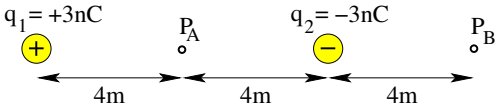
Unit Exam I: Problem #1 (Spring '07)

Consider the configuration of two point charges as shown.

(a) Find magnitude and direction of the force $\mathbf{F}_{21}$ exerted by q_2 on q_1.
(b) Find magnitude and direction of the electric field $\mathbf{E}_A$ at point P_A.
(c) Find magnitude and direction of the electric field $\mathbf{E}_B$ at point P_B.
(d) Find the electric potential V_A at point P_A.
(e) Find the electric potential V_B at point P_B.



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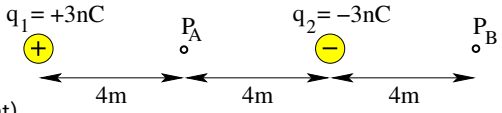

Solution:

(a) $F_{12} = k\dfrac{|3\text{nC}|^2}{(8\text{m})^2} = 1.27\text{nN}$ (directed right).

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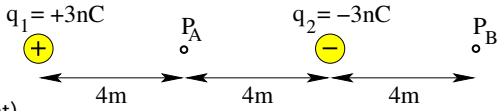

Solution:

(a) $F_{12} = k\dfrac{|3\text{nC}|^2}{(8\text{m})^2} = 1.27\text{nN}$ (directed right).

(b) $E_A = 2k\dfrac{|3\text{nC}|}{(4\text{m})^2} = 3.38\text{N/C}$ (directed right).

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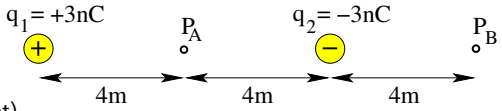

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(c) $E_B = k\dfrac{|3\text{nC}|}{(12\text{m})^2} - k\dfrac{|3\text{nC}|}{(4\text{m})^2} = -1.50\text{N/C}$ (directed left).

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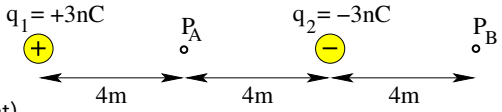

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(d) $V_A = k\dfrac{(+3\text{nC})}{4\text{m}} + k\dfrac{(-3\text{nC})}{4\text{m}} = 0.$

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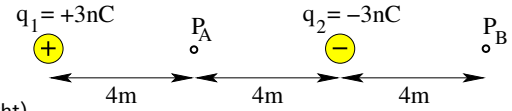

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(c) $V_B = k\dfrac{(+3\text{nC})}{12\text{m}} + k\dfrac{(-3\text{nC})}{4\text{m}} = -4.50\text{V}.$