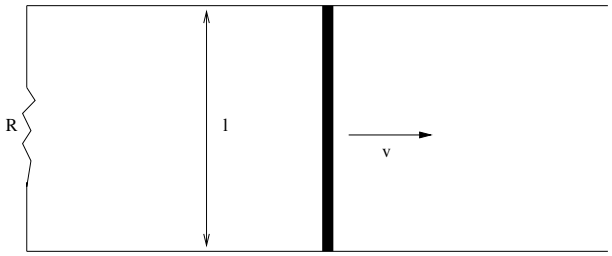
PHY102: Assignment 8

1. A metal bar of mass m slides frictionlessly on two parallel conducting rails a distance l apart. A resistor connected across the rails and a uniform magnetic field $\vec{B}$, pointing into the page, fills the entire region.



(a) If the bar moves to the right at velocity v, what is the current in the resistor? In what direction does it flow?
(b) What is the magnetic force on the bar?
(c) If the bar starts out with a velocity v_0 at $t = 0$, and is left to slide, what is the speed at a later time t ?
(d) Initial kinetic energy of the bar was $\frac{1}{2}mv_0^2$. Check that the energy delivered to the resistor is exactly $\frac{1}{2}mv_0^2$.

2. Find the self inductance per unit length of a long solenoid, of radius R, carrying n turns per unit length.

3. Find the current as a function of time in the following circuit.