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Paper # Phyics

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Q No:->1

(Part A)

Ans :->

physics, work is the process of energy transfer to the motion of an object via of application of a froce, often represented as the product of froce and displacement.

A froce is said to do positive work if (when applied) the froce has a component in the direction of the displacement of the point of application of the froce.

Common Symbols

W

SI Unit

joule (J)

other Units

Foot - pound, erg

In SI base Units

1 Kg · m2 · S-2

Derviation from other quantities

W= F.S

W= Tθ

Dimension

ML2T-2

The SI unit of work is the jorle (J).

QNO :→ 1

(part B)

Given Data

$F = 32N$

$\theta = 45^\circ$

$S = 50m$

Required

work = ?

Solution :→

We know that
work by formula

$W = F \cos\theta \times S$

Putting value "F" "θ" & "S"

$W = 32 \times \cos 45^\circ \times 50$

$W = 22.627 \times 50$

$W = 1131.37\,J$

QNO :-> 2

(part a)

Ans:->

Coulomb's law state that the magnitude of the electrostatic froce of attracttion or repulsion between two point charges is directly proportional to the product of the magnitude of charge and inversly proportional to the square of the distance between them. the froce is along the straight line joining them. if the two charges have the same sign, the electrostic froce them is repulsive if they have different signs, the froce betweeh them is attractive.

mathematical explain Coulomb's law let q_1 and q_2 be two stationary point charges separatt by a distance (r). According to the coulomb's law forceff between two stationary charge is given by

$$F_e \quad q_1 \; q_2$$

$$F_e \quad \frac{1}{r^2}$$

$$F_e \quad \frac{q_1 \quad q_2}{r^2}$$

$$F_e = (\text{constan}) \frac{q_1 q_2}{r^2}$$

$$F_e = \frac{K \; q_1 \; q^2 \; \hat{r}}{r^2}$$

coulamb's law to discuss rale of the of the material medium between charge Dierestric

A material in which all the electrons are tigntly bound to the nucles of the atoms is called a diesectric (or insulator)

glass Plactic, mic, all are example of dielectrics when the medium surrounding the charge is not a vacum but is non conducting or dielectic medium then the coulmb force between the charge is reduced. The eff action of coulomb force is now given by

$$F_e = \frac{1}{4\pi \epsilon r^2} q_1 q_2 \hat{r}.$$

Q No :-> 2

part (B)

Ans:-> Electric flux is the measure of flow of the electric field through a given area. It is proportional to the number of electric field lines going throug a normally perpendicular surface.

For electric field $\vec{E}$ passing through an area $\vec{A}$, the flux passing through it is $\vec{E} \cdot \vec{A}$.
Acording to Gauss's law: flux passing through a closed surface is proportional to amount of charge in the enclosed volume.

$$\vec{E} \cdot \vec{A} = \frac{q_{enc}}{\epsilon_0}$$

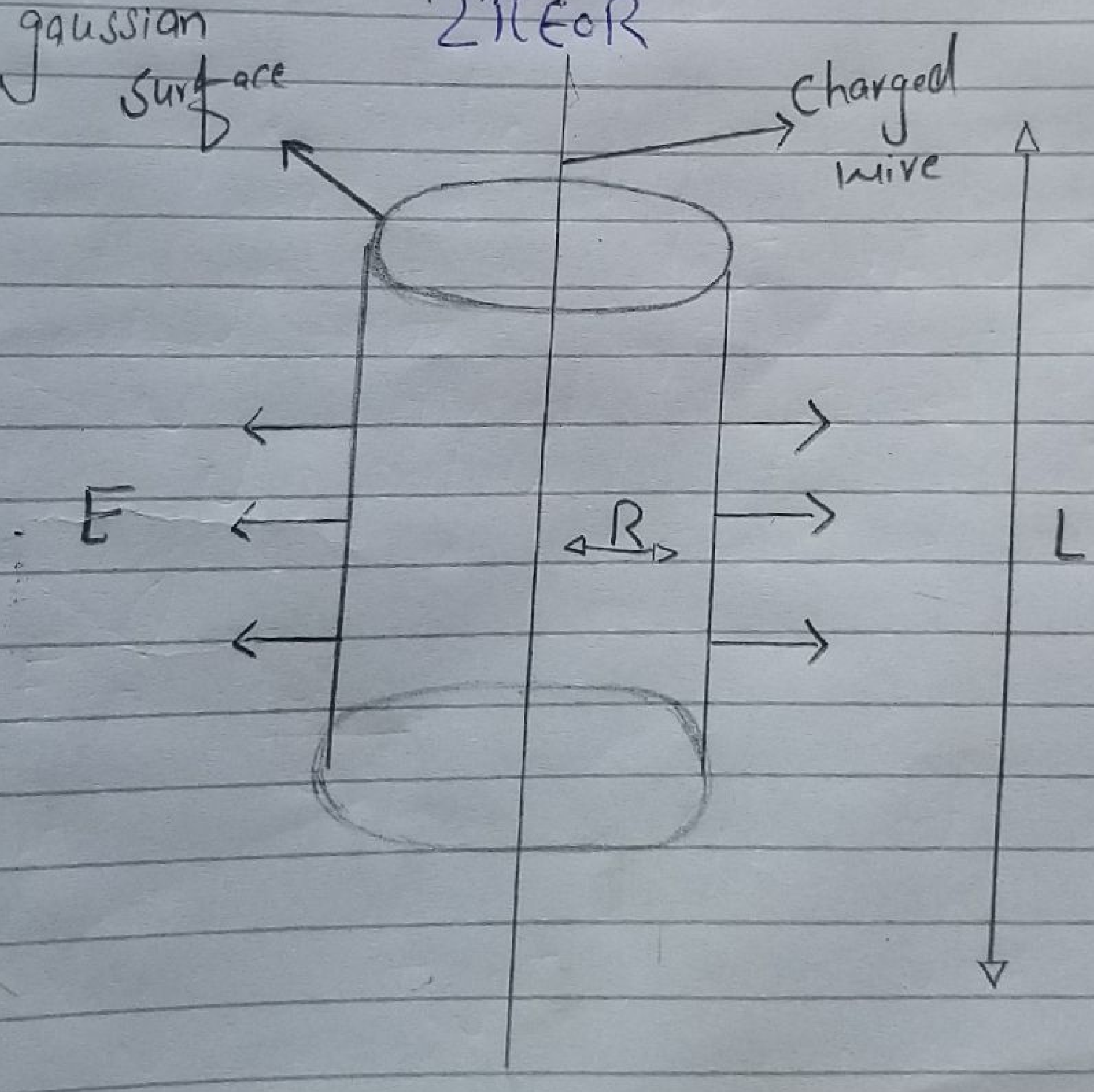
Let us take a cylindrical surface co-axial with the charge carring straight wire as Gaussian surface. Enclosed charge in the volume as shown in figure, assuming linear charge density to be λ, is

$q_{enc} = \lambda L$

Hence according to the Gauss' law.

$$E\,(2\pi R L) = \frac{\lambda L}{\epsilon_0}$$

$$\Rightarrow \quad E = \frac{\lambda}{2\pi \epsilon_0 R}$$



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Q NO :→ 3

(Part a)

Ans :→

When an electrical wire is exposed to the a magnet, the current in that wire will experience a force – the result of a magnet field.

The froce (F) a magnetic field (B) exerts an on individual charge (q) traveling at drift velcity vd is:

$$F = qv_dB \sin \theta$$

in this instance, θ represents the angle between magnetic field and the wire, (magnetic froce is typically calculated as a cross product) if B is constant throughout a wire and is 0 elsewhere, then for a wire with N charge carries in its total length l, the total magnetic froce on the wire is:

$$F = IIB \sin \theta$$

The direction of the magnetic froce can be determind using the night hand rule, demonstrated in. The thumb is Pointing in direction of the current, with the four other fingers parralled to the magnetic field curling the fingers reveals the direction of magnetic froce.

Q No :→ 3

(Part B)

Given Data

$I = 1.2A$

$B = 0.75\,T$

$L = 1m$ ∴ Per meter lenght

Requried

$F = ?$

Solution

By formula for maximum force

$F_B = BIL\sin\theta$

$\sin(90) = 1$ max

$F_B = BI1$

$\Rightarrow (0.75)(1.2)(1)$

$F_B = 0.9\,N$

Q No :→ 04
(part A)

Electrical classification of Solids

The Fundamental electrical property of a solid is its ability to conduct current. The requirment for electrical conduction is the presence of free charges within the material.

on the basis of electrical properties, Solids can be classified, as conductor's Semiconductors and insulators.

① CONDUCTOR

A substance which offers low resistance to the flow of electric current is called a conductor. Current can pass easily. Conductors. They contain free electrons.

Metals such as silver, Copper and aluminium are very good conductors. The conductivity of the conductors is of the order of 10^7 mho/m to $(\Omega\text{-m})^{-1}$

Their electrical resistivity is of the order of 10^{-7} ohm-meter $(\Omega\text{-m})$ of

② INSULATOR

A substance which (at a particular voltage) does not allow the flow of electrons (current) of through them is called an insulator.

They are very Poor Conductors of electricity, Charges are bound : no free electrons in insulators. Dry wood, diamond glass mica, and Pholythene and most of the non-metals are good insullators

(3) SEMI CONDUCTOR

- The materials which have their conductivity in between those of conductors and insultors are called Semiconductors.
  Elements of Group IV in the periodic table are Semiconductor. For example germanium and silicon are important Semiconductors.

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QNO :-> 4 (Pat B)

Basis of DIFFRENCE	INTRINSIC SEMICONDUCTOR	Extrinic SEMICONDUCTOR
Doping of impurity	Doping or addition of impurity does not take place in intrinsic SEMICONDOR	A small amount of impurity is dopped in a pure semiconductor for preparing extrinsic SEMICONDOR
Density of Electrons and Holes	The number of Free electrons in the conduction band is equal to the number of holes in the valence band.	The number of electrons and holes are not equal.
Electrical Conductivity	Electrical conductivity is low.	Electrical conductivity is high
Dependency of electrical conductivity	Electrical conductivity is a fuction of temperature alone.	Electrical conductivity depends on temperature as well as on the amount of impurity - doping in the pure Semiconductor

Example	Crystalline from of pure Silicon and Germanium	Impurity like As, Sb, P, In Bi, Al etc. are dropped with Germanium and Silicon atom.

Q NO :-> 5

Ans:->

Photoelectric effect, phenomenon in which electrically charged particles are released from or within a material when it absorbs electromagnetic radiation. The effect is often defined as the ejection of electrons from a metal plate when light falls on it. In a broader definition, the radiant energy may be infrared, visible or ultraviolet light, X-rays, or gamma rays.

the material may be a solid, liquid, or gas: and the released particles may be ions (electrically

Charged atom or molecules) as well as electrons.

The Phenomenon was fundamentally significalnt in the deveblopment of modem Phyics because of the puzzling it raised about the nature of light particle versus wave like behaviour — that were finally resd ved by Albert Einstein in 1905. The effect remain important for research in area from materials Science to astrophyics, as well as forming the basic for variety of usefu devices.

Experimental Observation of Photoelectric Effect.

(1) For a given metal, three exists a certain mimimum frequency above which the photoelectric effect take place which is known as threshod frequency.

(2) Maximum kinetic energy of the emitted photoelectrons increase as the frequency of the incident light is increased keeping the number of incident photons to be fixed.

(3) Above threshold frequency, maximum kinetic energy of the photoelectrons depends only on the frequency of incident light but is independ of the intensity of incident light.

(4) :->
For a given metal and frequency of incident light, the rate at which the photoelectrons ejected is directly proportional to the intensity of incident light. An increase the magnitude of the photoelectric current.

(5)
The time lag between the incidence of photons and ~~radius~~ radiation of photoelectric effect is very small, nearly 10^{-9} second.