

SECTION 'B' (Short-Answer Questions) (20)

NOTE: Answer any EIGHT part questions from this section. All questions carry equal marks. Draw diagrams where necessary.

2. i) A Carnot engine works between 800°C and 400°C , if source temperature is increased by 50°C or sink temperature is decreased by 50°C , then which will cause greater efficiency.

ii) What amount of current is required to produce a magnetic field of 3.2 Tesla at a distance of 2 cm from a long straight current carrying wire? ($\mu_0 = 4\pi \times 10^{-7}$ Weber/Am)

iii) In photo electric experiment, a stopping potential of 1.25 volt is needed. Find the maximum kinetic energy and maximum speed of photo electron $e = 1.6 \times 10^{-19}\text{C}$; $m_e = 9.1 \times 10^{-31}$ kg

iv) Write a note on Wilson Cloud Chamber.

v) What is semi conductor diode? Describe the working of full wave rectifier using semiconductor diode with the help of a circuit diagram.

vi) Define electric potential difference (V) and electric field intensity (\vec{E}). Derive relation $V = \vec{E} \cdot \vec{d}$

vii) A charge particle of charge $2 \times 10^{-9}\text{C}$, in an electric field between two parallel metal plates 4 cm apart, is acted upon by a force of 10^{-4}N

a) What is the intensity of the electric field?

b) What is potential difference between the plates,

viii) On what factors resistance of conductor at given temperature depends, Derive relevant formula.

ix) A 400 volt voltmeter has a total resistance of $40,000 \Omega$. What additional series resistance must be connected to it to increase the range to 750 volts?

x) Hydrogen atom in ground state is excited by absorbing a photon of 12.15eV . Find the quantum number of this excited state.

xi) If the number of atoms per gram of ${}_{88}\text{Ra}^{226}$ is 2.666×10^{21} and it decays with the half life of 1622 year. Find decay constant and activity of the sample.

xii) Who will be the velocity and momentum of particle whose rest mass is m_0 and whose K.E. (Kinetic Energy) is equal to its rest mass energy.

SECTION "C" (Detailed Answer Questions)(20)

NOTE: Attempt any TWO questions from this section. All questions carry equal marks. Draw diagrams where necessary.

3. a) State Ampere's law. Apply this law to find the magnetic field of induction inside a solenoid.

b) Explain Compton Effect and obtain an expression for the increase in the wavelength of the scatter photon.

4. a) Describe the construction and working of a moving coil Galvanometer. Show that the deflection produced in galvanometer is directly proportional to the current.

b) Derive an expression for total energy of the electron in the n^{th} orbit of a hydrogen atom.

5. a) Derive pressure formula of an ideal gas using kinetic molecular theory.

b) State Gauss's law and write mathematical expression. Apply this law to determine the electric field at a point close to a thin, infinite sheet of positive charges.