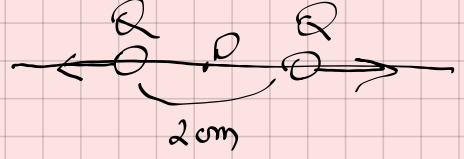
(13) $m_1 = m_2 = 2g = 2 \cdot 10^{-3} kg$

$Q = -50\,mC = -50 \cdot 10^{-3} C$



$d = 2\,cm = 2 \cdot 10^{-2} m$

a) $|\vec{F}| = K \cdot \frac{Q^2}{x^2} = K \cdot \frac{2500 \cdot 10^{18}}{4 \cdot 10^{-4}} = 9 \cdot 10^9 \cdot 625 \cdot 10^{14} =$

$= 9 \cdot 625 \cdot 10^5 =$

$= 5625 \cdot 10^5 N$

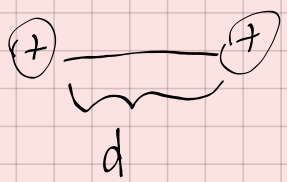
$K = \frac{1}{4\pi\varepsilon_0} = 9 \cdot 10^9$

b) $|\vec{G}| = m \cdot g = 2 \cdot 10^{-3} \cdot 10 = 2 \cdot 10^{-2} N$

$\left|\frac{\vec{F}}{\vec{G}}\right| = \frac{5,625 \cdot 10^{-5}}{2 \cdot 10^{-2}} = 28125 \cdot 10^{-4}$

15.

$d = 2\,fm = 2 \cdot 10^{-15} m$



a) $|\vec{F}| = ?$

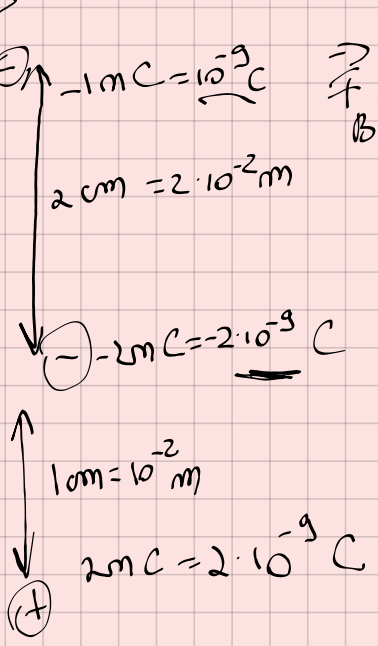
$|\vec{F}| = K \cdot \frac{Q \cdot Q}{d^2} = 9 \cdot 10^9$

$m_p = 1,67 \cdot 10^{-27} kg$?

$m_e = 9,1 \cdot 10^{-31} kg$

$e = 1,6 \cdot 10^{-19} C$ - sarcina elem.

14.

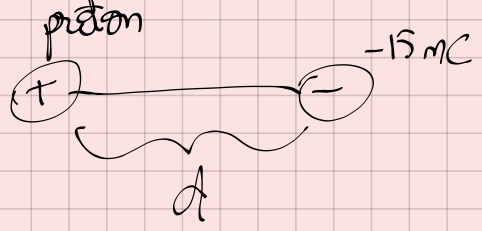


$\vec{F}_B = \vec{F}_{AB} + \vec{F}_{CB} = K \vec{j} \left(-\frac{10^{-3} \cdot (-2) \cdot 10^{-3}}{4 \cdot 10^{-4}} + \frac{-4 \cdot 10^{-8}}{10^{-4}} \right)$

$= \vec{j} \left(-\frac{9 \cdot 10^{-14}}{2} \right)$

$|\vec{F}_B| = \frac{81}{2} \cdot 10^5 N$

19.



$Q = -15\ mC = -15 \cdot 10^{-3}\ C$

$d = 1\ cm = 10^{-2}\ m$

$\vec{F} = m \cdot \vec{a} \Rightarrow \vec{a} = \frac{\vec{F}}{m}$

$F = k \frac{eQ}{d^2} = k \cdot \frac{1,6 \cdot 10^{-19} \cdot (-15) \cdot 10^{-3}}{10^{-2}} =$

$= 9 \cdot 10^9 \cdot \frac{16 \cdot 10^{-20} \cdot (-15) \cdot 10^{-3}}{10^{-2}} =$

$= \frac{9 \cdot 16 \cdot (-15) \cdot 10^{-20}}{10^{-2}} =$

$= 9 \cdot 16 \cdot (-15) \cdot 10^{-18}\ N$

$\vec{a} = \frac{9 \cdot 16 \cdot (-15) \cdot 10^{-18}}{1,67 \cdot 10^{-27}} = 1,3 \cdot 10^{14}\ m/s^2$

21. $\vec{E} = (400\vec{i} + 100\vec{j})\ N/C$

a) $|\vec{F}| = ?$ - proton

b) $|\vec{F}| = ?$ - electron

c) $\vec{a} = ?$ - proton

d) $\vec{a} = ?$ - electron

a) $\boxed{\vec{E} = \frac{\vec{F}}{q}}$

$|\vec{F_p}| = \vec{E} q = (400\vec{i} + 100\vec{j}) \cdot \frac{1,6}{10^{19}}$

b) $|\vec{F_e}| = |\vec{F_p}| = (400\vec{i} + 100\vec{j}) \cdot 1,6 \cdot 10^{-19}$

c) $\vec{a_p} = \frac{\vec{F_p}}{m}$

$a_p = \frac{\sqrt{(400^2 + 100^2)(1,6 \cdot 10^{-19})^2}}{1,67 \cdot 10^{-27}}$

$= \frac{1,6 \cdot 10^{-19} \cdot 100\sqrt{17}}{1,67 \cdot 10^{-27}} \simeq \frac{8}{1,67} \cdot 10^{10} \simeq 4,8 \cdot 10^{10}$

d) $\vec{a_e} = \frac{\vec{F_e}}{m_e} \Rightarrow a_e = \frac{8 \cdot 10^{-14}}{9,1 \cdot 10^{-31}} = \frac{8}{91} \cdot 10^{14} = 3,84 \cdot 10^{14}\ m/s^2$

c) $\frac{F}{G}$

$|\vec{F}| = G \cdot \frac{m_1 \cdot m_2}{d^2}$

$|\vec{F_G}| = G \cdot \frac{m_p^2}{d^2}$

$G = 6,67 \cdot 10^{-11}\ \frac{Nm^2}{kg^2}$ → constanta atracției gravitaționale universale

$F_G = G \cdot \frac{m_1 \cdot m_2}{d^2}$

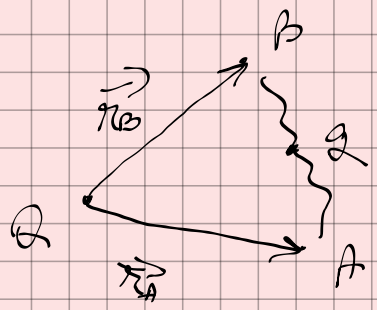
- $Q = 2mC = 2 \cdot 10^{-3} C$

a) $\vec{E} = ?$ în A $r_A = 1m$

b) $V_B = ?$ în B $r_B = 2m$

c) $L_{AB} \rightarrow q_0 = 1,5\ pC$ din $A \rightarrow B$

d) $F_{q_0} = ?$ q_0 situat în A



$V_B = \frac{kQ}{r_B}$ $\quad \frac{L}{q} = V$

$\frac{L_{AB}}{q_0} = V_A - V_B \Rightarrow L_{AB} = q_0 (V_A - V_B)$

d) $F_{q_0} = q_0 E_A$