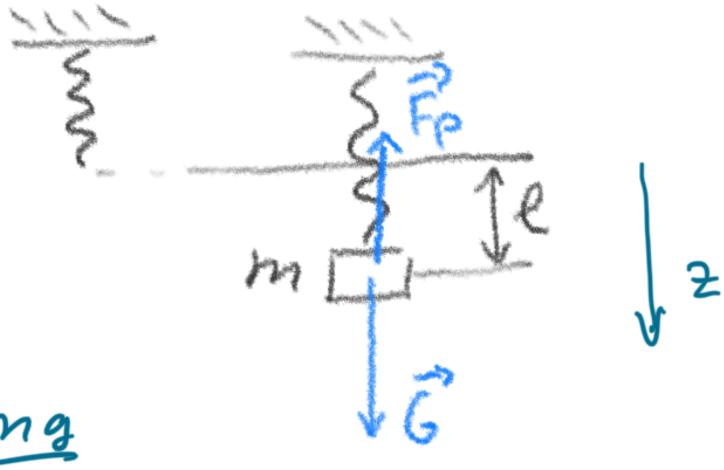
OPRAVNÁ PÍSOMKA Z FYZIKY 1 - RIEŠENIA
LS 2022/2023

1. $\dfrac{m, l}{f;}$



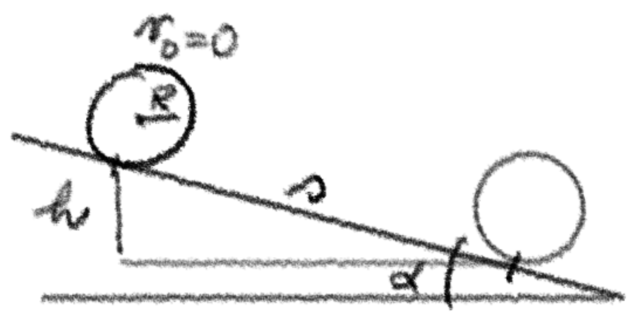
$$\vec{F}_p + \vec{G} = 0$$

$$z: -kl + mg = 0 \Rightarrow k = \frac{mg}{l}$$

$$\omega = \sqrt{\frac{k}{m}}, \quad f = \frac{\omega}{2\pi} = \frac{1}{2\pi}\sqrt{\frac{k}{m}} = \frac{1}{2\pi}\sqrt{\frac{mg}{lm}}$$

$$f = \frac{1}{2\pi}\sqrt{\frac{g}{l}}$$

2. $\dfrac{R, s, \alpha}{v;}$



$$J = \frac{1}{2} m R^2$$

zákon zachovania mechanickej energie

$$mgh = \frac{1}{2} m v^2 + \frac{1}{2} J \omega^2$$

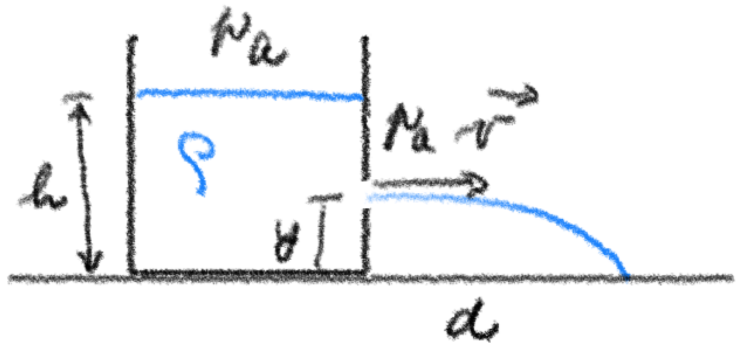
$$\omega = \frac{v}{R} \Rightarrow \frac{1}{2} J \omega^2 = \frac{1}{2}\frac{1}{2} m R^2 \frac{v^2}{R^2} = \frac{1}{4} m v^2$$

$$mgh = \frac{1}{2} m v^2 + \frac{1}{4} m v^2 = \frac{3}{4} m v^2$$

$$v^2 = \frac{4}{3} mgh \qquad h = s \cdot \sin\alpha$$

$$v = \sqrt{\frac{4}{3} mgs \sin\alpha}$$

3. $\dfrac{y,\ h > y,\ \rho}{d;}$



Bernoulliho rovnica

$$\rho g(h-y) + p_a = \frac{1}{2}\rho v^2 + p_a$$

$$v = \sqrt{2g(h-y)}$$

Vodorovný vrh:

$$d = vt$$

$$0 = y - \frac{1}{2}gt^2 \Rightarrow t = \sqrt{\frac{2y}{g}}$$

$$d = \sqrt{2g(h-y)}\sqrt{\frac{2y}{g}} = \underline{\underline{2\sqrt{y(h-y)}}}$$

4. $\dfrac{m,\ z_0, z_m, \omega, \varphi}{v;\ F(z);}$ $\qquad z = z_0 + z_m \cos(\omega t + \varphi)$

ide o harmonický pohyb: $z - z_0 = z_m \cos(\omega t + \varphi)$
teleso kmitá okolo rovnovážnej polohy $z = z_0$.
V tomto mieste má maximálnu rýchlosť:

$$v_m = \omega z_m$$

Sila spôsobujúca harmonické oscilácie:

$$F = -k(z - z_0) \qquad \omega = \sqrt{\frac{k}{m}} \Rightarrow k = m\omega^2$$

$$\underline{\underline{F = -m\omega^2(z - z_0)}}$$

Úlohu možno riešiť aj inak:

$$v = \frac{dz}{dt} = -z_m \omega \sin(\omega t + \varphi)$$

$z = z_0 \Rightarrow \cos(\omega t + \varphi) = 0$; t.j. $\omega t + \varphi = n\pi \quad n \in \mathbb{Z}$

vtedy $\sin(\omega t + \varphi) = \pm 1$

$$\underline{\underline{v = \mp z_m \omega}}$$

$F = ma \qquad a = \frac{dv}{dt} = -z_m \omega^2 \cos(\omega t + \varphi)$

ale $z_m \cos(\omega t + \varphi) = z - z_0$

$$\underline{\underline{F = -m\omega^2(z - z_0)}}$$