Correction Devoir n° 1 S1

EXO 1

1°) Pourcentage d'azote

$m_N = m(N_2) = n(N_2) \times M(N_2)$

$m_N = 0,1 \times 28 = \underline{2,8\ g}$

$\%N = \frac{m_N}{m} \times 100 = \frac{2,8}{6} \times 100$

$\underline{\%N = 46,67\%}$

2) masse molaire du composé

$M = d \times 29 = 2,07 \times 29 = \underline{60\ g/mol}$

3°) Pourcentage d'oxygène

$\frac{\%O}{100} = \frac{16}{M} \Rightarrow \%O = \frac{16 \times 100}{60} =$

$\underline{\%O = 26,67\%}$

4°) Montrer que $\%C = 3\%H$

$m_C = \frac{12 m(CO_2)}{44}$, $m_H = \frac{2 \times m(H_2O)}{18}$

$\%C = \frac{m_C}{m} \times 100 = \frac{12 \times m(CO_2)}{44m}$

$\%H = \frac{m_H}{m} \times 100 = \frac{2 \times m(H_2O)}{18m}$

$\frac{\%C}{\%H} = \frac{12\, m(CO_2)}{44 \times m} \times \frac{18 \times m}{2 m(H_2O)}$

$= \frac{12 \times 12}{44 \times 12} \times \frac{m(CO_2)}{m(H_2O)}$

$= \frac{12 \times 2}{44 \times 12} \times \frac{11}{9} = 3$

$\Rightarrow \underline{\%C = 3\%H}$ cqfd

Calcul des deux pourcentage

$\%C + \%O = 100 - (\%N + \%O) = 26,66$

$$\begin{cases} \%C + \%H = 26,66 & (1) \\ \%C = 3\%H & (2) \end{cases}$$

(2) dans (1) $\Rightarrow 4\%H = 26,66$

d'où $\%H = \frac{26,66}{4} = \underline{\underline{6,67}}\ \%$

$\%C = 3 \times 6,67 = \underline{\underline{20,01}}\ \%$

4) Détermination de la famille brute

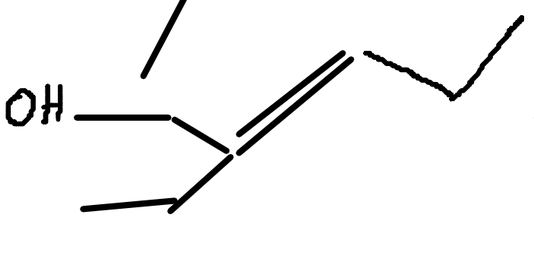
$\frac{12x}{60} = \frac{20,01}{100} \Rightarrow x = \frac{60 \times 20,01}{1200} = 1$

$\frac{y}{60} = \frac{6,67}{100} \Rightarrow y = \frac{60 \times 6,67}{100} = 4$

$\frac{14z}{60} = \frac{46,67}{100} \Rightarrow z = \frac{60 \times 46,67}{1400} = 2$

formule brute $C_x H_y O N_z \equiv \underline{\underline{CH_4ON_2}}$

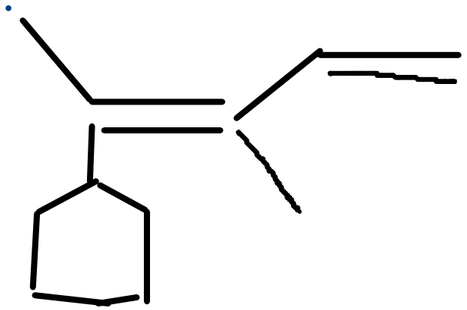
Une formule semi-développée possible :



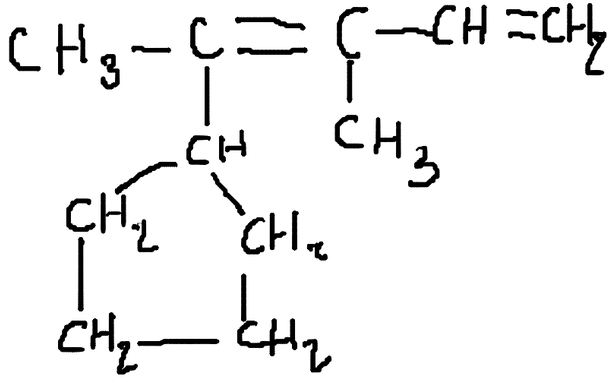
5.) Formule semi-développée à partir de la formule topologique.

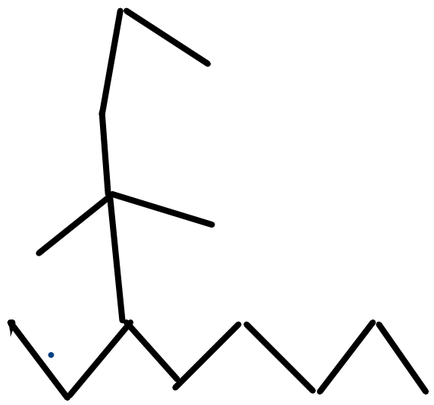
$\Rightarrow$ HC≡C—CH(CH$_3$)—CH(OH)CH$_3$

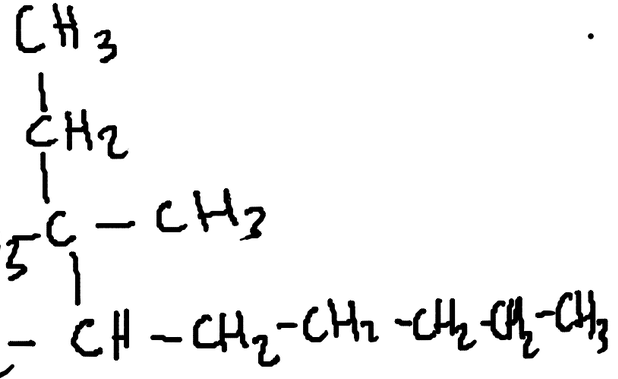
$\Rightarrow$ HO—CH$_2$—C(CH$_2$CH$_3$)=CH—CH$_2$—CH$_3$



$\Rightarrow$







EX03

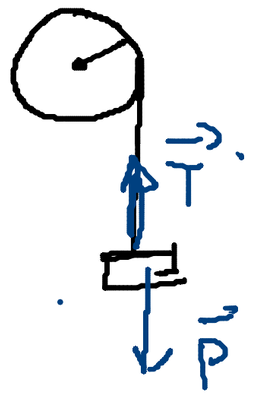
1) Rendement du moteur:

$$\eta = \frac{P_u}{P_t} = \frac{2700}{3000} = 0,90 \text{ ou } 90\,\%$$

2) Travail fourni par le treuil

$$W = P_w \times \Delta t = 2700 \times 8 = 21,6 \text{ kJ}.$$

3) Masse de la charge



- $v = cte \Leftrightarrow W_{\vec{T}} + W_{\vec{P}} = 0$ d'après le principe de l'inertie

$W_P = -W_T = -W$

$|W_P| = mgh = W \Rightarrow \boxed{m = \frac{W}{gh} = \frac{21,6\,10^3}{10 \times 5}}$

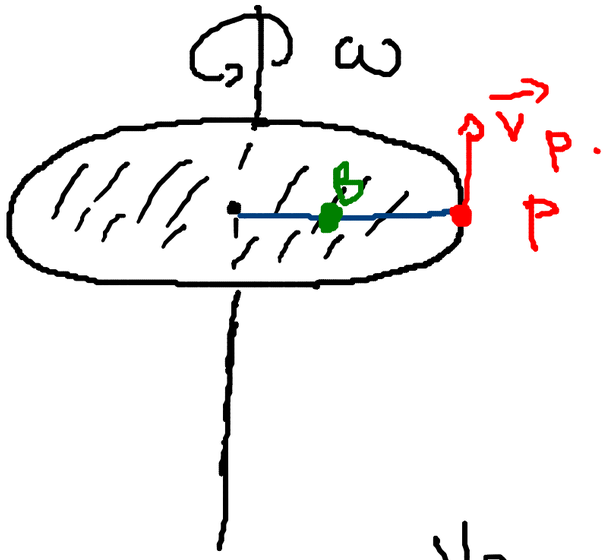
$\boxed{m = 432 g}$

EX04

: $m = 100 g$ $r = 20 cm$ $P = 36 mW$

$v_p = 2,4 m/s$ $\omega = cste$

1) Vitesse angulaire du disque :



$V_P = \omega \times r_P \Rightarrow \omega = \frac{V_P}{r_P} = \frac{2,4}{0,2} = \underline{12 rad/s}$

2°) Vitesse du point B

$V_B = \omega_B \cdot r_B$ avec $\omega_B = \omega$

$V_B = 12 \times 0,02 = \underline{0,24 m/s}$

3°) Moment du couple moteur

$\mathcal{P} = M_c \times \omega \Rightarrow \boxed{M_c = \frac{\mathcal{P}}{\omega} = \frac{3 10^{-3}}{12}}$

$\underline{M_c = 3 10^{-3} N \cdot m}$

4°) Travail du couple

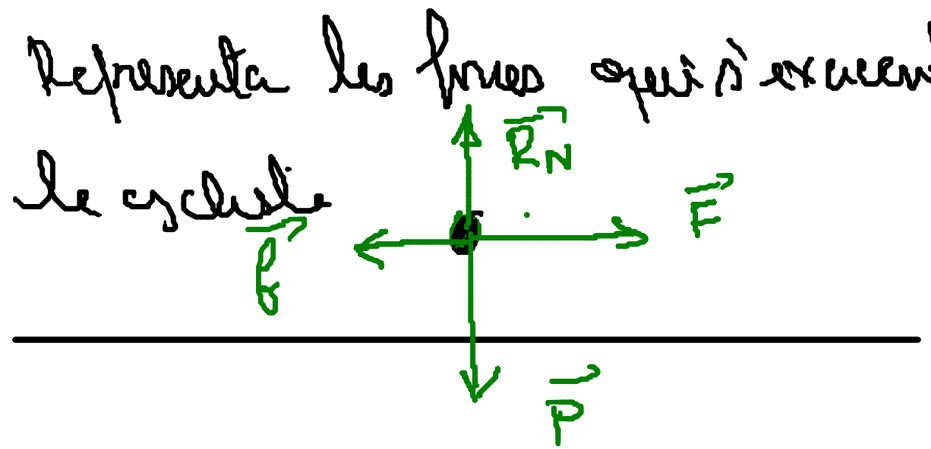
nombre de tour = 10 $\Rightarrow \theta = 2\pi \times 10 = 20\pi rad$

$W_c = M_c \times \theta = 3 10^{-3} \times 20\pi$

$\boxed{W_c = 60\pi 10^{-3} J}$

Exo 2 :

1°) Représenter les forces qui s'exercent sur le cycliste



1.2) Travail de la force motrice

$v = cte \Leftrightarrow \sum W = 0$ d'après le principe de l'inertie

$\sum W = W_{\vec{P}} + W_{\vec{F}} + W_{\vec{f}} + W_{\vec{R_N}}$

$W_{\vec{P}} = W_{\vec{R_N}} = 0$ $\vec{P}$ et $R_N \perp$ au déplacement

$W_{\vec{F}} = -W_{\vec{f}} = -(-f \cdot d)$

$W_{\vec{F}} = \underline{\underline{f \cdot d}}$

1.3) $\mathcal{P} = \dfrac{W_{\vec{F}}}{\Delta t} = \underline{\underline{f \cdot \dfrac{d}{\Delta t}}}$

$\dfrac{d}{\Delta t} = v \Rightarrow \underline{\underline{\mathcal{P} = f \cdot v}}$

de plus $f = kv^2$

$\Rightarrow \mathcal{P} = kv^2 \cdot v = \underline{\underline{kv^3}}$

1.4) Puissance développée pour la vitesse pour

$V = 10 m/s$

$V_1 = 5 m/s$ $\mathcal{P}_1 = 30 W$

$V_2 = 10 m/s$ $\mathcal{P}_2 = ?$

$\mathcal{P}_1 = kV_1^3$ $\mathcal{P}_2 = kV_2^3$

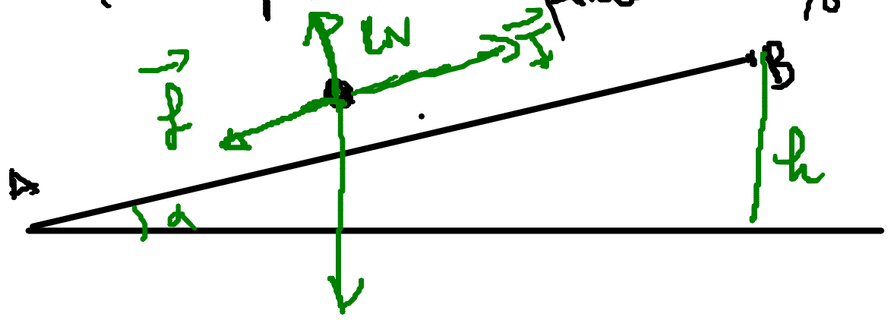
$\dfrac{\mathcal{P}_2}{\mathcal{P}_1} = \dfrac{kV_2^3}{kV_1^2} = \left(\dfrac{V_2}{V_1}\right)^3$

$\mathcal{P}_2 = \mathcal{P}_1 \times \left(\dfrac{V_2}{V_1}\right)^3 = 30 \left(\dfrac{10}{5}\right)^3$

$\mathcal{P}_2 = 30 \times 2^3 = \underline{\underline{240 W}}$

2.) le cycliste gravite une pente de 5%

2-1)



2.2) Calcul du travail du poids $\vec{P}$ et des forces exercés $\vec{f}$

$W_{\vec{P}} = -mgh$, $h = AB \sin\alpha$

$AB = d$ $\quad \sin\alpha = \frac{5}{100} = 0,05$

$W_{\vec{P}} = -600 \times 10 \times 200 \times 0,05 = -6 \cdot 10^4 J$

$W_{\vec{f}} = -f \cdot d = -kv^2 \times d.$

déterminons k on a

$f = kv^2 \Rightarrow k = \frac{f}{v^2} = \frac{30}{5^2} = \frac{30}{25}$

$k = \frac{6}{5} = 0,12$ SI

$W_{\vec{f}} = -0,12 \times 10^2 \times 200$

$W_{\vec{f}} = -2400 J$

2.4) Puissance développée par le cycliste si la remontée dure 1m30

P.E $\Leftrightarrow \sum W = 0$

$\Rightarrow W_{\vec{f}} + W_{\vec{P}} + \underbrace{W_{\vec{R_N}}}_{0} + W_{\vec{F}} = 0$

$\Rightarrow W_{\vec{F}} = -\left(W_{\vec{f}} + W_{\vec{P}}\right) = -(60.000 - 2400) = 62.400 J.$

$\mathcal{P} = \frac{W}{\Delta t} = \frac{62.400 J}{90 s} =$ **693,33 Watts**