Phys 112 2019

Review 1

Monday Warm Up 5 D2L

Friday: Class Exam I in class 50minutes

Covers: Ch 20, 21

~~HW~~ Lectures 1→10

HW 1→3 Discussions 1→3

Format: See exams from 2012, 2013

Bring: Calculator

Single 3" x5" index card, single side any info

Study: * Previous exams

2012 Exam I

2013 Exam I

* HW
* Discussion probs / quizzes
* Class quizzes

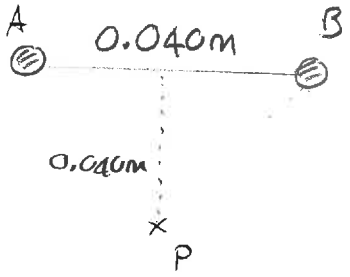
Ch 20.1 → 20.7

Equations $F = k\frac{q_1 q_2}{r^2}$ and direction rules $\vec{F} = m\vec{a}$

$\vec{F} = q_{probe}\vec{E}$ $E = k\,q/r^2$ (point source) Vector addition / components

Example Quiz 1 95%

Example: Two point charges are situated as illustrated These have charges:



$q_A = +50 \times 10^{-9} C$

$q_B = -80 \times 10^{-9} C$

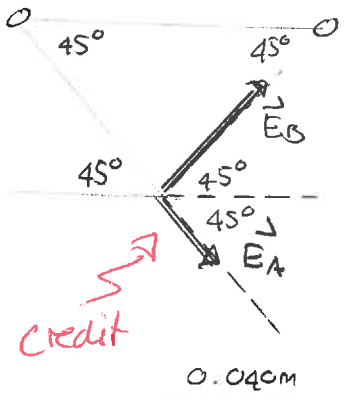
Determine:

a) net electric field produced by A, B at P

b) magnitude of force exerted on a particle with charge $-30 \times 10^{-6} C$ placed at P.

Answer a) $\vec{E} = \vec{E}_A + \vec{E}_B$ ← credit ADD VECTORS

We need magnitudes and components: First magnitudes



$$E_A = k \frac{q_A}{r_A^2}$$

$$= 8.99 \times 10^9 \, N m^2/C^2 \; \frac{50 \times 10^{-9} C}{(0.056m)^2}$$

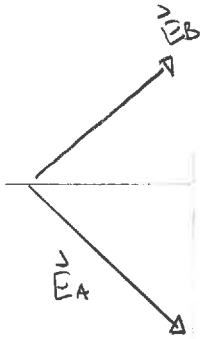
$$= 1.4 \times 10^5 \, N/C$$

$$E_B = k \frac{q_B}{r_B^2} = 8.99 \times 10^9 \, N m^2/C^2 \; \frac{80 \times 10^{-9} C}{(0.056m)^2}$$

$$= 2.3 \times 10^5 \, N/C$$

0.040m

$$r_A = \sqrt{(0.040)^2 + (0.040m)^2} = 0.056m$$



Now components: (DON'T ADD MAGNITUDES)

$E_{Ax} = E_A \cos 45° = 9.9 \times 10^4 \, N/C$

$E_{Ay} = -E_A \sin 45° = -9.9 \times 10^4 \, N/C$

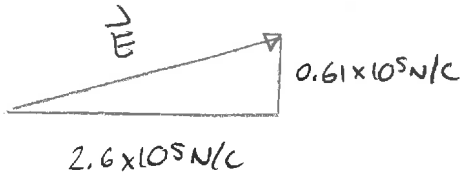
$E_{Bx} = E_B \cos 45° = 1.6 \times 10^5 \, N/C$

$E_{By} = E_B \sin 45° = 1.6 \times 10^5 \, N/C$

	x	y
$\vec{E}_A$	9.9×10^4 N/C	-9.9×10^4 N/C
$\vec{E}_B$	1.6×10^5 N/C	1.6×10^5 N/C

So $E_x = E_{Ax} + E_{Bx} = 2.6\times10^5 N/C$

$E_y = E_{Ay} + E_{By} = 0.61\times10^5 N/C$



b) $\vec{F} = q\vec{E} \Rightarrow F = |q|E$

$= 30\times10^{-6} C \times 2.7\times10^5 N/C$

$= 8.0 N$

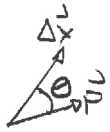
magnitude

$E = \sqrt{(2.6\times10^5)^2 + (0.61\times10^5)^2}$

$= 2.7\times10^5$

Ch 21.1 → 21.5

Equations $W = F\Delta x\cos\theta$



$W_{net} = \Delta K$ $\quad K = \frac{1}{2}mv^2$

$W_{elec} = -\Delta U_{elec}$ $\quad U_{elec} = q_{probe}V$ $\quad \Delta K + \Delta U_{elec} = 0$

$\Delta K + q\Delta V = 0$

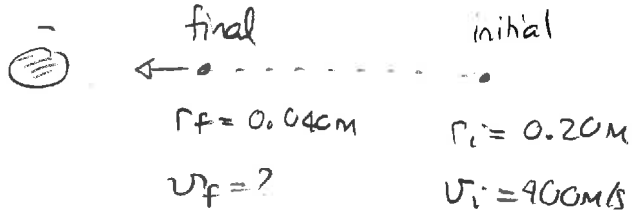
Point source $V = k\,q/r$

$\vec{E}$ = perpendicular to equip./downhill $\quad E = \left|\frac{\Delta V}{\Delta S}\right|$

Example: Quiz 2 30% → 70%

Example: A particle with charge $-6.0\times10^{-6}\,C$ is held fixed. Another particle with mass $0.010\,kg$ and charge $3.0\times10^{-3}\,C$ moves directly toward the fixed charge. At the moment that it is $0.20\,m$ away it moves with speed $400\,m/s$. Determine its speed when it is $0.040\,m$ from the fixed charge.

Answer: Energy conserved



$$\Delta K + q\Delta V = 0$$

$$K_f - K_i + q\Delta V = 0$$

$$K_f = K_i - q\Delta V$$

$$K_i = \tfrac{1}{2} m v_i^2 = \tfrac{1}{2}\, 0.010\,kg \times (400\,m/s)^2 = 800\,J$$

We need $\Delta V = V_f - V_i$

$$V_i = k\frac{q}{r_i} = 8.99\times10^9\,N m^2/C^2\ \frac{(-6.0\times10^{-6}\,C)}{0.20\,m} = -2.7\times10^5\,V$$

$$V_f = k\frac{q}{r_f} = 8.99\times10^9\,N m^2/C^2\ \frac{(-6.0\times10^{-6}\,C)}{0.040\,m} = -1.4\times10^6\,V$$

So $$q\Delta V = +3.0\times10^{-3}\,C\,\left(-1.4\times10^6\,V - (-2.7\times10^5\,V)\right)$$

$$= -3390\,J$$

So $K_f = 800\,J - (-3390\,J) = 4190\,J$

$$\Rightarrow \tfrac{1}{2} m v_f^2 = 4190\,J$$

$$\Rightarrow \tfrac{1}{2}\, 0.010\,kg\, v_f^2 = 4190\,J \Rightarrow v_f^2 = 8.4\times10^5\,m^2/s^2$$

$$\Rightarrow v_f = 915\,m/s$$

Example Quiz 3 70% →

Example Quiz 4 50% →