

A) $E_{pot} = -mg \cdot (h_{\text{centre masses}} - 0,5l)$

$$h_{\text{centre masses}} = \frac{l \cdot (\sqrt{l^2 + 0,36} \cdot 0,3l + \sqrt{(0,4l)^2 + x^2} \cdot 0,8l)}{(\sqrt{(0,6l)^2 + x^2} + \sqrt{(0,4l)^2 + x^2})^2} = 0,5l - 0,83 \left(\frac{x^2}{l^2}\right) \cdot l$$

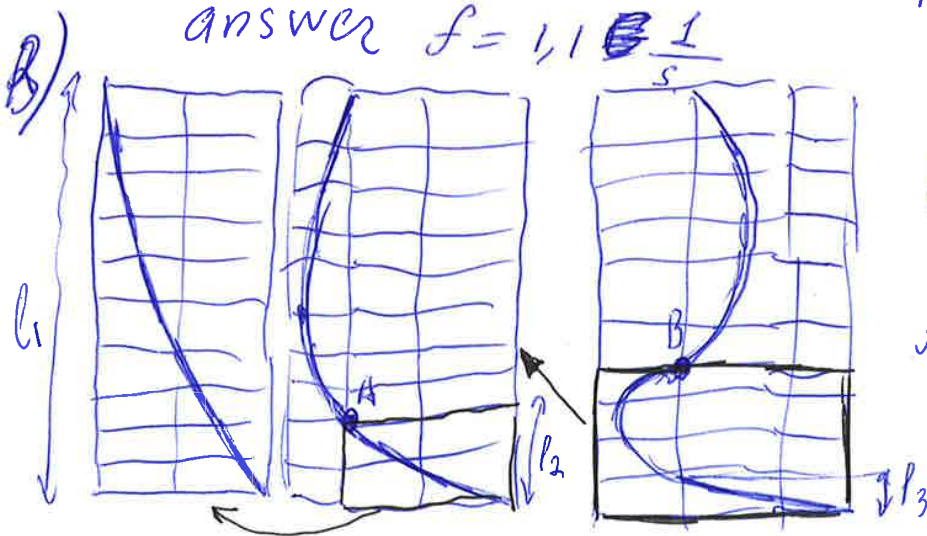
lets think $v(h) \sim h$.

$$E_{kin} = \int_0^l \left(\frac{x}{l} v\right)^2 \cdot \frac{dx}{2} \cdot \frac{M}{l} = \frac{Mv^2}{2} \int_0^l x^2 dx = \frac{Mv^2}{6}$$

$$\frac{Mv^2}{6} + 0,83 \cdot \frac{x^2}{l} \cdot mg = \text{const.} \Rightarrow \frac{Mv}{3} \cdot a + 0,83 \cdot 2 \cdot x \cdot v \cdot \frac{dv}{dx} = 0$$

$$a + 4,98 \cdot \frac{g}{l} \cdot x = 0 \Rightarrow \omega = \sqrt{4,98 \frac{g}{l}} \quad f = \frac{\omega}{2\pi} = 1,1 \frac{1}{s}$$

answer $f = 1,1 \frac{1}{s}$



we see. next picture include last picture.

Spot A and B $v=0$, so

$$f_1 : f_2 : f_3 = \sqrt{\frac{1}{l_1}} : \sqrt{\frac{1}{l_2}} : \sqrt{\frac{1}{l_3}} =$$

$$= 1 : \sqrt{5} : \sqrt{12,5} =$$

$$= 1 : 2,24 : 3,54$$

Answer: $1 : 2,24 : 3,54 = f_1 : f_2 : f_3$