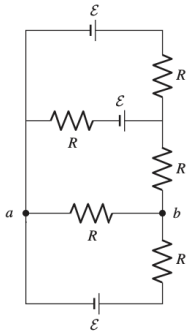
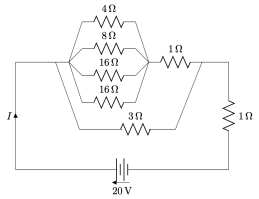
Exercise sheet #8

Problem 1. We have $5 \cdot 10^{16}$ doubly charged positive ions per m^3, all moving west with a speed of 10^5 m/s. In the same region there are 10^{17} electrons per m^3 moving northeast with a speed of 10^6 m/s. (Don't ask how we managed it!) What are the magnitude and direction of **J** ?

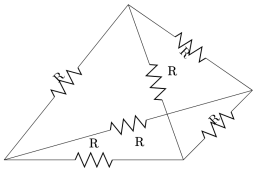
Problem 2. What is the potential difference between points a and b in the circuit shown in the figure below?



Problem 3. Find the current I in the circuit shown below:



Problem 4. A regular tetrahedron is a pyramid with a triangular base. Six $R = 10.0\Omega$ resistors are placed along its six edges, with junctions at its four vertices, as shown in the figure below. A 12.0-V battery is connected to any two of the vertices. Find (i) the equivalent resistance of the tetrahedron between these vertices and (ii) the current in the battery.



Problem 5. Determine the magnitude and directions of the currents through $R_1 = 22\Omega$ and $R_2 = 15\Omega$ in the circuit in the figure below. Let's consider that in addition to the explicit resistances, the batteries have an internal resistance of $r = 1.2\Omega$.