_A$  is the potential at  $x = 2\text{m}$  is
    - 10 V
    - 20 V
    - +20 V
    - 10 V
  - The potential at a point due to a charge of  $4 \times 10^{-7}\text{ C}$  located at 0.09 m away is
    - $4 \times 10^4\text{ V}$
    - $4 \times 10^2\text{ V}$
    - $1 \times 10^{-2}\text{ V}$
    - $2 \times 10^2\text{ V}$
  - A wire connected to a power supply of 230 V has power dissipation  $P_1$ . Suppose the wire is cut into two equal pieces and connected parallel to the same power supply. In this case power dissipation is  $P_2$ . The ratio of  $P_2/P_1$  is
    - 1
    - 2
    - 3
    - 4
  - A thin insulated wire forms a plane spiral  $N = 100$  tight turns carrying  $I = 8\text{ mA}$  (milli ampere). The radii of inside and outside turns are  $a = 50\text{ mm}$  and  $b = 100\text{ mm}$  respectively. The magnetic induction at the center of the spiral is
    - $5\text{ }\mu\text{T}$
    - $7\text{ }\mu\text{T}$
    - $8\text{ }\mu\text{T}$
    - $10\text{ }\mu\text{T}$
  - A non-conducting charged ring carrying a charge of  $q$ , mass  $m$  and radius  $r$  is rotated about its axis with constant angular speed  $\omega$ . The ratio of its magnetic moment with angular momentum is
    - $\frac{q}{m}$
    - $\frac{2q}{m}$
    - $\frac{q}{2m}$
    - $\frac{q}{4m}$
  - A coil of area of cross section  $0.5\text{ m}^2$  with 10 turns is in a plane which is parallel to a uniform magnetic field of  $0.2\text{ Wb/m}^2$ . The flux through the coil is
    - 100 Wb
    - 10 Wb
    - 1 Wb
    - zero
  - In a series resonant RLC circuit the voltage across  $100\text{ }\Omega$  resistor is 40 V. The resonant frequency  $\omega$  is 250 rad/s. If the value of  $C$  is  $4\text{ }\mu\text{F}$ , then the voltage across  $L$  is
    - 600 V
    - 4000 V
    - 400 V
    - 1 V
  - Which of the following is NOT true for electromagnetic waves?
    - it transports energy
    - it transports momentum
    - it transports angular momentum
    - In vacuum, it travels with different speeds which depend on their frequency
  - For light incident from air on a slab of refractive index 2, the maximum possible angle of refraction is
    - $30^\circ$
    - $45^\circ$
    - $60^\circ$
    - $90^\circ$
  - The transverse nature of light is shown in
    - interference
    - diffraction
    - scattering
    - polarisation
  - In an electron microscope, the electrons are accelerated by a voltage of 14 kV. If the voltage is changed to 224 kV, then the de Broglie wavelength associated with the electronic would
    - increase by 2 times
    - decrease by 2 times
    - decrease by 4 times
    - increase by 4 times
  - Nuclear force is
    - electrostatic force
    - long range force
    - short range force
    - magnetic force
  - The ratio between the radius of first three orbits of hydrogen atom is
    - 1:2:3
    - 2:4:6
    - 1:4:9
    - 1:3:5

14. To obtain sustained oscillation in an oscillator
- feedback should be positive
  - feedback factor must be unity
  - phase shift must be 0 or  $2\pi$
  - all the above
15. The technology used for stopping the brain from processing pain is
- precision medicine
  - wireless brain sensor
  - virtual reality
  - radiology

**Part - II**

**II. Answer any 6 questions. (Q.No.24 is compulsory)**

6 x 2 = 12

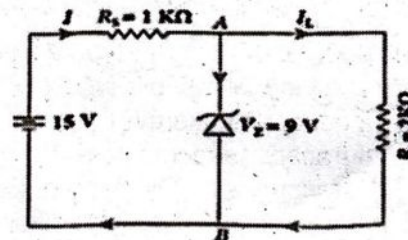
- Write any two applications of capacitors.
- State Peltier effect.
- Compute the magnitude of the magnetic field of a long straight wire carrying a current of 1A at distance 1 m from it. Compare it with the Earth's magnetic field.
- Mention the ways of producing induced emf.
- What are Fraunhofer lines.
- Define critical angle.
- Calculate the distance up to which ray optics is a good approximation for light of wavelength 500 nm falls on an aperture of width 0.5 mm.
- What is a photo cell? Write its types.
- Calculate the radius of  ${}_{79}^{197}\text{Au}$  nucleus.

**Part - III**

**III. Answer any 6 questions. (Q.No.33 is compulsory)**

6 x 3 = 18

- Derive an expression for the electric potential at a point due to a point charge.
- Two resistances  $4\ \Omega$  and  $6\ \Omega$  are connected in parallel with the 24 V battery. Calculate the equivalent resistance and the values of current in the circuit.
- Explain the conversion of galvanometer into an ammeter.
- How will you induce an emf by changing the area enclosed by the coil?
- Describe Hertz experiment.
- Two light sources with amplitudes 5 units and 3 units respectively interfere with each other. Calculate the ratio of maximum and minimum intensities.
- Derive an expression for de Broglie wavelength of electrons.
- Discuss the alpha decay process with example.
- Find the current through the Zener diode when the load resistance is  $2\ \text{k}\Omega$ . Use diode approximation.



**Part - IV**

**IV. Answer all the questions.**

5 x 5 = 25

- Deduce the relation for the magnetic field at a point due to an infinitely long straight conductor carrying current using Biot-Savart law. (OR)
  - Obtain the expression for electric field due to an infinitely long charged wire.
- How the emf of two cells are compared using potentiometer? (OR)
  - Find the phase relationship between voltage and current in a pure capacitive circuit.
- Explain the types of absorption spectrum. (OR)
  - Describe the Fizeau's method to determine the speed of light.
- Discuss the interference in thin films and obtain the equations for constructive and destructive interference for transmitted and reflected light. (OR)
  - Explain the spectral series of hydrogen atom.
- How do we obtain characteristic X-ray spectra?
    - Write to the uses of X-rays. (OR)
  - Draw the circuit diagram of half wave rectifier and explain its working.