5.11.14
Physik
Tutorium

B3 / A3

a) $m_B = 100kg \quad \mu_{RH} = 0{,}5 \quad \mu_{RG} = 0{,}3 \quad \Theta 20°$

$\vec{F}_{gH} = m_B \cdot g \cdot \sin\Theta = 100kg \cdot 9{,}81 \frac{N}{kg} = \underline{\underline{335{,}5N}}$

$|\vec{F_R}| = \vec{F_N} \cdot \mu_R = m_B \cdot g \cdot \cos(\Theta \cdot \mu =$

$|\vec{F_{R,H}}| = F_N \cdot \mu_{R,H} = \underline{\underline{460{,}9N}}$

$|\vec{F_{R,G}}| = F_N \cdot \mu_{RG} = \underline{\underline{276{,}6N}}$

$|\vec{F_{GH}}| > |\vec{F_{RG}}| \quad + m \cdot g$

$m < \frac{|\vec{F_{GH}}| - |\vec{F_{RG}}|}{g} = m_B(\sin\Theta - \cos\Theta \cdot \mu_{RG})$

$m < 100kg \cdot (\sin 20° - \cos 20° \cdot 0{,}3)$

$m < 6 kg$

$\underline{\underline{0 < m < 6kg}}$

b) $m \cdot g > |\vec{F_{GH}}| + |\vec{F_{RG}}|$

$m > \frac{|\vec{F_{GH}}| + |\vec{F_{RG}}|}{g} = m_B(\sin\Theta + \cos\Theta \cdot \mu_{RG})$

$m > 62{,}4kg$

$m < \frac{|\vec{F_{GH}}| + |\vec{F_{RH}}|}{g} = m_B(\sin\Theta + \cos\Theta \cdot \mu_{RH})$

$m < 81{,}2kg$

$\underline{\underline{62{,}4kg < m < 81{,}2kg}}$

B4 / A1

Geg: $v_A = 16 \frac{m}{s}$ $\Theta = 60°$ $h = 12m$

mit Energieerhaltungssatz:

a)

$$E_S = E_A^{\text{End}}$$

$$\frac{1}{2} \cdot m \cdot v_A^2 + m \cdot g \cdot h = \frac{1}{2} \cdot m \cdot v_E^2 + m \cdot g \cdot h$$

$$\frac{1}{2} \cdot m \cdot v_A^2 = \frac{1}{2} m \cdot v_E^2 + m \cdot g \cdot y_S$$

$$y_S = \frac{v_A^2 - v_S^2}{2g} \qquad v_S = \vec{v_A} \cdot \cos\Theta$$

$$= \frac{v_A^2 (1 - \cos^2\Theta)}{2g} = \frac{16 \frac{m}{s} \cdot \sin^2(60°)}{2 \cdot 9{,}81 \frac{N}{kg}} = \underline{\underline{9{,}8m}}$$

b) v_E

$y = y_E = -12m$

Energie d. Balls:

$$E_E = \frac{1}{2} \cdot v_E^2 + m \cdot g \cdot y_E$$

Energieerhaltung:

$$E_A = E_E$$

$$\frac{1}{2} \cdot m v_E^2 + m \cdot g \cdot y_E = \frac{1}{2} \cdot m \cdot v_A^2$$

$$v_E = \sqrt{v_A^2 - 2 \cdot g \cdot y_E} = \underline{\underline{22 \frac{m}{s}}}$$

b) Ges: μ_{RG}?

$$|\vec{F}_{RG}| = |\vec{F}_N| \cdot \mu_{RG}$$

$$m \cdot g \cdot \mu_{RG}$$

$$\Rightarrow \mu_{RG} = \frac{|\vec{F}_{RG}|}{m \cdot g} = \frac{\Delta E_{kin}}{\Delta s \cdot m \cdot g} = \frac{6{,}3 \cdot 10^3 \text{ J}}{60\text{m} \cdot 2000 \cdot 9{,}81} = \underline{\underline{0{,}53}}$$

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B4 A2

Geg.: $m = 40kg$ $\Delta h = 4m$ $\Theta = 30°$ $\mu_{R0} = 0,35$
$s = 8m$

$E_{kin} = E_{pot}$

$\Delta E_{pot} = m \cdot g \cdot \Delta h$ $\Delta E_{kin} = \frac{1}{2} \cdot m \cdot v_E^2$

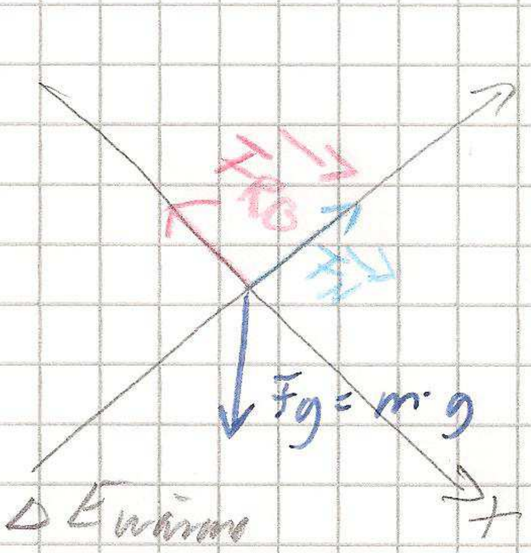
$\Delta E_{waerme} = |\vec{F_R}| \cdot s$

$W_{ext} = \Delta E = \Delta E_{pot} + \Delta E_{kin} + \Delta E_{waerme}$

$|\vec{F_{RG}}| = \mu_{R,G} \cdot |\vec{F_n}|$

$= \mu_{R,G} \cdot \cos\Theta \cdot m \cdot g$

$\Delta h = s \cdot \sin\Theta$



ΔE_{pot} ΔE_{kin}

$0 = m \cdot g \cdot \Delta h + \frac{1}{2} m v_E^2 + \mu_{RG} \cdot m \cdot g \cdot \cos\Theta \cdot s$

$v_E^2 = 2 \cdot g \cdot s (\sin\Theta - \mu_{R0} \cdot \cos\Theta)$

$= 5,6 \frac{m}{s}$

B4 A3

Geg.: $m = 2000kg$ $v_A = 25 \frac{m}{s}$ $\Delta s = 60m$

a) $\Delta E = 0$

$\Delta E = \Delta E_{kin} + \cancel{\Delta E_{pot}}$ (nicht vorhanden) $+ \Delta E_{waerme}$

$\Delta E_{kin} = E_{kin_E} - E_{kin_A} = 0 - E_{kin_A} = -E_{kin_A}$

$\Delta E_{waerme} = |\vec{F_{RG}}| \cdot \Delta s$

$0 = -\frac{1}{2} \cdot m v_A^2 + |\vec{F_{RG}}| \cdot \Delta s$

$F_{RG} \cdot \Delta s = \frac{1}{2} m v_A^2 = \frac{1}{2} \cdot 2000kg \cdot (25 \frac{m}{s})^2 = 6,3 \cdot 10^5 J$