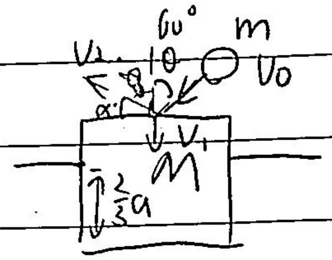
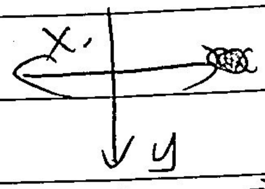
141. 3-23



$e = \frac{2}{3}$ $M = 4m$



(1) 碰撞过程有

$$\int (Mg + mg + \vec{F}_{浮})\, dt = M\vec{v}_1 + m\vec{v}_2 - m\vec{v}_0$$

水平: $mv_2 \cdot \cos\alpha - mv_0 \cdot \sin\theta = 0$

竖直: $Mv_1 - mv_2 \cdot \sin\alpha - mv_0\cos\theta = 0$, $e = \frac{v_1 + v_2\sin\alpha}{v_0\cos\theta - 0} = \frac{2}{3}$

$$\Rightarrow \begin{cases} \vec{v}_2\cos\alpha = \frac{\sqrt{3}}{2}v_0\,\vec{i} \\ \vec{v}_2\sin\alpha = -\cancel{\frac{\sqrt{3}}{18}v_0\vec{j}} - \frac{1}{6}v_0\,\vec{j} \end{cases}$$

(2). $\cancel{\vec{v}_1 = \frac{1}{6}v_0\vec{j}}$, $\cancel{v_1 = \frac{1}{6}v_0}$ $\vec{v}_1 = \frac{1}{6}v_0$

记大物体没入水中长度为 X ∴ $X(0) = \frac{2}{3}a$. $\cancel{X = \frac{2}{3}a + \int v\,dt}$

$$0 - \frac{1}{2}Mv_1^2 = \int (\vec{F}_{浮} + Mg)\, dX \qquad \cancel{dx = \frac{1}{6}v_0\,dt}$$

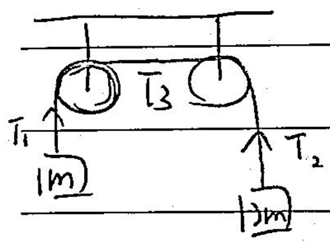
$$\vec{F}_{浮} = \frac{3X}{2a}Mg(-\vec{j})$$

$$\therefore \quad \frac{1}{2}Mv_1^2 = \int_{\frac{2}{3}a}^{a} Mg\left(\frac{3X}{2a} - 1\right)dX = \frac{1}{12}aMg$$

$$\Rightarrow v_1 = \sqrt{\frac{ag}{6}} = \frac{1}{6}v_0$$

$$\therefore \quad v_0 = \sqrt{6ag}$$

174. 4-1



$$\begin{cases} T_1 - mg = am \\ 2mg - T_2 = a\,2m \end{cases} \qquad \therefore \begin{cases} a = \frac{g}{4} \\ T_3 = \frac{11}{8}mg \end{cases}$$

$$\begin{cases} (T_3 - T_1)r = \frac{1}{2}mr^2\beta \\ (T_2 - T_3)r = \frac{1}{2}mr^2\beta \\ a = \beta r \end{cases}$$

175. 4-2

(1) ~~距O 1处的一段~~ O左边用质心运动定理.

$r_1 = \frac{1}{4}l$, $F_1 = \frac{1}{2}mg\mu$ ∴ $\vec{M}_1 = |r_1|\cdot|F_1| = \frac{1}{8}mg\mu L(-\vec{k})$

又∵ $\vec{r}_1 = -\vec{r}_2$, $\vec{F}_1 = -\vec{F}_2$ ∴ $\vec{M} = 2\vec{M}_1 = \frac{1}{4}mg\mu L(-\vec{k})$.

(2) ~~$\int M dt = L_0 - L_0$~~

$\vec{L} = \vec{L}_c + \vec{L}_i$，质心不适用质点系角动量定理.

$M = J\beta \Rightarrow \beta = \frac{M}{J}$. $t = \frac{\omega_0}{\beta} = \frac{\omega_0 L}{3g\mu}$

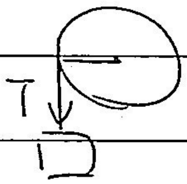
~~L_0 = 同样用质心运动定理~~

~~$\vec{L}_0 = 2\vec{L}_1$, $\vec{L}_1 = \frac{L}{2}\cdot\frac{1}{2}mg\cdot\frac{L}{4}\cdot\omega = \frac{1}{16}m\omega L^2(\vec{k})$~~

~~∴ $\vec{L}_0 = \frac{1}{8}m\omega L^2(\vec{k})$~~ $0-|L_0| = (-\frac{1}{4}mg\mu L)\cdot t$

~~∴ $t = \frac{\frac{1}{2}\omega L}{} \frac{1}{2}\frac{\omega L}{g\mu}$~~

175. 4-3.

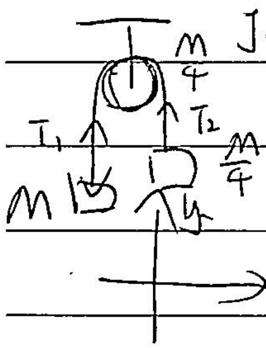


对物体 $mg - T = ma$. , $v = \int a\,dt$.

对滑轮 $R\cdot T = \frac{1}{2}MR^2\cdot\beta$, $a = \beta\cdot R$.

$\Rightarrow a = \frac{2mg}{2m+M}$ ∴ $v = \frac{2mg}{2m+M}t$.

175. 4-4.



$J = \frac{MR^2}{4}$.

设绳加速度 a_1. ，相对地面，有.

$$\begin{cases} Mg - T_1 = Ma_1 \\ T_2 - \frac{1}{4}Mg = \frac{M}{4}a_1 \\ (T_1 - T_2)R = \frac{M}{4}R^2\beta \\ a_1 = \beta R. \end{cases} \Rightarrow a_1 = \frac{1}{2}g$$

∴ $\vec{a}_B = \frac{1}{2}g(\vec{j})$.