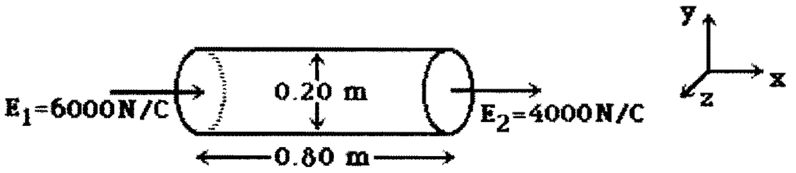
Exam QUIZ 2 PHYSICS 2B SPRING 2010

Name_Professor S.K. Sinha________________________________

(epsilon)0 = 8.85. 10^-12 C2/N.m2 k (Coulomb'c constant) = 9.0 10^9 N.m2/C2 electon mass = 9.11 10^-31 kg
electron charge (magnitude) = e = 1.6 10^-19 C
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Figure 23.1



A nonuniform electric field is directed along the x-axis at all points in space. This magnitude of the field varies with x, but not with respect to y or z. The axis of a cylindrical surface, 0.80 m long and 0.20 m in diameter, is aligned parallel to the x-axis. The electric fields E_1 and E_2, at the ends of the cylindrical surface, have magnitudes of 6000 N/C and 4000 N/C repsectively, and are directed as shown.

1) In Figure 23.1, the charge enclosed by the cylindrical surface is closest to:

A) +2.8 nC B) -2.8 nC C) +1.4 nC D) +0.6 nC E) -0.6 nC

$\Phi = \sum E \cdot A$

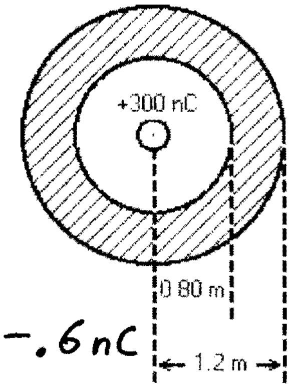
Since E goes into surfaces not out

$= -(6000\pi r^2) + 4000\pi r^2 = \frac{Q_{enc}}{\varepsilon_0}$

$Q_{enc} \approx -.6nC$

Since E is in x direction no flux goes through the walls

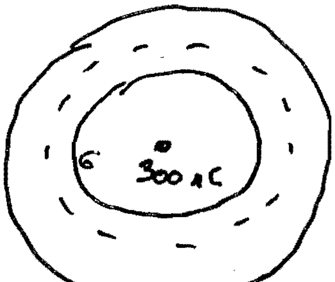
Figure 23.5



A hollow conducting sphere has radii of 0.80 m and 1.20 m. The sphere carries a charge of -500 nc. A point charge of +300 nC is present at the center.

2) In Figure 23.5, the surface charge density on the inner spherical surface is closest to:

A) -6 x 10-8 C/m2
B) -4 x 10-8 C/m2
C) +6 x 10-8 C/m2
D) +4 x 10-8 C/m2
E) zero



$E_{inside\ a\ conductor} = 0$

so $\frac{Q_{enc}}{\varepsilon_0} = EA = 0$

so $Q_{enc} = 0$

$4\pi r^2 \sigma + 300nC = 0$

$r = .80m \quad \sigma \approx -4 \times 10^{-8} C/m^2$

$V_{ring} = \frac{-800\,nC}{4\pi\epsilon_0 (2.4^2+x^2)^{1/2}}$

$V_{point} = \frac{600\,nC}{4\pi\epsilon_0 x}$

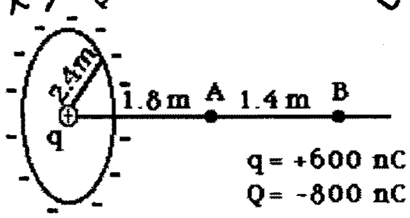
Figure 24.2

$V_{ring} + V_{point} = \frac{1}{4\pi\epsilon_0}\left(\frac{-800}{(2.4^2+x^2)^{1/2}} + \frac{600}{x}\right) = 0$

$+4x = 3(2.4^2+x^2)^{1/2}$

$16x^2 = 9(2.4^2+x^2)$

$x = 2.7\,m$

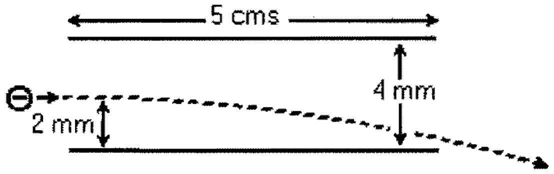


A charge Q = -800 nC is uniformly distributed on a ring of 2.4 m radius. A charge q = +600 nC is placed at the center of the ring. Points A and B are located on the axis of the ring, as shown.

3) In Figure 24.2, the electric potential is equal to zero at a point on the axis of the ring. The distance of this point from the center of the ring is closest to:

A) 2.6 m B) 2.8 m C) 2.4 m D) 2.5 m E) 2.7 m

Figure 22.12



4) In Figure 22.12, an electron of speed 4 x 106 m/s is fired midway between two large parallel plates. The plates are maintained at a potential difference V_0 and are separated by 4 mm. The length of the plates in the direction of electron motion is 5 cms. What is the maximum value of the potential difference V_0 which will not result in the electron hitting the far edge of the lower plate?

A) 12.4 V B) 0.58 V C) 123 V D) 37.5 V E) 216 V

$2\,mm = \frac{1}{2}at^2$

$t = \frac{5\,cm}{4\times10^6\,m/s} = \frac{d}{V_x}$

electric field is in y direction, so it does not effect V_x

$ma = F = qE$

$a = \frac{q}{m}E$

E = constant for parallel plates $\Rightarrow V_0 = -E(4\,mm)$

$2\,mm = \frac{1}{2}\frac{q}{m}\frac{V_0}{4\,mm}\left(\frac{5\,cm}{4\times10^6}\right)^2$ $|V_0| = .58\,V$