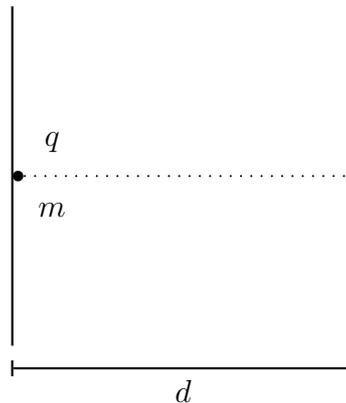


1. Exercise:

Find the ratio of the electric and the gravitational force

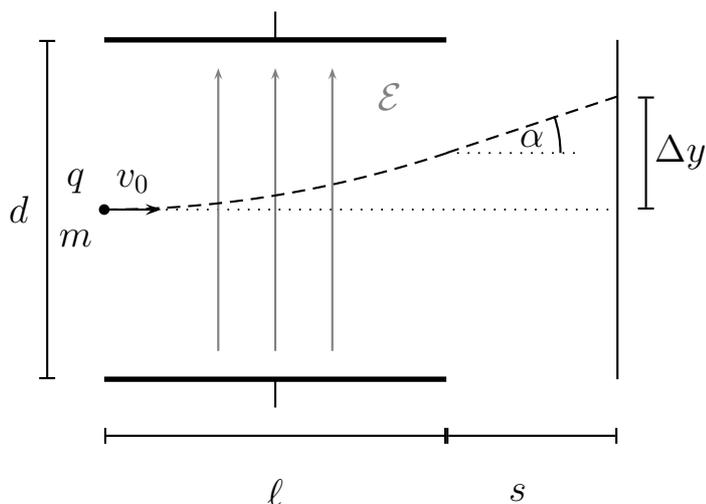
- between two electrons with mass $m_e = 9.1 \cdot 10^{-31}$ kg which are separated by a distance $r = 1$ m.
- for an isotropic ball with mass $m = 1$ kg charged by $q = 1$ mC in a thunderstorm generating an homogeneous electric field of $\mathcal{E} = 10^6 \frac{\text{V}}{\text{m}}$ on the earth ($g = 10 \frac{\text{m}}{\text{s}^2}$).

2. Exercise:

Consider a point charge $q = 50$ mC with mass $m = 20$ g which is emitted by the left plate of a capacitor. The plates of the capacitor are separated by a distance $d = 20$ m.

- How much energy gains the point charge by passing through the capacitor if a voltage of $U = 2$ V is applied to the capacitor?
- Which side has to be on the higher potential?
- In which direction points the electric field inside the capacitor?
- What voltage U_0 is needed in order to accelerate the point charge to a speed $v_0 = 20 \frac{\text{m}}{\text{s}}$ (at the second plate)?
- Determine the acceleration a in the last case.
- How long did the point charge need in order to pass through the capacitor?

3. Exercise:



Consider now a point charge $q = 10 \text{ mC}$ with mass $m = 5 \text{ g}$ which moves from the left inside a parallel plate capacitor with velocity $v_0 = 6 \frac{\text{m}}{\text{s}}$ parallel to the plates and just in the center of the capacitor. The parallel plates of the capacitor are squares which are separated by a distance $d = 7 \text{ m}$ and have a length $\ell = 3 \text{ m}$. There is an electric field $\mathcal{E} = 20 \frac{\text{V}}{\text{m}}$ present which points upwards in the region between the plates. A screen is placed perpendicular to the plates at a distance $s = 7 \text{ m}$ from the end of the plates.

- At which voltage U lies the capacitor?
- In which direction is the point charge deflected, i.e. is it correctly drawn in the figure?
- What is the acceleration a of the point charge?
- How long does the point charge need in order to pass through the parallel plate capacitor?
- What is its velocity v then?
- Determine the angle α with which the point charge leaves the capacitor.
- Find the displacement Δy of the point charge at the screen measured from the axis of the motion before the capacitor.