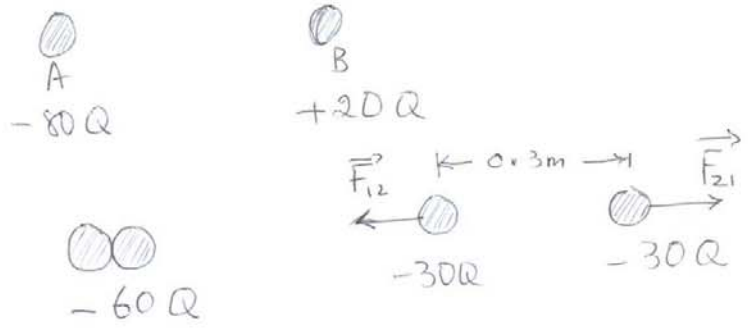
KING FAHD UNIVERSITY OF PERTOLEUM & MINERALS
PHYSICS DEPARTMENT
QUIZ #5- CHAPTER 21

NAME: Key ID# SECTION#

Consider two identical conducting spheres, A and B. Initially, sphere A has a charge of -80 Q and Sphere B has a charge of +20 Q. If the spheres are touched and then separated by a distance of 0.3 m, what is the magnitude of the resultant force between them? [Take $Q = 5.7 \times 10^{-8}$ C]



$$|\vec{F}_{12}| = \frac{k\,q_1 q_2}{r^2} = \frac{9\times10^{9}\,(30\times5.7\times10^{-8})^2}{(0.3)^2}$$

$$= \boxed{0.292\ \text{N}}$$

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QUIZ #5- CHAPTER 19

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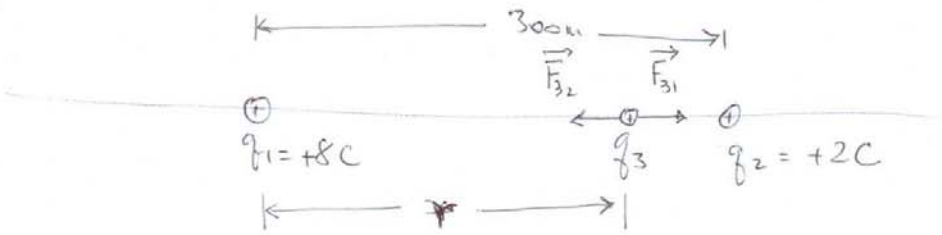
Two positive charges $q_1 = +8.0$ C and $q_2 = +2.0$ C are separated by 300 m. A third charge q_3 is placed a distance r from q_1 so that the resultant electric force on q_3 due to the other two charges is zero. Calculate the distance r.



$$|\vec{F}_{32}| = |\vec{F}_{31}|$$

$$\frac{k q_3 q_2}{(300-r)^2} = \frac{k q_3 q_1}{r^2}$$

$$\frac{2}{(300-r)^2} = \frac{8}{r^2} \Rightarrow \frac{(300-r)^2}{r^2} = \frac{2}{8} = \frac{1}{4}$$

$$\frac{(300-r)}{r} = \frac{1}{2}$$

$$2(300-r) = r \Rightarrow 600 - 2r = r$$

$$3r = 600$$

$$\Rightarrow \boxed{r = 200\text{m}}$$

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QUIZ #5- CHAPTER 21

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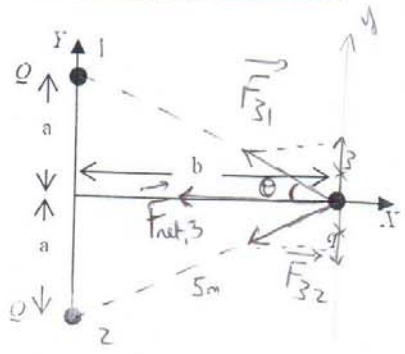
In the figure, Q = 60 μC, q = – 20 μC, a = 3.0 m, and b = 4.0 m. Calculate the magnitude and direction of the total electric force on charge q.



$$\vec{F}_{net,3} = \vec{F}_{31} + \vec{F}_{32}$$

$$|\vec{F}_{31}| = |\vec{F}_{32}| = \frac{k\, q_1\, q_3}{r^2}$$

$$= \frac{9\times10^{9} \times (60\times10^{-6})(20\times10^{-6})}{(5)^2} = 0.432\ N$$

$$\theta = \cos^{-1}\left(\frac{4}{5}\right) = 36.9^\circ$$

$$F_{net,y} = 0$$

$$F_{net,x} = -F_{31}\cos\theta - F_{32}\cos\theta$$

$$= -2F_{31}\cos\theta = -2 \times 0.432 \times \frac{4}{5} = -0.691\ N$$

$$\boxed{\vec{F}_{net,3} = -0.691\,\hat{i} + 0\,\hat{j}}$$

magnitude = 0.691 N direction: negative x-axis