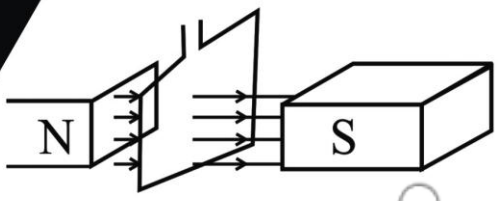

Chapter 14

ELECTROMAGNETISM

TOPICAL MULTIPLE CHOICE QUESTIONS

Topic 14.1:

Magnetic Field due to Current in a Long Straight Wire

(1) The force that appears as a result of the interaction between two moving charges is called
(a) induced force **(b)** electrostatic force
(c) magnetic force **(d)** gravitational force

(2) The study of magnetism produced by electric current and electric current produced by changing magnetic field is called
(a) magnetic field **(b)** electric current
(c) electric and magnetic field **(d)** electromagnetism

(3) If a current flow through the wire directed out of the paper, the magnetic field is represented by
(a) clockwise circular lines **(b)** antilock wise
(c) lines parallel to the wire **(d)** lines perpendicular to the wire

(4) The magnetic field lasts only as long as the _____ flowing through the conductor
(a) emf **(b)** voltage
(c) current **(d)** all of these

(5) The direction of magnetic field due to current carrying conductor can be determined by
(a) left hand rule **(b)** right hand rule
(c) palm right hand rule **(d)** Fleming's left hand rule

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(6) Which of following is not the property of magnetic field?
(a) Magnetic lines of force emerge from N-pole and end on S-pole
(b) Magnetic lines of force fill whole space around a magnet
(c) Number of magnetic lines at a point gives strength of magnetic field
(d) Two magnetic lines of force can intersect each other

Topic 14.2:

Force on Current Carrying Conductor in a Magnetic Field

(7) The SI unit of magnetic field strength
(a) ampere **(b)** tesla
(c) henry **(d)** weber

(8) 1 tesla =
(a) $N\,Am^{-1}$ **(b)** $NA^{-1}\,m^{-1}$
(c) NA^{-1} **(d)** $NA^{-1}\,m^{-2}$

(9) Magnetic force on a current carrying conductor is given by
(a) IL B sin α **(b)** IL B cos α
(c) IL B tan α **(d)** IL AB sin α

(10) The strength of magnetic field around the current carrying conductor is
(a) smaller near the conductor **(b)** greater near the conductor

(c) greater at large distance from the conductor **(d)** zero near the conductor

(11) Current carrying conductor experiences maximum magnetic force in a uniform magnetic field when it is placed
(a) perpendicular to the field **(b)** parallel to the field
(c) at 180^o **(d)** at 60^o on the field

(12) Magnetic force per unit length on a current carrying conductor placed in a magnetic field is _____
(a) ILB **(b)** ILB $\sin\theta$
(c) IB **(d)** none of these

(13) A current carrying conductor always surrounded by a
(a) conservative field **(b)** electric field
(c) magnetic field **(d)** gravitational field

(14) Two parallel straight wires carrying currents in opposite direction
(a) repel each other **(b)** attract each other
(c) no effect produce **(d)** none of these

(15) The symbol dot (.) represent the current flowing
(a) into the page **(b)** out of the page
(c) both a and b **(d)** none of these

(16) The magnetic field at a point due to a current carrying conductor is directly proportional to
(a) thickness of the conductor **(b)** resistance of the conductor
(c) current passing through the conductor **(d)** none of these

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(17) Magnetic field strength is measured in terms of. **GRW-2022 (G-I)**
(a) Wbm^{-2} **(b)** Wb
(c) NmA **(d)** As

(18) Representation of a current flowing towards a reader is denoted by a; MIRPUR (AJK) 2017
(a) dot **(b)** dash
(c) cross **(d)** tick

(19) One weber = **MIRPUR (AJK) 2017**
(a) $Nm.A^{-1}$ **(b)** $Nm^{-1}\ A^{-1}$
(c) Nm.A **(d)** $N^{-1}m.A^{-1}$

(20) A current carrying conductor experiences maximum magnetic force in a uniform magnetic field when it is placed **SGD-2017 (G-I)**
(a) perpendicular to field **(b)** parallel to field
(c) at an angle of 60° to the field **(d)** at an angle of 180° to the field

(21) One Tesla is equal to **SWL-2017**
(a) $NA^{-1}\ m^{-1}$ **(b)** $N\ m\ A^{-1}$
(c) $Nm^{-1}\ A$ **(d)** NAM

(22) Tesla can be written as **DGK-2017 (G-I)**
(a) $NA^{-1}m^{-1}$ **(b)** $NA\ m^{-1}$
(c) $N^{-1}Am^{-1}$ **(d)** $NA^{-1}m$

(23) Two parallel wires carrying the current in the same direction: **BWP-2017 (G-I)**
(a) repel each other **(b)** attract each other
(c) cancel their field in between them **(d)** no effect on each other

(24) A cross (×) represents the direction of magnetic field: **MTN-2019 (G-II)**
(a) Out of page **(b)** Tangent to page
(c) Parallel to page **(d)** In to the page

(25) The magnetic force on a neutron in the magnetic field of 10 T is_____. RWP-2022 (G-I)

(A) zero (B) 1.6×10^{-18}

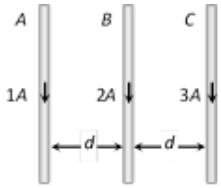
(C) 100N (D) 1.6×10^{-19}N

ENTRY TEST MCQS

(26) A current carrying conductor is placed in a uniform magnetic field parallel to it. The magnetic force experienced by the conductor is_____

(a) F = ILB (b) F = 1/Bsinθ (c) F = 0 (d) F = 1/Bcosθ

(27) There long straight wires A, B and C are carrying current as shown figure. Then the resultant force on B is directed:



(a) Perpendicular to the plane of paper and inward
(b) Perpendicular to the plane of paper and outward
(c) Towards A
(d) Towards C

Topic 14.3 & 14.4:

Magnetic Flux and Flux Density, Ampere's Law and Determination of Flux Density

(28) Magnetic flux and magnetic flux density are related as

(a) $\text{magnetic flux} = \frac{\text{magnetic flux density}}{\text{area}}$ **(b)** magnetic flux x flux density = area

(c) $\text{flux density} = \frac{\text{magnetic flux}}{area}$ **(d)** flux density = Magnetic flux x area

(29) Direction of magnetic flux is

(a) normal to the surface **(b)** parallel to the surface
(c) at any angle **(d)** no direction

(30) The relation of $B = \frac{\mu_o I}{2\pi r}$ is called

(a) Faraday's law **(b)** Gauss's law
(c) Ampere's law **(d)** Lenz's law

(31) Magnetic flux density is a _____ quantity

(a) scalar **(b)** vector
(c) linear **(d)** both a and b

(32) Magnetic lines of force passing through an area is called

(a) magnetic field **(b)** magnetic flux
(c) magnetic induction **(d)** electric flux

(33) The relation for the magnetic flux is given by

(a) $\phi_B = \vec{B}.\vec{A}$ **(b)** $\phi_B = \vec{B} \times \vec{A}$

(c) $\phi_B = \frac{B}{A}$ **(d)** $\phi_B = BA \sin\theta$

(34) The unit of magnetic flux is called

(a) tesla **(b)** weber
(c) gauss **(d)** none of these

(35) The unit of permeability of free space is

(a) $WbA^{-1}m^{-1}$ **(b)** $WbA^{-2}m^{-1}$

(c) $WbA^{-1}m^{-2}$ **(d)** $WbAm^{-1}$

(36) Magnetic flux would be zero when

(a) $\vec{B}$ is parallel to $\vec{A}$ **(b)** $\vec{B}$ is along to $\vec{A}$

(c) $\vec{B}$ is perpendicular to $\vec{A}$ **(d)** none of these

(37) The magnetic flux will be maximum when the angle between $\vec{B}$ and $\vec{A}$ is

(a) 270° **(b)** 60°

(c) 90° **(d)** 0°

(38) Ampere's law expressed as

(a) $\sum(\vec{B}\times\Delta\vec{L}) = \mu_o I$ **(b)** $\sum(\vec{B}\bullet\Delta\vec{L}) = \mu_o I$

(c) $\sum(\vec{B}\bullet\Delta\vec{L}) = \dfrac{\mu_o}{I}$ **(d)** $\sum(\vec{B}-\Delta\vec{L}) = \dfrac{\mu_o}{I}$

(39) A long tightly wound coil in the form of cylinder is called

(a) solenoid **(b)** toroid

(c) both a and b **(d)** resistor

(40) When the current passes through the tightly wounded coil, it behaves like

(a) phantom magnet **(b)** bar magnet

(c) both a and b **(d)** solenoid

(41) According to Ampere's circuital law the magnetic field along the axis of solenoid with n number of turns per unit length is given by

(a) $B = \mu_o nI$ **(b)** $B = \mu_o I$

(c) $B = \dfrac{\mu_o I}{n}$ **(d)** $B = \dfrac{n}{\mu_o I}$

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(42) The current loop can be imagined to be a _____ with a North pole and South pole

(a) bar magnet **(b)** phantom bar magnet

(c) solenoid **(d)** toroid

(43) S.I unit of magnetic permeability is: **GRW-2019 (G-I)**

(a) Wb $A^{-1}m^{-1}$ **(b)** Wb m^2

(c) Wb mA^{-1} **(d)** Wb Am^{-1}

(44) The SI unit of magnetic induction is **GRW-2019 (G-II)**

(a) weber **(b)** henry

(c) tesla **(d)** guass

(45) In current carrying long solenoid the magnetic field produced does not depend upon. **SGD-2017 (G-I)**

(a) the radius of solenoid **(b)** number of turns per unit length

(c) current flowing through solenoid **(d)** all of above

(46) The magnetic field inside a current carrying long solenoid is **SGD-2017 (G-II)**

(a) non-uniform **(b)** weak

(c) uniform and strong **(d)** zero

(47) The relation $B = \dfrac{\mu_o I}{2\pi r}$ is called: **FSD-2019 (G-I)**

(a) Ampere's law **(b)** Faraday's law

(c) Lenz's law **(d)** Gauss's law

(48) Unit of magnetic flux density is. **SGD-2022 (G-II)**

(a) Wb m^{-2} **(b)** N A^{-1} m^{-1}
(c) tesla **(d)** All of the above

(49) The Magnetic Flux Density is measured in: **BWP-2019 (G-II)**
(a) Weber **(b)** Weber/m^2
(c) Tesla/m^2 **(d)** Nm

(50) Formula for magnetic field due to solenoid is given by: **MTN-2019 (G-I)**
(a) $\mu_o I$ **(b)** $\mu_o nI$
(c) $\mu_o SI$ **(d)** $\mu_o nl$

(51) The value of permeability of free space is given by : **MTN-2019 (G-I)**
(a) $4\pi \times 10^{7}$ Wb $A^{-1}m^{-1}$ **(b)** $4\pi \times 10^{7}$ Wb $A^{-1}m^{-1}$
(c) $4\pi \times 10^{-7}$ Wb Am^{-1} **(d)** $4\pi \times 10^{7}$ Wb Am^{-1}

(52) The S.I. unit of magnetic induction is: **MTN-2019 (G-II)**
(a) weber **(b)** gauss
(c) tesla **(d)** Nm

(53) If 300 turns of wire are wounded on 10 cm length, then number of turns per unit length is **DGK-2022 (G-I)**
(a) 100 **(b)** 2000
(c) 1000 **(d)** 3000

(54) If current flowing through a solenoid becomes four times, then magnetic field inside it becomes. **DGK-2022 (G-II)**
(a) Half **(b)** Two times
(c) Three times **(d)** Four times

(55) Magnetic field due to current carrying straight varies as _____. **RWP-2022 (G-II)**
(a) $\frac{1}{r^2}$ **(b)** r^2
(c) $\frac{1}{r}$ **(d)** r

ENTRY TEST MCQS

(56) The magnetic field in a certain region is given by $40\hat{i} - 18\hat{k}$. How much flux passes through a 5.0 cm^2 area loop in this region if loop lies flat in YZ plane?
(a) 90×10^{-4} Wb (b) 2×10^{-2} Wb
(c) 2×10^{2} Wb (d) 9×10^{-4} Wb

(57) Due to 10 amperes of current flowing in a circular coil of 10 cm length, the magnetic field produced at its centre is 3.14×10^{-3} weber/m^2. The number of turns in the coil will be
(a) 25 (b) 50
(c) 20 (d) 100

Topic 14.5 and 14.6:

Force on a Moving Charge in Magnetic Field and Motion of Charged Particle in an Electric and Magnetic Field

(58) A charged particle moving in a magnetic field experiences a resultant force
(a) in the direction of field
(b) in the opposite direction of field
(c) in the direction perpendicular to both the field and its motion

(d) in the opposite direction to its motion

(59) The direction of force experience by a charged particle moving in a magnetic field will be

(a) parallel to the field
(b) opposite to the field
(c) parallel to its direction
(d) perpendicular to boun the field and velocity vector

(60) When a charged particle moves through a magnetic field, the effect of the field changes the particles

(a) speed **(b)** mass
(c) energy **(d)** direction

(61) The total charge moving in the piece of wire

(a) ALq **(b)** nlq
(c) nAq **(d)** nALq

(62) The force $F = F_e + F_m$ in the equation is called

(a) deflecting force **(b)** restoring force
(c) lorentz force **(d)** none of these

(63) The electric force can

(a) change the speed of particle **(b)** cannot change the speed
(c) has not effect **(d)** all of these

(64) If an electron projected in a magnetic field with a velocity v, it will experience a force given by

(a) $\vec{F} = -e\,\vec{v}\times\vec{B}$ **(b)** $\vec{F} = +e\,\vec{v}\times\vec{B}$
(c) $\vec{F} = -e\,\vec{v}.\vec{B}$ **(d)** $\vec{F} = +e\,\vec{v}.\vec{B}$

(65) The magnetic force experienced by a charge particle moving in a magnetic field will be maximum if it moves

(a) at an angle of 60^0 to the field **(b)** parallel to the field
(c) anti parallel to the field **(d)** perpendicular to the field

(66) Work done by magnetic force is

(a) maximum **(b)** F_m d cosθ
(c) zero **(d)** F_m d sinθ

(67) The mathematical relation for drift velocity is given by

(a) $v = InAq$ **(b)** $v = \dfrac{I}{nAq}$

(c) $v = \dfrac{1}{InAq}$ **(d)** $v = \dfrac{nAq}{I}$

(68) The magnetic force experienced by a charge particle moving in a magnetic field will be zero if it moves

(a) at an angle of 60^0 to the field **(b)** parallel to the field
(c) anti parallel to the field **(d)** both b and c

(69) The charges moving perpendicular to $\vec{B}$ experiences

(a) maximum force **(b)** minimum force
(c) no force **(d)** none of these

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(70) Work done on a charged particle moving in uniform magnetic field is:

LHR-2021 (G-II), LHR-2022 (G-I)

(a) maximum **(b)** Zero
(c) Minimum **(d)** Negative

(71) The magnetic force on an electron moving with speed 10^6 m/sec perpendicular to the magnetic field of strength 1 web m^{-2} is **GRW-2022 (G-II)**

(a) 1.6×10^{-19}N **(b)** 1.6×10^{-13}N
(c) Zero **(d)** 1.6×10^{-31}N

(72) The magnetic force on an electron, travelling at 10^6 ms^{-1} parallel to the magnetic field of strength 1 tesla is: **FSD-2019 (G-I)**

(a) 10^{-12} N **(b)** 10^3 N
(c) 0 **(d)** 16×10^{-12} N

(73) An electron travelling at 10^6 m/s enters parallel in a magnetic field of 1 tesla, the magnetic force acting on it is: **RWP-2019 (G-I)**

(a) zero **(b)** 10^{-12} N
(c) 10^3 N **(d)** 1.6×10^{-13} N

(74) When a charged particle is projected opposite to the direction of magnetic field, it experiences a force equal to: **RWP-2019 (G-I)**

(a) quB cosθ **(b)** quB sin90°
(c) quB **(d)** zero

(75) When a charge is projected perpendicular to uniform magnetic field its path is. **SGD-2022 (G-II)**

(a) spiral **(b)** circular
(c) helix **(d)** ellipse

(76) The charge moving perpendicular to magnetic field experience force. **MTN-2022 (G-I)**

(a) maximum **(b)** minimum
(c) 0 **(d)** infinite

(77) Work done by a magnetic force of 5 N when a q charge is displaced 2 m is: **LHR-2022 (G-II)**

(a) Non-zero **(b)** Zero
(c) 10J **(d)** 5J

(78) A 5m wire carrying current 2A at right angle to uniform magnetic field of 1.5 T. The force on the wire is. **DGK-2022 (G-II)**

(a) 10 N **(b)** 4 N
(c) 5N **(d)** 2.5 N

(79) A charge particle cannot be accelerated in ____ field. **RWP-2022 (G-I)**

(a) electirc **(b)** gravitational
(c) magnetic **(d)** scalar

ENTRY TEST MCQS

(80) When a charge particle moves in magnetic field at angle 45° the trajectory of charged particle is

(a) Circle (b) Straight line
(c) Helix (d) Parabola

(81) If the velocity of electron entering in velocity selector is $v < \frac{E}{B}$, the electron will

(a) Move straight (b) Deflect towards $\vec{E}$
(c) Deflect towards $\vec{B}$ (d) Move in circular path

Topic 14.7:

Determination of e/m of an Electron

(82) If $F_m = F_e$, then the velocity of charge particle is

(a) v = E B **(b)** $v = \frac{E}{B}$

(c) $v = \frac{B}{E}$ **(d)** none of these

(83) Charge to mass ratio (e/m) of a charged particle is also called

(a) specific charge **(b)** specific force

(c) both a and b **(d)** magnetic ratio

(84) When a charge particle enters a magnetic field it will move on a circular path of radius

(a) $r = \frac{qB}{mv}$ **(b)** $r = \frac{mv}{qB}$

(c) $r = \frac{qmv}{B}$ **(d)** $r = \frac{qmB}{r}$

(85) The relation for e/m of an electron is

(a) $\frac{2V^2}{Br}$ **(b)** $\frac{2V}{B^2 r}$

(c) $\frac{2V}{Br^2}$ **(d)** $\frac{2V}{B^2 r^2}$

(86) $\frac{e}{m}$ is maximum for

(a) electron **(b)** proton

(c) helium nuclei **(d)** neutron

(87) An electron enters a region where the electric field E is perpendicular to the magnetic field B. It will suffer no deflection if

(a) E = BeV **(b)** B = e E/v

(c) E = Bv **(d)** E = BeV/2

(88) The ratio of electric field to the magnetic field has unit

(a) m **(b)** m/s

(c) m/s^2 **(d)** kgm/s

(89) The value of e/m of an electron

(a) 9.43×10^{-19} Ckg^{-1} **(b)** 9.43×10^{-31} Ckg^{-1}

(c) 1.76×10^{11} Ckg^{-1} **(d)** 9.43×10^{-27} Ckg^{-1}

(90) The circular trajectory of a charged particle is gained easily by

(a) gravitational field **(b)** magnetic field

(c) electric field **(d)** nuclear field

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(91) If a charge is at rest in a magnetic field then the force on charge is GRW-2019 (G-II)

(a) $q(\bar{v} \times \bar{B})$ **(b)** q v B sinθ

(c) q v B **(d)** zero

(92) The value of $\frac{e}{m}$ is smallest for: LHR-2019 (G-II)

(a) Proton **(b)** Electron
(c) β-particle **(d)** Positron

(93) The unit of $\vec{E}$ is NC^{-1} and that of $\vec{B}$ is $NA^{-1}m^{-1}$ then the unit of $\frac{E}{B}$ is : LHR-2019 (G-II)

(a) ms^{-2} **(b)** ms
(c) $m^{-1}s^{-1}$ **(d)** ms^{-1}

(94) The e/m of neutron is: LHR-2021 (G-I)

(a) Less than electron **(b)** Zero
(c) Greater than electron **(d)** The same as electron

(95) The sum of electric and magnetic force is called: SGD-2022 (G-I)

(a) Maxwell force **(b)** Newton's force
(c) Lorentz force **(d)** centripetal force

(96) $\frac{E}{B}$ has the unit of: LHR-2022 (G-II)

(a) meter **(b)** ms^{-1}
(c) ms^{-2} **(d)** s^{-2}

(97) Charge to mass ratio of neutron is _____. RWP-2022 (G-II)

(a) zero **(b)** $9.53 \times 10^{9} C\ kg^{-1}$
(c) $1.758 \times 10^{4} C\ kg^{-1}$ **(d)** $1.775 \times 10^{-11} C\ kg^{-1}$

ENTRY TEST MCQS

(98) A beam of ions with velocity 2×10^{5}m/s enters normally into a uniform magnetic field of 4×10^{-2}tesla. If the specific charge of the ion is 5×10^{7}C/kg, then the radius of the circular path described will be

(a) 0.10 m **(b)** 0.16 m
(c) 0.16 m **(d)** 0.25 m

(99) One proton beam enters a magnetic field of 10^{-4}T normally, Specific charge = 10^{11}C/kg. velocity = 10^{7}m/s. What is the radius of the circle described by it

(a) 0.1 m **(b)** 1 m
(c) 10 m **(d)** none

Topic 14.8:

Cathode Ray Oscilloscope (C.R.O)

(100) The high speed graph plotting device is called

(a) CRO **(b)** galvanometer
(c) ammeter **(d)** ERG

(101) The voltage applied across x-plates displaces the spot along x-axis and displacement is proportional to

(a) voltage **(b)** current
(c) time **(d)** all of these

(102) Beam of electrons can be called as

(a) positive rays **(b)** gamma rays
(c) cathode rays **(d)** cosmic rays

(103) In a cathode ray tube the electrons are produced

(a) by applying an electric field to y-plates **(b)** gamma rays
(c) from fluorescent material **(d)** by heating a cathode

(104) Cathode ray oscilloscope works by deflecting beam of

(a) electrons **(b)** neutrons
(c) positrons **(d)** protons

(105) When filament heats, then it emits

(a) electrons itself **(b)** electrons from cathode

(c) radiations from anode **(d)** protons from cathode

(106) The function of grid in CRO

(a) controls the number of electrons accelerated by anode

(b) controls the brightness of spot formed on the screen

(c) both a and b **(d)** none of these

(107) In CRO the waveform created by sweep or time base generator is

(a) cosine wave **(b)** sinusoidal wave

(c) saw tooth wave **(d)** none of these

(108) Electric potential on grid is

(a) positive **(b)** negative

(c) zero **(d)** none of these

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(109) Filament in C.R.O: **LHR-2017(G-I)**

(a) controls the number of electrons **(b)** controls the brightness of screen

(c) has negative potential **(d)** emits electrons

(110) The brightness of spot on CRO screen is controlled by: **LHR-2021 (G-I)**

(a) Plates **(b)** Cathode

(c) Anode **(d)** Grid

(111) Output wave form of sweep or time base generator is:

LHR-2021 (G-II), GRW-2022 (G-I), SGD-2022 (G-I)

(a) Saw tooth wave **(b)** Digital wave

(c) Sinusoidal wave **(d)** Square wave

(112) The function of three anodes in a C.R.O is **SWL-2017**

(a) to accelerate electrons only **(b)** to focus the electrons only

(c) to control the brightness of spot on screen **(d)** to accelerate and focus the electrons

(113) In CRO which component controls the brightness **DGK-2017 (G-II)**

(a) filament **(b)** grid

(c) anode **(d)** deflecting plates

(114) Which of the following is not accurate potential measuring device? **DGK-2022 (G-I)**

(a) Voltmeter **(b)** C.R.O

(c) Potentiometer **(d)** Digital multimeter

(115) In Cathode ray oscilloscope, grid controls. **BWP-2022 (G-I)**

(a) Temperature of Filament **(b)** Charge of Electrons

(c) Number of Electrons **(d)** Energy of Electorns

ENTRY TEST MCQS

(116) Pattern of wave appears to be stationary on screen of CRO when

(a) $f_x = nf_y$ **(b)** $f_x = \frac{n}{2} f_y$

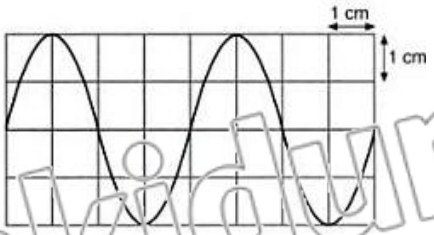
(c) $f_x = \sqrt{n}\, f_y$ **(d)** $f_x = 2\sqrt{n}\, f_y$

(117) An instrument which can measure potential without drawing any current, is ___

(a) voltmeter **(b)** galvanometer

(c) cathode ray oscilloscope (CRO) **(d)** ammeter

(118) The diagram shows a trace on an oscilloscope set at 1.0 V per cm on the vertical axis and 1.0 millisecond per cm on the horizontal axis. What is the peak voltage and frequency of the alternating voltage applied across Y-plate?



	Peak voltage/V	Frequency/Hz
(a)	1.5	500
(b)	1.5	250
(c)	2.0	125
(d)	2.0	250

Topic 14.9:

Torque on a Current Carrying Coil

(119) The turning effect of force is called

(a) momentum **(b)** torque
(c) couple **(d)** moment arm

(120) Mathematically, torque on a current carrying loop whose plane makes an angle of α with $\vec{B}$ is given by

(a) IAB cot α **(b)** IAB sin α
(c) IAB tan α **(d)** IAB cos α

(121) The torque acting on a coil is minimum when vector area of coil is

(a) parallel to magnetic field **(b)** perpendicular to magnetic field
(c) antiparallel to magnetic field **(d)** none of these

(122) The torque acting on a coil is maximum when magnetic flux through coil is

(a) minimum **(b)** maximum
(c) has any value **(d)** none of these

(123) The torque acting on a coil is maximum when plane of coil is

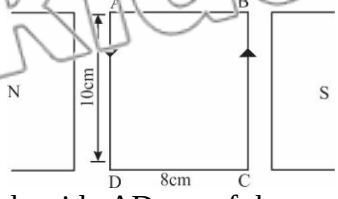
(a) parallel to $\vec{B}$ **(b)** perpendicular to $\vec{B}$
(c) antiparallel to $\vec{B}$ **(d)** none of these

ENTRY TEST MCQS

(124) Coil of a galvanometer is suspended in a radial magnetic field so that the deflecting torque on the coil is always_____, (in usual symbols)

(a) BINA cosα **(b)** BINA sinα
(c) BINA tanα **(d)** BINA

(125) A 100 turns coil shown in figure carries a current of 2 A in a magnetic field B of 0.2 Wbm^{-2}. The torque acting on the coil is



(a) 0.32 Nm tending to rotate the side AD out of the page
(b) 0.32 Nm tending to rotate the side AD into the page
(c) 0.0032 Nm tending to rotate the side AD out of the page
(d) 0.0032 Nm tending to rotate the side AD into the page

Topic 14.10:

Galvanometer

(126) If θ is the angle between the direction of B and normal to the plane of the coil, then torque on the rectangular coil is
(a) NIBA cos θ **(b)** NIAB sin θ
(c) NIAB tan θ **(d)** none of these

(127) The working of all D.C electric meters (ammeters, galvanometer and voltmeter) based upon
(a) magnetic force exerted on the moving charge
(b) chemical effect of current
(c) magnetic effect of current
(d) none of these

(128) If the plane of the current carrying coil with N turns of area A, makes an angle θ with the magnetic induction B, the torque on the coil is
(a) NIBA cos θ **(b)** NIBA sin θ
(c) NIAB tan θ **(d)** none of these

(129) The working of galvanometer depends upon
(a) magnetic force exerted on the coil **(b)** torque exerted on the coil
(c) momentum of coil **(d)** all of the above

(130) The current passing through a coil of galvanometer is given by
(a) $\frac{c\theta}{BNA}$ **(b)** $\frac{c\theta}{AB}$
(c) $\frac{BAN}{c\theta}$ **(d)** $\frac{c\theta A}{BN}$

(131) Concave pole faces of the magnet and soft iron cylinder in galvanometer are used to make the field
(a) strong **(b)** weak
(c) radial **(d)** radial and stronger

(132) The shunt resistance is also called
(a) low value bypass resistance **(b)** high resistance
(c) specific resistance **(d)** both b and c

(133) Galvanometer works on the principle of conversion of electrical energy into
(a) mechanical energy **(b)** light energy
(c) nuclear energy **(d)** solar energy

(134) In pivoted type galvanometer the coil is pivoted between
(a) two jeweled bearings **(b)** three jeweled bearings
(c) one jeweled bearings **(d)** four jeweled bearings

(135) Deflection per unit current I is called
(a) sensitivity of voltmeter **(b)** sensitivity of ohm meter
(c) sensitivity of ammeter **(d)** sensitivity of galvanometer

(136) The galvanometer in which the coil comes to rest quickly after the current passed through it or the current is stopped from flowing through it is called
(a) stable galvanometer **(b)** dead beat galvanometer
(c) both a and b **(d)** none of these

(137) The relation between I and the angle of deflection in a moving coil galvanometer is
(a) $I \propto \theta$ **(b)** $I \propto \frac{1}{\theta}$

(c) $I \propto \sin\theta$ **(d)** $I \propto \cos\theta$

(138) An ammeter is an electrical instrument which is used to measure
(a) voltage **(b)** current
(c) resistance **(d)** all of these

(139) Lamp and scale arrangement is used in galvanometer to measure the
(a) current **(b)** voltage
(c) torque **(d)** angle of deflection

(140) The low current required to produce 1mm deflection on a scale placed 1m away from mirror of galvanometer is called
(a) sensitivity of voltmeter **(b)** sensitivity of ohm meter
(c) sensitivity of ammeter **(d)** current sensitivity of galvanometer

(141) The galvanometer in series with a high resistance acts as a
(a) voltmeter **(b)** ohm meter
(c) ammeter **(d)** CRO

(142) The sensitivity of a galvanometer can be increased by
(a) decreasing the area of the coil **(b)** increasing the magnetic field
(c) decreasing the number of turns **(d)** all of these

(143) To convert the galvanometer in ammeter
(a) shunt resistance is connected in parallel
(b) shunt resistance is connected in series
(c) no resistance is connected in any combination
(d) none of these

(144) In an ideal ammeter shunt resistance is
(a) low resistance **(b)** infinite
(c) intermediate **(d)** none of these

(145) A voltmeter always connected in a circuit in
(a) parallel **(b)** series
(c) both a and b **(d)** none of these

(146) The shunt resistance is given by

(a) $R_s = \dfrac{I_g R_g}{I + I_g}$ **(b)** $R_s = \dfrac{I_g R_g}{I - I_g}$

(c) $R_s = \dfrac{I_g R_g}{I_g - I}$ **(d)** $R_s = \dfrac{I_g R_g}{I_g + I}$

(147) To convert the galvanometer into voltmeter the high resistance is given by

(a) $R_h = \dfrac{V}{I_g} + R_g$ **(b)** $R_h = \dfrac{V}{I_g} - R_g$

(c) $R_h = \dfrac{V}{R_g} - I_g$ **(d)** $R_h = \dfrac{V}{R_g} + I_g$

(148) To increase the range of voltmeter the series resistance is
(a) increased **(b)** constant
(c) decreased **(d)** none of these

PAST PAPER MCQS

(149) When ohmmeter gives full scale deflection, it indicates, **GRW-2019 (G-I)**
(a) zero resistance **(b)** infinite resistance
(c) small resistance **(d)** very high resistance

(150) Method "Lamp and scale arrangement" is used to measure the **SGD-2017 (G-II)**

(a) voltage **(b)** current
(c) torque **(d)** angle of deflection

(151) In order to increase the range of voltmeter R_h is: **RWP-2019 (G-I)**

(a) increased **(b)** decreased
(c) unchanged **(d)** increased by 4 times

(152) Galvanometer is sensitive, when c/BAN is **DGK-2017 (G-II)**

(a) small **(b)** zero
(c) large **(d)** negative

(153) Shunt Resistance is: **BWP-2019 (G-II)**

(a) high Resistance **(b)** zero Resistance
(c) infinite Resistance **(d)** low Resistance

(154) To convert a galvanometer into a voltmeter a high resistance is connected. **MTN-2022 (G-I)**

(a) in series **(b)** in parallel
(c) in perpendicular **(d)** along tangent

(155) Range of voltmeter can be measured by. **MTN-2022 (G-II)**

(a) increasing high resistance **(b) d**ecreasing high resistance
(c) increasing full scale deflection current **(d) c**hanging resistance of coil

(156) A voltmeter is always connected in. **BWP-2022 (G-I)**

(a) Series **(b)** Parallel
(c) Place of battery **(d)** All these

(157) To convert a galvanometer into a voltmeter, a high resistance connected in series with galvanometer is given by **BWP-2022 (G-II)**

(a) $R_h = \frac{V}{R_g} - I_g$ **(b)** $\frac{V}{R_g} + I_g = R_h$

(c) $R_h = \frac{V}{I_g} - R_g$ **(d)** $\frac{V}{I_g} + R_g = R_h$

ENTRY TEST MCQS

(158) The galvanometer resistance is 100Ω and gives full scale deflection for 30mA. If it is to changed to voltmeter of 30 V range, the resistance added will be

(a) 900 Ω **(b)** 1800 Ω
(c) 500 Ω **(d)** 1000 Ω

(159) An galvanometer has a resistance 72Ω and gives full scale deflection for a current of 1A. it is used to convert into an ammeter of range 25A. The resistance of ammeter thus formed is:

(a) 3Ω **(b)** $(72/25)\Omega$
(c) $(25/72)\Omega$ **(d)** 75Ω

Topic 14.11:

AVO-meter (Multimeter)

(160) Which of the following is not an electromechanical instrument

(a) galvanometer **(b)** voltmeter

(c) specific resistance **(d)** none of these

(161) In order to increase the range of ammeter, the shunt resistance is

(a) decreased **(b)** increased

(c) kept constant **(d)** all of these

(162) AVO-meter is used to measure the

(a) resistance **(b)** current

(c) voltage **(d)** all of these

(163) Ohmmeter is used measure

(a) resistance **(b)** current

(c) voltage **(d)** potential difference

(164) In voltmeter measuring part of AVO meter the AC voltage is first converted in to DC by

(a) resistor **(b)** diode

(c) rectifier **(d)** both b and c

(165) Digital version of AVO-meter is called

(a) digital multimeter **(b)** digital ammeter

(c) digital rectifier **(d)** digital voltmeter

(166) DMM stands for

(a) digital ammeter **(b)** digital multimeter

(c) digital measuring meter **(d)** digital voltmeter

(167) The switch used in current measuring part of AVO meter for measuring of different currents is called

(a) range switch **(b)** power switch

(c) selective switch **(d)** all of these

PAST PAPER MCQS

(168) Which of the following is not accurate measuring device? GRW-2022 (G-II)

(a) Digital multi-meter **(b)** Cathode ray oscilloscope

(c) Volt meter **(d)** Potentiometer

(169) Which of the following apparatus is used to measure current, voltage and Resistance BWP-2022 (G-II)

(a) Ammeter **(b)** Voltmeter

(c) Avometer **(d)** Galvanometer

ENTRY TEST MCQS

(170) The switch used in current measuring part of AVO meter for measuring of different currents is called

(a) Range switch **(b)** Power switch

(c) Selective switch **(d)** All of these

ANSWER KEYS

(Topical Multiple Choice Questions)

1	C	21	A	41	A	61	D	81	B	101	C	121	A	141	A	161	A
2	D	22	A	42	B	62	C	82	B	102	C	122	A	142	B	162	D
3	B	23	B	43	A	63	A	83	A	103	D	123	A	143	A	163	A
4	C	24	D	44	C	64	A	84	B	104	A	124	D	144	D	164	D
5	B	25	A	45	A	65	B	85	D	105	B	125	C	145	A	165	A
6	D	26	C	46	C	66	C	86	A	106	C	126	B	146	B	166	B
7	B	27	D	47	A	67	B	87	C	107	C	127	C	147	B	167	A
8	B	28	C	48	D	68	D	88	B	108	B	128	A	148	A	168	C
9	A	29	D	49	A	69	A	89	C	109	D	129	B	149	A	169	C
10	B	30	C	50	B	70	B	90	B	110	D	130	A	150	D	170	A
11	A	31	A	51	A	71	B	91	D	111	A	131	D	151	A		
12	D	32	B	52	C	72	C	92	A	112	D	132	A	152	A		
13	C	33	A	53	D	73	A	93	D	113	B	133	A	153	D		
14	A	34	B	54	D	74	D	94	B	114	A	134	A	154	A		
15	B	35	A	55	C	75	B	95	C	115	C	135	D	155	A		
16	C	36	C	56	B	76	A	96	B	116	A	136	C	156	B		
17	A	37	D	57	A	77	B	97	A	117	C	137	A	157	C		
18	A	38	B	58	C	78	C	98	A	118	D	138	B	158	A		
19	A	39	A	59	D	79	D	99	B	119	B	139	D	159	B		
20	A	40	B	60	D	80	C	100	A	120	D	140	D	160	C		

KIPS TOPICAL SHORT QUESTIONS

14.1 MAGNETIC FIELD DUE TO CURRENT IN A LONG STRAIGHT WIRE

(1) Describe right hand rule to find the direction of lines of magnetic field. LHR-2014

Ans: "If the wire is grasped in fist of right hand with the thumb pointing in the direction of the current, the fingers of the hand will circle the wire in the direction of the magnetic field"

(2) What is the effect of current passing through a long straight wire? RWP-2019 (G-I)

Ans: When current pass through a long straight wire then

- Circular magnetic field produced around the wire.
- The direction of field depends upon the direction of current.
- The magnetic field lasts only as long as the current is flowing through the wire.
- The direction of the lines of force can be found by Right Hand Rule.

PAST PAPER SHORT QUESTIONS

14.2 FORCE ON A CURRENT CARRYING CONDUCTOR IN A UNIFORM MAGNETIC FIELD

(3) Two wires having current direction opposite to each other are twisted together. What will be resultant magnetic field?

Ans: Magnetic field produced by one wire is opposite to that of the other wire Hence, magnetic fields are cancelled out and there will be no resultant field between the wire.

(4) Do two long and parallel current carrying wires attract each other? Explain. FSD-2013

Ans: Two long and parallel current carrying wires can attract or repel each other, it depends upon the direction of current through the wire.

(i) When two long and parallel wires having current in the same direction, will attract each other.

(ii) When two long and parallel wires having current in opposite direction, will repel each other.

(5) Define Tesla. Write its mathematical formula. MIRPUR (AJK) 2015

Ans: In SI units, the unit of B is tesla (T). It is defined as

"A magnetic field is said to have a strength of 1 tesla if it exerts a force of 1 newton on 1 meter length of the conductor placed at right angles to the field when a current of 1 ampere passes through the conductor.

$1T = 1NA^{-1}m^{-1}$

$B = \frac{F}{IL}$

(6) Write down the factors upon which the force on current carrying conductor placed in uniform magnetic field depends. RWP-2019 (G-I)

Ans: The magnitude of the force depends upon the following factors:

(i) The force F is directly proportional to sin α which is the angle between the conductor and the field.

$$F \propto \sin\alpha$$

(ii) The force F is directly proportional to the current I flowing through the conductor.

$$F \propto I$$

(iii) The force F is directly proportional to the length L of the conductor inside the magnetic field.

$$F \propto L$$

(iv) The force F is directly proportional to the strength of the applied magnetic field B

$$F \propto B$$

(7) Why do parallel currents attract and opposite currents repel each other?

MTN-2015

Ans: Two parallel current wires attract each other because magnetic field between the wire is weak as compare to the sides of the wire.
Two opposite current wires repel each other because magnetic field between the wire is strong as compare to the sides of the wire.

(8) A conductor contains abundance of charges. What can you conclude about the magnetic field due to stationary charges?

Ans: As current carrying conductor has magnetic field**.** Because stationary charges have no electric current so there is no magnetic field around the conductor. Magnetic field produce only due to moving charges.

PAST PAPER SHORT QUESTIONS

(9) Explain the principle of extension of right hand rule. **LHR-2021 (G-I)**
(10) What is the effect of current passing through a long straight wire? **RWP-2019 (G-I)**
(11) Define tesla and write its formula. **SGD-2017 (G-I)**

14. 3 MAGNETIC FLUX AND FLUX DENSITY

(12) What is the difference b/w flux density and flux?

Ans:

FLUX DENSITY	FLUX
• Total number of lines passing through a unit area, if area is perpendicular to the magnetic field lines	• Total number of lines of force passing through a certain area known as flux.
• It is represented by B	• It is represented by Φ_e
• $B = \frac{\Phi_B}{A} if\ \theta = 0^0$	• $\Phi_B = \vec{B} \bullet \vec{A}$
• Its SI unit is wbm^{-2}	• Its S.I unit is Wb

(13) Is it possible for two magnetic lines of force to intersect?

Ans: No, magnetic lines of force can never intersect. If magnetic lines of force intersect then magnetic field intensity has two directions at the same point which is not possible. Hence magnetic lines of force can never intersect.

(14) How magnetic flux and magnetic flux density are related?

Ans: If ϕ is the magnetic flux and B is the magnetic flux density, then relation between them is

$$\phi = \vec{B}.\vec{A}$$

Here $\vec{A}$ is a vector whose magnitude is the area of the element and whose direction is along the normal to the surface of the element,

$\phi = BA\cos\theta$ or $B = \frac{\phi}{A\cos\theta}$

θ is the angle between the directions of the vectors B and vector A.
Here A is the flat surface area whose normal is at an angle θ to the magnetic field.

(12) Define magnetic flux and magnetic flux density.

Ans: Magnetic flux:

"The dot product of magnetic field $\vec{B}$ and vector area $\vec{A}$".
Mathematically, it can be written as:

$$\Phi_B = \vec{B}.\vec{A}$$

$$\Phi_B = BA\cos\theta$$

Magnetic flux density:

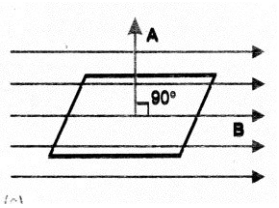
It is defined as:
"The flux passing through a unit area held perpendicular to the magnetic field".

$$\Phi = BA$$

$$B = \Phi / A$$

(13) What is magnetic flux through a plane surface of area 20 cm^2. It is held parallel to magnetic field B = 0.1 T inside the field (DGK 2013)

Ans: When a plane surface is held parallel to the magnetic field then angle between magnetic field and vector area will be 90^o.



As, magnetic flux is;

$$\Phi_B = \vec{B}.\vec{A}$$

$$\Phi_B = BA\cos\theta$$

$$\Phi_B = BA\cos 90^o$$

$$\Phi_B = 0$$

So, there is no magnetic flux passing through plane surface.

PAST PAPER SHORT QUESTIONS

(15) A conductor contains abundance of charges. What can you conclude about the magnetic field due to stationary charges? **DGK-2017 (G-I)**

(16) A plane conducting loop is located in a uniform magnetic field that is directed along the x-axis. For what orientation of the loop is the flux a maximum? For what orientation is the flux a minimum? **LHR -2021 (G-II)**

(17) What is magnetic flux and flux density? Also write their units.
BWP-2019 (G-II), MTN-2019 (G-I)

(18) Differentiate between magnetic flux and magnetic flux density. Also write units of both.
LHR-2022 (G-I)

14. 4 AMPERE'S LAW AND DETERMINATION OF FLUX DENSITY 'B'

(14) Is it possible to obtain on isolated North Pole?

Ans: An electron in motion produces its own magnetic field around the conductor in such a way that its one end act as North Pole, while other as South Pole. Hence, single north or South Pole formation is not possible.

(15) Can a single proton in motion produce magnetic field?

Ans: Yes, a moving charge (either electron or proton) produces its magnetic field but in the case of proton, the magnetic field produced is very weak.

(16) A wire is underlying a carpet. How one can find whether current is flowing or not in the wire?

Ans: A current carrying conductor produces its own magnetic field which may be detected with the help of a compass. Compass will only deflect when current passed through wire.

(17) How can we determine the polarity of solenoid?

Ans: The polarity of the ends of a solenoid can be determined by the following method.
"On looking at the end of the solenoid, if the current appears to flow in the anticlockwise direction, then this ends is north pole, and if it is flowing in clockwise direction then end is south pole.

(18) What is Solenoid?

Ans: A solenoid is a long, tightly wound, cylindrical coil of wire. When current passes through a solenoid, it behaves like a bar magnet.

(19) Why B is not zero outside the solenoid?

Ans: Since outside of a solenoid lines of force are in the same direction, so $\vec{B}$ is not zero. As these lines are far scattered, so this non-zero $\vec{B}$ is very small as compared to then inside the solenoid.

(20) Give dimensions of permeability of free space μ_o.

Ans: The unit of μ_o is = $Wb\ A^{-1}m^{-1}$

$= NA^{-1}m\ A^{-1}m^{-1} = kgms^{-2}A^{-1}m\ A^{-1}m^{-1} = kg\ ms^{-2}A^{-2}$

The dimension of $\mu_o = [MLT^{-2}A^{-2}]$

(21) State Ampere's law and write it in mathematical form.

Ans: "The sum of the quantities $\vec{B}.\Delta\vec{L}$ for all path elements into which the complete loop has been divided equals μ_o times the total current enclosed by the loop, where μ_o is the permeability of free space.

In SI system, its value is:

$\mu_o = 4\pi \times 10^{-7}\ WbA^{-1}\ m^{-1}$

$$\sum_{r=1}^{N} (\vec{B}.\overrightarrow{\Delta L})_r = \mu_o I$$

(22) What is a phantom bar magnet? **LHR-2014**

Ans: A phantom bar magnet is a rectangular piece of an object, made up of iron, steel or any other ferromagnetic substance or ferromagnetic composite, that shows permanent magnetic properties. It has two poles, a north and a south pole such that when suspended freely, the magnet aligns itself so that the northern pole points towards the magnetic north pole of the earth.

PAST PAPER SHORT QUESTIONS

(19) Give dimensions of permeability of free space μ_o. **LHR-2017 (G-I)**

(20) Describe the change in magnetic field inside a solenoid carrying a steady current I, if the number of turns is doubled, but length remains constant. **SGD-2017 (G-II)**

(21) Describe the change in the magnetic field inside a solenoid carrying a steady current I, if
(a) length of the solenoid is doubled and the number of turns remains the same.
(b) the number of turns is doubled, but the length remains the same.
DGK-2017 (G-I & G-II)

(22) Write Ampere's law and write its formula.
BWP-2017 (G-I), SWL-2019

(23) Describe the right hand rule to find the direction of magnetic field inside a current carrying solenoid. **LHR -2021 (G-II)**

(24) If a charged particle moves in a straight line through some region of space can you say the magnetic field in the region is zero? **MTN -2022 (G-I)**

(25) State Ampere's Law. Write down its mathematical expression. **MTN -2022 (G-II)**

(26) What is the effect on magnetic field inside solenoid if the length of the solenoid is doubled and number of turns remain the same? **MTN -2022 (G-II)**

(27) Describe the change in magnetic field inside of solenoid carrying a steady current. If the length of solenoid number is doubled and number of terms remains same.
DGK-2022 (G-I)

14. 5 FORCE ON A MOVING CHARGE IN A MAGNETIC FIELD

(23) Can magnetic force produce an acceleration in stationary electron?

Ans: No, magnetic force acts only on moving charges as given by the relation

$F = q\ vB \sin q$ Q $v = 0$

$F = 0$

Hence, magnetic force is only deflecting force. It is not an accelerating force.

(24) Can a charge at rest be set into motion by bringing a magnet close to it? Explain DGK-2012

Ans: By using that relation $\vec{F} = q(\vec{v} \times \vec{B})$ magnetic force act on a moving charge particles.

There is no force on a stationary charges so a charge at rest cannot be set into motion by bringing a magnet close to it.

PAST PAPER SHORT QUESTIONS

(28) At a given instant, a proton moves in positive x direction in a region where there is a magnetic field in the negative z direction. What is direction of magnetic field? Will the proton continue to move in position x direction? Explain. **LHR-2017 (G-I)**

(29) If point charge q of mass m is released in a non uniform electric field with field lines pointing in the same direction will it make a rectilinear motion? **LHR-2021 (G-I)**

(30) Two charged particles are projected into a region where there is a magnetic field perpendicular to their velocities. If the charges are deflected in opposite directions, what can you say about them? **LHR-2021 (G-I)**

(31) Why does the picture on a T.V screen become distorted when a magnet is brought near the screen? **SGD-2017 (G-I), BWP-2022 (G-I, II), LHR -2022 (G-II), RWP-2022 (G-I)**

(32) Suppose that a charge "q" is moving in a uniform magnetic field with a velocity. Why is there no work done by the magnetic force that acts on the charge q?
MTN-2013, SWL-2016, BWP-2014, BWP-2017 (G-I), DGK-2022 (G-II), RWP-2022 (G-II)

(33) If a charged particle moves in a straight line through some region of space, can you say that magnetic field in the region is zero. **SWL-2013, DGK-2012, 2017 (G-I)**

(34) Two charged particles are projected into a region where magnetic field is perpendicular to their velocities. If the charges are deflected in opposite direction, what can you say about them? **DGK-2017 (G-II)**

(35) Define Lorentz force and write its equation.
DGK-2012, BWP-2013, 2015 (G-II), MTN-2015, SWL-2019

(36) Electric force does work, while no work is done by the magnetic force. Why?
LHR -2021 (G-II)

(37) How can a current loop be used to determine the presence of a magnetic field in a given region of space? **LHR -2021 (G-II)**

(38) Suppose that a charge 'q' is moving in a uniform magnetic field with velocity. Why is there no work done by the magnetic force acts on charge q?

14. 6 MOTION OF CHARGED PARTICLE IN AN ELECTRIC AND MAGNETIC FIELD

(25) Compare electric and magnetic forces.

Ans: Electric Force: $\vec{F} = q\vec{E}$

(i) It acts along the direction of field E.

(ii) It can perform work

(iii) It can act on both static and moving charges.

(iv) It accelerates the charge particle.

Magnetic Force: $\vec{F} = q\left(\vec{v} \times \vec{B}\right)$

(i) It acts perpendicular to magnetic filed.

(ii) It performs no work.
(iii) It is a bending force
(iv) It only acts on moving charges.

(26) What is Lorentz force and how can it be formulated?

Ans: **Lorentz Force:** "Force acting on a charged particle moving in an electromagnetic field is called Lorentz force."

Formulation: If q is the charge on particle moving in a region where electric field $\vec{E}$ and magnetic field $\vec{B}$ are simultaneously present, then q $\vec{E}$ is electric force & q $\vec{v}\times\vec{B}$ is the magnetic force. "Vector sum of these forces is known as Lorentz Force on that charge q."

$$\vec{F} = q\vec{E} + q\vec{v}\times\vec{B}$$

Here $\vec{V}$ is velocity of the charge in the electromagnetic field.

PAST PAPER SHORT QUESTIONS

(39) Two charged particles are projected into a region where there is a magnetic field perpendicular to their velocities. If the charges are deflected in opposite directions, what can you say about them? **LHR-2022 (G-I)**

(40) What is Lorentz force? Write down its formula. **LHR-2022 (G-II)**

(41) Two charged particles are projected into region where there is a magnetic field perpendicular to their velocity. If the charges are deflected in opposite directions, what can you say about them? **GRW-2022 (G-I)**

14. 7 DETERMINATION OF e/m OF AN ELECTRON

(27) Find the radius of an orbit of an electron moving at a rate of $2.0 \times 10^7 ms^{-1}$ in a uniform magnetic field of $1.20\times10^{-3}T$. **RWP-2014, DGK-2015 (G-I)**

Ans:

Speed of the electron $= V = 2.0\times10^7\,ms^{-1}$
Magnetic field strength $= B = 1.20\times10^{-3}T$
Mass of the electron $= m = 9.11\times10^{-31}kg$
Charge on electron $= e = 1.61\times10^{-19}C$

The radius of the orbit is

$$r = \frac{mv}{eB}$$

$$= \frac{9.11\times10^{-31}kg\times2.0\times10^7\,ms^{-1}}{1.61\times10^{-19}C\times1.20\times10^{-3}T}$$

$$\mathbf{r = 9.43\times10^{-2}m}$$

(28) What is the value of charge to mass ratio of electron and which scientist measure it?

Ans: Charge to mass ratio of electron is $1.75\times10^{11}\,C\,kg^{-1}$ which is measured by J. J Thomson.

PAST PAPER SHORT QUESTIONS

(42) How can you use a magnetic field to separate isotopes of chemical element? **MIRPUR (AJK)- 2017, SGD-2017 (G-I), LHR-2017 (G-I)**

(43) Why does the picture on a TV screen become distorted when a magnet is brought near the screen? **SWL-2017**

(44) How can you use a magnetic field to separate isotopes of chemical element? **MTN-2022 (G-I), DGK-2022 (G-II), BWP-2022 (G-I, II)**

(45) How can you make an electronic trajectory visible? **RWP-2022 (G-I)**

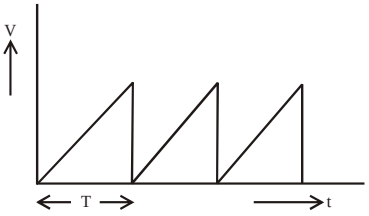
14. 8 CATHODE RAY OSCILLOSCOPE

(29) What are the components of electron gun of C.R.O.?

Ans: Electron gun consists of filament F which heats cathode C which emits electrons. Three anodes A_1, A_2 and A_3 which are at high positive potential with respect to cathode C, accelerates and focuses the electron beam on a screen S. Lastly control grid G, which is in front of cathode C and is at negative potential with respect to cathode, control the number of electrons or the brightness on screen.

(30) What is saw tooth voltage?

Ans: Saw tooth voltage is provided by time base generator which is connected to horizontal deflecting plates. This voltage increases linearly with time for a period T and then drops to zero. Thus due to this voltage, spot on the screen is deflected linearly along x-axis for time T.



(31) What are the uses of CRO?

Ans: **USES OF CRO:**

- The CRO is used for displaying the waveform of a given voltage.
- Once the waveform is displayed, we can measure the voltage, its frequency and phase.
- As the y-axis is calibrated in volts and the x-axis in time; we can easily find the instantaneous value and peak value of the voltage.
- With the help of time axis, we can determined the time period of the wave.
- It is used to obtained information about phase difference between two voltages by displaying their waveforms.

(32) What is the function of Grid "G" in Cathode Ray Oscilloscope?

Ans: It controls the no of electrons which fall on CRO screen, and hence controls illumination of the display of graph on that screen.

(33) Name main parts of C.R.O? **GRW-2014**

Ans: There are three main parts of C.R.O

(i) The Electron Gun:
(ii) The Deflecting Systems
(iii) Fluorescent screen

(34) What is cathode ray oscilloscope and galvanometer? **GRW-2015**

Ans: Cathode ray oscilloscope:

Cathode ray oscilloscope is an electronic instrument which can plot graph at a high speed.

Principle

Galvanometer works on the principle of conversion of electrical energy into mechanical energy. When current flows in a loop placed in magnetic field, it experiences a torque which tends to rotate it.

Galvanometer:

It is an instrument used for the detection of electric current.

Principle

It is based on the principle that whenever a loop carrying current is placed in a magnetic field, it experiences a torque which tends to rotate it.

(35) What is the function of 'X' and 'Y' planes in CRO? **GRW-2019 (G-II)**

Ans: The Deflecting Systems

This comprises of two pairs of plates usually referred as X and Y deflection plates, because a voltage applied between the X plates deflects the beam horizontally on the screen i.e., parallel to x-axis and a voltage applied across the 'y' plates deflects the beam vertically on the screen i.e. along the y-axis.

(36) What are the functions of anodes in C.R.O?

Ans: C.R.O has three anodes:

The anodes A_1, A_2, A_3 which are at high positive potential with respect to cathode, accelerate as well as focus the electronic beam to fixed spot on the screen S.

(37) Briefly explain the function of filament, cathode, grid and plates in C.R.O. SWL-2013

Ans: The beam of the electrons is provided by an electron gun which consists of an indirectly heated cathode, a grid and three anodes. The filament F heats the cathode C which emits electrons. The grid G is at a negative potential with respect to cathode. It controls the number of electrons which are accelerated by anodes, and thus it controls the brightness of the spot formed on the screen.

The deflection system comprises of two pairs of plates usually referred as X and Y deflection plates, because a voltage applied between the X plates deflects the beam horizontally on the screen i.e., parallel to x-axis and a voltage applied across the 'y' plates deflects the beam vertically on the screen i.e. along the y-axis.

PAST PAPER SHORT QUESTIONS

(46) What is the function of 'X' and 'Y' planes in CRO? **GRW-2019 (G-II)**

(47) What is CRO? What is the function of grid in CRO? **GRW-2019 (G-I), LHR-2019 (G-II)**

(48) How does the graph pattern appear stationary on the screen of CRO? Explain the condition. **LHR-2021 (G-I)**

(49) What is C.R.O.? Also give its two uses. **LHR-2021 (G-II)**

(50) Write uses of cathode ray oscilloscope. **MIRPUR (AJK) 2015, 2017**

(51) What are the uses of CRO? **FSD-2019 (G-I)**

(52) Name six essential parts of a CRO. **MTN- 2014, BWP-2019 (G-II)**

(53) Write down any four uses of CRO. **LHR-2022 (G-II)**

(54) Draw saw tooth voltage wave form and describe it? **GRW-2022 (G-I)**

(55) Write down two used of CRO. **GRW-2022 (G-II), DGK-2022 (G-I)**

(56) What is the function of grid? **DGK-2022 (G-II), BWP-2022 (G-II), RWP-2022 (G-I)**

(57) Write down the main parts of C.R.O. **BWP-2022 (G-I)**

14. 9 TORQUE ON A CURRENT CARRYING COIL

(38) Write down the factors on which torque on a current carrying coil depend?

Ans: There are main five factors on which torque on a current carrying coil depends.

(i) Amount of current through coil.

(ii) Strength of external magnetic field.

(iii) Area of the coil.

(iv) Number of turns of the coil.

(v) Angle between magnetic field and Plane of the coil.

PAST PAPER SHORT QUESTIONS

(58) A loop of wire is suspended between poles of a magnet with its plane parallel to the pole faces. What happens if a direct current is put through the coil? What happens if an alternating current is used instead? **LHR-2017 (G-I)**

(59) Is it possible to orient a current loop in a uniform magnetic field such that the loop will not tend to rotate? Explain. **MIRPUR (AJK) 2017**

(60) Write down the factors upon which the force on current carrying conductor placed in uniform magnetic field depends. **RWP-2019 (G-I)**

(61) What be the orientation of a current carrying coil in a magnetic field so that torque acting upon the coil is (a) maximum (b) minimum. **SWL 2017, DGK-2012, 2017 (G-I)**

(62) Is it possible to orient a current loop in a uniform magnetic field such that the loop will not tend to rotate? Explain.

DGK- 2013, MTN 2012, SWL- 2013 + BWP-2012, DGK-2017 (G-II)

(63) How can a current loop be used to determine the presence of a magnetic field in a given region of space? **LHR-2022 (G-I)**

(64) How can a current loop be used to determine the presence of a magnetic field in a given region of space? **GRW-2022 (G-II)**

(65) Is it possible to orient a current loop in a uniform magnetic field such that the loop will not tend to rotate? Explain. **MTN-2022 (G-II), DGK-2022 (G-II), RWP-2022 (G-II)**

14.10 GALVANOMETER

(39) How the sensitivity of a galvanometer be increased?

Ans: As $I = \frac{cq}{BAN}$

Hence, galvanometer can be made more sensitive,

If we,

(i) Increase B

(ii) Increase A

(iii) Increase N

(iv) Decrease c

(40) How a galvanometer can be converted into voltmeter?

Ans: When a wire of high resistance R_h is connected in series with a galvanometer, then such arrangement is called voltmeter. High resistance is attached to draw minimum current from the circuit and its value is given as $R_h = \frac{V}{Ig} - R_g$. Voltmeters always connected in parallel in a circuit

(41) How a galvanometer can be converted into an ammeter?

Ans: When a wire of low resistance R_s. is connected in parallel with a galvanometer, then arrangement formed is called ammeter. Low resistance wire called shunt resistance is attached to increase the range of galvanometer. The value of R_s. is given as $R_s = \frac{I_g R_g}{I - I_g}$

the ammeter is always used in series in a circuit

(42) A sensitive galvanometer cannot be stable. Explain why?

Ans: If the suspension wire is thin, it will have a small value of c (torque constant). When the current passes through the circuit, the pointer of the sensitive galvanometer vibrates about its mean position due to small value of c and large value of B, A and N. It comes to rest after vibrating for a longer time. Thus, the galvanometer is not stable due to small of c and large moment of inertia of the pointer.

(43) What is a stable or Dead beat galvanometer?

Ans: Such a galvanometer in which the coil comes to rest quickly after the current passed through it or the current is stopped from flowing through it is called stable or dead beat galvanometer.

(44) Show that the sensitivity and stability of a suspended moving coil galvanometer is exclusive of one another i.e., a sensitive galvanometer cannot be stable nor can a stable galvanometer be sensitive.

Ans: A sensitive galvanometer is one which produces large deflection even for very small current but galvanometer is stable if its pointer quickly comes to rest when the current is passed through or current is stopped through it. Usually, the pointer of a sensitive galvanometer does not come to rest quickly but vibrates about its equilibrium position for some time before coming to rest. Thus a sensitive galvanometer cannot be stable.

If a galvanometer is not sensitive, then small torque does not effect its position and it remains stable.

(45) Write the formula used to convert a galvanometer into a voltmeter. Why the resistance of voltmeter should be high?

Ans: **Formula:** It is $R_h = \frac{V}{I_g} - R_g$

Where

V = range of voltmeter

I_g = current for full scale deflection in galvanometer.

"Resistance of voltmeter should be high so that no current flows through it, otherwise it measures potential difference less than the actual value between two points across which it is connected.

(46) Briefly describe the experimental function of Galvanometer, Voltmeter, Ammeter and Ohm meter.

Ans: Experimental function of Galvanometer is to detect current in the circuit, while voltmeter measures potential difference across any two points in the circuit. Experimental function of ammeter is to measure current in the circuit whereas ohmmeter measures electric resistance in the circuit.

(47) Why a soft Iron cylinder is placed inside the coil of galvanometer?

Ans: When soft iron cylinder is placed inside the coil of galvanometer, then it makes the magnetic field radial as well as stronger. In turn maximum torque is produced in coil and galvanometer fairly sensitive.

(48) Differentiate between Sensitive and Dead Beat Galvanometer.

Ans:

- A sensitive galvanometer is that for which

$$\frac{1}{\theta} = \frac{C}{BAN}$$

has been made very small. Such a galvanometer can detect even the smallest of current that passes through it.

- A dead beat galvanometer is the one whose pointer quickly comes to half after deflection, on passing or stopping current through galvanometer.
- Any given galvanometer cannot be sensitive and dead beat (i.e stable) simultaneously. So a compromise has to be made between sensitivity and stability of a galvanometer.

(49) How a Galvanometer can be made more sensitive?

Ans: A galvanometer can be made more sensitive by the following strategies:

(i) Use of good magnet to provide large magnetic field to galvanometer coil.
(ii) Use coil of large area of cross-section.
(iii) Use coil having large number of turns of good copper wire.
(iv) Use soft iron cylinder in the coil of galvanometer.

(50) How can you prefer potentiometer over voltmeter? GRW-2019 (G-I)

Ans: We prefer potentiometer over voltmeter because it can measure e.m.f. or potential difference very accurately without drawing any current from the circuit.

(51) Define ammeter. How can we increase range of an ammeter? LHR-2019 (G-II)

Ans: Ammeter is an instrument which is used to measure current of the circuit.

By using that relation $R_s = \frac{I_g R_g}{I - I_g}$ We can increase the range of ammeter by decreasing the value of shunt resistance R_s.

(52) Define current sensitivity of a galvanometer. SGD 2015 (G-II)

Ans: Sensitivity of galvanometer mean that galvanometer gives maximum deflection by passing small amount of current through it.

Because, $I = \frac{c}{BAN}\theta$

Thus $I \propto \theta$, since $\frac{c}{BAN} = \text{Constant}$

(53) What happen to the current of a circuit of a load resistance of the circuit is much less than the voltmeter resistance, the voltmeter is supposed to connect in series to the circuit? DGK-2017 (G-II)

Ans: Voltmeter is always connected parallel in the circuit to measure potential difference across any two points of the circuit. If we supposed voltameter is connect in series to the circuit then it cannot measure value of potential difference.

(54) What is meant by the term 'meter movement'? (GRW 2013)

Ans: The portion of the galvanometer whose motion causes the needle of the device to move across the scale is usually known as meter movement.

PAST PAPER SHORT QUESTIONS

(55) How can we increase the sensitivity of galvanometer? **GRW-2019 (G-II)**

(56) How can you prefer potentiometer over voltmeter? **GRW-2019 (G-I)**

(57) Define ammeter. How can we increase range of an ammeter? **LHR-2019 (G-II)**

(58) Why the voltmeter should have a very high resistance? **SGD-2017 (G-I) & (G-II)**

(59) Define dead beat galvanometer and unstable galvanometer.
MIRPUR (AJK) 2017

(60) What do you know about sensitivity of galvanometer?
SGD-2017 (G-I), FSD-2019 (G-I)

(61) Why the voltmeter should have a very high resistance?
BWP-2017 (G-I), SWL-2017

(62) What is dead beat or stable galvanometer? **SWL-2017**

(63) What happen to the current of a circuit of a load resistance of the circuit is much less than the voltmeter resistance, the voltmeter is supposed to connect in series to the circuit?
DGK-2017 (G-II)

(64) What is galvanometer? On which principle it works? **MTN-2019 (G-I)**

(65) Define stable or dead-beat galvanometer. **LHR-2022 (G-I)**

(66) How a galvanometer can be made sensitive? **LHR-2022 (G-II)**

(67) How can a galvanometer made more sensitive? **GRW-2022 (G-I)**

(68) Why the resistance of an ammeter should be very low? **GRW-2022 (G-II)**

(69) What is a dead-beat galvanometer? **GRW-2022 (G-II)**

(70) How galvanometer can be made more sensitive? **MTN-2022 (G-I), RWP-2022 (G-II)**

(71) Why Ohm meter gives full deflection on zero resistance? **MTN-2022 (G-I)**

(72) Why the voltmeter should have a very high resistance? **MTN-2022 (G-II), RWP-2022 (G-I)**

(73) Define current sensitivity of galvanometer. **DGK-2022 (G-I)**

(74) Why the resistance of ammeter should be very low. **DGK-2022 (G-I)**

(75) What is meant by Zeroed of ohm – Meter? **BWP-2022 (G-I)**

(76) What is meant by sensitivity of Galvanometer? How can a galvanometer be made more sensitive? **BWP-2022 (G-II)**

14. 11 A.V.O METER MULTIMETER

(77) Draw a diagram of current measuring part of AVO-meter. **(MTN 2013)**

Ans: This part is actually a multi range ammeter. It consists of number of low resistances in parallel with galvanometer. The value of these resistances depend upon the range of ammeter. Range of current can be selected with the help of range switch.

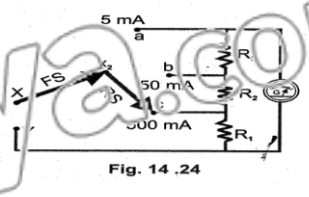


Fig. 14 .24

(78) What we can measure with a AVO-meter?

Ans: Electric current, electric voltage and electric resistance can be measured with an AVO-meter. Only one of these three quantities can be measured at a time. Simultaneous measurement of any two or all of the three is not possible by a given AVO-meter.

(79) What is meant by DMM?

Ans: DMM means "Digital Multi meter" which measures current, voltage or resistance.

PAST PAPER SHORT QUESTIONS

(80) What is digital multimeter? Give its two advantages over AVO meter. **LHR-2021 (G-II)**

(81) Draw a circuit diagram of current measuring part of Avometer. **RWP-2022 (G-II)**

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