SUBJECTIVE PART

QUESTION NO. 03 :-

— : Part (i) :-

Given

Distance = r = 30 cm = 3×10^{-2} m

charge = q = 3 μC = 3×10^{-6} C

Required

Electric field = $\vec{E}$ = ?

Solution

using the Formula,

(3) $E = k\frac{q}{r}$ (2)

$E = \frac{9 \times 10^9 \times 3 \times 10^{-6}}{3 \times 10^{-2}}$

$\boxed{E = 3 \times 10^5 \text{ c/m}}$ — Ans.

— : Part (ii) :—

Show that $E = -\frac{\Delta V}{\Delta r}$

~~W = q E Δr~~

$W = q E \Delta r$ (2)

$W = A$

$W = F \Delta V$

$W = E q \Delta r$

$q \Delta V = E q \Delta r$

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

Hence Proved

—: Part (iv) :—

Volts and Electron Volts

Volt

→ **definition :- (P.D)**

Work done in moving the charge from one point to another in a uniform

electric field, keeping the charge in electrostatic equillibrim.

→ **unit**

volt is basically the unit of Potiential Difference. It is mathematically given by the following equation.

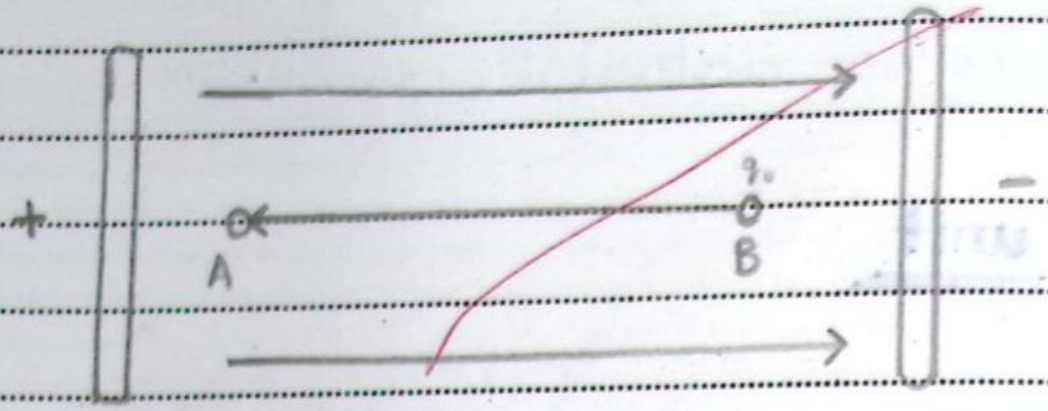
→ **mathematically,**

$$V = \frac{W_{BA}}{q_0}$$

therefore,

$$1 \text{ volt} = \frac{\text{Newton meter}}{\text{coloumb}}$$

→ **illustration**



→ Electron Volt

→ definition

The energy acquired or lost by an electron when it is moved through a potiential diff-erence of 1V.

→ mathematically,

Electron volt is mathe-matically given by the following equation.

$$1\,eV = (1.602 \times 10^{-19}\,C)(1V)$$
$$= 1.602 \times 10^{-19}\,eV$$

★ Similarity and Difference

• Similarity

There is no such notable similarity between the two. one is unit of energy other is unit of P.D.

• Difference

volt is the unit of potential difference whereas Electron volt is unit of energy.

-: Part (v) :-

Ohm's Law

→ Statement

Ohm's Law states that the current in a circuit is directly propotional to voltage as long as the temperature remains constant.

→ **mathematically,**

The following is the mathematical representation of Ohm's Law.

$$I \propto V$$

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

$$\boxed{V = IR}$$

In this equation, "V" is the potiential difference, "I" is the current and "R" is constant called resistance.

• Resistance

→ "The opposition to flow of current is called resistance."

→ Mathematically,

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

→ Unit

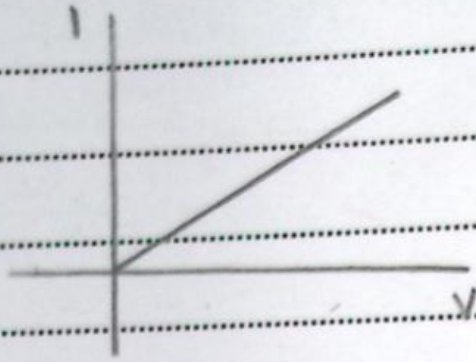
The unit of resistance is ohm.

Ohmic and Non-Ohmic Substances

Ohmic Substances

Those substance that obey Ohm's law are called Ohmic substances. There IV graph is linear.

→ **illustration**

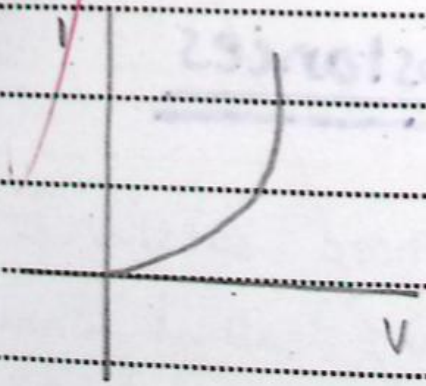


Non-Ohmic Substances

those substances that do not obey the Ohm's law are called non-ohmic substances. There IV graph is non-linear.

E.g :- Filament Bulb, etc.

→ **illustration**



- : Part (vi) :-

Inductance

→ definition

opposition to the flow of charges by an inductor is called inductance.

→ explaination

An inductor basically works to slow down the current or the change in magnitude of current in the circuit.

There are various factor-s upon which the inductance of a capacitor depends.

→ Factors affecting inductance

The following are the factors affecting the inductance of a circuit.

1) Nature of Material

The nature of material used affects the inductance. The material used to make the core is of great significance.

2) Shape and Area of Coil

The shape and area of coil also affects the inductance of a circuit.

3) Number and Length of Turns

The number and the length of the turns of the

coil significantly impacts the inductance of a circuit.

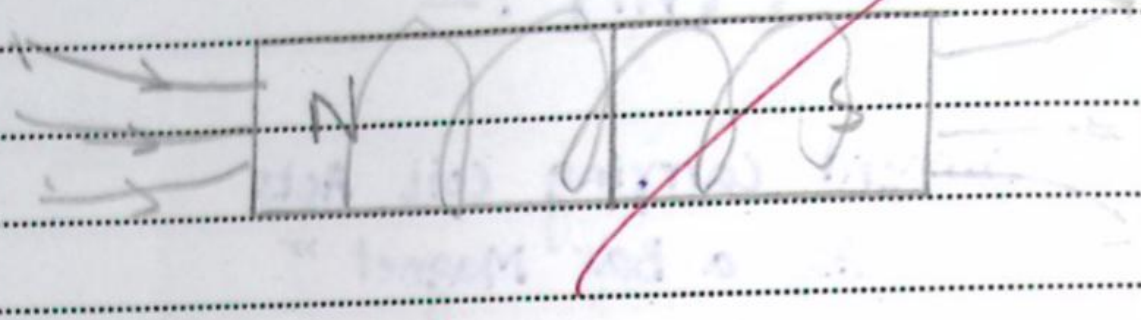
— : (vii) : —

" Current Carrying Coil Acts As a Bar Magnet "

A current carrying coil is capable of behaving like a bar magnet. When a current goes through a coil the coil creates a magnetic field around it. Consider a solenoid, when current passes thro -ugh the solenoid, the solenoid creates a magnetic field around it, hence behaving like a bar magnet. In a bar magnet, the magnetic field lines move outward from the south pole

and inward of the north pole.

→ **Illustration**



-: Part (viii) :-

- **Doubling Frequency of Inductor :-**

$$X_L = 2\pi f L$$

Doubling frequency

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

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

$$X_L = 2X_L'$$

Hence the doubling

the frequency of inductor doubles its reactance.

• Doubling the Frequency of capacitor

$$X_L = \frac{1}{2\pi fC}$$

* Doubling the frequency

$$X_L = \frac{1}{2\pi 2fC}$$

$$X_L = \frac{1}{2(2\pi fC)}$$

$$X_L = \frac{1}{2(X_L')}$$

Therefore, doubling the frequency doubles the capacitive reactance by $\frac{1}{2}$ times.

— : Part (ix) :—

Soft Magnetic Materials

→ definition

Soft Magnetic Materials are those materials that have small hysterisis loop.

→ Retentivity

Soft Magnetic materials have comparatively smaller retentivity value than hard magnetic material.

→ Coercivity

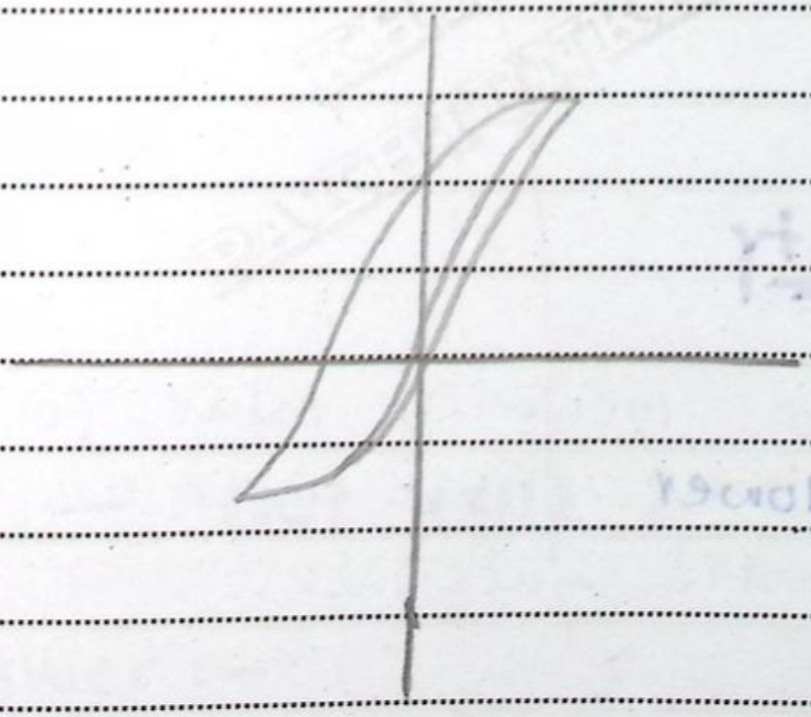
They similarly have greater value of coercivity than hard

magnetic materials.

Example :-

steel is an example of soft magnetic Material.

Graph



Hard Magnetic Materials

→ **def**

Hard magnetic materials are those magnetic materials that that have big hysterisis loop.

→ **Retentivity**

The value of retentivity is greater than of soft magnetic material.

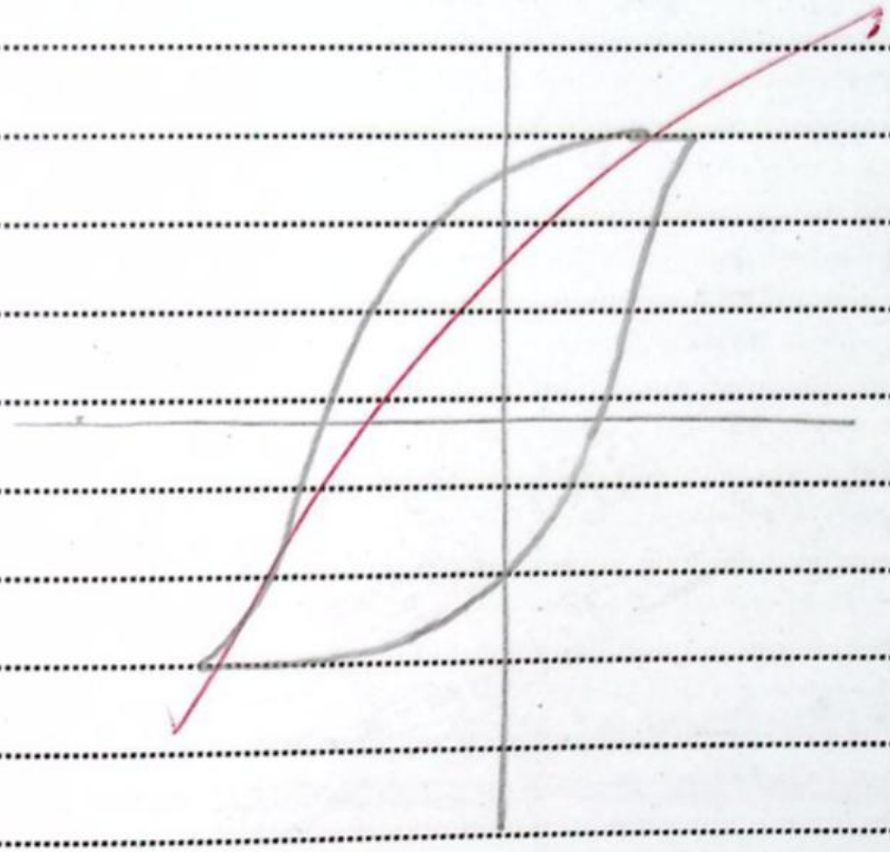
→ **coercivity**

The coercivity value for hard is lower than for soft magnetic materials.

Example :-

Iron is an example of hard magnetic material.

Graph



— : Part (xii) :-

Answer :-

If an electron and proton have same de-Broglie's wavelength, electron will have greater speed.

Reasons and Explaination

we know that from the equation,

$$\lambda = \frac{h}{mc}$$

Therefore,

$$\lambda \propto \frac{1}{m}$$

(4)

we know that speed of a particle is inversely propotional to its mass. Therefore, we know that the proton is 1860 times heavier than electron, i.e,

$\frac{m_e}{m_p} = \frac{1}{1860}$

Hence, electron will have greater speed than proton.

—: Part (x) :—

Answer :—

Coercive force of steel is greater than iron.

Reasons and Explaination

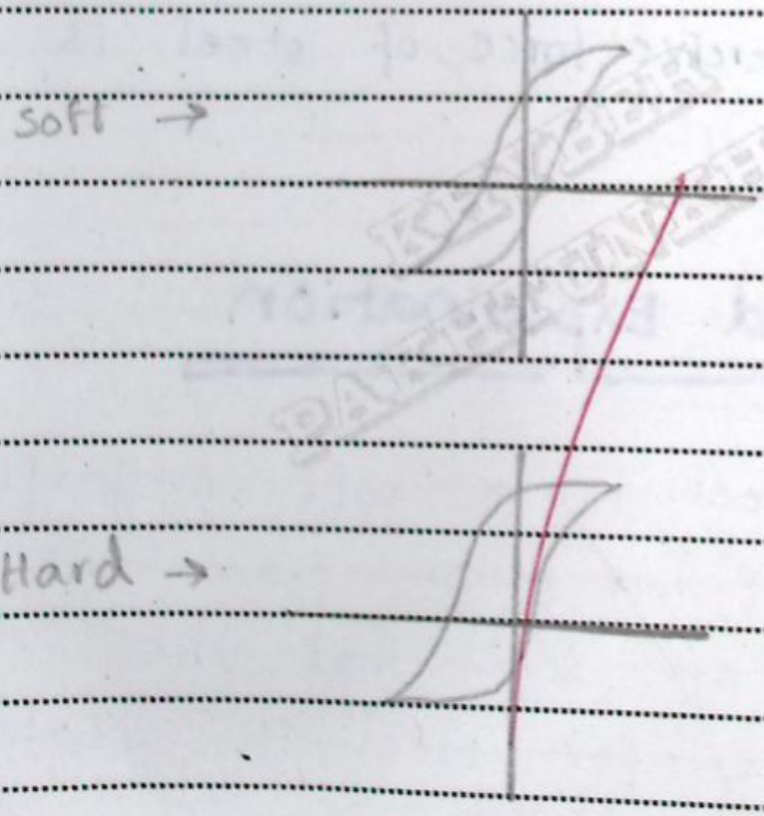
steel is a soft magnetic material. Hence we know from the hystersis loop of steel that the coercive force for steel is greater than coercive force for iron.

Iron is a hard magnetic

material. Hence from its hysterisis loop we can tell that the value of coercive force for hard magnetic material is greater than that of soft.

A combined loop study is given below.

→ **Graphs**



QUESTION NO. 03

—: Part (a) :—

AC GENERATOR

↳ definition

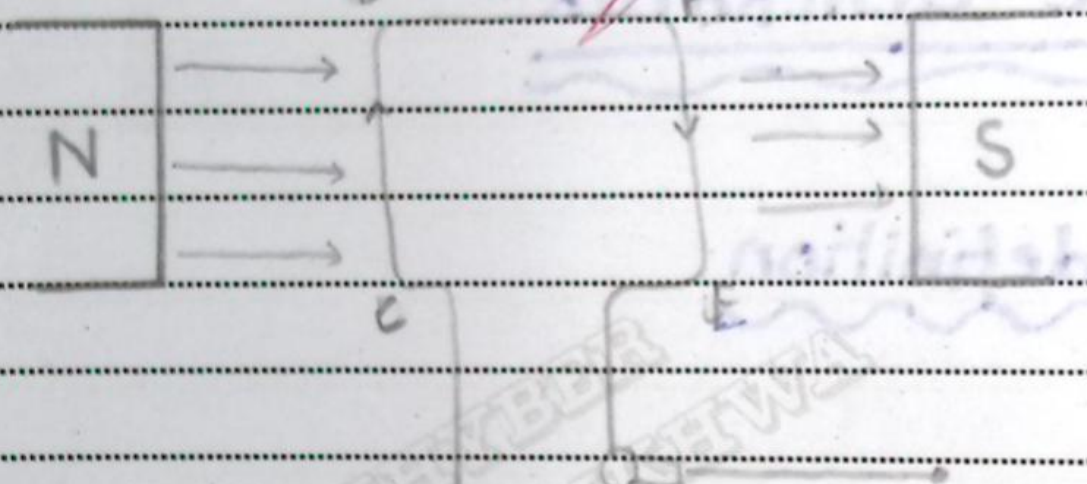
" An AC generator is a device that converts mech-anical energy into electrical energy is called AC generator. "

↳ construction & Working

In an AC generator, there is a current carrying loop

inserted inside uniform magnetic field. The ends of the loop are connected by slip rings.

→ **illustration**



Now we head over to the working of the AC generator.

We know that the current passes through the LOOP CDEF.

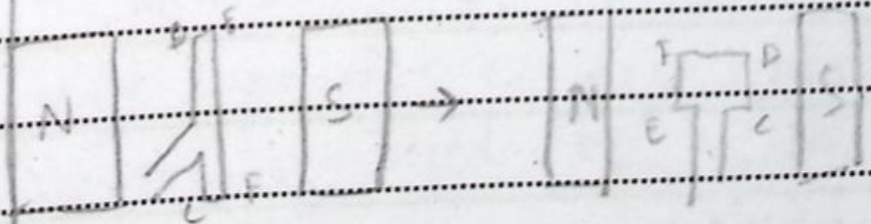
we know from the equations,

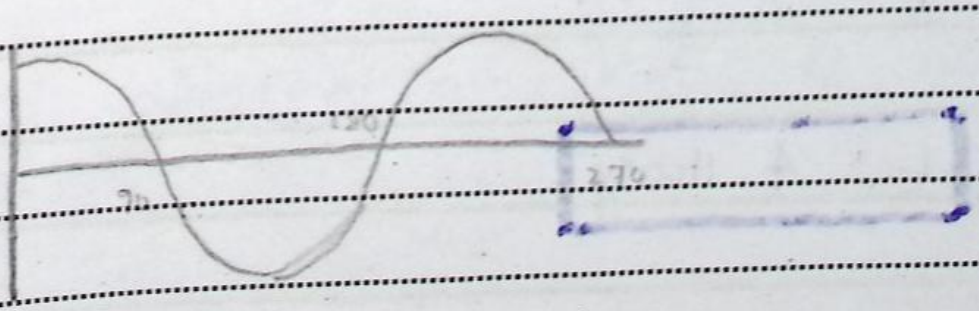
$I = NIAB \sin\theta$

Mathematical derivation ?

The current traveling through the loop and the magnetic field causes the loop to turn. Henceforth the current's direction now is from CDEF to EFDC.

A series of turning continues in this generator.





(b)

Given

change in current = $\Delta I = 5 - 0 = 5$ A

Time taken = $\Delta t = 0.1$ s

$\mathcal{E} = 200$ V

Required

$L = ?$

solution :—

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

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

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

$L = 4$ Henry

QUESTION NO. 05 :-

R.L.C Series circuit

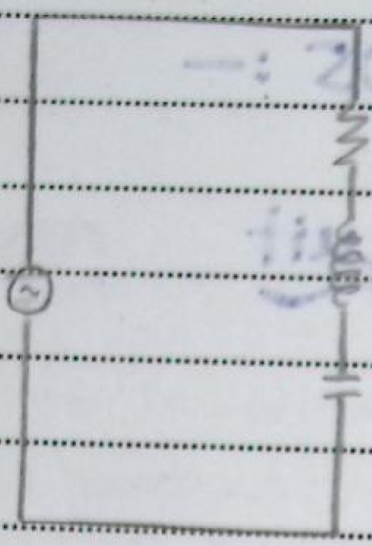
↳ def :-

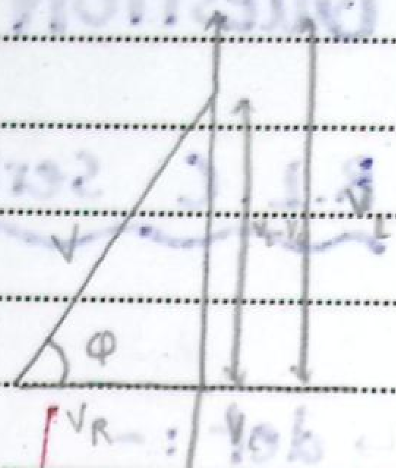
A circuit in which a resistor, inductor and capacitor are connected in series is called RLC series circuit.

↳ explanation

such a combination of resistor in which the resistor R, inductor L, and capacitor C are connected in series is called RLC series circuit.

The diagram of RLC is given below.





Now the circuit as a whole will be either inductive or capacitive. In order to find which we use the following math work.

Mathematical work

By Pythagoras theorem,

$$V^2 = V_R^2 + (V_L - V_C)^2$$

$$V = \sqrt{V_R^2 + (V_L - V_C)^2}$$

$V_R = IR$

$V_L = IX_L$

$V_C = IX_C$

$V = \sqrt{(IR)^2 + (IX_L - IX_C)^2}$

$V = I\sqrt{R^2 + (X_L - X_C)^2}$

$Z = \sqrt{R^2 + (X_L - X_C)^2}$

$V = IZ$

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

If the value of $X_L > X_C$ the circuit will be efficiently inductive and if the value of $X_C > X_L$ the circuit will be capacitive.

— : (b) :—

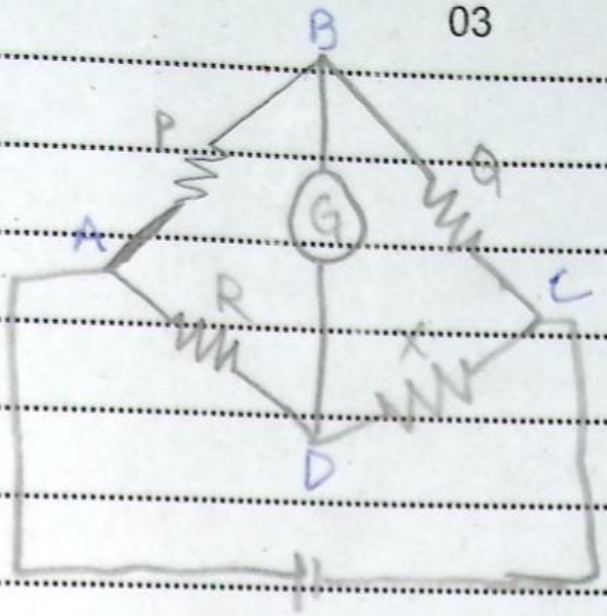
a) show that $1u = 1.66 \times 10^{-27}$

b) $1u = 931.5$ MeV

QUESTION NO. 06

(B)

Wheatstone Bridge



Wheatstone Bridge has such construction as shown above with four resistors. The value of two resistors is known (P and Q), value of one is variable (R) and one is to be known (X).

First, we will adjust the resistor R to show zero deflection in Galvanometer. Two charges separate at A one goes through P the othe through Q similarly one through R and one through X.

Mathematically,

$$\frac{P I_1}{R I_2} = \frac{Q I_1}{X I_2}$$

$$\frac{P}{R} = \frac{Q}{X}$$

$$X = \frac{QR}{P}$$

Hence from above equation we can calculate the value of x.

Board Of Intermediate & Secondary Education Khyber Pakhtunkhwa

CONTINUATION SHEET

Fic. No. 788

(صرف بورڈ کے استعمال کیلئے) اُمیدوار یہاں کچھ نہ لکھیں

-:(c):-

Nuclear Fission

when a large nuclei decay to form two intermediate size nuclei then such a process is called nuclear fission.

Explaination

In nuclear fission a heavy nuclei is reduced or split up into two nuclei of intermediate size.

The general formula for nuclear fission is given below.

$_0^1n + A \rightarrow Y + 3_0^1n + Q$

Nuclear chain Reaction

such reaction is a chain reaction where one fission reaction gives rise to more and more fission reactions.