

Physics hour 01 - 23.04.2019

1) Elementarladung 1

$$Q = N \cdot (-e) \rightarrow N = \frac{Q}{-e} = \frac{-6,7 \cdot 10^{-9} \text{ C}}{-1,6 \cdot 10^{-19} \text{ C}} = 4,2 \cdot 10^{10}$$

2) Elementarladung 2

$$M = N \cdot m_e = 4,2 \cdot 10^{10} \cdot 9,1 \cdot 10^{-31} \text{ kg} = 38 \cdot 10^{-21} \text{ kg} = 3,8 \cdot 10^{-20} \text{ kg}$$

3) Coulombkraft 1

$$\overline{F} = \frac{1}{4\pi\epsilon_0} \cdot \frac{q_1 \cdot q_2}{d^2} \rightarrow \overline{F}' = \frac{1}{4\pi\epsilon_0} \cdot \frac{\cancel{2} \cdot q_1 \cdot \cancel{\frac{1}{2}} q_2}{(2d)^2} = \frac{1}{4\pi\epsilon_0} \cdot \frac{q_1 \cdot q_2}{4 d^2} = \frac{1}{4} \cdot \overline{F}$$

4) Coulombkraft 2

$$\overline{F}_C = \frac{1}{4\pi\epsilon_0} \cdot \frac{q_1 \cdot q_2}{r^2} = \frac{1}{4\pi \cdot 8,85 \cdot \cancel{10^{-12}} \frac{\text{As}}{\text{Vm}}} \cdot \frac{3 \cdot \cancel{10^{-6}} \text{ C} \cdot 1 \cdot \cancel{10^{-6}} \text{ C}}{(2 \cdot 10^{-2} \text{ m})^2} = 67 \text{ N}$$

5) Coulombkraft 3

A) $\oplus \leftarrow \ominus \rightarrow \oplus$ ✓

B) $\oplus \leftarrow \ominus \leftarrow \ominus$

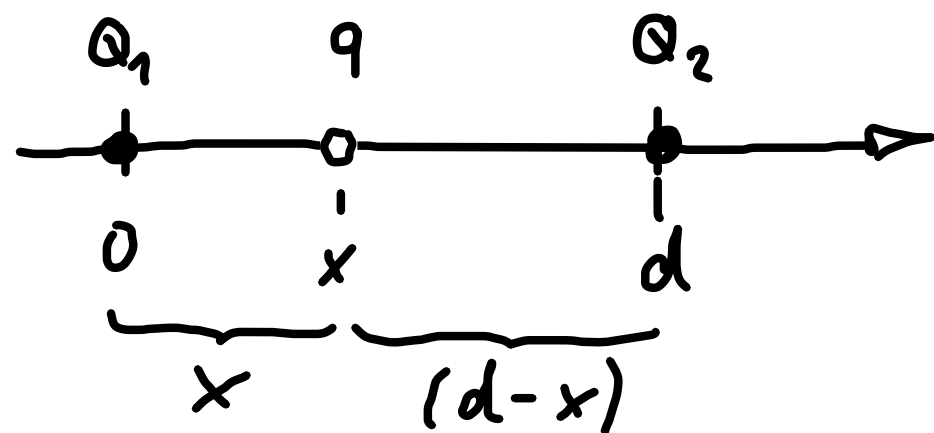
C) $\ominus \rightarrow \ominus \leftarrow \ominus$ ✓

D) $\ominus \leftarrow \oplus \rightarrow \ominus$ ✓

E) $\ominus \leftarrow \oplus \leftarrow \oplus$

F) $\oplus \rightarrow \oplus \leftarrow \oplus$ ✓

6) Coulombkraft 4



$$|F_{Q_1}| = |F_{Q_2}|$$

$$\frac{1}{4\pi\epsilon_0} \frac{Q_1 q}{x^2} = \frac{1}{4\pi\epsilon_0} \cdot \frac{Q_2 \cdot q}{(d-x)^2} \rightarrow \frac{Q_1}{x^2} = \frac{Q_2}{(d-x)^2}$$

$$Q_1 (d-x)^2 = Q_2 \cdot x^2 \rightarrow \underbrace{Q_1 d^2}_{a} - \underbrace{2dx Q_1}_{b} + \underbrace{Q_1 x^2}_{c} - \underbrace{Q_2 x^2}_{d} = 0$$

$$\underbrace{(Q_1 - Q_2)}_a x^2 - \underbrace{2dQ_1}_b x + \underbrace{Q_1 d^2}_c = 0 \quad ; \quad x_{1/2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x_{1/2} = \frac{2dQ_1 \pm \sqrt{4d^2Q_1^2 - 4(Q_1 - Q_2)Q_1d^2}}{2(Q_1 - Q_2)} = \dots \text{TR} = \begin{cases} -\sqrt{} \Rightarrow 11.7 \text{ cm} \\ +\sqrt{} \Rightarrow 13.3 \text{ cm} \end{cases}$$