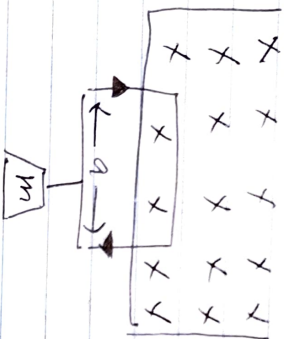


Question: A rectangular loop of wire, hanging vertically with one end in an uniform magnetic field B which points into the page in the shaded region in Fig. 1

- For what current I in loop would the magnetic force upward exactly balance the gravitational force downward?
- What happens if current is increased? Explain the work-energy dynamics of the situation.



Solution Part a) ~~the~~ current must flow clockwise to balance mass m

Let F_{mag} = Force by magnetic field on the horizontal segment of the loop

$$F_{mag} = I B a$$

$a = \text{width of loop}$

$$\therefore B a = m g$$

$$\Rightarrow \left[l = \frac{m g}{B a} \right]$$

Part B) if we increase the current, the upwards magnetic force exceeds the downward force of gravity and loop lifts, lifting the weight

→ Here the work done on the mass is not by magnet but by the battery driving the current. Magnetic field just changes the direction of force

→ When l increased, charges move in gain a vertical velocity. (for horizontal wire segment at top)