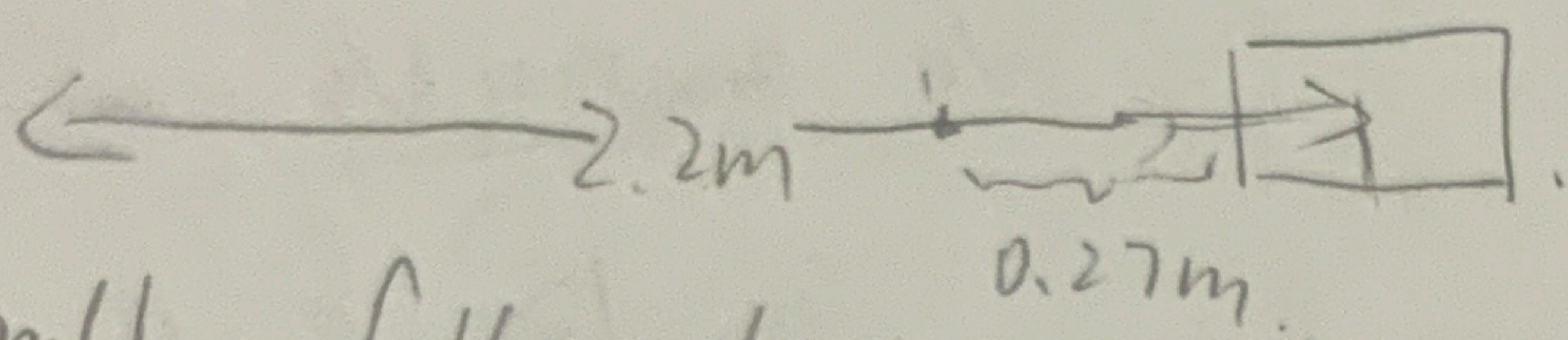
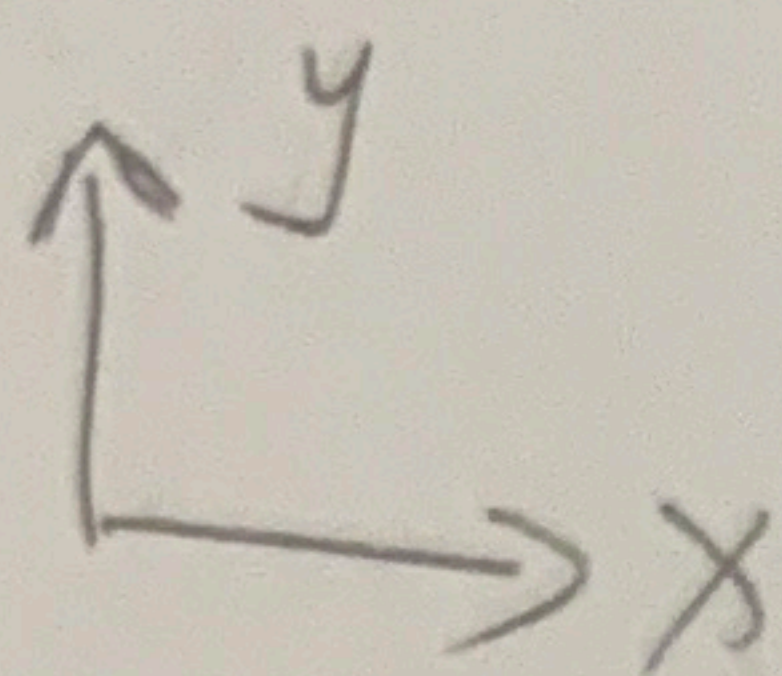
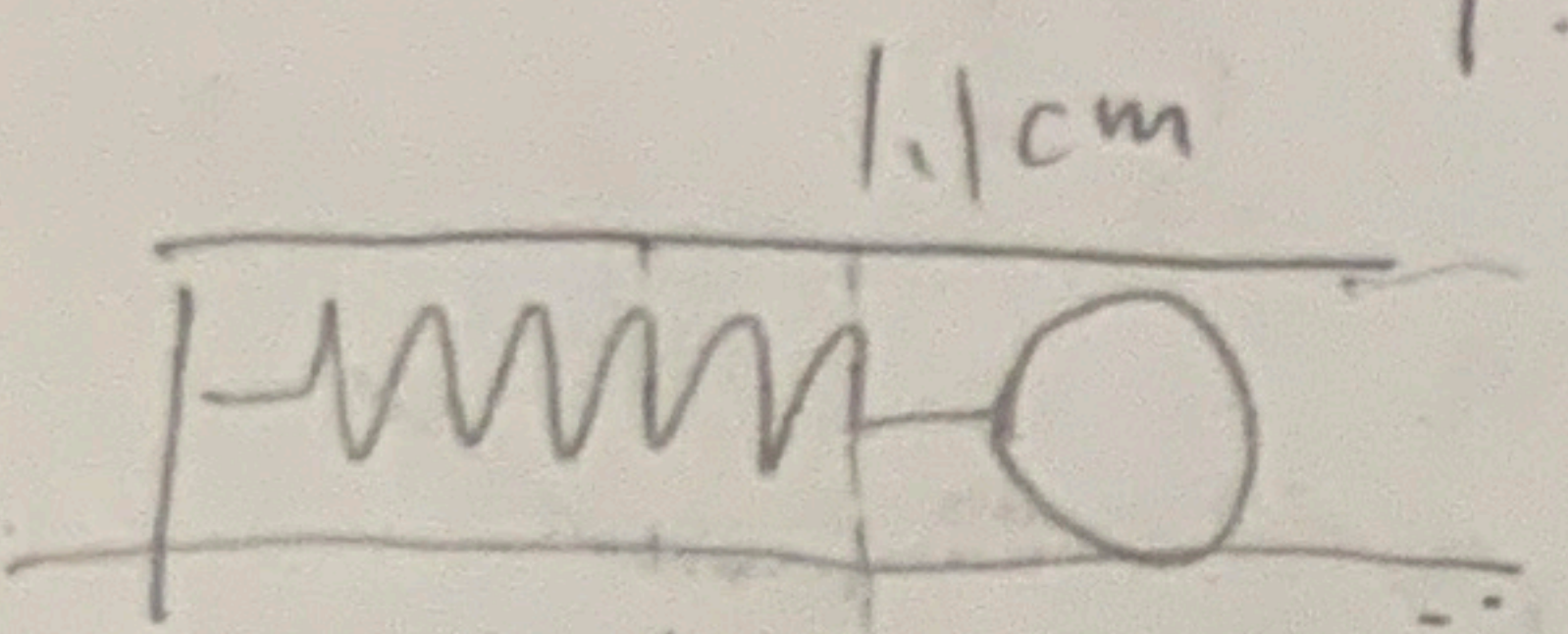


Junwei Zhang

Question 9



(a) when the ball falls down,
the velocity in y direction is 0.

$$\text{So } V_{yf}^2 - 0^2 = 2gh$$

$$V_{yf} = \sqrt{2gh}$$

$$\text{where } V_{yf} = gt$$

$$\text{So } t = \sqrt{\frac{2h}{g}}, \text{ h, g is constant}$$

hence t is constant

In x-direction, we know

$$\frac{1}{2}mV_x^2 = \frac{1}{2}k\Delta X_{\text{compress}}^2$$

$$V_x = \sqrt{\frac{k}{m}}\Delta X_{\text{compress}}$$

Set L to length the ball moves in x-direction

$$L = V_x t = \sqrt{\frac{k}{m}} \cdot \sqrt{\frac{2h}{g}} \cdot \Delta X = A \Delta X \quad A \text{ is a constant.}$$

We set $L_1 = 2.2\text{m}$ where the ball can hit the center of box...

$$\frac{L_1}{L_0} = \frac{\Delta X_1}{\Delta X_0}$$

$$\Delta X_1 = \frac{L_1}{L_0} \Delta X_0 = \frac{2.2}{1.93} \cdot 1.1 = 1.25 \text{ cm}$$