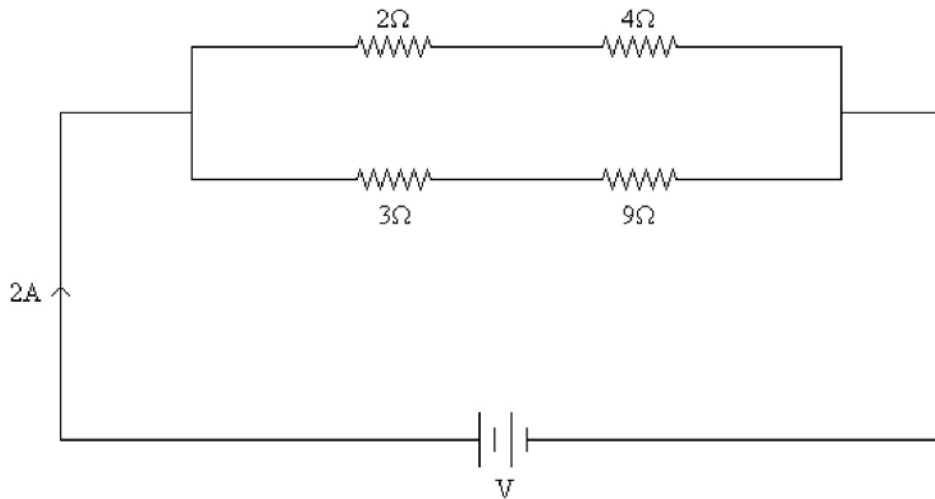


Sample test 3, PHYS 1112, Summer 2009.
The actual test will differ from the problems given here.

Problem 1: Resistors, Ohm's Law

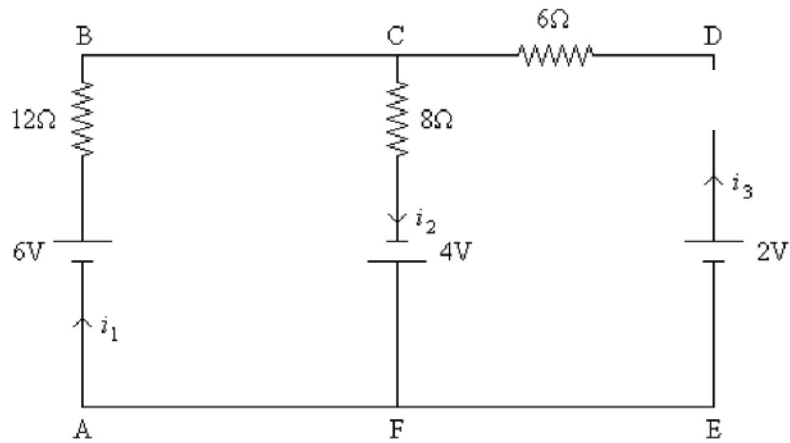


Four resistors of values $2.0\ \Omega$, $4.0\ \Omega$, $3.0\ \Omega$, and $9.0\ \Omega$ are connected across a DC source with voltage V as shown in the Figure.

If the total current through this circuit is $2.0\ \text{A}$, what is

- the voltage of the battery?
- the current through the $9\text{-}\Omega$ resistor?

Problem 2: Kirchhoff's Rules



For the circuit shown,

- set up three independent equations, using Kirchhoff's loop and junction rules (for the loops, indicate the direction of the paths in the diagram).
- calculate the currents i_1 , i_2 and i_3 .
- calculate the voltage difference between point C and point A.

Problem 3: Magnetic Forces

An electron moving in the positive y direction with a velocity $v = 5 \times 10^5$ m/s, at right angles to a magnetic field with a magnitude $B = 1.5$ T, experiences a magnetic force in the negative x direction.

- a) What is the direction of the magnetic field?
- b) What is the magnitude of the magnetic force on the electron?

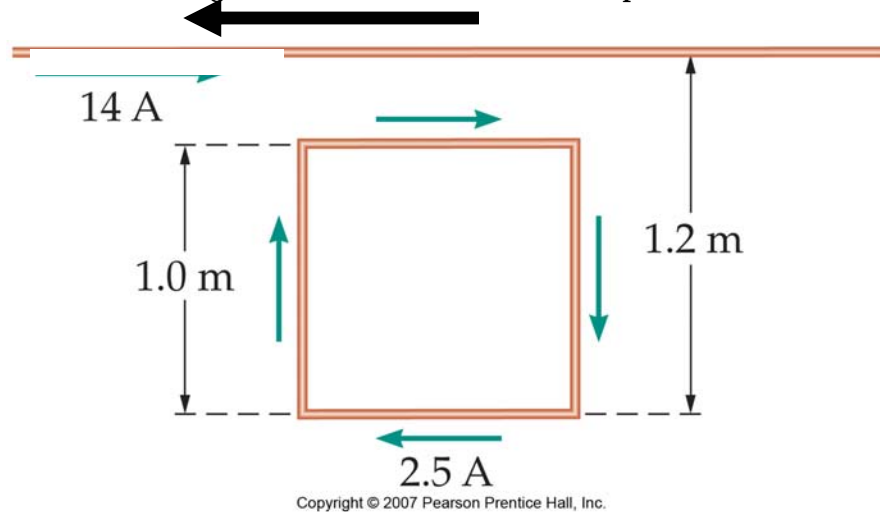
To keep the electron on a straight trajectory, the electron is subject to the influence of an additional electric field.

- c) What is the direction of the electric field?
- d) What is the magnitude of the electric field?

Problem 4: More Magnetic Forces

A long straight wire carries a current of 10A in the direction of the black arrow. Next to the wire is a square loop with sides 1.0m in length (see figure). The loop carries a current of 2.5A.

- What is the direction of the net force on the loop?
- Calculate the magnitude of the net force on the loop?



Problem 5: Potential

Four charges $q = +5 \mu\text{C}$ are arranged in a square of sidelength $d = 2.0 \text{ m}$.
Find

- a) electric potential in the centre of the square.
- b) potential energy of charge $Q = -1 \mu\text{C}$ located midway between charge q_2 and q_3 .