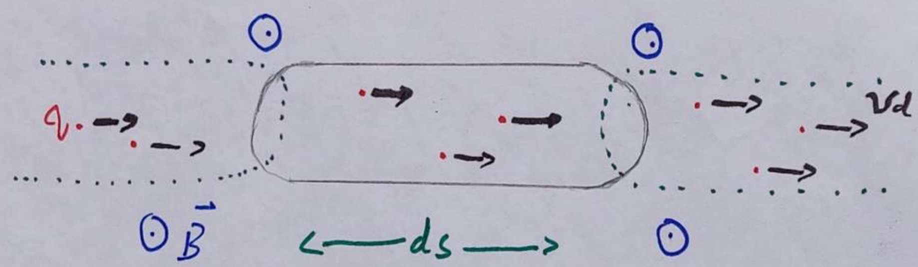
Name: M.Abbas ID# 13063 DePt# CS(SE)

Q1 (A)

How to calculate the magnetic force on current carrying wire?

Ans:-

A magnetic field exerts a force on a single moving charge. Since current is just a bunch of moving charges, a wire carrying a current should also feed a force due to a magnetic field.



Consider a little segment of wire of length ds. Charges q move through the wire with a drift velocity v_d.

Each one feels a magnetic force.

$$\vec{F}(\text{Per charge}) = q\,\vec{v}_d \times \vec{B}$$

Q1 (b)

What is the difference **between** Resistance and Resistivity?

Ans:- Resistivity:- (a) The resistivity of a conductor is the resistance of a conductor of unit length and unit area of cross section.

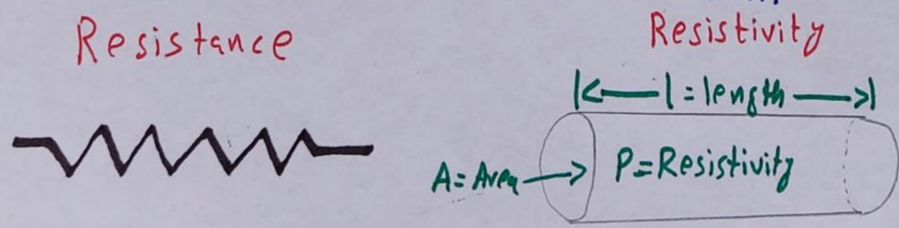
(b) The SI unit of resistivity is ohm-metre(m).

(c) The resistivity of a conductor does not depend on its length and area of cross section.

Resistance:- (a) The property of the conductor due to which it opposes a flow of current through it is called resistance.

(b) The SI unit of resistance is ohm ( ).

(c) The resistance of a conductor depends on its length and area of cross section.



$$R = P\frac{l}{A}$$

Q2(A):- What is the difference between reflection and refraction?

Ans:-

Reflection:-

* This Phenomenon usually occurs in mirrors.
* Reflection can simply be defined as the reflection of light when it strikes the medium on a plane.
* The light entering the medium returns back in the same direction.
* Considering the light waves, the bounce from the plane and change direction.
* The angle of incidence of the light is equal to the angle of reflection.

Refraction:-

* The Phenomenon usually occurs in lenses.
* Refraction can be defined as the Process of shift of light when it Passes through a medium leading to the bending of light.
* The light entering the medium travels from one medium to anothe.
* The light waves Pass through the surface while simultaneously change from medium to medium.
* The angle of incidence is not equal to the angle of reflection.

Q2 B

Ans:-

Angle of Incidence:- The angle of incidence is the angle between a ray incident on a surface and the line Perpendicular to the surface at the Point on incidence called the normal. The ray can be formed by any wave.

Angle of Reflection:- It is the change in direction of a wavefront at an interface between two different media so that the wavefront returns into the medium from which it originated.

$$n_i \sin\theta_i = n_t \sin\theta_t .$$

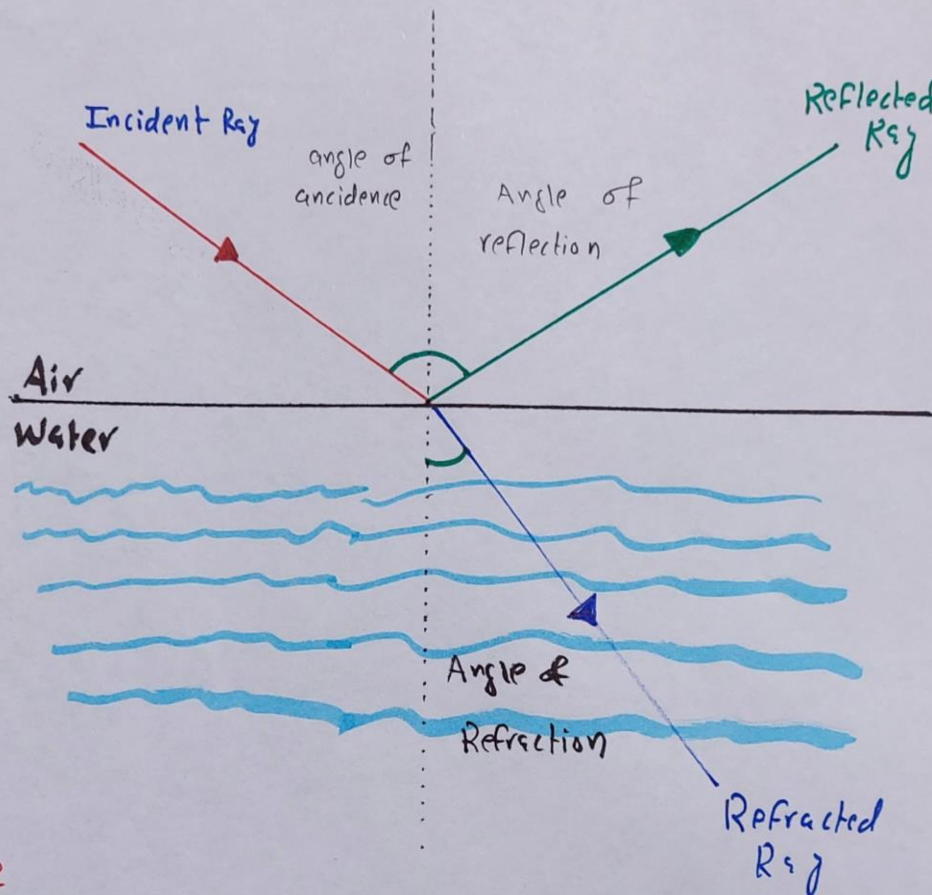
Angle of Refraction:- It states that, on reflection from a smooth surface, the angle of the reflected ray is equal to the angle of Incident Ray.

$$n_1 \text{ sine } \angle i = n_2 \text{ sine } \angle R$$

$\angle i$ is the angle of incidence

$\angle R$ is the angle of reflection

$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$



Angle of Incidence, Reflaction And Refraction Diagram

Q3(A)

Find the difference between electric Potential energy and electric potential?

Ans:- **Electric Potential energy:-** Electric Potential energy of a system = - work (against electrostatic forces) needed to needed to build the system.

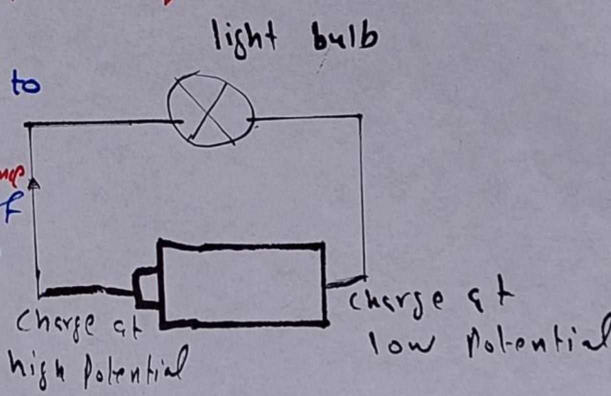
$$U = -W$$

Electric Potential difference:- Electric Potential difference between two points = work per unit charge needed to move a charge between the two points.

$$\Delta V = V_f - V_i = -W/q$$

Battereries 'lift' charges to a higher Potential.

There is a Potential difference because each Coulomb of charge has a difference Potential energy at either end of the battery.



Potential difference $V = \frac{E}{Q}$ Energy / charge

$1V = 1J/C$

Q3(B) How to find the potential difference between any two points in the electric field lines?

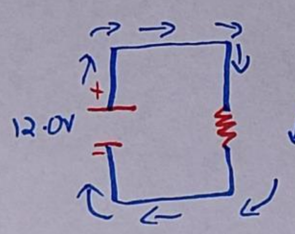
Ans:-

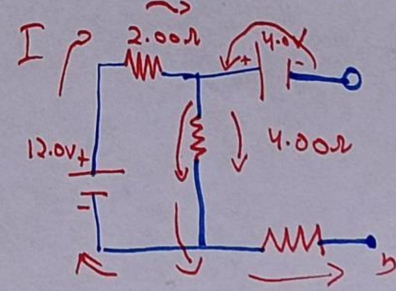
Formula for calculating potential difference

Multiply the amount of the current by the amount of resistance in the circuit. The result of multiplication will be the potential difference, measured in volts, This formula is known as Ohm's Law, $V = IR$

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

Example:- calculate the potential diff between points a and b in fig and (b) identify which point is at the higher potential.





$$I = \frac{\Delta V}{R} = \frac{12V}{6\Omega} = 2A$$

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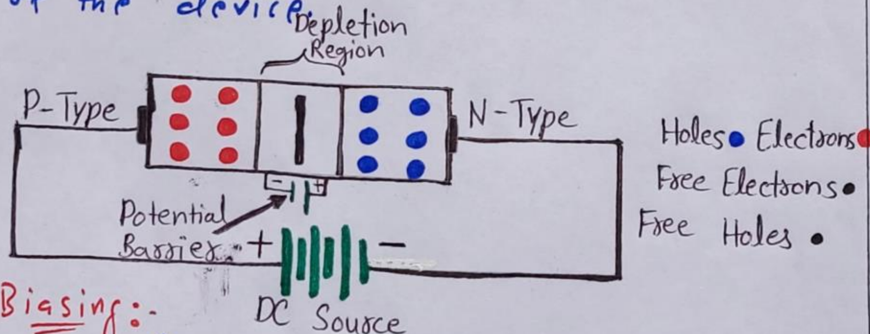
Q4(A) Compare the depletion regions in forward bias and reverse bias?

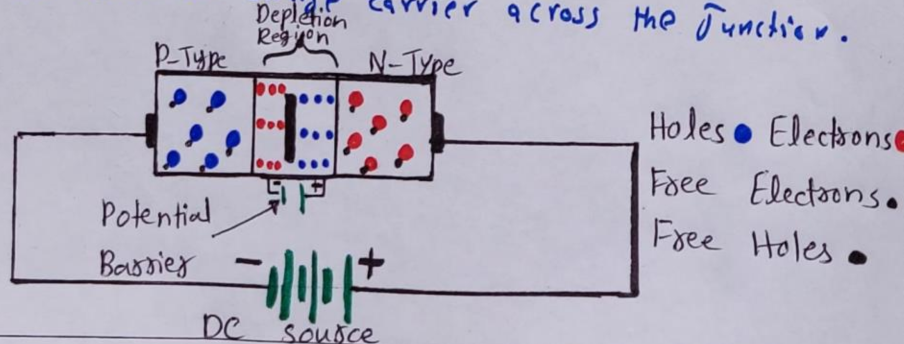
Ans:- Forward Biasing:-

In Forward biasing the external voltage is applied across the PN-Junction diode. This voltage cancels the Potential barrier and provides the low resistance path to the flow of current. The forward bias means the positive region is connected to the p-terminal of the supply and the negative region is connected to the n-type of the device.



Reverse Biasing:-

In reverse biasing the negative region is connected to the positive terminal of the battery and the positive region is connected to the negative terminal. The reverse potential increases the strength of the potential barrier. The potential barrier resists the flow of charge carrier across the Junction.



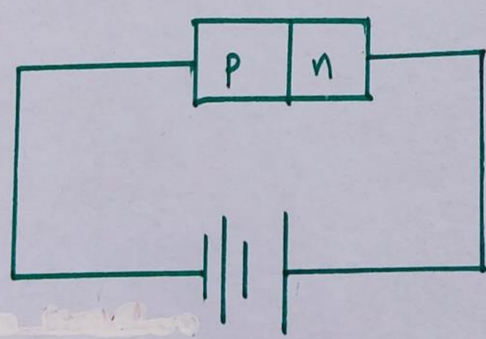
Q4 B How reverse breakdown occur in a diode?

Ans:- Reverse breakdown in Diode:-

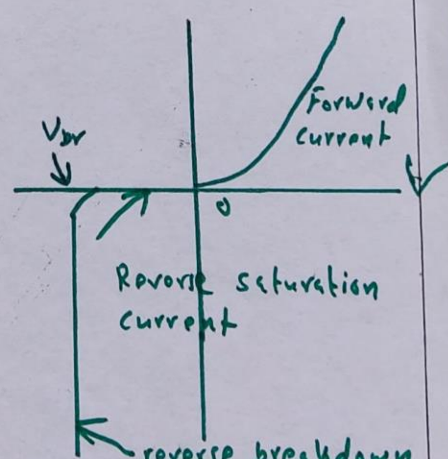
∴ Breakdown diodes are P-n junction diodes operated in the reverse-bias mode.

∴ This breakdown occurs at a critical reverse-bias voltage (V_{br}) At this critical voltage the reverse current through the diode increases sharply, and relatively large currents flow with little increases in voltage.

∴ These diodes are designed with sufficient power-dissipation capabilities to work in the breakdown region. The following two mechanisms can cause reverse breakdown in a junction diode.



Reverse-biased P-n Junction



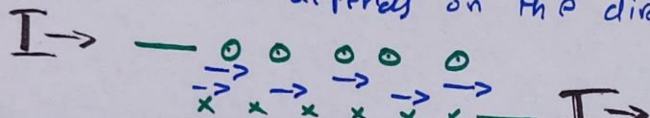
Reverse breakdown in P-n junction.

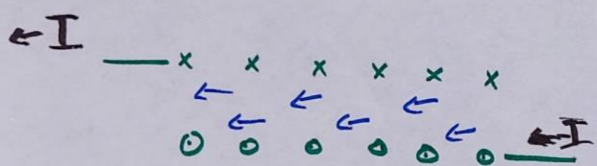
Q5(A)

Explain the magnetic field of Solenoids?

Ans:- **The solenoids:-** A coil of wire wrapped tightly around a cylinder.

within the coils, a strong magnetic field arises whenever current is run through the wire. The direction of the magnetic field depends on the direction of the current.

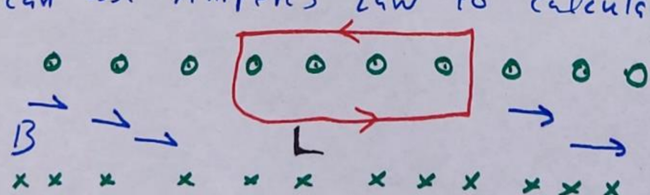




outside the coils, the magnetic field is small.

The Magnetic Field of a Solenoid

If we look deep within a solenoid, far from the ends, we can use Ampere's Law to calculate the field strength.



The magnetic field (deep) within the solenoid has a uniform value B, and outside the coils has value zero. If there are n coils per meter than →

$I_{enclosed} = I(nL)$

And the Integral

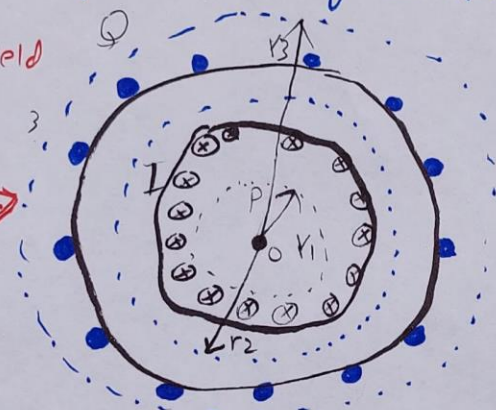
$\oint \vec{B} \cdot d\vec{s} = BL + 0 + 0 + 0$
$= BL$

Q5(B) Explain the Magnetic Field of Toroids?

Ans:- Toroids:-

When a solenoid is bent in a circular shape and the ends are joined, we get a toroid. Alternately, one can start with a nonconducting ring and wind a conducting wire closely on it.

Magnetic Field of Toroid Diagram →



The magnetic field in the open space inside (Point P) and exterior (Point Q) is zero, The field B inside the toroid is constant magnitude for the ideal toroid of closely wound turns. The direction of magnetic field inside is clockwise.

Example:- The number of turns per unit length in a toroid is 10^3 and current flowing in it is $\frac{1}{4\pi}$ amp. then the magnetic induction produced in it is.

Magnetic field in a toroid $B = B = \mu_0 n i$

Given $n = 10^3$ and $i = \frac{1}{4\pi} A$

we know that $\mu_0 = 4\pi \times 10^{-7} T/A$

$B = 4\pi \times 10^{-7} \times 10^3 \times \frac{1}{4\pi} = 10^{-4} T$