Consider a 1.5 V battery with a 0.3 Ω resistor attached to two conducting, frictionless rails 0.200 m apart. The entire apparatus is in a uniform magnetic field \( B \) directed out of the page and of magnitude 0.400 T perpendicular to the rails. A conducting bar can slide over the rails perpendicular to them as well as to the field. All other resistances in the problem are negligible compared to the 0.3 Ω resistor. The bar is placed on the rails, starts from rest, and is observed to accelerate.

(a) What is the direction of the bar’s acceleration?

(b) What is the direction of the emf induced in the bar?

(c) Use Faraday’s Law to calculate the magnitude of the induced emf when the bar reaches a speed of 12.0 m/s.

(d) Calculate the current in the bar when its speed is 12.0 m/s.