ASIA ENGLISH SCHOOL		1st Term Exam September 2009-10
Secondary /Higher Secondary Section		Date :10-09-09
Asia Campus, Drive-in Road, Ahmedabad-380054		Time : 3 hours
Std :XII Sci.	**Sub : Physics 054 (E)**	Total Marks : 100

Roll No. _____

Instructions :

(1) There are four sections and total 60 questions in this question paper.
(2) Symbols used in this paper have their usual meanings.
(3) Log table (or) simple calculator can be used.
(4) Begin new section on a new page. Follow the sequence.

SECTION – A

Q.No. 1 to 16 are multiple choice questions, each carry one mark. Choose correct answer (a/b/c/d with answer) and write it.

(1) Charge Q each is placed on (n-1) corners of a polygon of sides 'n'. The distance of each corner from the centre of the polygon is 'r'. The electric field at its centre is _____

[a] $\frac{kQ}{r^2}$ [b] $?n?1?\frac{kQ}{r^2}$ [c] $\frac{n}{n?1}\frac{kQ}{r^2}$ [d] $\frac{n?1}{n}\frac{kQ}{r^2}$

(2) Two spheres carrying charge 'q' are hanging from a same point of suspension with the help of threads of length 1 m, in a space free from gravity. The distance between them will be _____

[a] O [b] 2m [c] 0.5 [d] cannot be determined

(3) State S.I. unit of line-integral of electric filed.

[a] erg/cm [b] J/C [c] J/A [d] $NC^{?1}m^{?2}$

(4) A parallel plate capacitor is charged. A dielectric slab is introduced in it. The _____will remain constant amongst the following options.

[a] Electric charge Q [b] Potential difference, V.
[c] Capacitance, C [d] energy, U.

(5) A copper wire having resistance R is divided into ten equal parts. Five of these are connected in series and other five are connected in parallel and finally both of them are connected in parallel with each other. Calculate the resultant resistance of such an arrangement.

[a] R [b] $R/_{52}$ [c] $R/_{4}$ [d] $R/_{5}$

(6) If potential gradient along the potentiometer wire be decreased keeping voltage source constant then zero deflection position will be obtained at _____.

[a] Shorter length [b] mid-point
[c] Longer length [d] none of the above.

(7) If p.d. across a conductor is constant and resistivity of its material is ' ', the Joule heat produced in one second is proportional to _____

[a] $1/\sqrt{\ }$ [b] [c] $1/$ [d]

(8) When current is passed through a circular wire prepared from a long conducting wire, magnetic field produced at its center is B. Now a loop having two turns is prepared from the same wire and the same current is passed through it. The magnetic field at its centre will be _____

[a] $B/_{4}$ [b] 4B [c] $B/_{2}$ [d] 2B

(9) Unit of effective torsional constant of the spring system holding coils is

[a] $\frac{N}{rad?m}$ [b] N – m [c] $\frac{J}{rad}$ [d] $\frac{J?m}{rad}$

(P.T.O.)

(10) A straight steel wire of length '□' has magnetic dipole moment 'M'. If this wire is bent in the form of a semicircle, then the new value of the Magnetic dipole moment is.

[a] M [b] $M/2$ [c] $M/?$ [d] $2M/?$

(11) The relative permeability of a diamagnetic substance is _____

[a] Very large [b] small but greater than one
[c] Negative [d] less than one

(12) A magnetic needle hung using a silk fiber oscillates in Earth's magnetic field. If the temperature of this needle is raised beyond the curie temperature of the material of the needle then

[a] The periodic time of the oscillation will increase.
[b] The periodic time of the oscillation will decrease.
[c] The needle will stop oscillating.
[d] The periodic time of the oscillation will not change.

(13) Magnetic flux linked with a coil is $? ? 7t^2 ? 2t ? 3,$ where t is in seconds and $?$ is in Weber. At t = one second, the induced emf = _____volts.

[a] 1.6 [b] 6 [c] 14 [d] 16

(14) The real power in an AC circuit containing only inductor is equal to ____W.

[a] zero [b] $LI^2/2$ [c] $LI/2$ [d] $2LI^2$

(15) A capacitor of one Farad magnitude of capacitance has air as the medium between its two plates. Area of the plates is $1.13?10^9 m^2$ then distance between the plates is equal to _____. $?_0 ? 8.9?10^{?12} C^2 N^{?1} m^{?2}$

[a] one centimeter [b] one millimeter [c] one metre [d] all of the above.

(16) If $5?10^4$ ohm is the resistance of a person's wet hand, then _____potential difference will generate a fatal current of one milli ampere

[a] 110 V [b] 230 V [c] 220 V [d] 50 V

SECTION – B

Q.No. 17 to 23 are very short answer questions. Each carrying one mark.

(17) State dimensional formula of electric flux in terms of M,L,T & A.
(18) Why a coulombian force is a two body force ?
(19) What do you mean by linear dielectric ?
(20) Define capacitor.
(21) State difference between WHEATSTONE'S BRIDGE and POTENTIOMETER (any two points)
(22) Define drift velocity.
(23) What is VOLTAIC PILE ?
(24) State principle of galvanometer.

OR

State principle of cyclotron.

(25) State equation of LORENTZ FORCE

OR

State SI definition of ONE AMPERE current

(26) State name of physical quantity whose dimensional formula is $M^{?1} L^0 T^1 A^1$

OR

$Joule/Tesla$ is the unit of which physical quantity.

(27) State the name of the instrument which measures induced magnetic moment.
(28) State the names of two devices which works on the principle of electromagnetic induction.
(29) Draw a Labelled diagram of A.C. Dynamo
(30) State name of physical quantity whose dimensional formula is $M^1 L^0 T^{?1} A^{?1}$
(31) State limitation of Faraday's Law of e.m, induction.
(32) Explain the term BACK E.M.F. (in very short)

Contd…3

SECTION – C

Q.No. 33 to 48 are short answer questions. Each carrying two marks.

(33) Prove that resultant force on electric dipole placed in a non-uniform electric field is $q\frac{d\vec{E}}{dx}\ 2a\cos?$ along positive direction.

OR

Using Gauss's theorem, prove that the electric field intensity at any point from the plane is not dependent on the distance of the point from the plane.

(34) What are BOUND CHARGES ? Show that electric field in dielectric medium is given by $??\frac{?_f ??_b}{?_0}$

(35) Show that electric field at any point of the electrically charged surface is given by $\frac{?}{?_0}$ where $?$ = surface charge density.

(36) Explain – "An ordinary table voltmeter cannot measure the emf of the battery, but can measure its terminal voltage."

(37) State difference between ELECTRIC CURRENT and ELECTRIC CURRENT DENSITY.

(38) Deriving equation $W?I^2Rt$ for Joule's heat. Write JOULE'S LAW.

(39) Using knowledge of energy levels, Define contact potential and explain how peltier emf $?(?_{AB})$ is developed at junction.

OR

State and explain Faraday's First Law of electrolysis and define electrochemical equivalent.

(40) State difference between. VOLTAMETER and ELECTROCHEMICAL CELL.

(41) State Limitations (any two) and Uses (any two) of CYCLOTRON.

(42) Using Ampere's circuital law, obtain equation for the magnetic field inside a long current carrying solenoid

(43) Accepting equation $\vec{B}?\frac{?_o Iy}{4?}?\frac{dx}{(x^2?y^2)^{3/2}}K$ for a magnetic field due to a straight conductor carrying electric current prove that $\vec{B}?\frac{?_o I}{2?y}K$

OR

Obtain equation $dB(x)?\frac{?_o I}{4?}\frac{dl}{r^2}\cos?$ at a point on the axis of a circular ring carrying a current.

(44) Define Magnetic declination and magnetic dip angle at a place and draw labeled figure to indicate Geo-magnetic elements

(45) Discuss reason behind the origin of 'induced emf.

OR

Define EDDY CURRENTS and show that due to eddy currents, metal plate falling in magnetic field have acceleration less than that of gravitational acceleration.

(46) State equation of impedance for an AC circuit containing ONLY INDUCTOR. Represent it on a complex plane. Obtain equation for electric current for this case. Plot graph of voltage, current $?\ wt$

(47) Compare magnetic dipole &electric dipole.

(48) State equation for power in series L-C-R, A.C. circuit. Represent its impedance in the complex plane, Obtain equation for power factor from it. What happens to power when $?^2LC?1$.

Contd…4

SECTION – D

Q.No. 49 to 60 are short answer question, each carrying three marks.

(49) Two spheres of copper weighing one gram each, are kept one metre apart. The number of electrons in them are 1% less than number of protons. Find electrical force acting between them. Atomic weight of copper is 63.54 g/mol, atomic number is 29. Avogadro's number = $N_A ? 6.023?10^{23} mol^{?1}$ and $k ? 9?10^9 SI$

(50) Q amount of electric charge is uniformly distributed on a ring of radius 'r'. A sphere of radius 'r' is drawn in such a way that the centre of the sphere lies on the surface of the ring. Calculate the electric flux associated with the surface of the sphere.

(51) An infinite number of conducting plates, each of them are separated by a small distance dx spread over a distance 'd' to form a capacitor. Calculate the value of the capacitance of such an arrangement.

OR

$q_1 ? 2$ micro coulomb amount of electric charge is placed at origin of Cartesian co-ordinate system. Another $q_2 ? ?3$ micro coulomb amount of the charge is placed along the $x ? axis$ at a distance $x ? 100$ centimeter. At which point along $x ? axis$ will the electric potential be equal to zero ?

(52) Eleven equal wires each of resistance 'r' ohms form the edges of an incomplete cube. Find the equivalent resistance from one end of vacant edge to the other end.

OR

Twelve equal wires each of resistance 'r' ohms form the edges of complete cue. Find the equivalent resistance at the mid-points of the diagonally opposite edges.

(53) Electric current divides among two resistors connected in parallel in such a way that the joule heat developed becomes minimum. Using this fact obtain the equation of division of currents.

(54) A 3 coulomb charge passes with a velocity of 50 $\hat{j}$ m/s through a region having a uniform magnetic field 2 $\hat{k}$ tesla and some uniform electric field. If the lorentz force acting on it is 330 $\hat{i}$ newton, find the electric field in this region.

(55) A magnet makes an angle of 45^0 with the horizontal in a plane making an angle of 30^0 with the magnetic meridian. Find the true value of the dip angle at the place.

OR

The work for rotating a magnet with dipole moment M, by 90^0 from its magnetic meridian is 'n' times the work to rotate it by 60^0. Find the value of 'n'

(56) A field is given by $\vec{A} ? x\hat{i} ? y\hat{j} ? x\hat{k}$ can this field be used to obtain induced emf.

OR

Find the value of the self induction of a very long solenoid of length ℓ, having total number of turns equal to N, and cross sectional area A.

(57) A coil having 200 turns has a surface area $0.12 m^2$. A magnetic field of strength 0.10 wb/m^2 linked perpendicular to this area change to 0.5 wb/m^2 in 0.2 second. Find the average induced emf in the coil.

(58) There are $1.5?10^4$ turns in the winding of a toroidal ring. The radius of circular axis of the ring is 10cm. The radius of cross- section of ring is 2.0cm. Find inductance of the ring.

(59) 11,000 W of electric power at 220 voltage is transmitted over a cable. The resistance of the cable is 'R'. Calculate the power lost in the above case. Also calculate the loss in the transmission of the power, if the same amount of power is transmitted at 22,000 voltage. Which of the two options will be preferred by you ?

(60) Calculate the resultant inductance of two inductors L_1 and L_2. When they are connected in parallel in an appropriate A.C. circuit.

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