WebAssign
CH16-HW02-FALL2010 (Homework)

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PHYS 272-FALL 2012, Fall 2012
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Current Score : 21 / 21 **Due :** Tuesday, September 11 2012 11:59 PM EDT

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1. 10/10 points | Previous Answers MI3 16.4.X.033

Two rings of radius 5 cm are 20 cm apart and concentric with a common horizontal *x*-axis. The ring on the left carries a uniformly distributed charge of +36 nC, and the ring on the right carries a uniformly distributed charge of -36 nC.

What is the electric field due to the right ring at a location midway between the two rings?

$\vec{E}_{right}$ = < 23183.55 , 0 , 0 > N/C

What is the electric field due to the left ring at a location midway between the two rings?

$\vec{E}_{left}$ = < 23183.55 , 0 , 0 > N/C

What is the net electric field at at a location midway between the two rings?

$\vec{E}_{net}$ = < 46367.1 , 0 , 0 > N/C

If a charge of -5 nC were placed midway between the rings, what would be the force exerted on this charge by the rings?

$\vec{F}$ = < -2.318e-4 , 0 , 0 > N

- *Read the eBook*
- Section 16.4

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2. 3/3 points | Previous Answers MI3 16.5.X.005

For a disk of radius R = 24 cm and Q = 9 × 10^{-6} C, calculate the magnitude of the electric field 3 mm from the center of the disk using all three formulas below, and using the accurate value ε_0 = 8.85 × 10^{-12} $C^2/(N \cdot m^2)$.

(a) Formula 1: $E = \frac{Q/A}{2\varepsilon_0}\left[1 - \frac{z}{(R^2 + z^2)^{1/2}}\right]$ 2774817.47 N/C

(b) Formula 2: $E = \frac{Q/A}{2\varepsilon_0}\left[1 - \frac{z}{R}\right]$ 2774814.73 N/C

(c) Formula 3: $E = \frac{Q/A}{2\varepsilon_0}$ 2809938.96 N/C

- *Read the eBook*
- Section 16.5

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3. 8/8 points | Previous Answers MI3 16.5.P.058

A thin circular sheet of glass of diameter 6 meters is rubbed with a cloth on one surface, and becomes charged uniformly. A chloride ion (a chlorine atom which has gained one extra electron) passes near the glass sheet. When the chloride ion is near the center of the sheet, at a location 0.9 mm from the sheet, it experiences an electric force of 4e-15 N, toward the glass sheet. In this problem, use the value ε_0 = 8.85e-12 $C^2/(N \cdot m^2)$

It will be useful to you to draw a diagram on paper, showing field vectors, force vectors, and charges, before answering the following questions about this situation.

(a) Which of the following statements about this situation are correct? Select all that apply.

- [ ] The force on the chloride ion is equal to the electric field of the glass sheet.
- [x] The charged disk is the source of the electric field that causes the force on the chloride ion.
- [ ] The net electric field at the location of the chloride ion is zero.
- [ ] The electric field that acts on the chloride ion is due to the charge on the glass sheet and to the charge on the chloride ion.
- [ ] The electric field of the glass sheet is equal to the electric field of the chloride ion.

(b) In addition to an exact formula for the electric field of a disk, the textbook derives two approximate formulas. In the current situation we want an answer that is correct to 3 significant figures. Which of the following is correct?

- ( ) z is nearly equal to R, so we have to use the exact formula.
- (•) R >> z, so it is adequate to use the most approximate formula here.
- ( ) z << R, so we can't use an approximation.
- ( ) We should never use an approximation if we have enough information to do an exact calculation.

(c) How much charge is on the surface of the glass disk? (give amount, including sign, and correct units)

1.25e-5 C

- *Read the eBook*
- Section 16.5