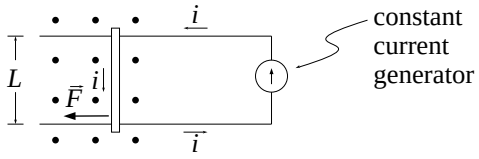
Primitive motor



(a.) The force on the sliding bar is $\vec{F} = i\vec{L} \times \vec{B}$ so $|\vec{F}| = iLB$

acceleration of wire $= \dfrac{|\vec{F}|}{m} = \dfrac{iLB}{m} =$ constant

so $v(t) = v_0 + at$ becomes $v(t) = \dfrac{iLB}{m}t$ (to left)

(b.) Once the bar starts to move, the total velocity of the charge carriers is the sum of $\vec{v}_d$, the drift velocity of the carries relative to the bar, plus $\vec{v}_b$, the velocity of the sliding bar relative to the rails. However, the magnetic force due to $\vec{v}_b$ points straight up and doesn't affect the horizontal motion of the bar.

Grading: Start off — perhaps with a sketch: 2 points
Force equation: 3 points
Use of force equation to find $v(t)$: 3 points
part (b): 2 points