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MATRIC NO: 17/MHS01/248

DEPARTMENT: PHARMACOLOGY

COURSE: PHYSICS 102

1. A. If a negatively charged object is used to charge a neutral object by induction, then the neutral object will acquire a positive charge. And if a positively charged object is used to charge a neutral object by induction, then the neutral object will acquire a negative charge. If you understand the induction charging process, you can see why this would always be the case. The charged object that is brought near will always repel like charges and attract opposite charges. Either way, the object being charged acquires a charge that is opposite the charge of the object used to induce the charge. To further illustrate this, the diagram below shows how a positively charged balloon will charge a sphere negatively by induction.



B. k= 9X109  Nm2/c2

Given,

F= 1.0 N, D=2.0m, q1+q2 = 5X10-5c

Q1= 5X10-5c –q2

From coulomb’s law,

F= kq1q2/r2

1.0=9x109(5x10-5-q2)q2/(2)2

1.0=4.5x105q2 – 9x109q22/4

9x109q22 – 4.5x105q2 +4=0

Q1= 3.8x10-5C and q2= 1.1x10-5C

C. E1= Kq1/r2

 = 9x109x8x10-6/(1.12)2

 = 57397.959

 Eq= kq/r2 =9x109xq/1

 =1

|  |  |  |  |
| --- | --- | --- | --- |
| vector | angle | x-component | y-component |
| E1= 57397.959 | 63.4o | E1xcoso = 25700.45 | E1ysin0= 51322.62 |
| E2= 57397.959 | 63.4o | E2xcoso= 25700.45 | E2ysin0= 51322.62 |
| EQ= 9x10q9 | 90o | Eqxcos0=0 | Eqysin0= 10264.52568 |

Magnititude=

Q= 10264.52568/9x109

Q=1.140502853x10-6

= 11.4

2. a. The electric field is a region around a charge in which it exerts electrostatic force on another charges. While electric field intensity is the strength of electric field at any point in space

b. i. E=E1+E2

 E1= kq1/r12 = 9x109x8x10-9/(7)2

 =1.469N/C

 E2= kq2/r22 =9x109x12x10-9/(3)2

 = 12.0N/C

 E= 1.469+12

 =13.469N/C

 ii. Using Pythagoras theorem,

 Hyp2= 32+42

Hyp=5

E=E1+E2

E1= kq1/r12 = 8.0N/C

E2=4.32N/C

E=11.2N/C

4. a. Magnetic flux is a measurement the total magnetic field which passes through a given area.

 b. FB=qvB=mv2/r

 mpv=qBr

 w=Qb/mp

 Given,

M=9.11x10-31kg

R=1.4x10-7

 B= 3.5x10-1/m2

 Cyclotron frequency=angular speed

 W=Qb/mp

 = 1.60x10-11x3.5x10-1/9.11x10-11

 = 6.15x1010 T or 6.2 T-1

 c. In the question we were given ;

 mass of the electron = 9.11x10-31kg

 radius= 1.4x10-7m

 magnetic field of 3.5x10-1 webter/meter square

 Then we go on to find the cyclotron frequency which is also equal or the same thing as angular speed. It is called cyclotron frequency because it is a frequency of an accelerator called cyclotron

Recall,

Angular speed: w=v/r=Qb/m

Then we substitute in the figures giving the answer 6.15x1010 T or 6.2 T-1

5. a. Biot Savart law states that:

The magnetic intensity dh at a point A due to current I flowing through a small element dl is;

* Directly proportional to current (I)
* Directly proportional to the length of the element (dl)
* Directly proportional to the sine of angle tita between the direction of current and the line joining the element dl from point A
* Inversely proportional to the square of the distance (x) of point A from the element dl.

Where k is constant and depends on the magnetic properties of the medium

 b.