139.3-11

$F dt = (m-dm)(v+dv) - (m-dm)v = (m-dm)dv$

$dm = qdt$, $m = m_0 - qt$.

∴ ~~$Fdt = mdv-(m_0-2qdt)dv = m_0 dv$~~

$Fdt = (m_0 - qt - qdt)dv = (m_0 - qt)dv$

$\Rightarrow \quad v = \frac{F}{q}\ln\left(\frac{m_0}{m_0-qt}\right)$.

139.3-12

(1) $(m-dm)(\vec{v}+d\vec{v}) - dm(\vec{u}-\vec{v}-d\vec{v}) = -mgdt$.

只克服重力 ∴ $\vec{v} = d\vec{v} = 0$ g 取10

∴ $dm\,\vec{u} = mgdt \Rightarrow \frac{dm}{dt} = \frac{mg}{u} = 60kg$

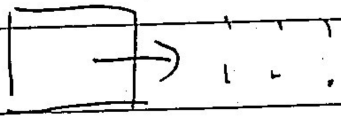
(2) 此时 $\vec{v} = 0$.

∴ $(m-dm)d\vec{v} - \vec{u}dm + dm\,d\vec{v} = -mgdt$

$\Rightarrow md\vec{v} - \vec{u}dm = -mgdt$. $\frac{d\vec{v}}{dt} = \vec{a}$, $\frac{dm}{dt}$ = 要求的.

∴ $\frac{dm}{dt} = 177.6kg$

139.3-13



$\begin{cases} (m+dm)(\vec{v}+d\vec{v}) - m\vec{v} = 0 \\ mv = m_0 v_0 \end{cases}$ $\frac{dm}{dt} = \rho S v$

$\Rightarrow \begin{cases} \vec{v}\frac{dm}{dt} = -m\frac{d\vec{v}}{dt} \\ m = \frac{m_0 v_0}{v} \end{cases}$

$\Rightarrow \frac{\rho S t}{m_0 v_0} + C = \frac{1}{2}\frac{1}{v^2}$

$\Rightarrow v = \cancel{\frac{\;}{m+2\rho s}} \sqrt{\frac{m_0}{m_0 + 2\rho S v_0 t}}\, v_0$

139. 3-15

(1) $\frac{1}{2}kx_0^2 = \frac{1}{2}(m_1+m_2)V^2 \Rightarrow V = \frac{x_0}{2}\sqrt{\frac{k}{m}}$

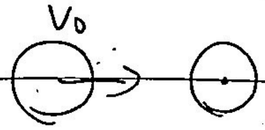
(2) 弹簧回到原长时 V_B 有 $\frac{1}{2}kx_0^2 = \frac{1}{2}m_2V_B^2 \Rightarrow V_B = \sqrt{\frac{k}{m_2}}\,x_0$

在此时刻到共速时弹簧一直伸长.

$m_2V_B = (m_1+m_2)V_0$, $\frac{1}{2}m_2V_B^2 = \frac{1}{2}(m_1+m_2)V^2 + \frac{1}{2}k\Delta x_m^2$

$\Rightarrow \Delta x_m = \sqrt{\frac{m_1}{m_1+m_2}}\,x_0 = \frac{x_0}{2}$

140. 3-16



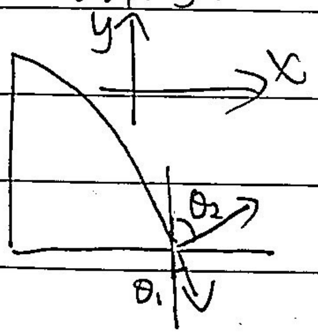
(1) $mV_0 = 2mV \Rightarrow V = \frac{V_0}{2}$

(2) $\begin{cases} mV_0 = mV_1 + mV_2 \\ e = -\frac{V_2-V_1}{0-V_0} = 1 \end{cases}$

$\Rightarrow V_1 = 0,\ V_2 = V_0$

(3) $\begin{cases} mV_0 = mV_1 + mV_2 \\ e = \frac{V_2-V_1}{V_0-0} = \frac{1}{2} \end{cases} \Rightarrow \begin{cases} V_1 = \frac{1}{4}V_0 \\ V_2 = \frac{3}{4}V_0 \end{cases}$

~~142.~~ 141. 3-22



~~水平方向~~ x方向: $mV\sin\theta_1 = mV_1\sin\theta_2$

y方向: $\begin{cases} mV_1\cos\theta_2 + mV\cos\theta_1 = I \\ e = \frac{V_1\cos\theta_2 - 0}{0 + V\cos\theta_1} \end{cases}$

$\begin{cases} V\sin\theta_1 = V_0 \\ V\cos\theta_1 = \sqrt{2hg} \end{cases} \Rightarrow \begin{cases} \cancel{\tan\theta_1 = \frac{V_0}{\sqrt{2hg}}} \\ \cancel{\tan\theta_2 = \frac{V_0}{\sqrt{2hg}}} \cdot \frac{1}{e} \end{cases}$

∴ ~~2 arctan θ1 = arctan θ2~~

$\tan\theta_1 = e\tan\theta_2$.