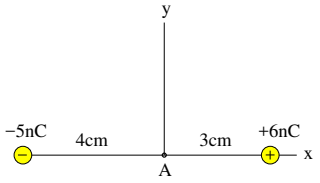
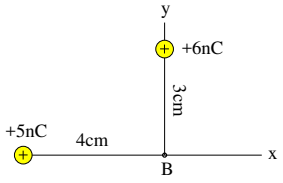
Unit Exam I: Problem #1 (Spring '16)

Consider a pair of point charges in two different configurations. Find the electric potential V and the components E_x and E_y of the electric field at point A and at point B.





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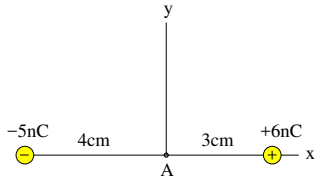

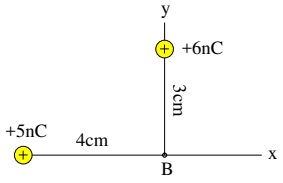

Solution:

- $V^{(A)} = k\dfrac{6\text{nC}}{3\text{cm}} + k\dfrac{(-5\text{nC})}{4\text{cm}} = 1800\text{V} - 1125\text{V} = 675\text{V}.$

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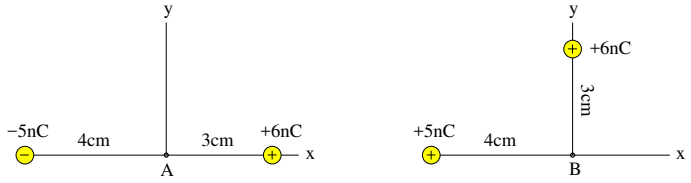

Solution:

- $V^{(A)} = k\dfrac{6\text{nC}}{3\text{cm}} + k\dfrac{(-5\text{nC})}{4\text{cm}} = 1800\text{V} - 1125\text{V} = 675\text{V}.$
- $E_x^{(A)} = -k\dfrac{|6\text{nC}|}{(3\text{cm})^2} - k\dfrac{|-5\text{nC}|}{(4\text{cm})^2} = -88\,125\text{V/m}, \qquad E_y^{(A)} = 0.$

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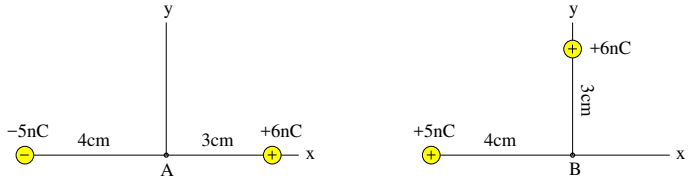

Solution:

- $V^{(A)} = k\dfrac{6\text{nC}}{3\text{cm}} + k\dfrac{(-5\text{nC})}{4\text{cm}} = 1800\text{V} - 1125\text{V} = 675\text{V}.$
- $E_x^{(A)} = -k\dfrac{|6\text{nC}|}{(3\text{cm})^2} - k\dfrac{|-5\text{nC}|}{(4\text{cm})^2} = -88\,125\text{V/m}, \qquad E_y^{(A)} = 0.$
- $V^{(B)} = k\dfrac{6\text{nC}}{3\text{cm}} + k\dfrac{5\text{nC}}{4\text{cm}} = 1800\text{V} + 1125\text{V} = 2925\text{V}.$

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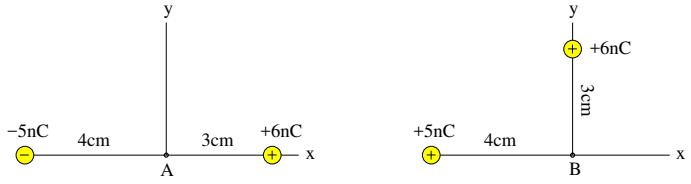

Solution:

- $V^{(A)} = k\dfrac{6\text{nC}}{3\text{cm}} + k\dfrac{(-5\text{nC})}{4\text{cm}} = 1800\text{V} - 1125\text{V} = 675\text{V}.$
- $E_x^{(A)} = -k\dfrac{|6\text{nC}|}{(3\text{cm})^2} - k\dfrac{|-5\text{nC}|}{(4\text{cm})^2} = -88\,125\text{V/m}, \qquad E_y^{(A)} = 0.$
- $V^{(B)} = k\dfrac{6\text{nC}}{3\text{cm}} + k\dfrac{5\text{nC}}{4\text{cm}} = 1800\text{V} + 1125\text{V} = 2925\text{V}.$
- $E_x^{(B)} = k\dfrac{|5\text{nC}|}{(4\text{cm})^2} = 28\,125\text{V/m}, \qquad E_y^{(B)} = -k\dfrac{|6\text{nC}|}{(3\text{cm})^2} = -60\,000\text{V/m}.$