Moving Charge

1. The current in a wire is 1.5 mA.
    a. Calculate the amount of charge that moves through a given area in 5 s.
    b. Determine the number of electrons that move through this area in 5 s.

2. Proton beam therapy is a cancer treatment method that involves bombarding a tumor with a beam of high energy protons. During a typical treatment 2×10^6 protons may be directed into a tumor over a time span of approximately 1 minute. Calculate the current of this beam.

3. The drift speed through a wire with radius r is v. The radius is doubled to $2r$ and the current stays constant. Determine the new drift speed.

4. A copper wire of diameter of 0.65 mm carries a current of 0.25 A. There are 8.5×10^{28} charge carriers in each cubic meter of copper. The charge on each charge carrier electron is 1.6×10^{-19} C. Calculate the drift speed of the charge carriers.

5. The potential difference across a resistor is 5 V and the current through the resistor is 1 mA. Calculate the resistance.

6. Two resistors with resistance 2 Ω and 5 Ω have a current of 1 A running through them. Calculate the potential difference across each resistor.

7. A 5 cm long, 5 mm diameter wire has a resistance of 1 Ω. Calculate the resistivity of the wire.

8. Two different types of material are used to make wires of the same length L and resistance R, one which has a diameter of 2 mm and the other has a diameter of 4 mm.
    a. Compare the resistivity of each wire material.
    b. Compare the resistance of the wires if they have the same length and diameter.

9. The resistivity of copper is 1.72×10^{-8} Ω m. Calculate the resistance of a 20.0 cm wire that has a diameter of 1.60 mm.

10. A given resistor has a resistivity of 1.23 Ω m. It is 1.5 cm long and has a diameter of 5.0 mm.
    a. Calculate the resistance.
    b. Determine the current through the resistor when a 6.0 V potential difference is applied across the resistor.