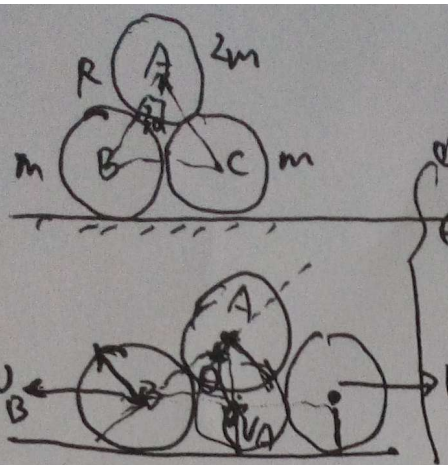
①



$h_A = \frac{\sqrt{3}}{2}2R - 2R\cos\theta$

$mAg\,h_A = \frac{1}{2}m_A v_A^2 + \frac{1}{2}m_B v_B \times 2$

$v_A\cos\theta = v_B\sin\theta$

$mAg\cos\theta = m_A\frac{(v_A\sin\theta + v_B\cos\theta)^2}{2R}$

$h_{A_2} = 2R\cos\theta \quad \cos\theta = \frac{\sqrt{3}}{3} \Rightarrow \sin^2\theta = \frac{2}{3}$

$v_A^2 = \frac{4}{9}\sqrt{3}gR$

$v_A'^2 - v_A^2 = 2g\,h_{A_2} \quad v_A' = \frac{4}{3}\sqrt{\sqrt{3}gR}$

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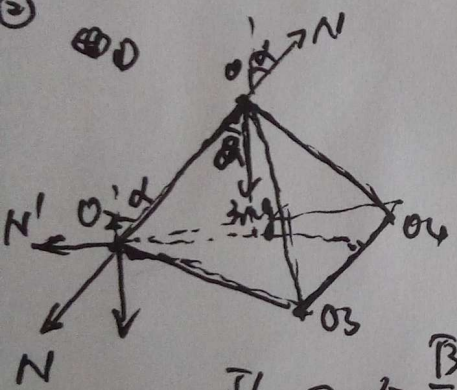
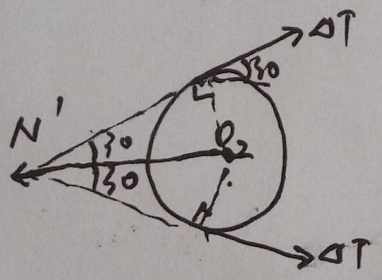
②

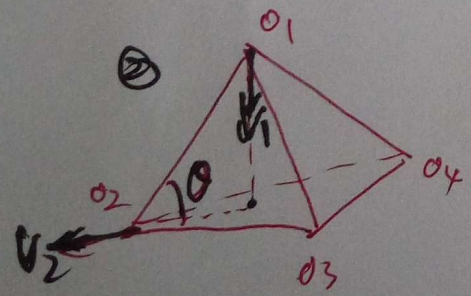




$\cos\alpha = \frac{\sqrt{6}}{3} \quad \sin\alpha = \frac{\sqrt{3}}{6}$

$3N\cos\alpha = 3mg \quad N = \frac{\sqrt{6}}{2}mg$

$2\Delta T\cos 30 = N \quad \Delta T = \frac{N'}{2\cos 30} = \frac{\sqrt{6}}{6}mg$



对 O_0: $\sin\theta_0 = \frac{\sqrt{6}}{3} \quad V_1\sin\theta = V_2\cos\theta$

$3m\frac{(V_1\sin\theta + V_2\cos\theta)^2}{2R} = 3mg\sin\theta$

$V_1^2 = 2Rg\sin\theta\cos^2\theta \quad V_2^2 = 2Rg\sin^3\theta$

下滑 $2R(\sin\theta_0 - \sin\theta)$

$\frac{1}{2}3mV_1^2 + 3\cdot\frac{1}{2}mV_2^2 = 3mg\,2R(\sin\theta_0 - \sin\theta)$

$\sin\theta = \frac{2\sqrt{6}}{9} \quad V_1^2 = \frac{76\sqrt{6}}{243}Rg$

$u^2 - V_1^2 = 2gh \quad h = 2R\sin\theta \quad u = \sqrt{\frac{876\sqrt{6}}{27}}\sqrt{Rg}$