

Physics MCQ Practice

+2 2nd Year (Class XII)

55 questions · 14 chapters · answers with explanations

How to use: attempt each chapter's questions without looking, then check the Answer Key at the end. Read the one-line explanation for every question you got wrong, and revise that topic in your notes.

Electric Charges and Fields

- The SI unit of electric charge is
(a) ampere (b) coulomb
(c) volt (d) farad
- If the distance between two charges is doubled, the force between them becomes
(a) double (b) half
(c) one-fourth (d) four times
- The electric field inside a charged conducting sphere is
(a) maximum (b) zero
(c) equal to that on the surface (d) infinite
- Electric flux through a closed surface enclosing charge q is
(a) $q \epsilon_0$ (b) q/ϵ_0
(c) ϵ_0/q (d) zero
- The SI unit of electric dipole moment is
(a) C m (b) C/m
(c) N/C (d) V m

Electrostatic Potential and Capacitance

- Two $6 \mu\text{F}$ capacitors in series have an equivalent capacitance of
(a) $12 \mu\text{F}$ (b) $3 \mu\text{F}$
(c) $6 \mu\text{F}$ (d) $36 \mu\text{F}$
- The energy stored in a capacitor is
(a) CV (b) $\frac{1}{2}CV^2$
(c) CV^2 (d) $\frac{1}{2}QV^2$
- Inserting a dielectric (constant K) between the plates of a capacitor makes its capacitance
(a) K times (b) $1/K$ times
(c) unchanged (d) zero
- The work done in moving a charge along an equipotential surface is
(a) maximum (b) zero
(c) negative (d) infinite

Current Electricity

10. The SI unit of resistivity is
 (a) ohm (b) ohm metre
 (c) ohm per metre (d) siemens
11. Kirchhoff's junction rule is based on conservation of
 (a) energy (b) charge
 (c) momentum (d) mass
12. Three $6\ \Omega$ resistors in parallel have an equivalent resistance of
 (a) $18\ \Omega$ (b) $2\ \Omega$
 (c) $3\ \Omega$ (d) $6\ \Omega$
13. A Wheatstone bridge is balanced when
 (a) $P/Q = R/S$ (b) $P + Q = R + S$
 (c) $PQ = RS$ (d) $P - Q = R - S$
14. The resistance of a metal wire, when its temperature rises,
 (a) decreases (b) increases
 (c) stays the same (d) becomes zero

Moving Charges and Magnetism

15. The force on a charge q moving with velocity v in a magnetic field B is
 (a) qvB (b) $q(v \times B)$
 (c) $q(B \times v)$ (d) zero always
16. The magnetic force on a charge moving parallel to the field is
 (a) maximum (b) zero
 (c) qvB (d) infinite
17. An ammeter is made from a galvanometer by connecting
 (a) a high resistance in series
 (b) a low resistance in parallel (shunt)
 (c) a high resistance in parallel
 (d) a low resistance in series
18. Two parallel wires carrying current in the same direction
 (a) attract each other (b) repel each other
 (c) have no force (d) rotate

Magnetism and Matter

19. Which material is diamagnetic?
 (a) iron (b) aluminium
 (c) bismuth (d) nickel
20. Above the Curie temperature, a ferromagnet becomes
 (a) diamagnetic (b) paramagnetic
 (c) superconducting (d) more ferromagnetic
21. Magnetic susceptibility of a diamagnetic substance is
 (a) small and positive (b) small and negative
 (c) large and positive (d) zero

Electromagnetic Induction

22. Lenz's law is a consequence of conservation of
 (a) charge (b) energy
 (c) momentum (d) mass
23. The SI unit of self-inductance is
 (a) weber (b) henry
 (c) tesla (d) farad
24. The energy stored in an inductor carrying current I is
 (a) LI (b) $\frac{1}{2}LI^2$
 (c) LI^2 (d) $\frac{1}{2}L^2I$
25. Eddy currents are reduced by using
 (a) a solid core (b) a laminated core
 (c) a copper core (d) no core

Alternating Current

26. The rms value of an AC current with peak I_0 is
 (a) I_0 (b) $I_0/\sqrt{2}$
 (c) $\sqrt{2} I_0$ (d) $I_0/2$
27. At resonance in a series LCR circuit
 (a) $X_L > X_C$ (b) $X_L = X_C$
 (c) $X_L < X_C$ (d) $R = 0$
28. The power factor of a purely inductive circuit is
 (a) 1 (b) 0
 (c) 0.5 (d) infinite
29. A transformer works on
 (a) AC only (b) DC only
 (c) both AC and DC (d) neither

Electromagnetic Waves

30. Electromagnetic waves are
 (a) longitudinal (b) transverse
 (c) stationary (d) mechanical
31. The displacement current concept was introduced by
 (a) Faraday (b) Maxwell
 (c) Ampère (d) Hertz
32. Which EM wave has the shortest wavelength?
 (a) radio waves (b) X-rays
 (c) gamma rays (d) microwaves
33. The speed of EM waves in vacuum is
 (a) $1/\sqrt{(\mu_0\epsilon_0)}$ (b) $\sqrt{(\mu_0\epsilon_0)}$
 (c) $\mu_0\epsilon_0$ (d) $1/(\mu_0\epsilon_0)$

Ray Optics and Optical Instruments

34. The focal length of a spherical mirror of radius R is
 (a) R (b) R/2
 (c) 2R (d) R/4
35. The critical angle for glass ($\mu = 1.5$) is about
 (a) 30° (b) 42°
 (c) 48° (d) 60°
36. The power of a lens of focal length 50 cm is
 (a) +0.5 D (b) +2 D
 (c) +50 D (d) -2 D
37. Sparkling of diamond is due to
 (a) dispersion (b) total internal reflection
 (c) diffraction (d) polarisation
38. The magnifying power of an astronomical telescope (normal adjustment) is
 (a) $f_o \times f_e$ (b) f_o/f_e
 (c) f_e/f_o (d) $f_o + f_e$

Wave Optics

39. Fringe width in Young's double-slit experiment is
 (a) $\lambda d/D$ (b) $\lambda D/d$
 (c) $D/\lambda d$ (d) $d/\lambda D$
40. If the YDSE apparatus is put in water ($n = 4/3$), the fringe width
 (a) increases (b) decreases
 (c) stays the same (d) becomes zero
41. Polarisation shows that light waves are
 (a) longitudinal (b) transverse
 (c) stationary (d) sound-like

Dual Nature of Radiation and Matter

42. Photoelectric emission happens only if the light's frequency is above the
 (a) threshold frequency (b) critical frequency
 (c) resonant frequency (d) beat frequency
43. Increasing the intensity of light (same frequency) increases the
 (a) maximum kinetic energy of photoelectrons
 (b) number of photoelectrons
 (c) stopping potential
 (d) work function
44. The de Broglie wavelength of a particle is
 (a) h/p (b) p/h
 (c) hp (d) h/mc

Atoms

45. In Bohr's model, the energy of the hydrogen electron in the ground state is
 (a) +13.6 eV (b) -13.6 eV
 (c) -3.4 eV (d) 0 eV

46. The Balmer series of hydrogen lies in the
(a) ultraviolet region (b) visible region
(c) infrared region (d) X-ray region
47. Rutherford's α -scattering experiment showed that
(a) electrons orbit in fixed shells
(b) the atom has a tiny, dense, positive nucleus
(c) atoms are indivisible
(d) neutrons exist

Nuclei

48. 1 atomic mass unit is equivalent to about
(a) 931.5 MeV (b) 1 MeV
(c) 9.31 MeV (d) 13.6 eV
49. Nuclear fission of uranium-235 releases about
(a) 2 MeV per fission (b) 200 MeV per fission
(c) 200 eV per fission (d) 2 eV per fission
50. The energy source of the Sun is
(a) fission (b) fusion
(c) chemical burning (d) radioactive decay
51. Isotopes have the same
(a) mass number (b) number of protons
(c) number of neutrons (d) nuclear mass

Semiconductor Electronics

52. A p-type semiconductor is made by doping silicon with
(a) phosphorus (b) boron
(c) arsenic (d) antimony
53. In a forward-biased p-n junction, the depletion layer
(a) widens
(b) narrows
(c) stays the same
(d) disappears completely and current stops
54. A full-wave rectifier with 50 Hz input gives an output ripple frequency of
(a) 25 Hz (b) 50 Hz
(c) 100 Hz (d) 0 Hz
55. A Zener diode is mainly used as a
(a) rectifier (b) voltage regulator
(c) amplifier (d) oscillator

Answer Key with Explanations

Electric Charges and Fields

1. (b) coulomb — $1\text{ C} = 1\text{ A} \times 1\text{ s}$.
2. (c) one-fourth — Coulomb's law: $F \propto 1/r^2$.
3. (b) zero — Charges reside on the surface; E inside a conductor is zero.
4. (b) q/ϵ_0 — Gauss's law: $\phi = q/\epsilon_0$.
5. (a) C m — $p = q \times 2a$.

Electrostatic Potential and Capacitance

6. (b) $3\text{ }\mu\text{F}$ — $1/C = 1/6 + 1/6 \rightarrow C = 3\text{ }\mu\text{F}$.
7. (b) $\frac{1}{2}CV^2$ — $U = \frac{1}{2}CV^2 = Q^2/2C$.
8. (a) K times — $C = K\epsilon_0 A/d$.
9. (b) zero — $W = q\Delta V$ and $\Delta V = 0$.

Current Electricity

10. (b) ohm metre — $\rho = RA/l \rightarrow \Omega\text{ m}$.
11. (b) charge — Current entering a junction equals current leaving it.
12. (b) $2\text{ }\Omega$ — $1/R = 3/6 \rightarrow R = 2\text{ }\Omega$.
13. (a) $P/Q = R/S$ — Then no current flows through the galvanometer.
14. (b) increases — For metals $R = R_0(1 + \alpha\Delta T)$ with $\alpha > 0$.

Moving Charges and Magnetism

15. (b) $q(\mathbf{v} \times \mathbf{B})$ — Lorentz magnetic force $\mathbf{F} = q(\mathbf{v} \times \mathbf{B})$.
16. (b) zero — $\sin 0^\circ = 0$.
17. (b) a low resistance in parallel (shunt) — The shunt carries most of the current, keeping ammeter resistance low.
18. (a) attract each other — Like currents attract.

Magnetism and Matter

19. (c) bismuth — Bismuth is weakly repelled by a magnet.
20. (b) paramagnetic — Thermal agitation destroys domain alignment.
21. (b) small and negative — Diamagnets are magnetised opposite to the field.

Electromagnetic Induction

22. (b) energy — The induced current opposes the change, so work must be done to produce it.
23. (b) henry — $1\text{ H} = 1\text{ V s/A}$.
24. (b) $\frac{1}{2}LI^2$ — $U = \frac{1}{2}LI^2$.
25. (b) a laminated core — Laminations break up the current loops.

Alternating Current

26. (b) $I_0/\sqrt{2}$ — $I_{\text{rms}} = I_0/\sqrt{2}$.
27. (b) $XL = XC$ — Then $Z = R$ (minimum) and current is maximum.
28. (b) 0 — $\phi = 90^\circ$, $\cos 90^\circ = 0$, so no average power.
29. (a) AC only — It needs a changing flux, which DC cannot give.

Electromagnetic Waves

30. (b) transverse — E and B oscillate perpendicular to the direction of travel.
31. (b) Maxwell — Maxwell added it to Ampère's law.
32. (c) gamma rays — Gamma rays have the highest frequency.
33. (a) $1/\sqrt{(\mu_0\epsilon_0)}$ — $c = 1/\sqrt{(\mu_0\epsilon_0)} \approx 3 \times 10^8\text{ m/s}$.

Ray Optics and Optical Instruments

34. (b) $R/2$ — $f = R/2$.
35. (b) 42° — $\sin C = 1/1.5 = 0.667 \rightarrow C \approx 42^\circ$.

36. (b) $+2 D$ — $P = 1/f(m) = 1/0.5 = +2 D$ (convex).
 37. (b) total internal reflection — Diamond's small critical angle ($\approx 24^\circ$) traps light inside.
 38. (b) f_o/f_e — $m = f_o/f_e$.

Wave Optics

39. (b) $\lambda D/d$ — $\beta = \lambda D/d$.
 40. (b) decreases — λ in water $= \lambda/n$, so β also falls by n .
 41. (b) transverse — Only transverse waves can be polarised.

Dual Nature of Radiation and Matter

42. (a) threshold frequency — Below the threshold, no electrons are emitted however bright the light.
 43. (b) number of photoelectrons — More photons $\rightarrow$ more electrons, but each has the same $K_{\max}$.
 44. (a) h/p — $\lambda = h/p = h/mv$.

Atoms

45. (b) -13.6 eV — $E_n = -13.6/n^2 \text{ eV}$, and $n = 1$.
 46. (b) visible region — Transitions ending on $n = 2$.
 47. (b) the atom has a tiny, dense, positive nucleus — Most α -particles passed straight through; a few bounced back.

Nuclei

48. (a) 931.5 MeV — $1 \text{ u} \times c^2 \approx 931.5 \text{ MeV}$.
 49. (b) 200 MeV per fission — Typical energy release $\approx 200 \text{ MeV}$.
 50. (b) fusion — Hydrogen nuclei fuse into helium.
 51. (b) number of protons — Same Z , different number of neutrons.

Semiconductor Electronics

52. (b) boron — Trivalent boron creates holes.
 53. (b) narrows — The applied voltage opposes the barrier.
 54. (c) 100 Hz — Both halves are used, so the frequency doubles.
 55. (b) voltage regulator — In reverse breakdown it holds the voltage nearly constant.