ST ANDREWS SCOTS SENIOR SECONDARY SCHOOL

PHYSICS ASSIGNMENT

CHAPTER 1 TO 7

CLASS xII

CHAPTER 1: ELECTRIC CHARGES AND FIELDS

Q1. **Two point charges +q and -q are separated by distance r. The force between them is F. If the distance is doubled and charges remain same, the new force is:**

A) 2F
B) F/2
C) F/4
D) 4F

Q2. **Electric field intensity at a point on the axial line of an electric dipole of dipole moment p at distance r (r >> a) varies as:**

A) $1/r$
B) $1/r^2$
C) $1/r^3$
D) $1/r^4$

Q3. **A surface enclosed charge q. The total electric flux passing through the enclosed surface is given by Gauss's Law as:**

A) q / ε_0
B) $q\ \varepsilon_0$
C) zero
D) $q / (2\varepsilon_0)$

Q4. **The unit of electric permittivity of free space (ε_0) is:**

A) $C\ N^{-1}\ m^{-1}$
B) $C^2\ N^{-1}\ m^{-2}$
C) $N\ m^2\ C^{-2}$
D) $C^2\ N\ m^2$

Q5. **An electric dipole placed in a uniform electric field experiences:**

A) Net force only
B) Torque only
C) Both force and torque
D) Neither force nor torque

Q6. **The electric field inside a hollow conducting sphere carrying charge Q is:**

A) Non-zero and constant
B) Zero
C) Variable depending on radius
D) Infinite

Q7. **If an electric dipole is placed in a non-uniform electric field, it experiences:**

A) Only torque
B) Only net force
C) Both net force and torque
D) Neither force nor torque

Q8. The SI unit of electric dipole moment is:

A) C/m
B) C m
C) C/m^2
D) N/C

Q9. Two equal negative charges -q are fixed at points (0, a) and (0, -a). A positive charge Q is released from rest at (x, 0) where x << a. It will undergo:

A) Uniform motion
B) Simple Harmonic Motion
C) Circular motion
D) Parabolic path

Q10. A spherical Gaussian surface encloses a point charge q. If the radius of the sphere is doubled, the electric flux will:

A) Be doubled
B) Be halved
C) Remain unchanged
D) Increase four times

Q11. The angle between the electric dipole moment and the electric field for maximum potential energy is:

A) 0°
B) 90°
C) 180°
D) 45°

Q12. The dielectric constant of a metallic conductor is:

A) Zero
B) 1
C) Infinity
D) 80

Q13. Which of the following figures correctly represents the electric field lines for two equal positive charges?

A) Lines intersecting between charges
B) Lines repelling each other and curving outwards
C) Lines terminating on charges
D) Parallel lines

Q14. Electric flux over a closed surface containing zero net charge is:

A) Positive
B) Negative
C) Zero
D) Infinite

Q15. The work done in rotating an electric dipole of moment p in an electric field E from θ = 0° to θ = 180° is:

A) zero
B) pE
C) 2pE
D) -2pE

Q16. A soap bubble is given a negative charge. Its radius will:

A) Decrease
B) Increase
C) Remain same
D) Fluctuate

Q17. The dimensional formula of electric field intensity E is:

A) $[M\ L\ T^{-3}\ A^{-1}]$
B) $[M\ L\ T^{-2}\ A^{-1}]$

C) $[M L^2 T^{-3} A^{-1}]$

D) $[M L T^{-1} A^{-2}]$

Q18. A charge Q is placed at the center of an imaginary cube. The flux through any one face is:

A) Q / ε_0

B) $Q / (6\varepsilon_0)$

C) $Q / (4\varepsilon_0)$

D) $Q / (8\varepsilon_0)$

Q19. Quantization of electric charge implies that:

A) Charge cannot be created

B) Charge exists in discrete integral multiples of fundamental charge e

C) Total charge of isolated system is constant

D) Charge is continuous

Q20. Two point charges attract each other with force F in air. If dielectric medium of constant K is introduced between them, the force becomes:

A) F / K

B) F · K

C) F / K^2

D) $F \cdot K^2$

Q21. The ratio of electrostatic force to gravitational force between two protons separated by distance r is of the order of:

A) 10^{36}

B) 10^{38}

C) 10^{42}

D) 10^{24}

Q22. Force per unit positive test charge is defined as:

A) Electric potential

B) Electric flux

C) Electric field intensity

D) Capacitance

Q23. An electric dipole has components +q and -q separated by 2a. The field at distance r on equatorial line (r >> a) is proportional to:

A) 1/r

B) $1/r^2$

C) $1/r^3$

D) $1/r^4$

Q24. The force between two charges separated by distance r is F. If a copper plate of thickness r/2 is placed between them, the force becomes:

A) F/2

B) F/4

C) Zero

D) Infinite

Q25. The electric field at the surface of a charged conductor is:

A) Tangential to surface

B) Normal to surface everywhere

C) Zero

D) Inclined at 45°

CHAPTER 2: ELECTROSTATIC POTENTIAL AND CAPACITANCE

Q1. The electrostatic potential at a point on the equatorial plane of an electric dipole is:

A) Maximum
B) Minimum
C) Zero
D) Dependent on distance

Q2. The work done in moving a charge of 5 C across two points having a potential difference of 10 V is:

A) 2 J
B) 50 J
C) 0.5 J
D) 500 J

Q3. A parallel plate capacitor is charged and then disconnected from the battery. If the plate separation is increased, the capacitance:

A) Increases
B) Decreases
C) Remains same
D) Becomes zero

Q4. The equivalent capacitance of three capacitors each of capacitance C connected in series is:

A) 3C
B) C/3
C) C
D) 3/C

Q5. Energy stored in a capacitor of capacitance C charged to potential V is given by:

A) $1/2\ C\ V^2$
B) $C\ V^2$
C) $1/2\ C^2\ V$
D) C / V^2

Q6. Equipotential surfaces around an isolated point positive charge are:

A) Concentric cylinders
B) Concentric spheres
C) Parallel planes
D) Hyperbolic surfaces

Q7. When a dielectric slab of dielectric constant K is inserted between plates of a connected battery capacitor, energy stored:

A) Increases K times
B) Decreases K times
C) Remains same
D) Becomes zero

Q8. The unit of electric potential difference is Volt, which is equivalent to:

A) Joule / Coulomb
B) Joule · Coulomb
C) Newton / Coulomb
D) Ampere / Volt

Q9. Two metallic spheres of radii R_1 and R_2 are charged to same potential. The ratio of their surface charge densities is:

A) R_1 / R_2
B) R_2 / R_1
C) R_1^2 / R_2^2
D) 1

Q10. **The capacitance of a spherical conductor of radius R is:**

A) $4\pi \varepsilon_0 R$
B) $4\pi \varepsilon_0 / R$
C) $2\pi \varepsilon_0 R$
D) $\varepsilon_0 R$

Q11. **The potential energy of a system of two point charges q_1 and q_2 separated by distance r is:**

A) $q_1q_2 / (4\pi \varepsilon_0 r)$
B) $q_1q_2 / (4\pi \varepsilon_0 r^2)$
C) $q_1q_2 / (2\pi \varepsilon_0 r)$
D) Zero

Q12. **An equipotential surface is a surface where:**

A) Potential varies linearly
B) Potential is same at all points
C) Electric field is zero
D) Charge is zero

Q13. **The angle between electric field lines and an equipotential surface is always:**

A) 0°
B) 45°
C) 90°
D) 180°

Q14. **Three capacitors of 2 μF, 3 μF, and 6 μF are connected in series. The effective capacitance is:**

A) 11 μF
B) 1 μF
C) 6 μF
D) 0.5 μF

Q15. **If a dielectric slab of dielectric constant K is introduced in a charged isolated capacitor, the electric field between plates:**

A) Increases K times
B) Decreases K times
C) Remains unchanged
D) Becomes zero

Q16. **Work done in moving a test charge over an equipotential surface is:**

A) Maximum
B) Minimum
C) Zero
D) Infinite

Q17. **Two capacitors of capacitances 3 μF and 6 μF are connected in parallel across 12 V. Total charge drawn is:**

A) 108 μC
B) 36 μC
C) 72 μC
D) 18 μC

Q18. **The energy density in the electric field between capacitor plates is:**

A) $1/2\ \varepsilon_0 E^2$
B) $1/2\ \varepsilon_0^2 E$
C) $\varepsilon_0 E^2$
D) $1/2\ E / \varepsilon_0$

Q19. **A hollow conducting metal sphere of radius 5 cm is charged such that potential at surface is 10 V. Potential at center is:**

A) 0 V
B) 10 V
C) 5 V
D) 20 V

Q20. **Polarization vector P is related to electric field E and susceptibility χ as:**

A) $P = \varepsilon_0 \chi E$

B) $P = \chi E / \varepsilon_0$

C) $P = E / (\varepsilon_0 \chi)$

D) $P = \varepsilon_0 E / \chi$

Q21. Capacitance of a parallel plate capacitor does NOT depend on:

A) Plate area

B) Plate distance

C) Medium between plates

D) Metal material of plates

Q22. If 1000 identical drops of water each of radius r and charge q combine to form a big drop, potential of big drop is:

A) 10 times small drop

B) 100 times small drop

C) 1000 times small drop

D) Same

Q23. A variable capacitor is connected to a 200V battery. If capacitance changes from 2 μF to 10 μF, change in energy is:

A) 0.16 J

B) 0.32 J

C) 1.6 J

D) 0.08 J

Q24. The slope of V versus Q graph for a capacitor represents:

A) Capacitance C

B) 1 / Capacitance (1/C)

C) Energy stored

D) Electric field

Q25. The work done to place a charge of 8×10^{-18} C on a condenser of capacity 100 μF is:

A) 3.2×10^{-31} J

B) 1.6×10^{-31} J

C) $4 \times 10^{-3}2$ J

D) 3.2×10^{-32} J

CHAPTER 3: CURRENT ELECTRICITY

Q1. **The drift velocity v_d of electrons depends on electric field E as:**

A) $v_d \propto E$
B) $v_d \propto 1/E$
C) $v_d \propto E^2$
D) $v_d \propto \sqrt{E}$

Q2. **Ohm's law is valid when the temperature of conductor is:**

A) Very high
B) Very low
C) Constant
D) Continuously changing

Q3. **Specific resistance (resistivity) of a wire depends on:**

A) Length
B) Cross-sectional area
C) Material and temperature
D) Mass

Q4. **The temperature coefficient of resistance is negative for:**

A) Copper
B) Germanium (Semiconductors)
C) Nichrome
D) Silver

Q5. **Kirchhoff's First Rule (Loop / Junction rule $\Sigma I = 0$) is based on conservation of:**

A) Energy
B) Charge
C) Momentum
D) Mass

Q6. **Kirchhoff's Second Rule (Loop rule $\Sigma \Delta V = 0$) is based on conservation of:**

A) Charge
B) Energy
C) Momentum
D) Angular momentum

Q7. **In a Wheatstone bridge circuit, maximum sensitivity is achieved when four resistances are:**

A) Very high
B) Very low
C) Nearly equal
D) Unbalanced

Q8. **If a wire of resistance R is stretched to double its original length, its new resistance becomes:**

A) 2 R
B) 4 R
C) R / 2
D) R / 4

Q9. **The color code on a resistor reads: Yellow, Violet, Brown, Gold. Its resistance value is:**

A) 470 Ω ± 5%
B) 47 Ω ± 10%
C) 4700 Ω ± 5%
D) 4.7 Ω ± 5%

Q10. **Internal resistance of a cell increases with:**

A) Increase in temperature
B) Decrease in concentration of electrolyte
C) Increase in distance between electrodes
D) Increase in electrode area

Q11. Two copper wires of lengths L and 2L have radii r and 2r respectively. Ratio of their specific resistances is:

A) 1 : 2
B) 2 : 1
C) 1 : 1
D) 1 : 4

Q12. Current density J is related to electric field E and conductivity σ by:

A) $J = \sigma E$
B) $J = E / \sigma$
C) $J = \sigma / E$
D) $J = \sigma^2 E$

Q13. Mobility of free electrons is defined as:

A) Drift velocity per unit electric field
B) Electric field per unit drift velocity
C) Relaxation time per unit mass
D) Current density per unit area

Q14. SI unit of electrical conductivity is:

A) Ω m
B) $\Omega^{-1} m^{-1}$ ($S m^{-1}$)
C) Ωm^{-1}
D) $\Omega^{-1} m$

Q15. Three resistors 2 Ω, 3 Ω, and 6 Ω are connected in parallel. Total resistance is:

A) 11 Ω
B) 1 Ω
C) 0.5 Ω
D) 6 Ω

Q16. A cell of emf E and internal resistance r is connected across external resistance R. Terminal potential difference V is:

A) $E + Ir$
B) $E - Ir$
C) E / r
D) $I R + E$

Q17. When cell is being charged, its terminal potential difference V is:

A) $V = E - Ir$
B) $V = E + Ir$
C) $V = E$
D) $V = 0$

Q18. Potentiometer is preferred over voltmeter for measuring emf because:

A) It draws heavy current
B) It draws no current at balance point
C) It is portable
D) It has low resistance

Q19. The relaxation time of electrons in metals with increase in temperature:

A) Increases
B) Decreases
C) Remains constant
D) First increases then decreases

Q20. Power dissipated in a resistor R carrying current I is given by:

A) $I R$
B) $I^2 R$

C) $I R^2$

D) I / R

Q21. Two electric bulbs rated (60W, 220V) and (100W, 220V) are connected in series across 220V source. Which bulb glows brighter?

A) 60 W bulb

B) 100 W bulb

C) Both glow equally

D) Neither glows

Q22. The resistance of an ideal ammeter and ideal voltmeter respectively are:

A) Zero, Infinity

B) Infinity, Zero

C) Zero, Zero

D) Infinity, Infinity

Q23. Dimensions of electrical resistance are:

A) $[M L^2 T^{-3} A^{-2}]$

B) $[M L^2 T^{-3} A^{-1}]$

C) $[M L T^{-2} A^{-2}]$

D) $[M L^3 T^{-3} A^{-2}]$

Q24. The electric current in a conductor is due to flow of:

A) Positive ions

B) Free electrons

C) Bound electrons

D) Protons

Q25. A uniform wire of resistance 12 Ω is bent in the form of a circle. Effective resistance between two diametrically opposite points is:

A) 12 Ω

B) 6 Ω

C) 3 Ω

D) 1.5 Ω

CHAPTER 4: MOVING CHARGES AND MAGNETISM

Q1. **The magnetic field at the center of a circular loop of radius R carrying current I is:**

A) $\mu_0 I / (2 R)$
B) $\mu_0 I / (4\pi R)$
C) $\mu_0 I / (2\pi R)$
D) $\mu_0 I R / 2$

Q2. **Biot-Savart Law in vector form is written as dB =**

A) $(\mu_0 / 4\pi) I (d\vec{l} \times \hat{r}) / r^2$
B) $(\mu_0 / 4\pi) I (d\vec{l} \cdot \vec{r}) / r^3$
C) $(\mu_0 / 4\pi) I (d\vec{l} \times \vec{r}) / r$
D) $(\mu_0 / 4\pi) I d\vec{l} / r^2$

Q3. **Lorentz force on a charge q moving with velocity v in magnetic field B and electric field E is:**

A) $F = q (E + v \times B)$
B) $F = q (E \cdot v + B)$
C) $F = q (v \times E + B)$
D) $F = q (E - v \times B)$

Q4. **A charged particle moves perpendicular to a uniform magnetic field. Its path will be:**

A) Straight line
B) Circular
C) Helical
D) Parabolic

Q5. **The magnetic force on a charge q moving with velocity v parallel to magnetic field B is:**

A) q v B
B) Zero
C) q v B / 2
D) Infinite

Q6. **Cyclotron frequency is independent of:**

A) Charge of particle
B) Mass of particle
C) Radius of trajectory and velocity
D) Magnetic field intensity

Q7. **SI unit of magnetic field B is Tesla, which is equivalent to:**

A) $N A^{-1} m^{-1}$
B) $N A m^{-1}$
C) $N A^{-1} m^{-2}$
D) $J A^{-1} m^{-1}$

Q8. **Two long parallel straight wires carrying current in same direction:**

A) Repel each other
B) Attract each other
C) Exert no force
D) Rotate perpendicular

Q9. **The force per unit length between two parallel current-carrying conductors is:**

A) $(\mu_0 I_1 I_2) / (2\pi d)$
B) $(\mu_0 I_1 I_2) / (4\pi d)$
C) $(\mu_0 I_1 I_2) / (2 d)$
D) $(\mu_0 I_1 I_2) d / 2\pi$

Q10. **To convert a galvanometer into an ammeter, we connect:**

A) High resistance in series
B) Low resistance (shunt) in parallel
C) High resistance in parallel
D) Low resistance in series

Q11. To convert a galvanometer into a voltmeter, we connect:

A) High resistance in series
B) Low resistance in parallel
C) Low resistance in series
D) High resistance in parallel

Q12. Magnetic dipole moment of a current loop of area A with N turns carrying current I is:

A) $M = N I A$
B) $M = N I / A$
C) $M = I A / N$
D) $M = N^2 I A$

Q13. Gyromagnetic ratio of an electron orbiting in an atom is:

A) $e / (2 m_e)$
B) $2 m_e / e$
C) $e m_e / 2$
D) e / m_e

Q14. The deflection θ produced in a moving coil galvanometer is related to current I as:

A) $I \propto \sin\theta$
B) $I \propto \theta$
C) $I \propto \tan\theta$
D) $I \propto \theta^2$

Q15. In a radial magnetic field, the angle between plane of coil and magnetic lines of force is:

A) 0° (field parallel to plane)
B) 90°
C) 45°
D) 180°

Q16. The magnetic field at distance r from long straight current-carrying wire varies as:

A) $1/r$
B) $1/r^2$
C) r
D) $1/r^3$

Q17. Current sensitivity of a galvanometer is defined as:

A) Deflection per unit voltage
B) Deflection per unit current (θ / I)
C) Current per unit deflection
D) Voltage per unit deflection

Q18. Work done by a magnetic field on a moving charged particle is always:

A) Positive
B) Negative
C) Zero
D) Dependent on velocity

Q19. A proton and an alpha particle enter a uniform magnetic field perpendicularly with same velocity. Ratio of radii of their paths r_p / r_α is:

A) 1 : 2
B) 2 : 1
C) 1 : 4
D) 1 : 1

Q20. An ideal solenoid has magnetic field inside given by:

A) $B = \mu_0 n I$
B) $B = \mu_0 N I$

C) $B = \mu_0 I / (2 n)$

D) B = zero

Q21. Dimensions of magnetic field B are:

A) $[M T^{-2} A^{-1}]$

B) $[M L T^{-2} A^{-1}]$

C) $[M T^{-1} A^{-2}]$

D) $[M L T^{-1} A^{-1}]$

Q22. The nature of force between two moving charges with parallel velocities v is:

A) Only electrostatic

B) Only magnetic

C) Both electrostatic and magnetic

D) Neither

Q23. A circular coil of 100 turns has radius 8 cm and current 0.4 A. Magnetic field at center is:

A) 3.14×10^{-4} T

B) 6.28×10^{-4} T

C) 1.25×10^{-4} T

D) 2.51×10^{-4} T

Q24. Ampere's Circuital Law is given by:

A) $\oint B \cdot dl = \mu_0 I\_enclosed$

B) $\oint E \cdot dl = \mu_0 I$

C) $\oint B \cdot dA = \mu_0 I$

D) $\oint B \cdot dl = 0$

Q25. Bohr magneton is defined as the magnetic moment of electron in:

A) First orbit of hydrogen atom

B) Free state

C) Nucleus

D) Excited state

CHAPTER 5: MAGNETISM AND MATTER

Q1. The net magnetic flux through any closed Gaussian surface is:

A) Positive
B) Negative
C) Zero
D) Infinite

Q2. Which of the following materials is repelled by a magnet?

A) Ferromagnetic
B) Paramagnetic
C) Diamagnetic
D) Ferrimagnetic

Q3. The magnetic susceptibility χ is negative and small for:

A) Diamagnetic materials
B) Paramagnetic materials
C) Ferromagnetic materials
D) Non-magnetic materials

Q4. Curie's Law states that magnetic susceptibility of paramagnetic material is:

A) Directly proportional to absolute temperature T
B) Inversely proportional to absolute temperature T ($\chi \propto 1/T$)
C) Independent of temperature
D) Proportional to T^2

Q5. At Curie temperature, a ferromagnetic material becomes:

A) Diamagnetic
B) Paramagnetic
C) Superconducting
D) Strongly magnetic

Q6. The SI unit of magnetic dipole moment is:

A) A m^2
B) A / m
C) T m
D) J / T^2

Q7. The angle of dip at the magnetic poles of Earth is:

A) 0°
B) 45°
C) 90°
D) 180°

Q8. The angle of dip at the Earth's magnetic equator is:

A) 0°
B) 45°
C) 90°
D) 60°

Q9. Relative magnetic permeability μ_r for a diamagnetic substance is:

A) μ_r > 1
B) 0 < μ_r < 1
C) μ_r >> 1
D) μ_r = 0

Q10. Permanent magnets are made of materials having:

A) High retentivity and high coercivity
B) Low retentivity and low coercivity
C) High retentivity and low coercivity
D) Low retentivity and high coercivity

Q11. Transformer cores are made of soft iron because soft iron has:

A) Low retentivity and high coercivity
B) Low hysteresis loss and high permeability
C) High hysteresis loss
D) Zero permeability

Q12. The horizontal and vertical components of Earth's magnetic field are equal at angle of dip equal to:

A) 30°
B) 45°
C) 60°
D) 90°

Q13. Unit of magnetic susceptibility χ is:

A) A/m
B) Dimensionless / No units
C) Tesla
D) Weber

Q14. Magnetic lines of force form:

A) Open curves
B) Continuous closed loops
C) Discontinuous lines
D) Straight lines only

Q15. The magnetic field at a point on axial line of bar magnet of length 2l at distance r (r >> l) is:

A) $(\mu_0 / 4\pi) (2M / r^3)$
B) $(\mu_0 / 4\pi) (M / r^3)$
C) $(\mu_0 / 4\pi) (M / r^2)$
D) $(\mu_0 / 4\pi) (2M / r^2)$

Q16. The magnetic field on equatorial line of bar magnet is:

A) Parallel to dipole moment M
B) Anti-parallel to dipole moment M
C) Perpendicular to M
D) Zero

Q17. Which material shows hysteresis loop phenomenon?

A) Diamagnetic
B) Paramagnetic
C) Ferromagnetic
D) All of these

Q18. The area of hysteresis loop represents:

A) Retentivity
B) Coercivity
C) Energy dissipation per unit volume per cycle
D) Magnetic susceptibility

Q19. Earth's magnetic field points broadly from:

A) Geographic North to South
B) Geographic South to North
C) Geographic East to West
D) Geographic West to East

Q20. Elements of Earth's magnetic field at a place are:

A) Magnetic declination, Angle of dip, Horizontal component B_H
B) Dip angle, Declination, Latitude
C) Longitude, Latitude, Dip
D) B_H, B_V, B_total

Q21. **A bar magnet of dipole moment M is cut into two equal halves perpendicular to length. Dipole moment of each half is:**

A) M
B) M / 2
C) 2 M
D) M / 4

Q22. **A bar magnet of dipole moment M is cut into two equal halves parallel to length. Dipole moment of each half is:**

A) M
B) M / 2
C) 2 M
D) M / 4

Q23. **When a diamagnetic rod is suspended freely in a uniform magnetic field, it aligns:**

A) Parallel to magnetic field
B) Perpendicular to magnetic field
C) At 45° to field
D) Does not align

Q24. **Electromagnets are made of soft iron because it has:**

A) High retentivity, high coercivity
B) High retentivity, low coercivity
C) Low retentivity, low coercivity
D) Low retentivity, high coercivity

Q25. **Gauss's Law for magnetism ($\oint B \cdot dA = 0$) indicates that:**

A) Isolated magnetic monopoles do not exist
B) Magnetic poles always exist in pairs
C) Net magnetic flux over closed surface is zero
D) All of the above

CHAPTER 6: ELECTROMAGNETIC INDUCTION

Q1. Faraday's Law states that induced emf in a circuit is proportional to:

A) Magnetic flux
B) Rate of change of magnetic flux
C) Area of loop
D) Resistance of loop

Q2. Lenz's Law is a direct consequence of the law of conservation of:

A) Charge
B) Mass
C) Energy
D) Momentum

Q3. The SI unit of magnetic flux is:

A) Weber (Wb)
B) Tesla (T)
C) Henry (H)
D) Gauss

Q4. The SI unit of self-inductance and mutual inductance is:

A) Weber
B) Tesla
C) Henry (H)
D) Ohm

Q5. Induced emf produced in a conductor of length L moving with velocity v in magnetic field B perpendicular to it is:

A) $e = B L v$
B) $e = B L / v$
C) $e = B v / L$
D) $e = B^2 L v$

Q6. Self-inductance of a solenoid of N turns, area A and length l is given by:

A) $L = \mu_0 N^2 A / l$
B) $L = \mu_0 N A / l$
C) $L = \mu_0 N^2 A l$
D) $L = \mu_0 N A l^2$

Q7. Energy stored in an inductor carrying current I is:

A) $1/2 L I^2$
B) $L I^2$
C) $1/2 L^2 I$
D) L / I^2

Q8. Eddy currents are produced when:

A) Metal is kept in steady magnetic field
B) Metal is kept in varying magnetic field
C) Direct current passes through metal
D) Metal is placed in vacuum

Q9. Direction of induced current is determined by:

A) Fleming's Left Hand Rule
B) Fleming's Right Hand Rule / Lenz's Law
C) Right Hand Thumb Rule
D) Ampere's Rule

Q10. Mutual inductance between two coaxial coils depends on:

A) Distance between coils
B) Number of turns
C) Relative orientation
D) All of the above

Q11. **If rate of change of current in a coil is 1 A/s and induced emf is 1 V, the self-inductance is:**

A) 1 Henry
B) 1 Weber
C) 1 Tesla
D) 1 Ohm

Q12. **A metal ring is held horizontally and a magnet is dropped through it. Acceleration of falling magnet is:**

A) Equal to g
B) Less than g
C) Greater than g
D) Zero

Q13. **Dimensional formula of self-inductance L is:**

A) $[M L^2 T^{-2} A^{-2}]$
B) $[M L^2 T^{-2} A^{-1}]$
C) $[M L T^{-2} A^{-2}]$
D) $[M L^2 T^{-3} A^{-2}]$

Q14. **The magnetic flux linked with a coil changes from 12 Wb to 2 Wb in 0.1 s. Induced emf is:**

A) 100 V
B) 10 V
C) 1 V
D) 1000 V

Q15. **Choke coil works on the principle of:**

A) Self-inductance
B) Mutual inductance
C) Eddy currents
D) Joule heating

Q16. **Two circular coils of radii r_1 and r_2 ($r_1 >> r_2$) are coplanar. Mutual inductance M is proportional to:**

A) r_2^2 / r_1
B) r_1^2 / r_2
C) $r_1 r_2$
D) r_1 / r_2

Q17. **An AC generator works on the principle of:**

A) Electromagnetic Induction
B) Mutual Induction
C) Self Induction
D) Joule Heating

Q18. **A rectangular coil rotates in a uniform magnetic field. Maximum induced emf occurs when plane of coil is:**

A) Parallel to magnetic field
B) Perpendicular to magnetic field
C) At 45° to field
D) At 135° to field

Q19. **Lenz's law formula for induced emf is:**

A) $e = + d\Phi / dt$
B) $e = - d\Phi / dt$
C) $e = - \Phi / t$
D) $e = d^2\Phi / dt^2$

Q20. **Eddy currents are minimized in transformer cores by:**

A) Using thick solid iron core
B) Using laminated sheets insulated from each other
C) Using copper core
D) Increasing frequency

Q21. **When current in a coil changes from 5A to 2A in 0.05s, an emf of 12V is induced. Self-inductance of coil is:**

A) 0.2 H
B) 0.4 H
C) 0.1 H
D) 0.8 H

Q22. **The unit of magnetic flux density is:**

A) Weber
B) Tesla (Wb / m^2)
C) Henry
D) Ampere / meter

Q23. **A copper rod of length L rotates with angular speed ω in a uniform magnetic field B perpendicular to length. Induced emf between ends is:**

A) 1/2 B ω L^2
B) B ω L^2
C) 1/2 B ω L
D) B ω L

Q24. **If number of turns per unit length in a solenoid is doubled, its self-inductance increases by a factor of:**

A) 2
B) 4
C) 8
D) 16

Q25. **Dynamic emf (motional emf) is produced due to motion of:**

A) Conductor in magnetic field
B) Magnetic field around static conductor
C) Both A and B
D) Neither A nor B

CHAPTER 7: ALTERNATING CURRENT

Q1. **The rms value of AC current (I_rms) is related to peak value (I_0) by:**

A) $I_{rms} = I_0 / \sqrt{2} \approx 0.707\ I_0$
B) $I_{rms} = I_0 / 2$
C) $I_{rms} = \sqrt{2}\ I_0$
D) $I_{rms} = 2\ I_0 / \pi$

Q2. **The average value of AC over a complete cycle is:**

A) $I_0 / \sqrt{2}$
B) $2\ I_0 / \pi$
C) Zero
D) $I_0 / 2$

Q3. **In a purely inductive AC circuit, current:**

A) Leads voltage by 90°
B) Lags voltage by 90°
C) Is in phase with voltage
D) Lags voltage by 45°

Q4. **In a purely capacitive AC circuit, current:**

A) Leads voltage by 90°
B) Lags voltage by 90°
C) Is in phase with voltage
D) Leads voltage by 180°

Q5. **Inductive reactance X_L of an inductor of inductance L connected to AC frequency f is:**

A) $2 \pi f L$
B) $1 / (2 \pi f L)$
C) $2 \pi f / L$
D) $L / (2 \pi f)$

Q6. **Capacitive reactance X_C of capacitor C connected to AC frequency f is:**

A) $2 \pi f C$
B) $1 / (2 \pi f C)$
C) $2 \pi f / C$
D) $C / (2 \pi f)$

Q7. **At resonance in a series LCR circuit, impedance Z is equal to:**

A) Resistance R (minimum)
B) Zero
C) $\sqrt{(R^2 + X_L^2)}$
D) Infinite

Q8. **Resonant frequency f_r of a series LCR circuit is:**

A) $1 / (2\pi \sqrt{(LC)})$
B) $2\pi \sqrt{(LC)}$
C) $\sqrt{(LC)} / 2\pi$
D) $1 / (LC)$

Q9. **Power factor of an AC circuit is given by:**

A) $\cos \varphi = R / Z$
B) $\sin \varphi = R / Z$
C) $\tan \varphi = X / R$
D) $\cos \varphi = Z / R$

Q10. **Power factor of a purely resistive circuit is:**

A) 0
B) 1
C) 0.5
D) Infinity

Q11. Power factor of a purely inductive or purely capacitive circuit is:

A) 1
B) 0
C) 0.5
D) -1

Q12. Wattless current flows in a circuit containing:

A) Pure R only
B) Pure L or Pure C only
C) Both R and L
D) Both R and C

Q13. Quality factor (Q-factor) of series resonant LCR circuit is:

A) (1/R) √(L/C)
B) R √(C/L)
C) (1/L) √(R/C)
D) (1/C) √(L/R)

Q14. A step-up transformer converts:

A) Low voltage high current to high voltage low current
B) High voltage low current to low voltage high current
C) AC to DC
D) DC to AC

Q15. Transformation ratio K of a transformer is given by:

A) N_s / N_p = V_s / V_p = I_p / I_s
B) N_p / N_s = V_s / V_p
C) N_s / N_p = I_s / I_p
D) V_p / V_s = I_p / I_s

Q16. Transformer does NOT work on:

A) AC
B) Direct Current (DC)
C) High frequency AC
D) Low frequency AC

Q17. Core of transformer is laminated to reduce energy loss due to:

A) Copper loss
B) Flux leakage
C) Eddy currents
D) Hysteresis

Q18. In a series LCR circuit at resonance, phase angle between voltage and current is:

A) 90°
B) 45°
C) 0°
D) 180°

Q19. An AC source is 220 V, 50 Hz. The peak voltage V_0 is approximately:

A) 220 V
B) 311 V
C) 440 V
D) 155 V

Q20. The frequency of AC in India is:

A) 60 Hz
B) 50 Hz
C) 100 Hz
D) 120 Hz

Q21. **If frequency of AC source connected to a capacitor is doubled, its capacitive reactance X_C:**

A) Doubles
B) Halves
C) Quadruples
D) Remains same

Q22. **The sharp response of series LCR circuit at resonance corresponds to:**

A) High Quality factor Q
B) Low Quality factor Q
C) Zero Quality factor
D) High resistance

Q23. **Average power dissipated in a complete cycle of AC is P_{avg} =**

A) $V_{rms} I_{rms} \cos \varphi$
B) $V_{rms} I_{rms} \sin \varphi$
C) $V_o I_o \cos \varphi$
D) $V_{rms} I_{rms}$

Q24. **In an LC oscillation, maximum electrical energy in capacitor is equal to:**

A) Maximum magnetic energy in inductor
B) Half of maximum magnetic energy
C) Zero
D) Twice the total energy

Q25. **Which loss in transformer is minimized by using thick copper wires in windings?**

A) Eddy current loss
B) Hysteresis loss
C) Copper loss (I^2R loss)
D) Flux leakage

ANSWER KEY - CHAPTERS 1 TO 7

Chapter 1: Electric Charges and Fields

Q1: (C) Q2: (C) Q3: (A) Q4: (B) Q5: (B)
Q6: (B) Q7: (C) Q8: (B) Q9: (B) Q10: (C)
Q11: (C) Q12: (C) Q13: (B) Q14: (C) Q15: (C)
Q16: (B) Q17: (A) Q18: (B) Q19: (B) Q20: (A)
Q21: (A) Q22: (C) Q23: (C) Q24: (C) Q25: (B)

Chapter 2: Electrostatic Potential and Capacitance

Q1: (C) Q2: (B) Q3: (B) Q4: (B) Q5: (A)
Q6: (B) Q7: (A) Q8: (A) Q9: (B) Q10: (A)
Q11: (A) Q12: (B) Q13: (C) Q14: (B) Q15: (B)
Q16: (C) Q17: (A) Q18: (A) Q19: (B) Q20: (A)
Q21: (D) Q22: (B) Q23: (A) Q24: (B) Q25: (A)

Chapter 3: Current Electricity

Q1: (A) Q2: (C) Q3: (C) Q4: (B) Q5: (B)
Q6: (B) Q7: (C) Q8: (B) Q9: (A) Q10: (C)
Q11: (C) Q12: (A) Q13: (A) Q14: (B) Q15: (B)
Q16: (B) Q17: (B) Q18: (B) Q19: (B) Q20: (B)
Q21: (A) Q22: (A) Q23: (A) Q24: (B) Q25: (C)

Chapter 4: Moving Charges and Magnetism

Q1: (A) Q2: (A) Q3: (A) Q4: (B) Q5: (B)
Q6: (C) Q7: (A) Q8: (B) Q9: (A) Q10: (B)
Q11: (A) Q12: (A) Q13: (A) Q14: (B) Q15: (A)
Q16: (A) Q17: (B) Q18: (C) Q19: (A) Q20: (A)
Q21: (A) Q22: (C) Q23: (A) Q24: (A) Q25: (A)

Chapter 5: Magnetism and Matter

Q1: (C) Q2: (C) Q3: (A) Q4: (B) Q5: (B)
Q6: (A) Q7: (C) Q8: (A) Q9: (B) Q10: (A)
Q11: (B) Q12: (B) Q13: (B) Q14: (B) Q15: (A)
Q16: (B) Q17: (C) Q18: (C) Q19: (B) Q20: (A)
Q21: (B) Q22: (B) Q23: (B) Q24: (C) Q25: (D)

Chapter 6: Electromagnetic Induction

Q1: (B) Q2: (C) Q3: (A) Q4: (C) Q5: (A)

Q6: (A) Q7: (A) Q8: (B) Q9: (B) Q10: (D)
Q11: (A) Q12: (B) Q13: (A) Q14: (A) Q15: (A)
Q16: (A) Q17: (A) Q18: (A) Q19: (B) Q20: (B)
Q21: (A) Q22: (B) Q23: (A) Q24: (B) Q25: (C)

Chapter 7: Alternating Current

Q1: (A) Q2: (C) Q3: (B) Q4: (A) Q5: (A)
Q6: (B) Q7: (A) Q8: (A) Q9: (A) Q10: (B)
Q11: (B) Q12: (B) Q13: (A) Q14: (A) Q15: (A)
Q16: (B) Q17: (C) Q18: (C) Q19: (B) Q20: (B)
Q21: (B) Q22: (A) Q23: (A) Q24: (A) Q25: (C)