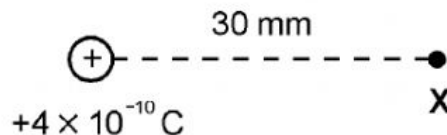


### Electrostatics 3

**Complete the exercises in your book and upload pictures to the assignment in Teams.**

#### Question 7

A small point charge carries a charge of  $+4 \times 10^{-10} \text{ C}$ .



- 7.1 Calculate the magnitude of the electric field strength at a distance of 30 mm from the point charge.
- 7.2 A second point charge of  $-8 \times 10^{-10} \text{ C}$  is placed at position X. Calculate the magnitude of the force between the charges.

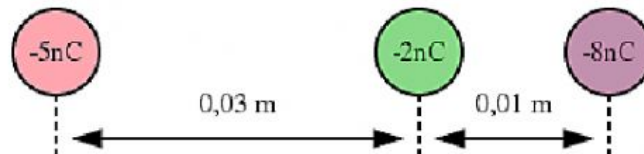
#### QUESTION 8

Consider a positive point charge of  $+5 \times 10^{-9} \text{ C}$ .

- 8.1 Draw a neat sketch of the electric field pattern around this point charge.
- 8.2 Calculate the magnitude and direction of the force exerted on a negatively charged particle of  $-3 \times 10^{-9} \text{ C}$  placed 0,5 m from the point charge of  $+5 \times 10^{-9} \text{ C}$ .
- 8.3 The negative charge moves toward the positive charge. Explain how the force experienced by each charge will change. (Only use the words DECREASE, REMAIN THE SAME or INCREASE as an answer.)
- 8.4 The two charges come into contact and then separate again. Calculate the charge on each after they have separated.

**Question 11**

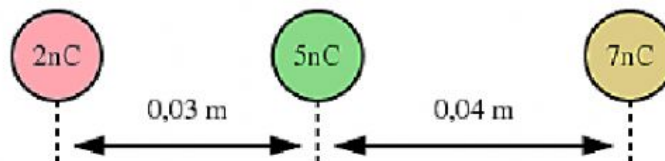
11. Three point charges are in a straight line. Their charges are  $Q_1 = -2 \times 10^{-9} \text{ C}$ ,  $Q_2 = -5 \times 10^{-9} \text{ C}$  and  $Q_3 = -8 \times 10^{-9} \text{ C}$ . The distance between  $Q_1$  and  $Q_2$  is 0,03 m and the distance between  $Q_2$  and  $Q_3$  is 0,01 m.



What is the net electrostatic force on  $Q_2$  from the other two charges? Write your answer in scientific notation, rounding to two digits after the decimal point.

12.

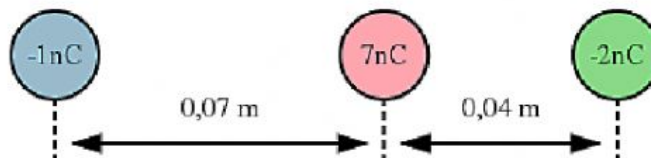
- Three point charges are in a straight line. Their charges are  $Q_1 = 5 \times 10^{-9} \text{ C}$ ,  $Q_2 = 2 \times 10^{-9} \text{ C}$  and  $Q_3 = 7 \times 10^{-9} \text{ C}$ . The distance between  $Q_1$  and  $Q_2$  is 0,03 m and the distance between  $Q_2$  and  $Q_3$  is 0,04 m.



What is the net electrostatic force on  $Q_2$  from the other two charges? Write your answer in scientific notation, rounding to two digits after the decimal point.

13.

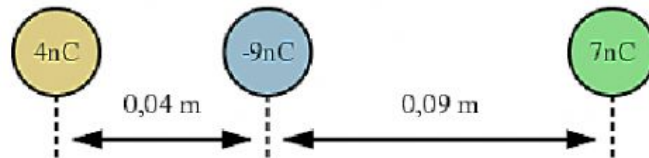
- Three point charges are in a straight line. Their charges are  $Q_1 = 7 \times 10^{-9} \text{ C}$ ,  $Q_2 = -1 \times 10^{-9} \text{ C}$  and  $Q_3 = -2 \times 10^{-9} \text{ C}$ . The distance between  $Q_1$  and  $Q_2$  is 0,07 m and the distance between  $Q_2$  and  $Q_3$  is 0,04 m.



What is the net electrostatic force on  $Q_2$  from the other two charges? Write your answer in scientific notation, rounding to two digits after the decimal point.

14.

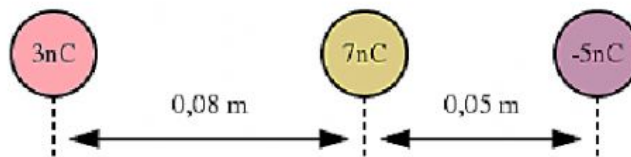
Three point charges are in a straight line. Their charges are  $Q_1 = -9 \times 10^{-9} \text{ C}$ ,  $Q_2 = 4 \times 10^{-9} \text{ C}$  and  $Q_3 = 7 \times 10^{-9} \text{ C}$ . The distance between  $Q_1$  and  $Q_2$  is 0,04 m and the distance between  $Q_2$  and  $Q_3$  is 0,09 m.



What is the net electrostatic force on  $Q_2$  from the other two charges? Write your answer in scientific notation, rounding to two digits after the decimal point.

15.

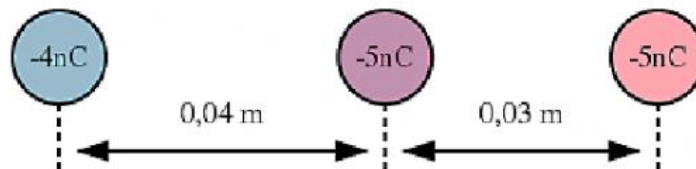
Three point charges are in a straight line. Their charges are  $Q_1 = 7 \times 10^{-9} \text{ C}$ ,  $Q_2 = 3 \times 10^{-9} \text{ C}$  and  $Q_3 = -5 \times 10^{-9} \text{ C}$ . The distance between  $Q_1$  and  $Q_2$  is 0,08 m and the distance between  $Q_2$  and  $Q_3$  is 0,05 m.



What is the net electrostatic force on  $Q_2$  from the other two charges? Write your answer in scientific notation, rounding to two digits after the decimal point.

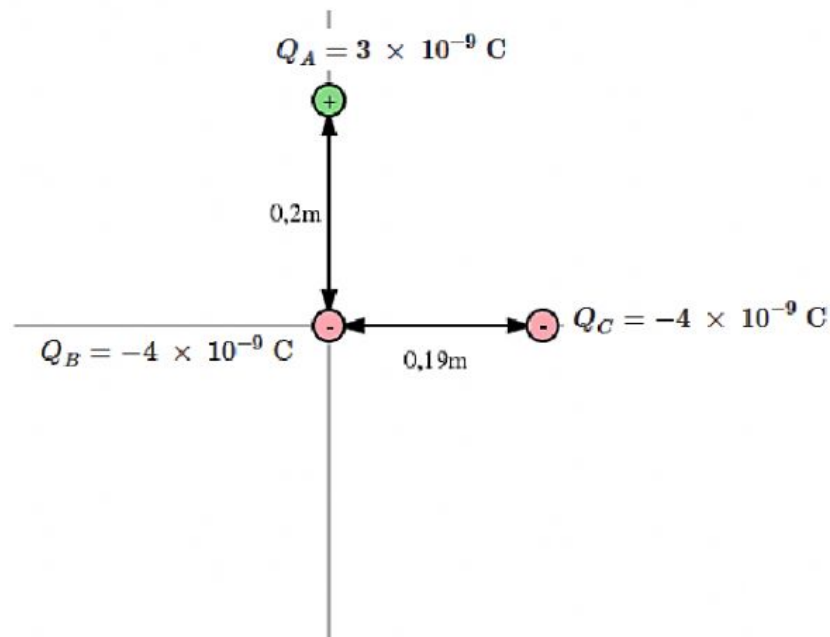
16.

Three point charges are in a straight line. Their charges are  $Q_1 = -5 \times 10^{-9} \text{ C}$ ,  $Q_2 = -4 \times 10^{-9} \text{ C}$  and  $Q_3 = -5 \times 10^{-9} \text{ C}$ . The distance between  $Q_1$  and  $Q_2$  is 0,04 m and the distance between  $Q_2$  and  $Q_3$  is 0,03 m.



What is the net electrostatic force on  $Q_2$  from the other two charges? Write your answer in scientific notation, rounding to two digits after the decimal point.

17.



Calculate the magnitude and bearing (relative to the positive x-axis) of the resultant force acting on  $Q_B$ .

18.

Diagram showing three point charges  $Q_A$ ,  $Q_B$ , and  $Q_C$  arranged in a right-angled triangle. Charge  $Q_A = -2 \times 10^{-9} \text{ C}$  is at the top vertex. Charge  $Q_B = -2 \times 10^{-9} \text{ C}$  is at the bottom vertex. Charge  $Q_C = -3 \times 10^{-9} \text{ C}$  is at the right vertex. The distance between  $Q_A$  and  $Q_B$  is  $0,2\text{m}$ . The distance between  $Q_B$  and  $Q_C$  is  $0,14\text{m}$ .

 $Q_B$ 

19.

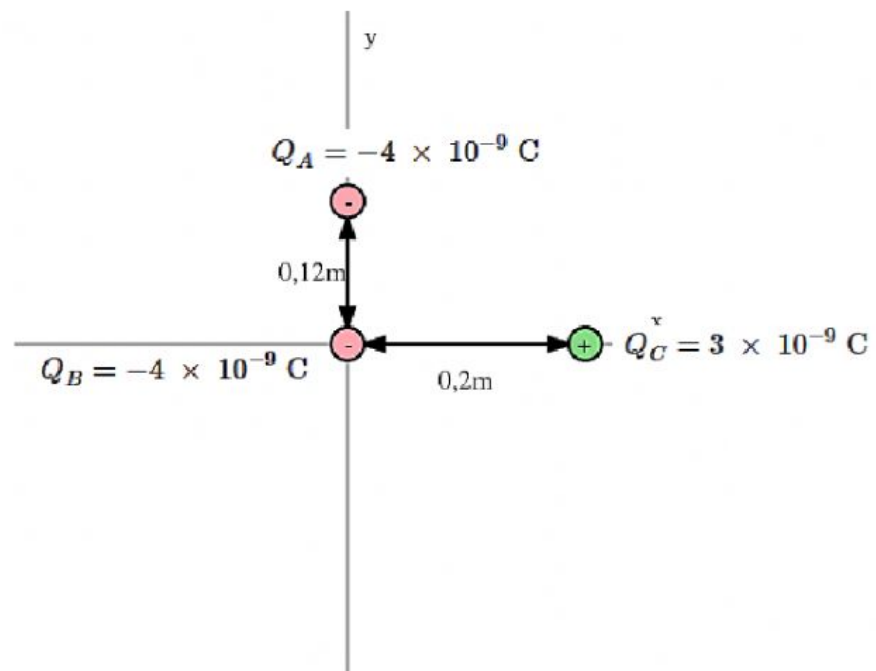
Diagram showing three point charges A, B, and C arranged in a right-angled triangle. Charge A is a positive charge ( $Q_A = 1 \times 10^{-9} \text{ C}$ ) located at a distance of  $0,19\text{m}$  from charge B. Charge B is a negative charge ( $Q_B = -1 \times 10^{-9} \text{ C}$ ) located at the center. Charge C is a positive charge ( $Q_C = 2 \times 10^{-9} \text{ C}$ ) located at a distance of  $0,19\text{m}$  from charge B. The charges are arranged such that the line segments AB and BC are perpendicular.

 $Q_B$

Diagram showing three point charges in a Cartesian coordinate system:

- Charge A (green circle with '+') is located on the y-axis at a distance of  $0,14\text{m}$  from the origin. Its value is  $Q_A = 1 \times 10^{-9} \text{ C}$ .
- Charge B (red circle with '-') is located at the origin  $(0,0)$ . Its value is  $Q_B = -1 \times 10^{-9} \text{ C}$ .
- Charge C (red circle with '-') is located on the x-axis at a distance of  $0,15\text{m}$  from the origin. Its value is  $Q_C = -1 \times 10^{-9} \text{ C}$ .

21.



Calculate the magnitude and bearing (relative to the positive x-axis) of the resultant force acting on  $Q_B$ .

27.

Calculate the charge on two identical spheres that are similarly charged if they are separated by 28 cm and the electrostatic force between them is 0,012 N.

**All my answers have been submitted on MS Teams!**