

PART - I

1. Which charge configuration produces a uniform electric field ?
 (a) Uniformly charged infinite plane
 (b) Point charge
 (c) Uniformly charged spherical shell
 (d) Uniformly charged infinite line
2. The blueprint for making ultra durable synthetic material is mimicked from :
 (a) Parrot fish (b) Lotus leaf
 (c) Peacock feather (d) Morpho butterfly
3. In a transformer, the number of turns in the primary and the secondary are 410 and 1230 respectively. If the current in primary is 6 A , then that in the secondary coil is :
 (a) 12 A (b) 2 A
 (c) 1 A (d) 18 A
4. Which of the following is false for electromagnetic waves ?
 (a) longitudinal
 (b) transverse
 (c) produced by accelerating charges
 (d) non-mechanical waves
5. If the nuclear radius of ^{27}Al is 3.6 fermi, the approximate nuclear radius of ^{64}Cu in fermi is :
 (a) 4.8 (b) 2.4
 (c) 3.6 (d) 1.2
6. The unit of electric flux is :
 (a) Nm^{-1}C^2 (b) $\text{Nm}^{-2}\text{C}^{-1}$
 (c) Nm^2C^{-1} (d) N^2mC^{-1}
7. In an oscillating LC circuit, the maximum charge on the capacitor is Q . The charge on the capacitor when the energy is stored equally between the electric and magnetic fields is :
 (a) $Q/\sqrt{2}$ (b) $Q/2$
 (c) Q (d) $Q/\sqrt{3}$
8. The ratio of magnetic length and geometrical length is :
 (a) 0.833 (b) 0.633
 (c) 0.933 (d) 0.733
9. The Zener diode is primarily used as :
 (a) Oscillator (b) Rectifier
 (c) Voltage regulator (d) Amplifier
10. If the Velocity and Wavelength of light in air is V_a and λ_a and that in water is V_w and λ_w , then the refractive index of water is :
 (a) $\frac{\lambda_w}{\lambda_a}$ (b) $\frac{V_w}{V_a}$
 (c) $\frac{V_a\lambda_a}{V_w\lambda_w}$ (d) $\frac{V_a}{V_w}$
11. For a healthy eye, the distance of the near point is ____ .
 (a) 30 cm (b) 20 cm
 (c) 35 cm (d) 25 cm
12. The internal resistance of a 2.1 V cell which gives a current of 0.2 A through a resistance of 10Ω is :
 (a) 0.8Ω (b) 0.2Ω
 (c) 1.0Ω (d) 0.5Ω
13. A particle having mass m and charge q accelerated through a potential difference V. Find the force experienced when it is kept under perpendicular magnetic field $\vec{B}$.

- (a) $\sqrt{\frac{2q^3 B^2 V}{m}}$ (b) $\sqrt{\frac{2q^3 B V}{m}}$
(c) $\sqrt{\frac{2q^3 B V}{m^3}}$ (d) $\sqrt{\frac{q^3 B^2 V}{2m}}$

14. In a Young's double slit experiment, the slit separation is doubled. To maintain the same fringe spacing on the screen, the screen-to-slit distance D must be changed to :

- (a) $\sqrt{2}D$ (b) 2 D
(c) $\frac{D}{\sqrt{2}}$ (d) $\frac{D}{2}$

15. Emission of electrons by the absorption of heat energy is called ____ emission.

- (a) Thermionic (b) Photoelectric
(c) Secondary (d) Field

PART - II

16. Mention the ways of producing induced emf.
17. Find the Polarizing angle for glass of refractive index 1.5 .
18. What is Peltier effect?
19. Define "Electrostatic Potential".
20. How will you define threshold frequency?
21. State Ampere's Circuital Law.
22. Why does sky appear blue?
23. Give two uses of IR radiation.
24. Dielectric strength of air is $4 \times 10^6 \text{Vm}^{-1}$. Suppose the radius of a hollow sphere in the Van de Graff generator is $R = 0.4 \text{ m}$, calculate the maximum potential difference created by this Van de Graaff generator.

PART - III

25. State Kirchhoff's current and voltage rule.
26. What are critical angle and total internal reflection?
27. List out the characteristics of Photons.
28. Obtain the expression for energy stored in the parallel plate capacitor.
29. Mention the differences between interference and diffraction.
30. The repulsive force between two magnetic poles in air is $9 \times 10^{-3} \text{ N}$. If the two poles are equal in strength and are separated by a distance of 10 cm. calculate the pole strength of each pole.
31. Draw the circuit diagram of a full wave rectifier and draw its input and output waveforms.
32. Mention the various energy losses in a transformer.
33. ${}_{92}\text{U}^{235}$ nucleus emits 2α particles, 3β particles and 2γ particles. What is the resulting atomic number and mass number ?

PART - IV

34. (a) Deduce the relation for the magnetic field at a point due to an infinitely long straight conductor carrying current.

OR

- (b) Obtain the law of radioactivity.

35. (a) Calculate the electric field due to a dipole on its axial line.

OR

- (b) What is Frequency Modulation ? List out the advantages and limitations of frequency modulation.

36. (a) (i) Derive an expression for de Broglie wavelength of electrons.
(ii) Calculate the momentum of an electron with kinetic energy 2 eV .

OR

- (b) Write down Maxwell equations in integral form.

37. (a) Explain about Astronomical telescope and obtain the equation for the magnification.

OR

(b) (i) Explain the equivalent resistance of a series resistor network.

(ii) A Copper wire of cross-sectional area 0.5 mm^2 carries a current of 0.2 A . If the free electron density of copper is $8.4 \times 10^{28} \text{ m}^{-3}$ then compute the drift velocity of free electrons.

38. (a) Obtain Lens maker's formula.

OR

(b) Derive an expression for phase angle between the applied voltage and current in a series RLC circuit.

