

Q1. The electric field at a point on the axis of an electric dipole is directed:

- (a) Perpendicular to the dipole
- (b) Along the dipole moment
- (c) Opposite to the dipole moment
- (d) None of these

Q2. A parallel plate capacitor with plate area A and plate separation d is filled with a dielectric of dielectric constant K . The capacitance of the system is:

- (a) $(\epsilon_0 A)/d$
- (b) $K(\epsilon_0 A)/d$
- (c) $(K A)/(\epsilon_0 d)$
- (d) $K \epsilon_0 A d$

Q3. A wire of resistance R is stretched to double its original length. The new resistance of the wire will be:

- (a) $2R$
- (b) $4R$
- (c) $R/2$
- (d) $R/4$

Q4. The drift velocity of electrons in a conductor is v when a potential difference V is applied across it. If V is doubled, the drift velocity will be:

- (a) $v/2$
- (b) v
- (c) $2v$
- (d) $4v$

Q5. Kirchhoff's first law is based on the conservation of:

- (a) Energy
- (b) Charge
- (c) Momentum
- (d) Angular momentum

Q6. The torque acting on a magnetic dipole in a uniform magnetic field is maximum when the angle between the magnetic moment and the field is:

- (a) 0°
- (b) 45°
- (c) 90°
- (d) 180°

Q7. A long straight conductor carrying current I produces a magnetic field B at a perpendicular distance r . The relation between B and r is:

- (a) $B \propto 1/r$
- (b) $B \propto 1/r^2$
- (c) $B \propto r$
- (d) $B \propto r^2$

Q8. In a moving coil galvanometer, the deflection of the coil is proportional to:

- (a) Current
- (b) Charge
- (c) Resistance
- (d) Voltage

Q9. A charged particle moves perpendicular to a uniform magnetic field. The path followed by the particle is:

- (a) Straight line
- (b) Parabola
- (c) Circle
- (d) Ellipse

Q10. The strength of an electromagnet can be increased by:

- (a) Increasing the number of turns in the coil
- (b) Using a laminated core
- (c) Using a soft iron core
- (d) All of these

Q11. Lenz's law is a consequence of:

- (a) Conservation of energy
- (b) Conservation of charge
- (c) Conservation of momentum

(d) Conservation of mass

Q12. A transformer works on the principle of:

- (a) Ohm's law
- (b) Faraday's law of electromagnetic induction
- (c) Kirchhoff's law
- (d) Coulomb's law

Q13. The inductive reactance of a coil increases when:

- (a) Frequency increases
- (b) Resistance increases
- (c) Capacitance decreases
- (d) Voltage increases

Q14. The power factor of a purely inductive circuit is:

- (a) 0
- (b) 1
- (c) 0.5
- (d) $\sqrt{2}$

Q15. In an AC circuit, the maximum value of current is I_0 and the RMS value is given by:

- (a) $I_0/\sqrt{2}$
- (b) $I_0/2$
- (c) $I_0/4$
- (d) $\sqrt{2} I_0$

Q16. The focal length of a convex lens is maximum when it is placed in:

- (a) Air
- (b) Water
- (c) Glass
- (d) Oil

Q17. A ray of light passing through the optical center of a lens:

- (a) Deviates from its path
- (b) Passes undeviated

- (c) Reflects back
- (d) Gets scattered

Q18. A convex lens behaves as a diverging lens when placed in a medium whose refractive index is:

- (a) Less than that of the lens
- (b) Greater than that of the lens
- (c) Equal to that of the lens
- (d) Zero

Q19. The critical angle for total internal reflection will be minimum for which pair of media?

- (a) Air and Glass
- (b) Water and Glass
- (c) Diamond and Air
- (d) Water and Air

Q20. The resolving power of a microscope can be increased by:

- (a) Increasing the wavelength of light
- (b) Decreasing the refractive index
- (c) Using light of shorter wavelength
- (d) Decreasing the aperture

Q21. Photoelectric effect demonstrates the:

- (a) Wave nature of light
- (b) Particle nature of light
- (c) Both (A) and (B)
- (d) Neither (A) nor (B)

Q22. The energy of a photon is given by:

- (a) $h\nu$
- (b) mc^2
- (c) mv^2
- (d) eV

Q23. A charged conductor is placed in a uniform electric field. The net force on the conductor is:

- (a) Always zero
- (b) Depends on charge distribution
- (c) Maximum at the center
- (d) Always nonzero

Q24. If a charge is placed inside a hollow conductor, then the induced charge on the inner surface is:

- (a) Equal to the placed charge but opposite in sign
- (b) Equal in magnitude and sign
- (c) Zero
- (d) Depends on the conductor

Q25. The capacitance of a parallel plate capacitor is increased n times when a dielectric of dielectric constant K is introduced. The relation between K and n is:

- (a) $K=n$
- (b) $K=1/n$
- (c) $K=n-1$
- (d) $K=n+1$

Q26. A parallel plate capacitor is connected to a battery and is fully charged. If the plate separation is doubled without disconnecting the battery, the energy stored will:

- (a) Increase
- (b) Decrease
- (c) Remain the same
- (d) Become zero

Q27. A wire of resistance R is bent into a circle. The resistance between two diametrically opposite points will be:

- (a) R
- (b) $2R$
- (c) $R/4$
- (d) $R/2$

Q28. A cell of emf E and internal resistance r is connected across an external resistance R . The voltage across the external resistance is maximum when:

- (a) $R = r$
- (b) $R \gg r$
- (c) $R \ll r$
- (d) $R = 0$

Q29. A charged particle moving in a uniform magnetic field follows a helical path. The pitch of the helix depends on:

- (a) Charge of the particle
- (b) Component of velocity perpendicular to the field

- (c) Component of velocity parallel to the field
- (d) Strength of the magnetic field

Q30. A circular coil of radius r carries a current I . At its center, the magnetic field is proportional to:

- (a) I/r
- (b) I/r^2
- (c) I^2/r
- (d) I/r^3

Q31. The torque experienced by a magnetic dipole in a uniform magnetic field is maximum when the angle between the dipole moment and field is:

- (a) 0°
- (b) 90°
- (c) 180°
- (d) 45°

Q32. If a coil is rotated in a uniform magnetic field, the magnitude of the induced emf is maximum when the plane of the coil is:

- (a) Perpendicular to the field
- (b) Parallel to the field
- (c) At 45° to the field
- (d) None of these

Q33. A resistor R , an inductor L , and a capacitor C are connected in series in an AC circuit. The condition for resonance is:

- (a) $L=C$
- (b) $R=L$
- (c) $R=C$
- (d) $X_L=X_C$

Q34. In an LCR circuit at resonance, the power factor is:

- (a) 1
- (b) 0
- (c) 0.5
- (d) $\sqrt{2}$

Q35. In Young's double-slit experiment, if the slit separation is doubled while keeping the screen at the same distance, the fringe width will:

- (a) Double

- (b) Halve
- (c) Remain the same
- (d) Increase four times

Q36. A convex lens has a focal length of 20 cm in air. When it is immersed in water, its focal length will:

- (a) Increase
- (b) Decrease
- (c) Remain unchanged
- (d) Become zero

Q37. A ray of light falls at the Brewster's angle on the surface of a transparent medium. The angle between the reflected and refracted rays is:

- (a) 0°
- (b) 45°
- (c) 90°
- (d) 180°

Q38. The maximum kinetic energy of emitted photoelectrons depends on:

- (a) Intensity of incident light
- (b) Frequency of incident light
- (c) Work function of the material
- (d) Both (B) and (C)

Q39. De Broglie wavelength associated with a charged particle moving in an electric field is inversely proportional to:

- (a) Charge of the particle
- (b) Velocity of the particle
- (c) Mass of the particle
- (d) Momentum of the particle

Q40. The speed of an electron in the first orbit of a hydrogen atom is proportional to:

- (a) n^2
- (b) $1/n$
- (c) $1/n^2$
- (d) n

Q41. Binding energy per nucleon is maximum for:

- (a) Hydrogen
- (b) Helium

- (c) Iron
- (d) Uranium

Q42. In amplitude modulation, the frequency of the modulated wave is:

- (a) Same as carrier wave
- (b) Less than carrier wave
- (c) More than carrier wave
- (d) Variable

Q43. In frequency modulation, the information is contained in:

- (a) Amplitude variations
- (b) Frequency variations
- (c) Phase variations
- (d) None of these

Q44. Which of the following waves is used for satellite communication?

- (a) Infrared
- (b) Ultraviolet
- (c) Microwaves
- (d) X-rays

Q45. A hollow metallic sphere is given a charge Q . The electric field inside the sphere will be:

- (a) Uniform and equal to Q/ϵ_0
- (b) Zero
- (c) Maximum at the center
- (d) Varies with the distance from the center

Q46. A charged particle is projected perpendicular to a uniform magnetic field. The time period of its circular motion depends on:

- (a) Velocity of the particle
- (b) Mass of the particle
- (c) Charge and mass of the particle
- (d) Radius of the circular path

Q47. The mutual inductance of two coils is 5H. If the current in one coil is changed at a rate of 2 A/s, the induced emf in the second coil is:

- (a) 0 V
- (b) 2.5 V
- (c) 10 V
- (d) 5 V

Q48. In a diffraction experiment, the width of the central maximum increases when:

- (a) Wavelength of light decreases
- (b) Width of the slit decreases
- (c) Distance between slit and screen decreases
- (d) Frequency of light increases

Q49. If the kinetic energy of an electron is doubled, the de Broglie wavelength associated with it:

- (a) Remains the same
- (b) Becomes half
- (c) Increases by $\sqrt{2}$ times
- (d) Decreases by $1/\sqrt{2}$ times

Q50. Which of the following is NOT an advantage of digital communication over analog communication?

- (a) Higher noise immunity
- (b) Better signal processing
- (c) Infinite bandwidth requirement
- (d) Easy data encryption

Solutions

S1.Ans.(b)

Sol. The electric field along the axis of an electric dipole aligns with the dipole moment direction.

S2.Ans.(b)

Sol. Capacitance increases by the dielectric constant K when a dielectric is introduced.

S3.Ans.(b)

Sol. Resistance increases as the square of the stretching factor; $R_{\text{new}} = 4R$.

S4.Ans.(c)

Sol. Drift velocity is directly proportional to applied voltage.

S5.Ans.(b)

Sol. Kirchhoff's first law is based on charge conservation.

S6.Ans.(c)

Sol. Maximum torque occurs when the angle is 90° .

S7.Ans.(a)

Sol. Magnetic field due to a straight conductor follows $B \propto 1/r$.

S8.Ans.(a)

Deflection in a galvanometer is proportional to the current.

S9.Ans.(c)

Sol. A charged particle in a perpendicular magnetic field follows a circular path.

S10.Ans.(d)

Sol. All methods listed increase the strength of an electromagnet.

S11.Ans.(a)

Sol. Lenz's law ensures energy conservation by opposing the cause.

S12.Ans.(b)

Sol. Transformers operate on electromagnetic induction.

S13.Ans.(a)

Sol. Inductive reactance increases with increasing frequency.

S14.Ans.(a)

Sol. In a purely inductive circuit, the power factor is zero.

S15.Ans.(a)

Sol. RMS value of AC current is given by $I_0/\sqrt{2}$.

S16.Ans.(a)

Sol. Air

S17.Ans.(b)

Sol. Passes undeviated

S18.Ans.(b)

Sol. Greater than that of the lens

S19.Ans.(c)

Sol. Diamond and Air

S20.Ans.(c)

Sol. Using light of shorter wavelength

S21.Ans.(b)

Sol. Particle nature of light

S22.Ans.(a)

Sol. $h\nu$

S23.Ans.(a)

Sol. Always zero

S24.Ans.(a)

Sol. Equal to the placed charge but opposite in sign

S25.Ans.(a)

Sol. $K=n$

S26.Ans.(b)

Sol. Decrease

S27.Ans.(d)

Sol. $R/2$

S28.Ans.(a)

Sol. $R = r$

S29.Ans.(c)

Sol. Component of velocity parallel to the field

S30.Ans.(a)

Sol. $1/r$

S31.Ans.(b)

Sol. 90°

S32.Ans.(b)

Sol. Parallel to the field

S33.Ans.(d)

Sol. $X_L = X_C$

S34.Ans.(a)

Sol. 1

S35.Ans.(b)

Sol. Halve

S36.Ans.(a)

Sol. Increase

S37.Ans.(c)

Sol. 90°

S38.Ans.(d)

Sol. Both (B) and (C)

S39.Ans.(d)

Sol. Momentum of the particle

S40.Ans.(b)

Sol. $1/n$

S41.Ans.(c)

Sol. Iron

S42.Ans.(a)

Sol. Same as carrier wave

S43.Ans.(b)

Sol. Frequency variations

S44.Ans.(c)

Sol. Microwave

S45.Ans.(b)

Sol. Zero

S46.Ans.(c)

Sol. Charge and mass of the particle

S47.Ans.(c)

Sol. 10 V

S48.Ans.(b)

Sol. Width of the slit decreases

S49.Ans.(d)

Sol. Decreases by $1/\sqrt{2}$ times

S50.Ans.(c)

Sol. Infinite bandwidth requirement