习题十

1. E　　2. C　　3. ~~mdv~~ mvd　　4. $m\sqrt{GMR}$

5. $\vec{M}=0$　　$\vec{L}=mab\omega\vec{k}$

6. 设此时$\vec{v}$与$\vec{l}$的夹角为θ. 则 $mlv_0=mlv\sin\theta$

由机械能守恒 $\frac{1}{2}mv_0^2=\frac{1}{2}mv^2+\frac{1}{2}k(l-l_0)^2$

解得 $v=\sqrt{v_0^2-\frac{k(l-l_0)^2}{m}}=4m/s$

$\sin\theta=\frac{1}{2}$, $\theta=30°$

7. 解：由机械能守恒

$$\frac{1}{2}mv_0^2-G\frac{Mm}{R}=\frac{1}{2}mv^2-G\frac{Mm}{3R}$$

小球绕O角动量守恒.

$$mRv_0=m\cdot 3R\,v\sin\theta$$

解得 $\sin\theta=\dfrac{v_0}{\sqrt{9v_0^2-\frac{12GM}{R}}}$

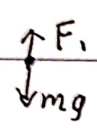
习题十一

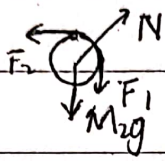
1. C　　2. D　　3. ~~$\frac{1}{2}MR^2$~~ $\frac{1}{2}Ma$　　4. 50π N·m

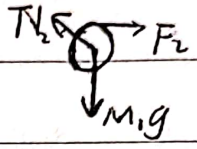
5. (1) $\beta = \frac{\Delta\omega}{\Delta t} = \frac{10}{20} = 0.5\ rad/s^2$

(2) $M = J\beta = \frac{1}{12}k^2 m \cdot \beta = 0.25\ N\cdot m$

(3) $\theta = \omega_0 \Delta t - \frac{1}{2}\beta(\Delta t)^2 = 75\ rad$

6. m: 

M_2: 

M_1: 

设 m 下落加速度为 a, M_1 角加速度为 β_1, M_2 角加速度为 β_2

对 m: $mg - F_1 = ma$　对 M_2: $-F_2 r + F_1 r = \frac{1}{2}M_2 r^2 \cdot \beta_2$

对 M_1: $F_2 R = \frac{1}{2}M_1 R^2 \cdot \beta_1$　又有 $a = \beta_1 R = \beta_2 r$, $v^2 - 0 = 2ah$

(1) 解得 $v = 2\ m/s$　(2) $F_1 = 58N$, $F_2 = 48N$

习题十二

1. B　　2. B　　3. $\frac{6}{5}\pi$　　4. $\frac{1}{3}\omega_0$　　5. 0.3998 rad/s