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***19/ENG03/019***

***CIVIL ENGINEERING***

***PHY 102 ASSIGNMENT***

1. A negative charge can be produced by the method of induction simply by putting two spheres (A and B) in contact with each other and introducing a positively charged object ( in this case a balloon). When the balloon is brought in contact with the merged spheres the negative charges in sphere B move to sphere A because of the positive nature of the balloon which attracts the negatively charged particles, the positive charges in sphere A repulse to sphere B.

Diagrams;

* + + - + + + + + - - + + - - - - + +

+ + + + + - - + + - - - - + +

Sphere A and B positively charged -ve +ve

Balloon brought close

To the spheres

b. using coulombs law;

f = kq1q2 / r2

Where f, k and r are known we find q1q2

; 1 = 9\*109 (q1q2 x 5.0x10-5) / 4

4 = 9x109q2 x 4.5x105

Using quadratic formula for the equation;

9x109q2 x 4.5x105 + 4 = 0

q1 = 1.11x10-5c

q2 = 3.8x10-5c

1c. given that Q1 =Q2 = 8uc

d = 0.5m

determine Q if electric field at a point p is 0

E1 Eq E2

1.12 1 1.12

63.4O 63.4O

Q2 0.5 q 0.5 Q1

E1 = kq/r2 = 9x109 x 8x10-6/ (1.12)2 = 5739.795918

E2 = kq/r2 = 9x109 x 8x10-6/ (1.12)2 = 5739.795918

Eq = kq/r2 = 9x109 x q / 1 = 9x109q

Vector angle x comp y comp

E1 = 5739.795918 63.4 -2.6x103 5.1x103

E2 = 5739.795918 63.3 2.6x103 5.1x103

Eq = 9x109q 90 0 9x109q

0 10.2x103

Magnitude is = square root of (Ex)2 + (Ey)2 = 1.0x104

Hence q = 1.0x104 / 9x109 = 1.14x10-6 = 11.4 uc.

1. Electric field can be defined as a region of space in which an electric charge will experience and electric force

Electric field intensity is defined as the electric force per unit charge.

2b

7.6m

3m 5m

37o 23.2o

q1 4m 3m q2

1. E1 = kq/r2 = 9x109 x 8x10-9 / 49 = 1.47

E2 = kq/r2 = 9x109 x 12x10-9 / 9 = 12

1.47 + 12 = 13.47

ii) E1 = kq/r2 = 9x109 x 8x10-9 / 9 = 8N

E2 = kq/r2 = 9x109 x 8x10-9 / 25 = 4.32N

X component Y component

8 cos(90) = 0 8 sin(90) = 8

4.32 cos(36.87) = 3.46 4.32 sin(36.87) = 2.60

3.46 10.60

Magnitude = 11.15 N/C

***Section b;***

1. A magnetic flux is defined as the strength of the magnetic field which can be represented by lines of forces. It is represented by the symbol Φ mathematically the formula is given as Φ = B.dA.

4b given the following parameters

m = 9.11x10-31kg

r = 14x10-7m

B = 3.5x10-1 weber/m2

Solution;

Since cyclotron frequency = angular speed

w = v/r = qB/m

w = 6.2x104.

4c. After given the parameters;

mass of electron = 9.11x10-31

magnetic field = 3.5x10-1 weber/m2

radius = 1.4x10-7m

knowing that cyclotron frequency is same as angular speed we drive a formula w =v/r = qB/m and finally input the values for the different parameter to get our cyclotron frequency which is 6.2x104.

1. Biot-savart law states that the magnetic field is directly proportional to the product permeability of free space (u), the current, the change in length, and the radius and inversely proportional to the square of the radius. It can be represented mathematically by unit is weber/m2.

5b. magnetic field of a straight current carrying conductor

+a

dl

y r = x2 + y2

-a

I x

Recall

Using special integrals:

Equation therefore becomes

When the length of conductor is very great in comparison to its distance from point P, we consider it infinitely long. That is, when is much larger than, in a physical situation, we have axial symmetry about the y axis. Thus, at all points in a circle of radius, around the conductor, the magnitude of B is Equation defines the magnitude of the magnetic field of flux density B near a long, straight current carrying conductor.