

LIONS SCHOOL MIRZAPUR
HALF YEARLY EXAMINATION - 2020-21

CLASS - XII
SUBJECT – PHYSICS (042)

TIME-3 HRS.
M.M -70

General Instructions: -

- a) This question paper comprises four sections A,B,C and D.
- b) There are 37 questions in the questions paper all questions are compulsory.

SECTION – A

Questions no. 1 to 20 are very short answer type questions carrying 1 mark each.

- Q.1 Minimum numbers of $8 \mu\text{F}$ and 250 volt. Capacitors used to make a combination of $16 \mu\text{F}$ and 1000 V are
- a) 32 b) 8 c) 4 d) 2
- Q.2 Charge Q is distributed to two different Metallic spheres having radii R and 2R such that both spheres have equal surface charge density. Then charges on larger sphere is-
- a) $\frac{4Q}{5}$ b) $\frac{Q}{5}$ c) $\frac{3Q}{5}$ d) none of these
- Q.3 The S.T unit of conductance is –
- a) ohm b) mho c) ohm-m d) mho- m^{-1}
- Q.4 Write of resistance 5 ohm is drawn out so that its length is increased to twice its original length. The value of its new resistance is-
- a) 10Ω b) 20Ω c) 15Ω d) 45Ω
- Q.5 In case of insulators as the temperature decreases resistivity.
- a) increases b) decreases c) becomes zero d) remain same
- Q.6 A circular coil of n turns and radius r carries a current I. the magnetic field at the centre is.
- a) $\frac{\mu_0 n i}{r}$ b) $\frac{\mu_0 n i}{2r}$ c) $\frac{2 \mu_0 n i}{r}$ d) $\frac{\mu_0 n i}{4r}$
- Q.7 A coil of wire has an area of 600 cm^2 and has 500 turns. If it carries 1.5 A current its. Magnetic moment is-
- a) 5 A.m^2 b) 15 A.m^2 c) 30 A.m^2 d) 45 A.m^2

Or

The force between two parallel current carrying wires is independent of –

- a) Their distance of separation
- b) The length of wires
- c) The radii of the wires
- d) The medium in which they are placed.

Q.8 To convert galvanometer into ammeter which one of the following is connected with the coil?

- a) High resistance wire in series
- b) Low resistance wire in parallel
- c) High resistance wire in parallel
- d) Low resistance wire in series

Or

The ratio of the shunt resistance and the resistances of a galvanometer is 1.499 if the full scale deflection current of the galvanometer is 2mA. The range of ammeter is-

- a) 1a
- b) 2A
- c) 3A
- d) 4A

Q.9 The cause of induced emf is

- a) magnetic flux
- b) magnetic field
- c) area
- d) change in the magnetic flux

Q.10 The magnetic flux linked with a coil is $\phi = (3t^2 - 2t + 1)$ milliweber. The emf induced in the coil at $t = 1 \text{ sec.}$ is –

- a) 4 volt
- b) 4×10^{-3} volt
- c) 6 volt
- d) 6×10^{-3} volt

Note: Fill in the blanks with appropriate answer:-

Q.11 If ω is angular frequency of a.c. then the reactance offered by inductances L is

Q.12 The voltmeter of range has lower resistance than the voltmeter of range.

Q.13 A linear conductor carrying current of placed parallel to the direction of magnetic field it experience force.

Q.14 The rate at which electric work is done by the source of emf in maintaining the current is called

Q.15 Kirchhoff's second rule is based on

Note: Answer the following.

Q.16 Why no electric lines of force can intersect each other?

Q.17 A wire of resistivity? Is stretched to three times to length what will be its new resistivity.

- Q.18 A current is set up in a long copper pipe. Is there a magnetic field (a) inside the pipe.
- Q.19 A loop of irregular shape carrying current is located in an external magnetic field if the wire is flexible. Why does it change to a circular shape?
- Q.20 A wire which is in N-S direction is dropped freely. Will any potential difference be induced across its ends.

SECTION – B

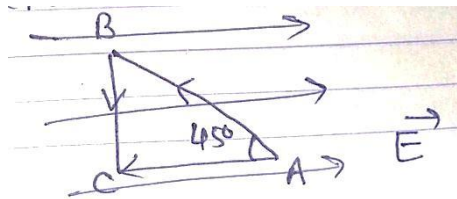
Questions no. 21 to 27 are short answer type questions carrying 2 marks each.

- Q.21 Derive an expression for torque acting on dipole in uniform electric field.

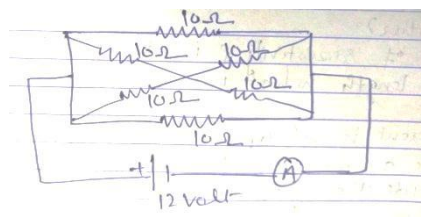
Or

An electric dipole, when held 30° with respect to a uniform electric field of 10^4 N/C experience a torque of 9×10^{-26} N-m. Calculate dipole moment of the dipole.

- Q.22 A test charge q is moved without acceleration from A to C over the path ABC. Calculate potential difference between A and C.



- Q.23 Derive the relation between electric current and drift velocity.
- Q.24 Calculate the current shown by the ammeter A in the circuit diagram.



- Q.25 A proton and particle, whose kinetic energies are same, enter perpendicularly a uniform magnetic field. Compare the radii of their path and time periods.
- Q.26 Derive an expression of coefficient of self-inductance of long solenoids.

Or

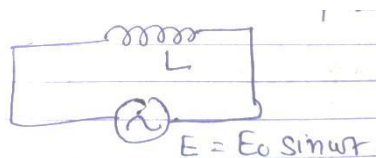
A coil of resistance 300 ohm and inductance 1.0 henry is connected across an alternating voltage of frequency $\frac{300}{2\pi}$ Hz. Calculate the phase difference between the voltage and current in the circuit.

- Q.27 A plane electromagnetic wave of frequency 25 MHz. travel in free space along the x-direction. At a particular point in space and time the electric vector is $\vec{E} = 6.3 \text{ v/m} \hat{j}$ calculate \vec{B} at this point.

SECTION – C

Questions no. 28 to 34 are long answer type questions carrying 3 marks each.

- Q.28 What is electromagnetic wave and also write the basic properties of electromagnetic wave. Draw e.m. wave in terms of E and B.
- Q.29 Show that alternating current is lags by $\frac{\pi}{2}$. When A.C. connected with coil of inductance 'L'



Or

Show that average power dissipated through inductor 'L' is zero.

- Q.30 Kamla peddles a stationary bicycle the pedals of which are attached to a 100 turn coil of area 0.10m^2 . The coil rotates at half a revolution in one second and it is placed in a uniform magnetic field of 0.01 T perpendicular to the axis of rotation of the coil. What is the maximum voltage generated in the coil?

Or

Obtain the resonant frequency of a series LCR circuit with $L = 2\text{H}$ $C = 32\mu\text{F}$ and $R = 10 \text{ ohm}$. What is the Q-value of this circuit?

- Q.31 Derive an expression for magnetic field due to current – carrying long solenoid.
- Q.32 State the ohm's law and show that $R = \frac{ml}{ne^2ca}$.
- Q.33 A battery of 10 volt is connected across the diagonally opposite corners of a cubical network consisting of 12 resistors each of resistance 1 ohm. Determine equivalent resistance of the network and the current through the battery.
- Q.34 Derive the electric potential due to an electric dipole at point on axial line and show that potential is zero on equatorial line.

SECTION - D

Questions no 35 to 37 are also long answer type questions carrying 5 marks each.

Q.35 Derive an expression for electric field intensity due to infinite line charge by using Gauss's theorem.

Or

Derive an expression for energy density of capacitor. Show that the force on each plate of a parallel plate capacitor has a magnitude equal to $\frac{1}{2}qE$.

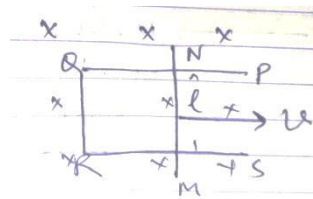
Q.36 Derive an expression for magnetic field at a point on the axis of current carrying circular coil.

Or

Derive the expression for force acting between two parallel current – carrying conductors and also define 1 Ampere of current.

Q.37 When a wire of length 'l' is moving on rectangular frame in magnetic field. Derive

i) $E = v l B$ ii) $i = \frac{v l B}{R}$ iii) $F = \frac{v l^2 B^2}{R}$ iv) $P = \frac{v^2 l^2 B^2}{2}$



Or

With the help of diagram explain construction and working of A.C. generator.