高二物理

A卷 簡答：

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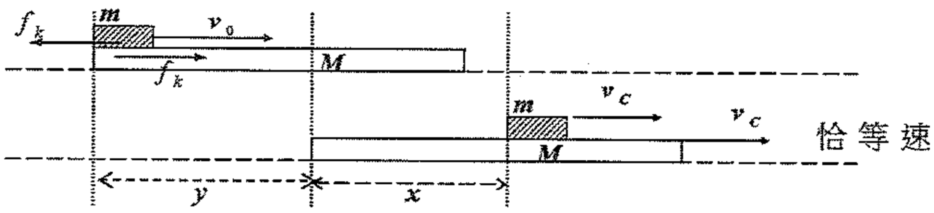

(1) 動量守恆 $v_C=\dfrac{mv}{M+m}=\dfrac{v}{5}$

(2) (3) (4)(5)

功能定理

$$\begin{cases} m:W_f(m)=-f_k\cdot(x+y)=\dfrac{1}{2}mv_C{}^2-\dfrac{1}{2}mv^2 \\ M:W_f(M)=+f_k\cdot y=\dfrac{1}{2}Mv_C{}^2-0 \end{cases}$$

摩擦力對木塊作功

$$W_f(m)=-f_k\cdot(x+y)=\frac{1}{2}mv_C{}^2-\frac{1}{2}mv^2=\frac{1}{2}m\times\left(\frac{mv}{M+m}\right)^2-\frac{1}{2}mv^2=\frac{-M^2m-2Mm^2}{2(M+m)^2}v^2=-\frac{12}{25}mv^2$$

摩擦力對木板作功

$$W_f(M)=+f_k\cdot y=\frac{1}{2}Mv_C{}^2-0=\frac{1}{2}M\times\left(\frac{mv}{M+m}\right)^2=\frac{Mm^2}{2(M+m)^2}v^2=\frac{2}{25}mv^2$$

$$\therefore W_f(m)+W_f(M)=-f_kx=-\frac{1}{2}\frac{Mm}{m+M}v^2 \quad \therefore x=\frac{\frac{1}{2}\frac{Mm}{m+M}v^2}{f_k}=\frac{\frac{1}{2}\frac{Mm}{m+M}v^2}{\mu mg}=\frac{v^2}{2\mu g}\frac{M}{m+M}=\frac{2v^2}{5\mu g}$$

$$\therefore y=\frac{\frac{1}{2}Mv_C{}^2}{f_k}=\frac{\frac{Mm^2}{2(M+m)^2}v^2}{\mu mg}=\frac{v^2}{2\mu g}\frac{Mm}{(M+m)^2}=\frac{2v^2}{25\mu g}$$

Ans: (1) $\dfrac{v}{5}$ (2) $\dfrac{-12}{25}mv^2$ (3) $\dfrac{2}{25}mv^2$ (4) $\dfrac{2v^2}{5\mu g}$ (5) $\dfrac{2v^2}{25\mu g}$