

問題 I

(1) [答] $N = mg \cos \theta$

(2) [答] $\mu = \tan \theta_0$

(3) [答] $a_1 = -g(\sin \theta + \mu' \cos \theta)$

(4) [答] $Y = -\frac{1}{2}a_1 t_1^2$

(5) [答] $a_2 = -g(\sin \theta - \mu' \cos \theta)$

(6) [答] $Y = -\frac{1}{2}a_2 t_2^2$

(7) [選択肢] (イ)

(8) [答] $r = \sqrt{\frac{\tan \theta - \mu'}{\tan \theta + \mu'}}$

(9) [答] $W = \frac{1}{2}mu^2(1 - r^2)$

(10) [答] $\vec{a}(t) = -g \sin \theta \vec{e}_y - \mu' g \cos \theta \frac{\vec{v}(t)}{|\vec{v}(t)|}$

(11) [選択肢] (キ)

問題 II

(1) [答] (あ) $\frac{V}{d}$ [答] (い) $\frac{eV}{d}$

[選択肢 (う)] (ウ) [答] (え) $\frac{e a}{mdv} V$

(2) [答] (お) $\mu n I$ [答] (か) $e v \mu n I$

[選択肢 (き)] (ア) [答] (く) $\frac{e a \mu n I}{m}$

(3) [答] (け) $\omega L I_0 \cos \omega t$ [答] (こ) $-\frac{I_0}{\omega C} \cos \omega t$

[答] (さ) $\left(\omega L - \frac{1}{\omega C}\right) I_0 \cos \omega t$ [答] (し) $\mu n I_0 \sin \omega t$

[答] (す) $\frac{I_0}{\omega C d} \cos \omega t$ [選択肢 (せ)] (エ)

問題Ⅲ

(1) [答] $T_{A1} = T_0 + \frac{2Q_{A1}}{5R}$

(2) [答] $W_{A1} = R(T_{A1} - T_0)$

(3) [答] $W_{A1} = \frac{2Q_{A1}}{5}$

(4) [答] $V_{B2} = \frac{1}{2} V_0$

(5) [選択肢] (ウ)

(6) [答] $T_{A2} = 3T_0$

(7) [答] $W_{A2} = Q_{A2} - 3RT_0$

(8) [答] $Q_{A2} - Q_{B2} = 3RT_0$

(9) [答] $Q_{A2} = 3RT_0 + RT_0 \log 2$

(10) [答] $T_{A3} = \frac{2V_0 - V_{B3}}{V_{B3}} T_{B3}$

(11) [答] $V_{B3} = \left(\frac{T_0}{T_{B3}}\right)^{\frac{3}{2}} V_0$

(12) [答] 気体A, Bの内部エネルギーの合計

$$3RT_0 + Q_{A3}$$