5.06

$m_A = 2{,}0\,kg$ $\quad m_B = 2{,}0\,kg$

$v_{AF} = 3{,}0\,m/s$ $\quad v_{BF} = 0{,}0\,m/s$

a)

Bevegelsesmengde

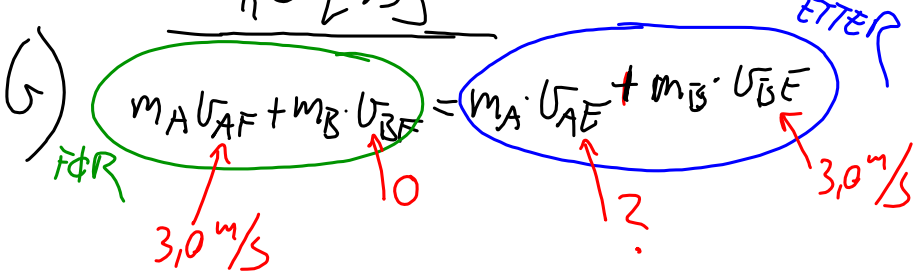
FØR $\quad m_A \cdot v_{AF} + m_B \cdot v_{BF}$ $\quad =$ ETTER $\quad (m_A + m_B) \cdot v_{ABE}$

$$v_{ABE} = \frac{m_A \cdot v_{AF} + m_B \cdot v_{BF}}{m_A + m_B}$$ ($v_{BF} = 0$)

$$= \frac{2{,}0\,[kg] \cdot 3{,}0\,[m/s]}{2{,}0\,[kg] + 2{,}0\,[kg]} = \frac{6{,}0\,[kg \cdot m/s]}{4{,}0\,[kg]}$$

$$= 1{,}5\,[m/s]$$

b)



$$m_A \cdot v_{AF} - m_B \cdot v_{BE} = m_A \cdot v_{AE}$$

$$v_{AE} = \frac{m_A \cdot v_{AF} - m_B \cdot v_{BE}}{m_A} = \frac{2{,}0 \cdot 3{,}0 - 2{,}0 \cdot 3{,}0}{2}$$

$$v_{AE} = 0{,}0\,m/s$$

c) a) $E_{KF} = \frac{1}{2} m_A v_{AF}^2 + \frac{1}{2} m_B \cdot v_{BF}^2$ ($v_{BF}^2 = 0$)

$E_{KE} = \frac{1}{2}(m_A + m_B) \cdot v_{ABE}^2$

$E_{KF} = \frac{1}{2} m_A v_{AF}^2 = \frac{1}{2} \cdot 2{,}0\,[kg] \cdot 3{,}0^2\,[\frac{m^2}{s^2}] = 9{,}0\,[kg \cdot \frac{m}{s^2} \cdot m]$

$[N \cdot m] = [J]$

$E_{KE} = \frac{1}{2}(2{,}0 + 2{,}0) \cdot 1{,}5^2\,[J] = 9{,}0\,[J]$

$= 2{,}0 \cdot 2{,}25\,[J] = 4{,}5\,[J]$

b) $E_{KF} = 9{,}0\,[J]$

$E_{KE} = \frac{1}{2} m_A \cdot v_{AE}^2 + \frac{1}{2} m_B \cdot v_{BE}^2 = \frac{1}{2} \cdot 2{,}0 \cdot 3{,}0^2\,[J]$

($v_{AE} = 0$, $v_{BE} = 3{,}0$)

$= 9{,}0\,[J]$

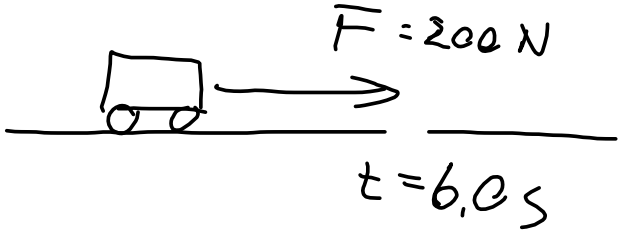
d) i a) $E_{KF} \neq E_{KE}$

: støtet er uelastisk

i b) $E_{KF} = E_{KE}$

: støtet er elastisk

5.09



Impuls $= I = F \cdot t$

a) $I = F \cdot t = 200\,N \cdot 6{,}0\,s$

$= 1200\ [N \cdot s]$

b) Impuls = endring i bevegelsesmengde

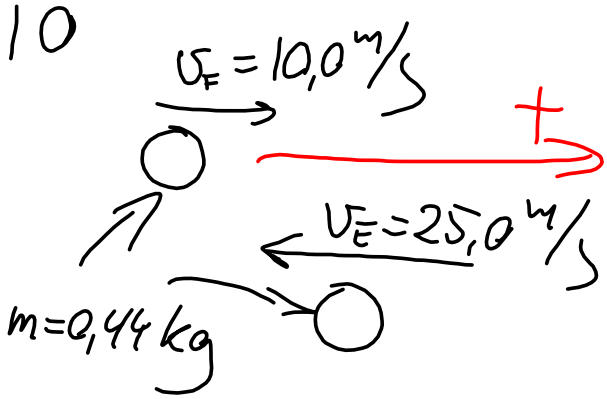
$\sum F \cdot t = \Delta p$

$\Delta p = p_1 - p_0 = 1200\ \left[\frac{kg \cdot m}{s^2} \cdot s\right]$

$N \cdot s$

$p_0 = 0$

5.10



$t = 0{,}020\ [s]$

$F \cdot \Delta t = \Delta p$

I = Δp = bevegelsesmengde forandring

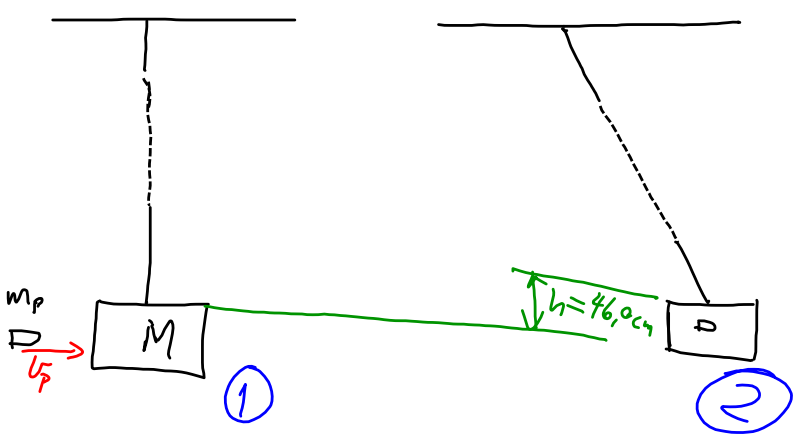
$$F = \frac{\Delta p}{\Delta t} = \frac{-25{,}0\,[m/s]\cdot m - 10{,}0\,[m/s]\cdot m}{0{,}020\ [s]}$$

(0,44 kg)

$$= \frac{0{,}44\,[kg]\cdot(-25{,}0 - 10{,}0)\,[m/s]}{0{,}020\,[s]}$$

$$= \frac{-35{,}0 \cdot 0{,}44\ [kg\cdot m/s]}{0{,}020\ [s]} = -770\,[N]$$

5,07



Bevaring av mekanisk energi

$E_{K1} + E_{P1} = E_{K2} + E_{P2}$

$\frac{1}{2} m v_M^2 + 0,0 = 0,0 + mgh$

Kassa er nådd høyeste

v_M (finner farten til sandkassa)

$(M+m)$ helt etter støtet

$m+M$ kula i sandkassa

$\frac{1}{2} m v_M^2 = mgh$

$v_M^2 = 2gh$

$v_M = \sqrt{2 \cdot g \cdot h} = \sqrt{2 \cdot 9,81 \cdot 0,46} = 3,004$

$= 3,00 \, m/s$

Bevaring av bevegelsesmengde

Bevegelsesmengde før

3,00 kg

Etter

$v_p \cdot m_p + v_M \cdot m_M = v_M (m_p + m_M)$

2 0,012 kg

0,0 (før kulatreffer)

$v_p \cdot m_p = v_M (m_p + m_M) - v_M \cdot m_M$

$0,0$

$v_p = \frac{v_M (m_p + m_M)}{m_p} = \frac{3,00 \cdot (3,012)}{0,012} = \frac{9,03}{0,012}$

$= 753 \, m/s$