(SECTION-B)

(QUESTION-2)

(PART 4)

Volts and electron volts are related and differed because of the following reasons:-

VOLTS:

Volt is the unit of potential difference - It is the work done of 1 Joule on 1 columb charge.

ELECTRON-VOLT:

Amount of energy gained or lost by an electron while moving through a potential difference of 1 volt.

RELATION:-

The relation between volt and electron volt is the energy given by:-

$$E = V \times Q$$

$$E = 2V \times 1.6022 \times 10^{-19} C$$

$$E = 1.6022 \times 10^{-19} J \quad : C \times V = J$$

$$E_{(eV)}$$

DIFFERENCE:-

The main difference between volt and electron volt is that volt is the other name of potential difference while electron volt is the unit of energy.

(PART-1)

GIVEN:

$r = 30\,cm$

$q = 3\,\mu C$

REQUIRED:-

Electric field = E = ?

SOLUTION:

As we know that

$$E = \frac{kQ}{(r)^2}$$

$$= \frac{9 \times 10^{-9} \times 3 \times 10^{-6}}{(0.3)^2}$$

$$E = 3 \times 10^5\ N/C$$

(PART-ii)

POTENTIAL GRADIENT:

The rate of change of potential difference with respect to change is displacement is called potential gradient.

FORMULA:

Potential gradient is equal to electric field intensity

$$\vec{\Delta E} = \frac{-\Delta V}{\Delta x}$$

MATHEMATICALLY:

Def of work:-

$W = F\Delta x$

by substituting

$F = Eq$

$W = Eq\Delta r$

$\frac{W}{q} = E\Delta r$

As we know that

$\frac{\Delta V}{\Delta r} = \frac{E\Delta r}{\Delta r}$

$\vec{E} = -\frac{\Delta V}{\Delta r}$

(PART NO 3)

DIELECTRIC:

The medium which is present between the two plates of a capacitor is called dielectric.

DIPOLE:

When two opposite poles are formed in a neutral atom under the influence of electric field is known as dipole.

DIPOLE MOMENT:

The vector product of charge "q" and distance between the dipoles (r) is called dipole moment.

UNIT:

The unit of dipole moment is Debye. (Columb meter)

POLARIZATION: (9)

The process of forming of dipoles in the di-electric under the influence of electric field is called polarization.

(PART NO 5)

OHM's LAW:

This law was firstly proposed by German physist George Simon OHM.

STATEMENT:

This law states that current is directly proportional to applied voltage when the temprature of a conductor is kept constant.

MATEMATICALLY:

According to Ohm's Law

$$I \propto V$$

$$I = KV \quad -i$$

where k is the constant of proportionality and is known as conductance of a conductor and its value is

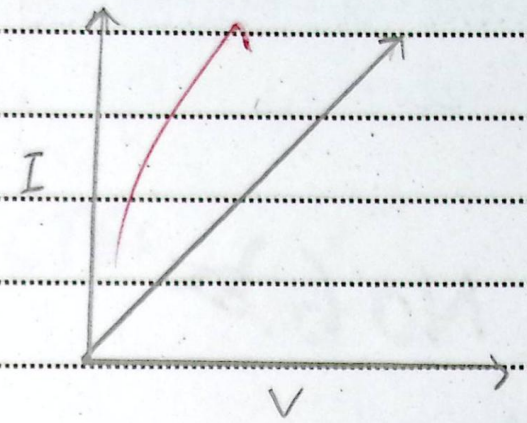
$$k = \frac{1}{R} \quad -ii$$

Put value in i

$$I = \frac{V}{R}$$

Here R is constant and is known as resistance of a conductor. It's value depends upon nature, dimension and shape of a material.

GRAPHICAL REPRESENTATION:-



OHMIC CONDUCTORS:

Those conductors which strictly obey's ohm law are called ohmic conductors.

EXAMPLE:-

Metals are the example of ohmic conductors.

NON-OHMIC CONDUCTORS:

Those conductors which donot obey's ohm law are called non-ohmic conductors

EXAMPLES:-

Filament of bulb, semiconductor diode etc.

(PART NO 6)

INDUCTANCE:-

The emf (E) induced in a coil due to change in magnetic flux is called inductance.

MATHEMATICALLY:-

We know that inductance is given by

$$L = N \frac{\Delta \phi}{\Delta I}$$

from the above equation it is clear that inductance depends upon number of coils, magnetic flux, current.

AFFECTS:

Inductance is directly proportional to number of turn "N" and Magnetic flux "ϕ" i.e with the increase in number of turns and magnetic flux inductance increases and vice versa.

Inductance is inversely proportional to change in current i-e with the increase in current the inductance decreases and vice versa.

PART NO 7

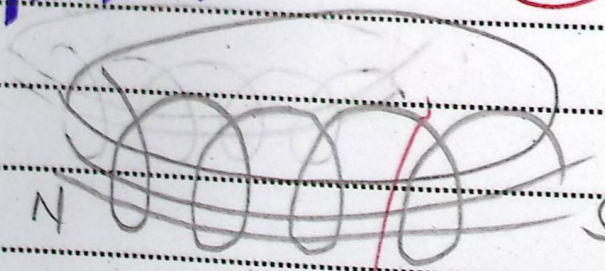
The current carrying coil behaves like a bar magnet in the following way:-

EXPLANATION:-

The magnetic field in a current carrying solenoid is is concentrated and parallel inside the solenoid and weak outside the solenoid.

It can be shown through a diagram:-

DIAGRAM:-



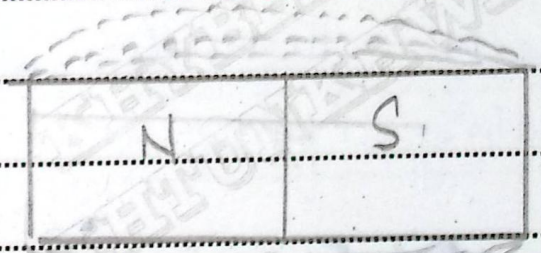
As we can see on the two ends of the solenoid

north and south poles are formed.

MAGNETIC FIELD OF THE BAR MAGNET:-

On the ends of bar magnet north and south poles are formed it can be shown through diagram:-

DIAGRAM:-



CONCLUSION:

Magnetic field of solenoid and bar magent is similar

PART NO 9)

Soft and hard magnetic materials are given below:-

SOFT MAGNETIC MATERIALS:

Soft magnetic materials are those materials in which the domain of a magnetic material becomes easily alligned through small magnetizing force.

EXAMPLE:

Soft iron.

HARD MAGNETIC MATERIALS:

Hard magnetic materials are those materials in which the domain of a magnetizing material requires large magnetizing force to become alligned.

EXAMPLE:-

Steel.

(PART NO 10)

Corrosive force of a steel is greater than iron

EXPLANATION:-

Corrosive force is a force which is used to overcome the residual magnetism of a substance oppositely magnetizing it

As the resistivity of a steel is greater than the iron

as a result its residual magnetism will also be high due to high residual magnetism the corrosive force of steel is greater than iron.

PART NO 8:-

DOUBLING THE FREQUENCY INDUCTOR:-

1-

$$X_L = 2\pi f L$$

$$X_L = 2\pi (2f) L$$

$$X_L = 2X_L$$

DOUBLING THE FREQUENCY OF CAPACITOR:

2-

$$X_C = \frac{1}{2\pi f C} \Rightarrow X_C = \frac{1}{2\pi (2f) C}$$

$$X_C = \frac{1}{2X_C}$$

SECTION - C

QUESTION NO 4

PART A

POSTULATES OF BOHR HYDROGEN MODEL:

1- Electrons revolves around the nucleus due to centripetal force provided by the columbic forces between negatively charged electron and nucleus.

$$F_{centripetal} = F_{columbic}$$

$$\frac{mv^2}{r} = \frac{Kq_1q_2}{r^2}$$

2- Electrons revolve around a nucleus in a fixed orbitary path having fixed momentum

$\frac{nh}{2\pi}$

$mvr = \frac{nh}{2\pi}$

3. Electrons does not release energy when it is revolves in an orbit but it release energy when it jumps from higher energy level to lower energy level.

$\Delta E = E_2 - E_1$

DERIVATION OF ~~the~~ RADIUS OF ELECTRONS:

According to bohr 1st postulate

$\frac{mv^2}{r} = \frac{k.e^2}{r^2}$

$mv^2 = \frac{ke^2}{r}$

$v^2 = \frac{ke^2}{mr}$ ——— i

from 2nd postulate $mvr = \frac{nh}{2\pi}$

$v = \frac{nh}{m2\pi r}$ —— ii

put ii in i

$\frac{n^2h^2}{4\pi^2m^2r^2} = \frac{ke^2}{mr}$

$\frac{n^2h^2}{4\pi mr} = ke^2$

$r_n = \frac{n^2h^2}{4\pi me^2}$

PART B:-

$\frac{1}{\lambda} = \frac{1}{R_H}\left[\frac{1}{(n_1)^2} - \frac{1}{(n_2)^2}\right]$

$\frac{1}{\lambda} = 1.097 \times 10^7 \left[\frac{1}{3^2} - \frac{1}{4^2}\right]$

$\frac{1}{\lambda} = 1.097 \times 10^7 \left[\frac{1}{9} - \frac{1}{16}\right]$

$\frac{1}{\lambda} = 1.097 \times 10^7 \times 0.05$

$\frac{1}{\lambda} = 0.054 \times 10^7$

$\frac{1}{\lambda} = 5.4 \times 10^5$

$\lambda = 1.85 \times 10^{-6}\ m$

(QUESTION-3)

(PART A)

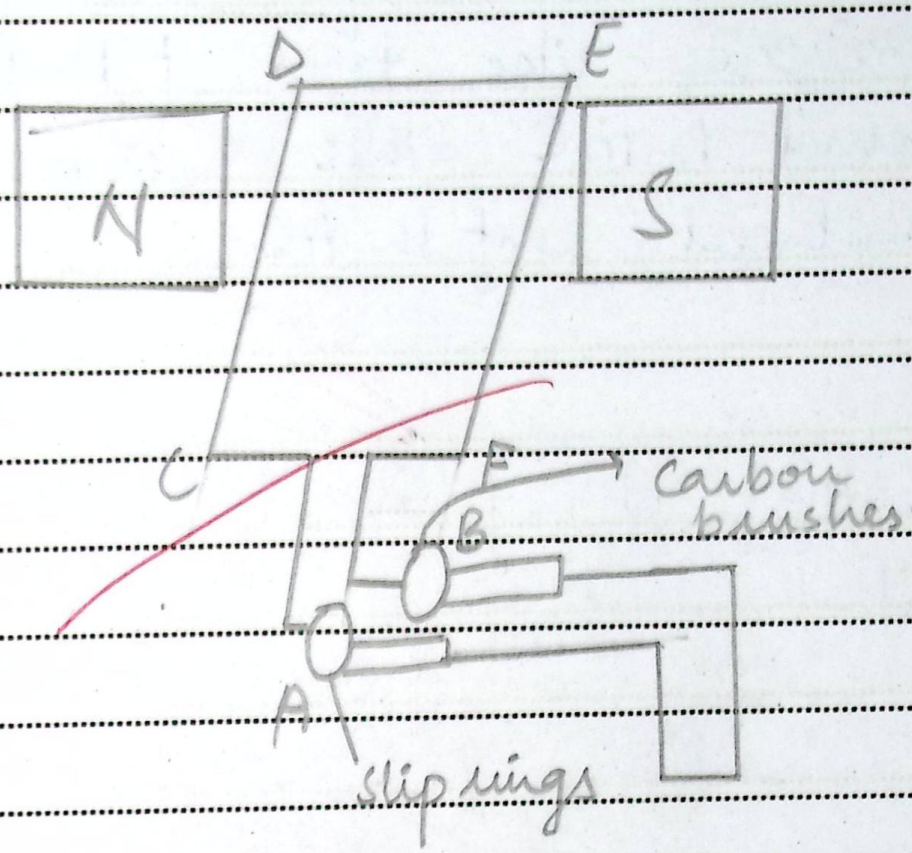
AC GENERATOR:-

An AC generator is a machine that converts mechanical energy into electrical energy. AC generator converts mechanical energy of armature coil into back emf.

CONSTRUCTION:-

Let a rectangular coil known as ABCDEF be present in a magnetic field with two ends A and B attached to slip rings. These slip rings are attached to carbon brushes which are inturn connected

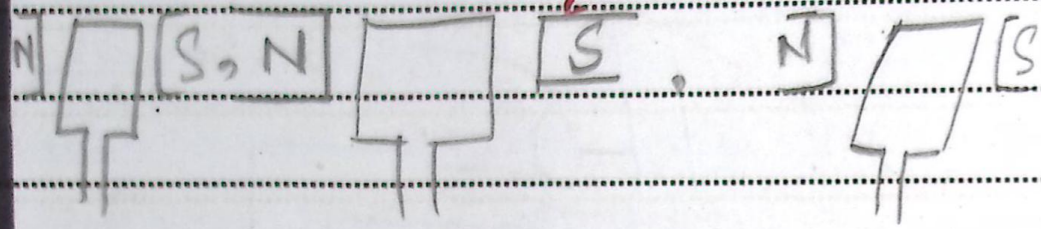
with a circuit.

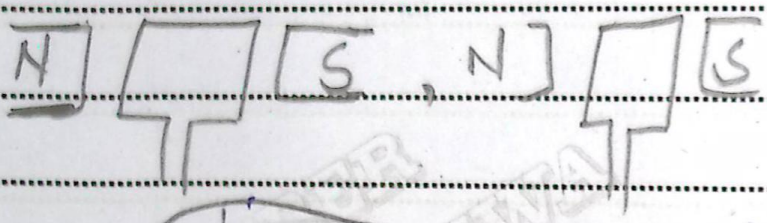


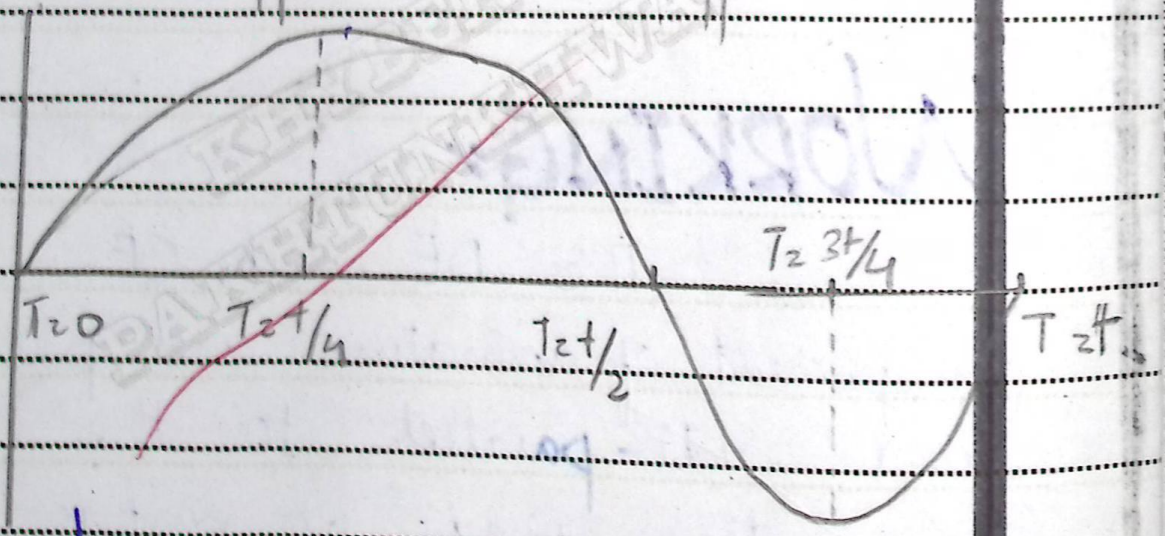
WORKING:-

The DE and CF component of armature are parallel and anti-parallel to the magnetic field no emf is produced in these parts. By flemming right hand rule emf is induced from C to D and E to F. After

half rotation EF replaces CD. The direction of induced emf reverses like from F to E and D to C. This way induced emf is AC.







$\Phi = BA$

$\varepsilon = \frac{N\Delta\Phi}{\Delta t}$

POSITION 1:-

$\theta = 0^\circ$

$\varepsilon = NAWB \sin(0)$

$= 0$

POSITION-2:-

$\theta = 90^\circ$

$\varepsilon = NWAB \sin 90^\circ$

$\varepsilon = NWAB$

POSITION-3:-

$\theta = 180^\circ$

$E = NWAB \sin(180^\circ)$

$= 0$

POS 4:- $\theta = 270^\circ$

$E = NWAB \sin(270^\circ)$

$E = -NWAB$

(PART-B)

GIVEN:-

$\Delta I = 5 - 0 = 5$

$t = 0.1s$

$E = 200V$

TO FIND:-

$L = ?$

SOLUTION:-

$$L = \frac{E \cdot t}{\Delta I}$$

$$L = \frac{200 \times 0.1}{5}$$

$L = 4H$

QNO6:- 8

c) NUCEAR FISSION:-

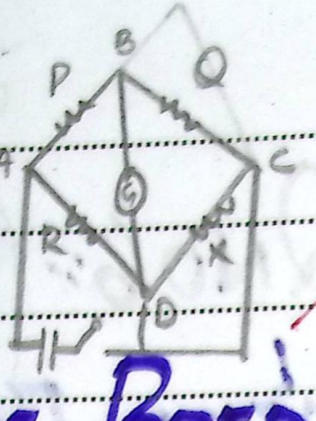
The process of splitting of nuclei into intermediate size nuclei is called nuclear fission

EXPLANATION:-

When a uranium nucleus absorbs nutron, it splits into two fragments of intermediate size. The splitting of a massive nucleus into two less massive fragments was formed as nuclear fission.

$$^{1}_{0}n + ^{235}_{92}U \rightarrow ^{236}_{92}U \rightarrow X + Y + \text{nutron}$$

(B):- Diagram:-



WHEAT STONE BRIDGE:-

A simple circuit used to determine the unknown resistance of a resistor is called wheat stone Bridge.

EXPLANATION:-

Four resistance of P, Q, R and X are arranged in such a way that they form closed loop ABCD. A single emf source is connected across point A and C through a key. It provides current to the circuit which divides into two branches AD and AB as I_1 and I_2. The galvanometer is connected as a bridge between B and D. The resistance of P and Q are fixed and R can be varied to find the unknown resistance.

The resistance R can be varied until the bridge becomes balance