

## Assignment 2

1]  $W = Fd \cos \alpha \rightarrow W = Fd$

$W = mad = 600 \text{ J}$   
 $100 \times \frac{1}{2} \times 5^2$

3]  $F = F_1 = F_2 = F_3 = F_4$

$d = d_1 = d_2 = d_3 = d_4$

$W = Fd = \frac{1}{2} m_1 v_1^2 = \frac{1}{2} m_2 v_2^2 = \frac{1}{2} m_3 v_3^2 = \frac{1}{2} m_4 v_4^2$

$\rightarrow v_1 = \sqrt{2} v_2 = \sqrt{3} v_3 = 2v_4$

5]  $\Delta K = -\Delta U$

$K_{E2} = -mg \Delta h$   
 $= -6 \times 9,8 \times -60$   
 $= 3500 \text{ J}$

7]  $F = 50 \text{ N} \quad m = 2 \text{ kg} \quad t = 2 \text{ s}$

$F = ma \rightarrow a = 25 \text{ m/s}^2$

$P = \frac{W}{t} = \frac{Fd}{t} = 50 \times \frac{U}{t}$   
 $\hookrightarrow U = at = 50$

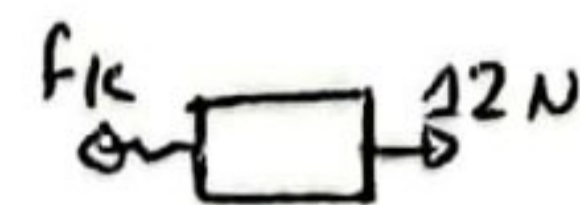
$P = 2500 \text{ W}$

9]  $P = 75 \times 746 \text{ W}$

$\rightarrow P = Fv \rightarrow F = 2,05 \times 10^3 \text{ N}$   
done by the car

$\rightarrow F_{net} = \frac{ma}{100} = 0$

$F_{done \text{ ch the car}} = 2,05 \times 10^3 \text{ N}$

11]  $\Sigma F = ma$  

$12 - (0,2 \times 9,8 \times 3) = 3a$

$a = 2,04$

$P = Fv \rightarrow v = at = 2 \times 2,04$

$\hookrightarrow$  not  $F_{net}$  Just  $P = 12 \text{ N}$

$P = 49 \text{ W}$

2]  $K_{E1} = K_{E2} \rightarrow \Delta K_{E2} = \Delta K_{E1}$

$F_1 = F_2 \rightarrow$  then

$W_1 = \Delta K_{E1} = W_2 = F_1 d_1 = F_2 d_2$


$\rightarrow d_1 = d_2$

4]  $K_{E1} = \frac{1}{2} m_1 (15)^2, K_{E2} = 18 K_{E1}$

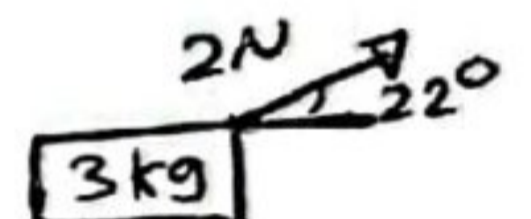
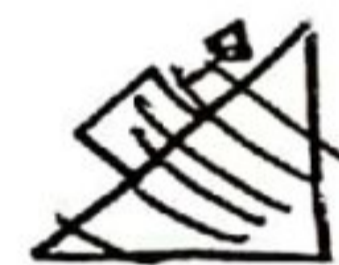
$m_2 = 2m_1$

$\rightarrow \frac{1}{2} \times 2m_1 \times v_2^2 = 18 \times \frac{1}{2} m_1 (15)^2$

$\rightarrow v_2 = 45 \text{ km/h}$

6]   $\rightarrow \Delta K = -\Delta U$   
 $\frac{1}{2} m (v_2^2 - v_1^2) = -mgh$   
 $v_1 = 0$   
 $\rightarrow \frac{1}{2} m v_2^2 = mgh$

8]  $\Sigma F = ma$

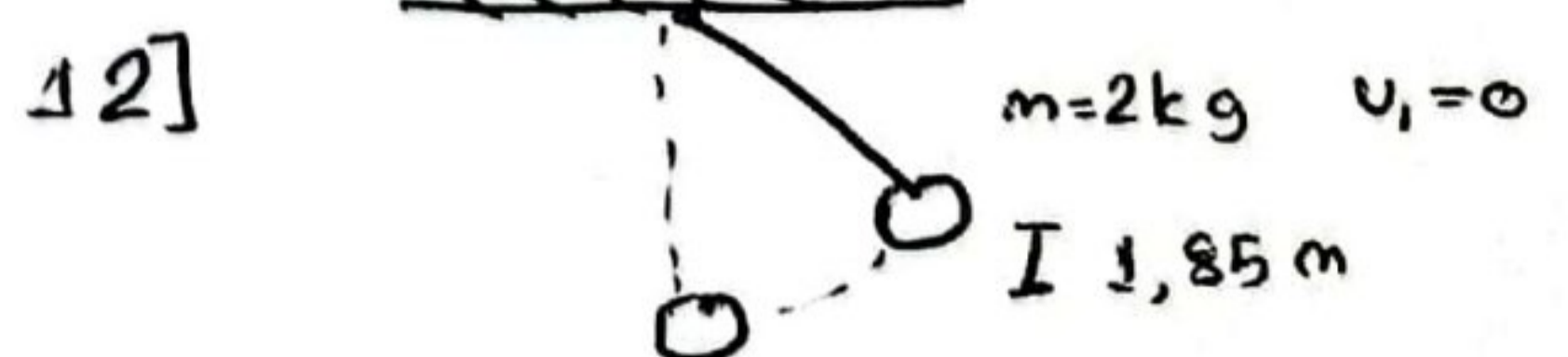


$2 \cos 22^\circ = 3a \rightarrow a = 0,62$

$P = Fv = 2 \cos 22^\circ \times a \times 2 = 2,3 \text{ W}$

10]  $\Delta K_E = 0 \rightarrow \Delta U = W = mgh = 250 \times 9,8 \times 45$

$P = \frac{W}{t} \rightarrow t = \frac{W}{P} = \frac{250 \times 9,8 \times 45}{7,08 \times 746} = 20,9 \text{ s}$



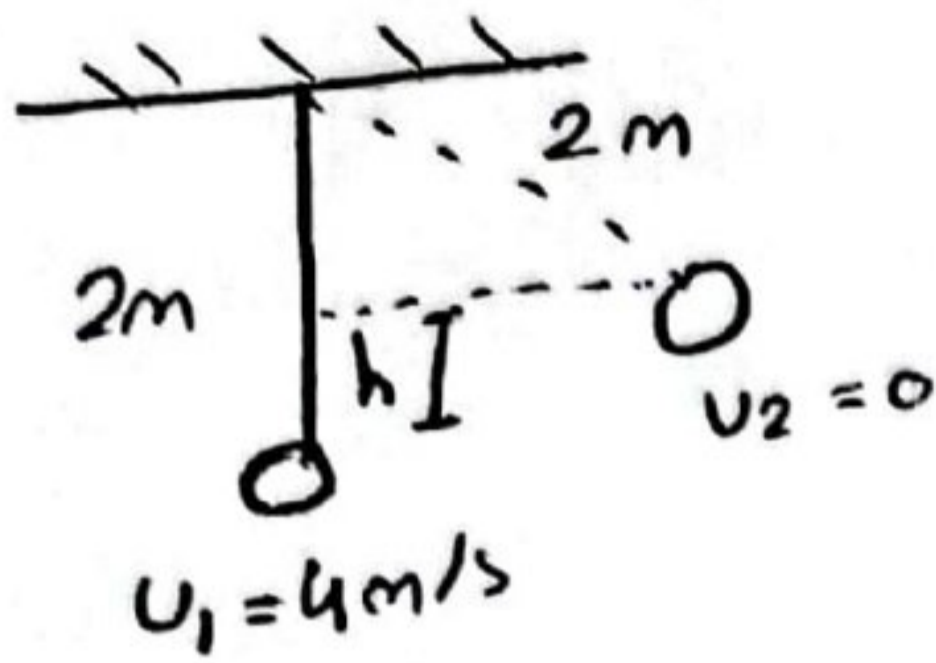
$\Delta K_E = -\Delta U$

$\frac{1}{2} m v_2^2 = mgl \rightarrow v_2 = 6 \text{ m/s}$



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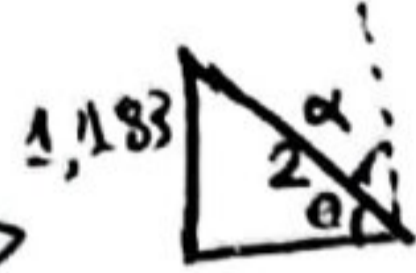


$$\Delta KE = -\Delta U$$

$$\frac{1}{2} m u_1^2 = mgh \rightarrow h = 0,816 \rightarrow$$

$$\sin^{-1}\left(\frac{1,183}{2}\right) = \theta = 36^\circ$$

$$\alpha = 90^\circ - \theta = 54^\circ$$

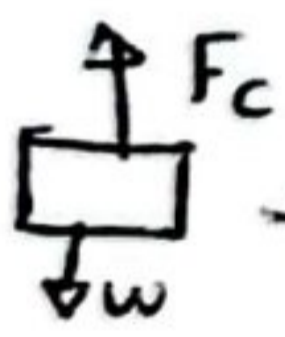


15]  $E_A = E_B$

$$E_A = \frac{1}{2} m u_A^2 + mgh_A = 172800 = 1,73 \times 10^5 \text{ J}$$

$$E_C = E_A = 1,73 \times 10^5 = \frac{1}{2} m u_C^2 + mgh_C \rightarrow u_C = \sqrt{1184} = 34,4 \text{ m/s}$$

17]

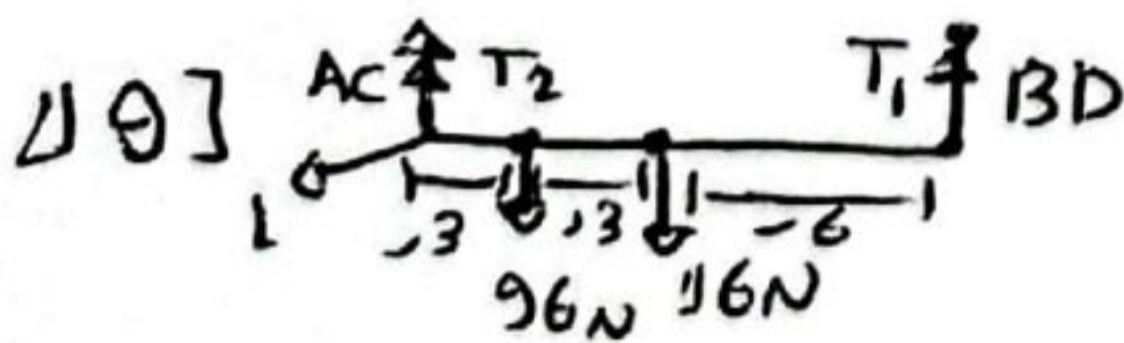


$$\Sigma F = ma$$

$$F_c - w = 425 \times 1,8$$

$$F_c = 4930$$

$$w_c = F_c d \cos \alpha = 4930 \times 117 \times \cos 50 = 5,8 \times 10^5 \text{ J}$$

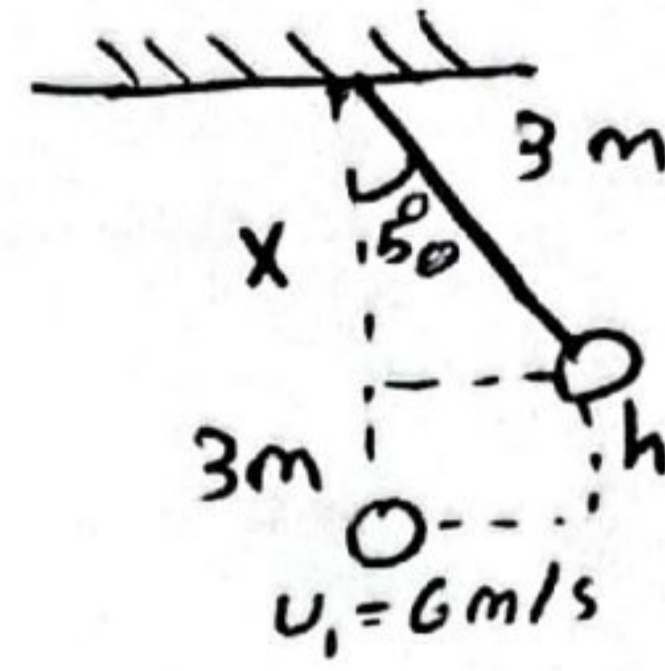


$$\Sigma \tau \text{ about } A = 0$$

$$T_1 \times 1,2 \sin 90^\circ = 16 \times 0,6 \sin 90^\circ + 96 \times 0,3 \sin 90^\circ$$

$$T_1 = 32 \text{ N}$$

14]



$m = 2 \text{ kg}$

$$\cos 50^\circ \times 3 = x = 1,928 \rightarrow h = 1,0716 \text{ m}$$

$$\Delta KE = -\Delta U$$

$$\frac{1}{2} m u_2^2 - \frac{1}{2} m u_1^2 = -mgh$$

$$\rightarrow \frac{1}{2} m u_2^2 = \frac{1}{2} m u_1^2 - mgh = 36 - 21 = 15 \text{ J}$$

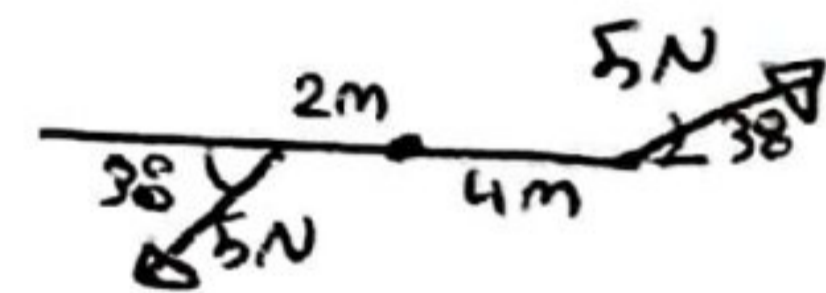
16]  $\Delta E = W_{nc} = F_k d \cos \alpha$

$$= \mu_k \times m \times g \times 25 \times 2 \times \cos 180^\circ$$

$$= -9,8 \text{ J}$$



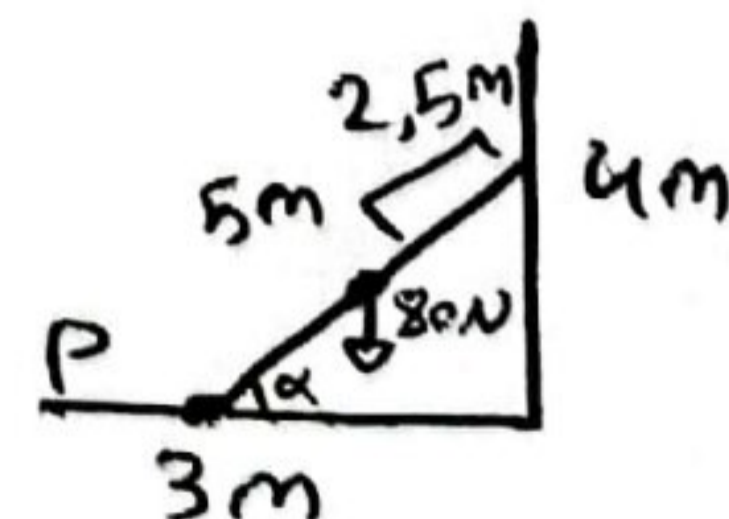
18]



$$\Sigma \tau = T_1 + T_2 = F_1 d_1 \sin \alpha_1 + F_2 d_2 \sin \alpha_2$$

$$= 5(4+2) \sin 30^\circ = 15 \text{ N.m}$$

20]



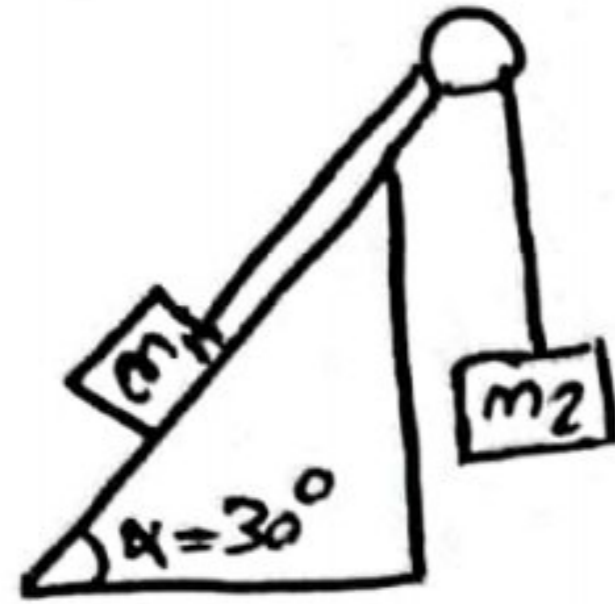
$$\tau \text{ about } P = 80 \text{ N} \times 2,5 \times \cos \alpha$$

$$= 80 \times \frac{5}{2} \times \frac{3}{5} = 120 \text{ N.m}$$



## Assignment 2

21]



$$m_1 = m_2 = 24 \text{ kg}$$

$$\mu_k = 0.31$$

$$\Sigma F_{\text{on system}} = 2ma$$

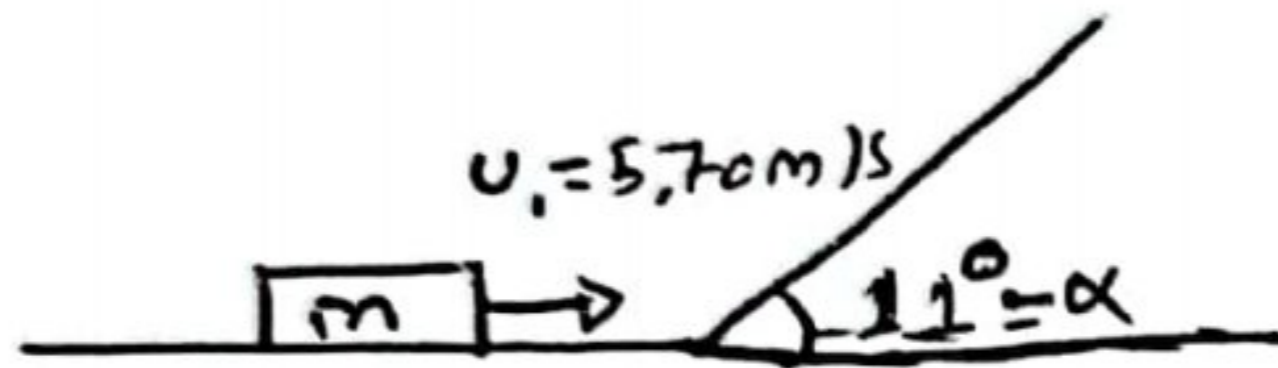
$$mg - [mgsin\alpha + \mu_k mg\cos\alpha] = 2ma$$

$$\rightarrow v_2 = \sqrt{2a\Delta x} = 1.9 \text{ m/s}$$

$$\Delta K_E + \Delta U = W_{nc}$$

or

22]



$$\mu_k = 0.260$$

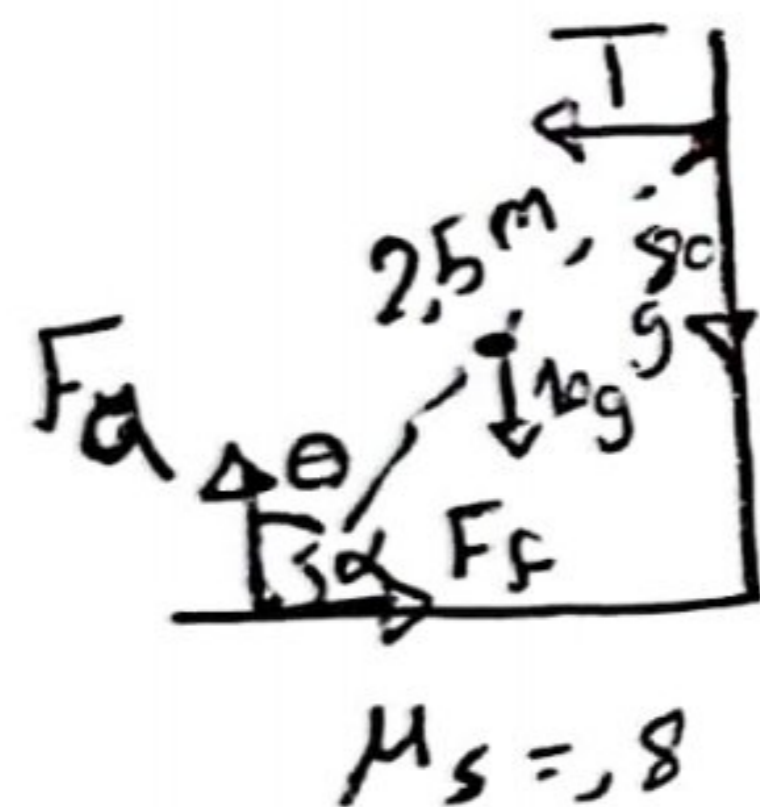
$$v_2 = 0$$

$$\Delta K_E = W_{net}$$

$$-\frac{1}{2} m v_1^2 = (\mu_k mg \cos\alpha + mg \sin\alpha) d \cos 180^\circ$$

$$\rightarrow d = 3.72 \text{ m}$$

23]



$$2.1 \text{ m}$$

$$\rightarrow \Sigma F = 0 \rightarrow \Sigma F_y = 0 \rightarrow F_a = 90g$$

$$\Sigma F_x = 0 \rightarrow T = F_f$$

$$\rightarrow \Sigma \tau = 0 \rightarrow \text{about } b$$



$$\rightarrow 2 F_f \sin\alpha = F_a \cos\alpha + 80g \cos\alpha$$

$$F_f = 80g \tan(\theta) = 538 \text{ N}$$