

TBM 8E, 30.4.14  
Kreisbewegungen

② Hier sollte man mit  $\omega$ ,  $f$  und  $T$  rechnen;

$\omega = 2\pi f$ ;  $T =$  Periodendauer, d. h. Zeit für einen Umlauf; es gilt:

$$T = \frac{1}{f} \Leftrightarrow \frac{1}{T} = f$$

Gleichgewicht:  $F_z = F_{\text{Reib}}$

$$m\omega^2 R = \mu mg$$

$$\omega^2 = \frac{\mu g}{R}; \quad \omega = 2\pi f$$

$$2\pi f = \sqrt{\frac{\mu g}{R}} \quad | : 2\pi$$

$$f = \frac{1}{2\pi} \sqrt{\frac{\mu g}{R}} \quad | \cdot 1/x$$

$$\frac{1}{f} = T = 2\pi \sqrt{\frac{R}{\mu g}}$$

$T$  prop. zu  $\sqrt{R}$ ; je grösser  $R$ , umso grösser  $T$

$$T = 2\pi \sqrt{\frac{20}{0.68 \cdot 9.81}}$$

$$T \approx 10.879 \text{ sec}$$

$$\approx \underline{\underline{10.9 \text{ sec}}}$$

Mittels  $F_2 = \frac{mv^2}{R}$  :

$$\frac{mv^2}{R} = \mu mg$$

$$v^2 = R \mu g$$

$$v = \sqrt{R \cdot \mu \cdot g} = 11.55 \text{ m/s}$$

$$U = 2\pi R \approx 125.66 \text{ m}$$

$$s = vt \Rightarrow t = \frac{s}{v} = \frac{125.66}{11.55} = 10.879 \text{ s}$$

$$\underline{\underline{t = 10.9 \text{ sec.}}}$$

③  $v = 630 \text{ km/h}$  ;  $a_2 = 3g = 3 \cdot 9.81 \text{ m/s}^2$

$$\frac{mv^2}{R} = 3gm \Rightarrow R = \frac{mv^2}{3gm} = \frac{v^2}{3g}$$

$$v = 175 \text{ m/s} ; R = \frac{175^2}{3 \cdot 9.81} = \underline{\underline{1040.608 \text{ m}}}$$

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$$R = 10\text{m}; \mu = 0.32$$

$$F_z = m\omega^2 R$$

$$F_G = F_{\text{reib}}; \quad F_{\text{reib}} = \mu \cdot F_{\text{Normal}}$$

$$F_{\text{Normal}} = F_z$$

$$mg = \mu m\omega^2 R$$

$$\frac{g}{\mu R} = \omega^2 \Rightarrow \omega = \sqrt{\frac{g}{\mu R}}$$

$$\omega = 2\pi f \Rightarrow f = \frac{1}{2\pi} \sqrt{\frac{g}{\mu R}} = \underline{\underline{0.27942}}$$

$$T = \frac{1}{f} = 3.589\text{s}$$

$$v_{\text{tang.}} = \omega R = 2\pi f R \approx 17.509\text{ m/s} \\ \approx 63.03\text{ km/h}$$

$$\omega = 2\pi f = \underline{\underline{1.751 \frac{\text{rad}}{\text{sec.}}}}$$

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$$m\omega^2 R = \mu mg$$

$$\mu = \frac{\omega^2 R}{g} = \frac{2\pi f R}{g}$$

$$\approx 0.18631..$$

$$\underline{\underline{\mu = 0.19}}$$

$$\cancel{R = 0.31}$$

$$R = 0.15 \text{ m}$$

$$f = \frac{33.3}{60} \text{ Hz}$$

$$f = \frac{5}{9} \text{ Hz}$$

$$\frac{mv^2}{R} = \mu mg$$

$$\mu = \frac{v^2}{Rg}$$