Planteando Newton en la componente x:

$$-IBl\cos\theta + mg\sin\theta = m\dot{v}$$

usando el I calculado:

$$-\frac{(Bl)^2\cos^2\theta}{R}v + mg\sin\theta = m\frac{dv}{dt}$$

La ecuación diferencial se resuelve:

$$v = v_h + v_p$$

- v_p constante $\quad v_p = \frac{mgR}{(Bl)^2}\frac{\sin\theta}{\cos^2\theta}$

- $v_h = Ae^{-t/\tau}$

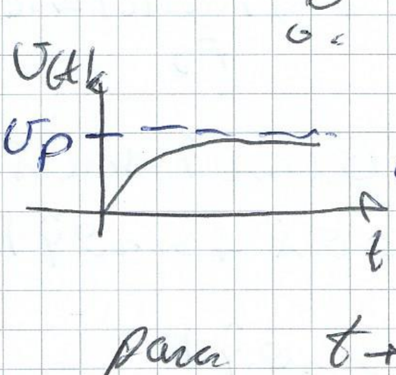
en la ecuación diferencial:

$$\cancel{-}\frac{(Bl)^2\cos^2\theta}{R}\left(\cancel{-\frac{1}{\tau}}\right)\cancel{Ae^{-t/\tau}} = m\left(\cancel{-}\frac{1}{\tau}\right)\cancel{Ae^{-t/\tau}}$$

$$\therefore \quad \boxed{\frac{1}{\tau} = \frac{(Bl)^2}{mR}\cos^2\theta}$$

Condiciones iniciales: $v(0) = 0 = v_p + A$

$$\therefore \quad \boxed{v(t) = \frac{mgR}{(Bl)^2}\frac{\sin\theta}{\cos^2\theta}\left(1 - e^{-t/\tau}\right)}$$



c) para $t \to \infty \quad v(t) \to \frac{mgR\sin\theta}{(Bl)^2\cos^2\theta}$

para $t \to \infty \quad I \to \frac{mg}{Bl}\operatorname{tg}\theta$

d) $P_{Joule} = I^2 R \to \left(\frac{mg}{Bl}\right)^2 \operatorname{tg}^2\theta\, R$