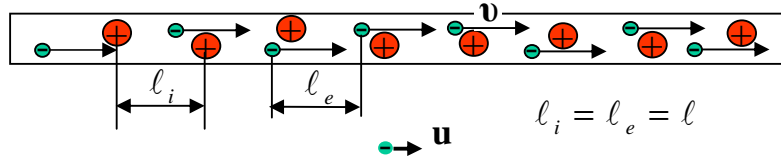


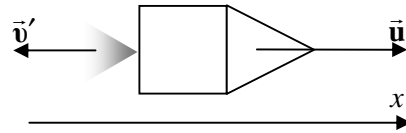
PHYS2100 Assignment

Problem 1. In the laboratory reference frame, electrons are moving with velocity \mathbf{v} in a wire where ions are at rest. The distance between electrons and the distance between ions are both equal l (therefore the total linear charge density of the wire is zero). A free electron is moving parallel to the wire with velocity \mathbf{u} .

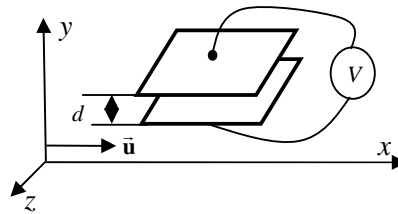


Calculate the distance between ions and the distance between electrons in a reference frame where the free electron is at rest.

Problem 2. A rocket accelerates by sending a jet of gas in the direction opposite to the rocket's motion. The jet has always a constant speed v' relative to the rocket. Find final velocity of the rocket if the final mass of the rocket is M_f and its initial mass is M_i .



Problem 3. A battery (voltage V) is connected to two metallic plates (distance d). The whole assembly moves with the velocity \mathbf{u} as shown in the figure. Calculate the field between the plates.



Problem 4. A plane mirror moves with velocity u and a ray of light of frequency ω_1 strikes the mirror at an angle of incidence θ_1 . Calculate the angle of reflection and the frequency of light after reflection.

Hint. Use a reference frame where calculations are most simple and then transform the answers to the initial reference frame.

