View from Above

1991E3. A conducting rod is free to move on a pair of horizontal, frictionless conducting rails a distance l apart. The rails are connected at one end so a complete circuit is formed. The rod has a mass m, the resistance of the circuit is R. and there is a uniform magnetic field of magnitude B directed perpendicularly into the plane of the rails, as shown above. The rod and the rails have negligible resistance. At time $t = 0$, the rod has a speed v_O to the right. Determine each of the following in terms of l, m, R, B, and v_O

a. The induced voltage in the rod at $t = 0$

b. The magnitude and the direction of the magnetic force on the rod at $t = 0$

c. The speed v of the rod as a function of time t

d. The total energy dissipated by the resistor beginning at $t = 0$