PHYS 1030
Tutorial 2

Yutong Zhao
Department of Physics and Astronomy
University of Manitoba

Problem 20.8

The resistance of a bagel toaster is 14 Ω. To prepare a bagel, the toaster is operated for one minute from a 120-V outlet. How much energy is delivered to the toaster?

$E = Pt$ $\qquad$ $1\,\text{min} = 60s$

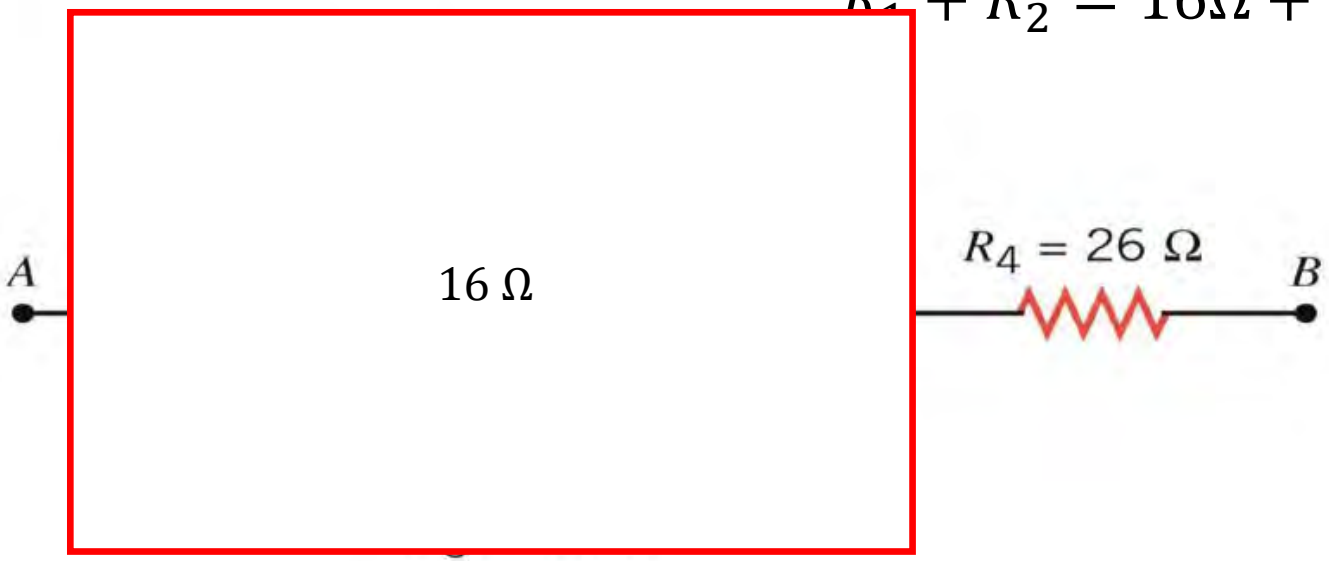
$P = IV$ $\qquad$ $I = \frac{V}{R}$ $\qquad$ $E = Pt = 6.171 \times 10^4 J$

$$P = \frac{V^2}{R} = \frac{120^2}{14} = 1.029 \times 10^3 W$$

Problem 20.67

Find the equivalent resistance between the points A and B in the figure below.

$$R_1 + R_2 = 16\Omega + 8\Omega = 24\ \Omega$$



$$\frac{1}{R_{123}} = \frac{1}{24\Omega} + \frac{1}{48\Omega} = \frac{3}{48\Omega}$$

$$R_{123} = \frac{48}{3}\Omega = 16\Omega$$

$$R_{tot} = 16\Omega + 26\Omega = 42\Omega$$

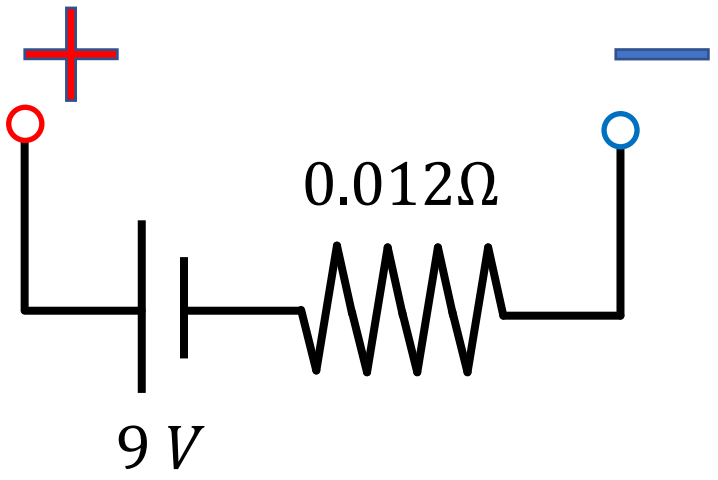
Problem 20.76

A battery has an internal resistance of 0.012 Ω and an emf of 9.00 V. What is the maximum current that can be drawn from the battery without the terminal voltage dropping below 8.90 V?

$$V = 9.0\ V\ - I \times r = 8.90\ V$$

$$I \times r = 9.0V\ - 8.90\ V$$

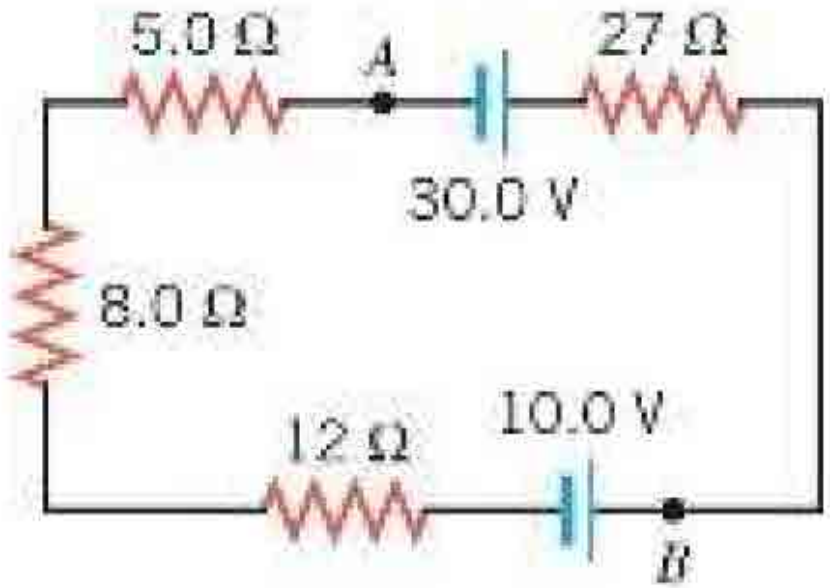
$$I = \frac{0.1V}{0.012\Omega} \approx 8.33\ A$$



Theory is when you know everything but nothing works.
Practice is when everything works but no one knows why.
In our lab, theory and practice are combined: nothing works and no one knows why.

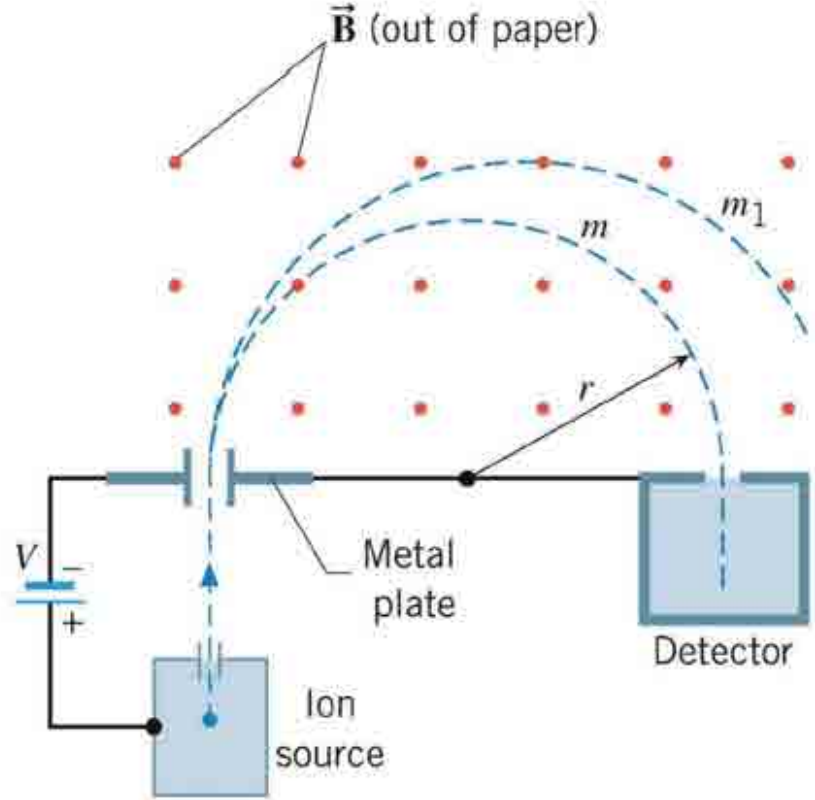
Problem 20.79

Consider the circuit in the drawing. Determine (a) the magnitude of the current in the circuit, and (b) the magnitude of the voltage between the points labeled A and B, and (c) state which point, A or B, is at the higher potential.



Problem 21.21

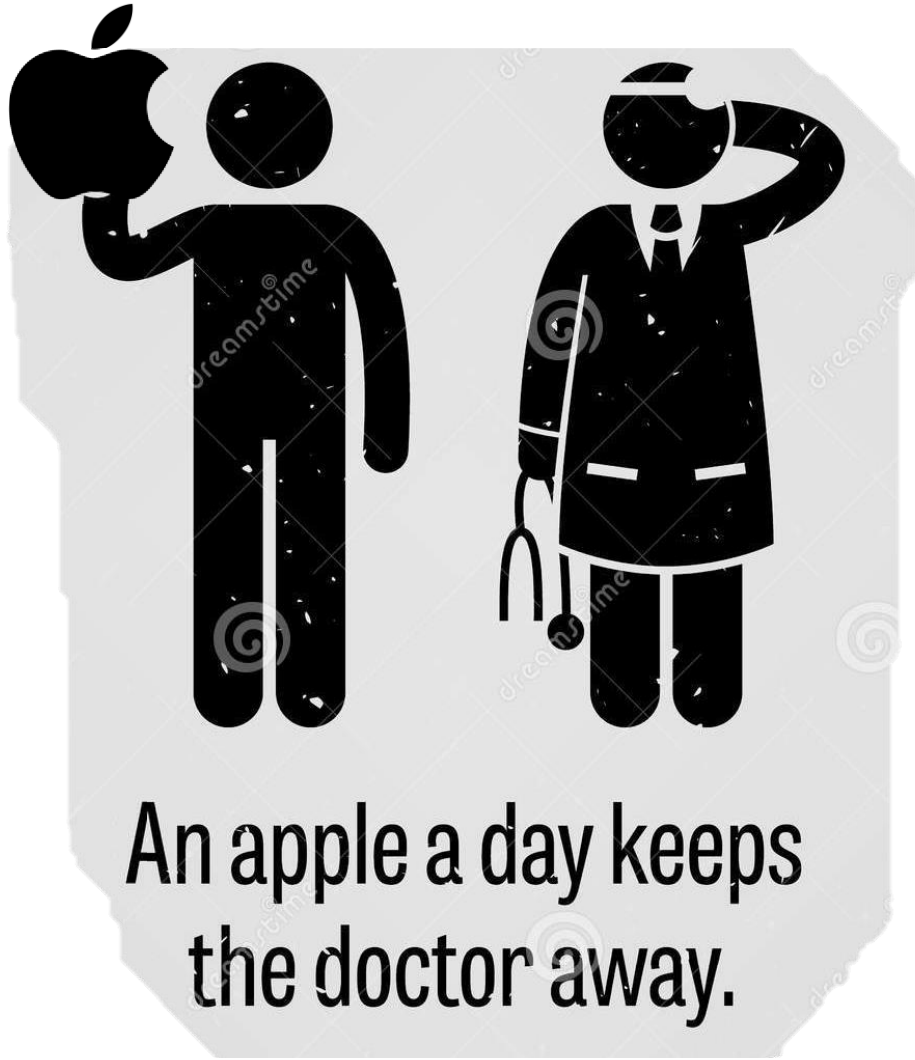
Two of the isotopes of carbon, carbon-12 and carbon-13, have masses of 19.93×10^{-27} kg and 21.59×10^{-27} kg, respectively. These two isotopes are singly ionized (+e), and each given a speed of 6.667×10^{5} m/s. The ions then enter the bending region of a mass spectrometer where the magnetic field is 0.8500 T.



Determine the spatial separation between the two isotopes after they have traveled through a half circle.

Problem 21.56

A long solenoid has 1400 turns per meter of length and it carries a current of 3.5 A. A small circular coil of wire is placed inside the solenoid with the normal to the coil oriented at an angle of 90.0 degrees with respect to the axis of the solenoid. The coil consists of 50 turns, has an area of $1.2 \times 10^{-3}\ m^2$, and carries a current of 0.50 A. Find the torque exerted on the coil.


An apple a day keeps
the doctor away.