

Physique : 13 pts

Les Convections

EX 1 :

Partie I

① a) La vitesse angulaire des roues arrière et avant ont la même vitesse

b) La vitesse linéaire d'un point de la circonférence des deux roues ont la même.

② $\omega_R = \frac{v}{D/2}$

A.N $\omega_R = \frac{20}{3,6} \times \frac{2}{69 \cdot 10^{-2}}$

$\omega_R = 16,1 \text{ rad/s}$

③ $v_R = R_R \cdot \omega_R$

A.N $v_R = \frac{6}{2} \cdot 10^{-2} \times 16,1$

$v_R = 0,483 \text{ m/s}$

④ $v_p = v_R = 0,483 \text{ m/s}$

⑤ a) $\omega_p = \frac{v_p}{R_p}$

A.N $\omega_p = \frac{0,483}{10 \cdot 10^{-2}}$

$\omega_p = 4,83 \text{ rad/s}$

⑥ $\omega_m = \omega_p = 4,83 \text{ rad/s}$

⑦ $v_A = L \cdot \omega_m$

A.N $v_A = 17 \cdot 10^{-2} \times 4,83$

$v_A = 0,821 \text{ m/s}$

Partie II

① $\Delta\theta = 2\pi \cdot n$
 $= 4\pi$

$= 12,56 \text{ rad}$

② $x_1 = r_1 \cdot \Delta\theta$

$x_1 = 0,628 \text{ m}$

$x_2 = R_2 \cdot \Delta\theta$

$x_2 = 0,314 \text{ m}$

③

$x_1 = R_1 \cdot \Delta\theta$

$R_1 = 2 R_2$ on remplace

$x_1 = 2 R_2 \cdot \Delta\theta$

Donc $x_1 = 2 \cdot x_2$

④ on a $v = r \cdot \omega \Rightarrow \omega = \frac{v}{r}$

$\omega_1 = \omega_2$

$\frac{v_1}{R_1} = \frac{v_2}{R_2}$

$\frac{v_1}{2R_2} = \frac{v_2}{R_2}$

$v_1 = 2v_2$

EX 2 :

① Le principe d'inertie :

$\vec{T} + \vec{P} = \vec{0}$

$T = m \cdot g$

A.N $= 250 \times 10$

$$\int \Delta\theta = 2\pi n$$

$$\Delta\theta = \frac{h}{r}$$

$$n = \frac{\Delta\theta}{2\pi} = \frac{h}{2\pi \cdot r}$$

A.N $n = \frac{20}{2\pi \cdot 10 \cdot 10^{-2}}$

$$n = 31,83 \text{ Tr}$$

$$\omega = \frac{\Delta\theta}{\Delta t} = \frac{v}{r} \quad (v = r \cdot \omega)$$

A.N $\omega = \frac{4}{10 \cdot 10^{-2}}$

$$\omega = 40 \text{ rad/s}$$

$$P_m = M_m \cdot \omega$$

$$M_m = \frac{P_m}{\omega}$$

A.N $M_m = \frac{12 \cdot 10^3}{40}$

$$M_m = 300 \text{ N.m}$$

④ In a $v = \text{cte}$ donc $\omega = \text{cte}$
donc Selon théorème des moments

$$\sum M = 0$$

$$M(T) + M_m + M_c = 0$$

$$M_c = T \cdot r - M_m$$

$$M_c = 2500 \times 10 \cdot 10^{-2} - 300$$

$$M_c = -50 \text{ N.m}$$

$$V(t) = A \cdot t + B$$

$$V(t) = -0,6 \cdot t + 12$$

$$P(t) = \vec{f} \cdot \vec{v}(t)$$

$$P(t) = -f \cdot v(t)$$

$$= -f(A \cdot t + B)$$

$$P(t) = \underbrace{-f \cdot A \cdot t}_a - \underbrace{f \cdot B}_b$$

$$P(t) = a \cdot t + b$$

$$a = -f \cdot A = -500 \times (0,6) = 300 \text{ W/s}$$

$$b = -f \cdot B = -500 \times 12 = 6000 \text{ W}$$

$$P(t) = 300t - 6000$$

Partie II:

$$W_{A \rightarrow B}(\vec{P}) = m \cdot g (z_A - z_B)$$

$$W_{A \rightarrow B}(\vec{P}) = m \cdot g \cdot h$$

$$= m \cdot g \cdot AB \cdot \sin \alpha$$

A.N $W_{A \rightarrow B}(\vec{P}) = 0,5 \times 10 \times 2 \times \sin 60^\circ$

$$= 8,66 \text{ J}$$

$$W_{B \rightarrow C}(\vec{P}) = m \cdot g \cdot (z_B - z_C)$$

$$= m \cdot g \cdot h'$$

$$= m \cdot g \cdot r(1 - \cos \theta)$$

A.N $W_{B \rightarrow C}(\vec{P}) = 0,5 \times 10 \times 0,5 (1 - \cos 60^\circ)$

2a

$$\begin{aligned} W(\vec{R})_{A \rightarrow B} &= \vec{R} \cdot \vec{AB} \\ &= \vec{f} \cdot \vec{AB} + \vec{R}_N \cdot \vec{AB} \\ &= -f \cdot AB + 0 \end{aligned}$$

$$W(\vec{R})_{A \rightarrow B} = -0.9 \times 2 = -1.8 \text{ J}$$

$$\begin{aligned} W(\vec{R})_{B \rightarrow C} &= \vec{R} \cdot \vec{BC} = \vec{f} \cdot \vec{BC} + \vec{R}_N \cdot \vec{AB} \\ &= -f \cdot BC + 0 \end{aligned}$$

$$W(\vec{R})_{B \rightarrow C} = -f \cdot BC = -f \cdot r \cdot \theta$$

$$\begin{aligned} \text{A.N} \quad W(\vec{R})_{B \rightarrow C} &= -f \cdot r \cdot \theta \quad (\theta = 60^\circ = \frac{\pi}{3}) \\ &= -0.9 \times 50 \times 10^{-2} \times \frac{\pi}{3} \end{aligned}$$

$$W(\vec{R})_{B \rightarrow C} = -0.471 \text{ J}$$

6.

$$R = \sqrt{f^2 + R_N^2}$$

Le coefficient de frottement $k = \frac{f}{R_N} \Rightarrow R_N = \frac{f}{k}$

$$R = \sqrt{f^2 + \left(\frac{f}{k}\right)^2}$$

$$\text{A.N} \quad R = 2.657 \text{ N}$$

3a

$$P(\vec{P}) = \vec{P} \cdot \vec{v}$$

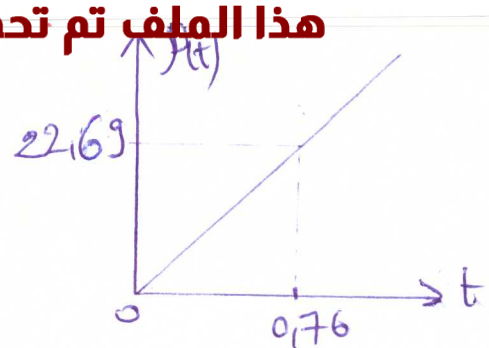
$$P_A(\vec{P}) = P \cdot v_A \cdot \cos(30^\circ) = 0$$

$$\begin{aligned} P_B(\vec{P}) &= P \cdot v_B \cdot \cos(30^\circ) \\ &= m \cdot g \cdot v_B \cdot \cos(30^\circ) \end{aligned}$$

$$P_B(\vec{P}) = 22.69 \text{ W}$$

6 on trace la courbe $P(t)$

$$t_A = 0$$



$$P(\vec{P}) = 29.855 \cdot t$$

$$P(\vec{P}) = \frac{\partial W(\vec{P})}{\partial t}$$

$$\begin{aligned} \Rightarrow W(\vec{P})_{A \rightarrow B} &= \frac{1}{2} (29.855) t^2 \\ &= 8.62 \text{ J} \end{aligned}$$

Chimie

Partie I:

① - éthanol : alcool

- C_2H_6O : formule brute

éthanol à 95% : Pourcentage en volume

- Corrosif et inflammable

②

$$m_{s_1}(\text{al}) = n(\text{al}) \times M(\text{al})$$

$$P = \frac{V(\text{al})}{V_{\text{sol}}}$$

$$m_{s_1}(\text{al}) = e_{\text{al}} \cdot V_{\text{al}}$$

$$d = \frac{e_{\text{al}}}{e_{\text{eau}}}$$

donc :

$$m_{s_1}(\text{al}) = e_{\text{eau}} \cdot d \cdot P \cdot V_{\text{sol}}$$

A.N

$$= 1 \times 0.79 \times 0.95 \times 100$$

$$m_{s_1}(\text{al}) = 75.05 \text{ g}$$

③

$$C_1 = \frac{n(\text{al})}{V_{\text{sol}}} = \frac{m_{\text{al}}}{M_{\text{al}}} \times \frac{1}{V_{\text{sol}}}$$

$$C_1 = \frac{e_{\text{eau}} \times d \cdot P}{M_{\text{al}}}$$

$$= \frac{1 \times 10^3 \times 0,79 \times 0,95}{24+6+16}$$

$$C_1 = 16,31 \text{ mol/L}$$

$$C_2 = \frac{e_{\text{eau}} \times d \cdot P'}{M_{\text{al}}}$$

$$= \frac{10^3 \times 1 \times 0,79 \times 0,19}{24+6+16}$$

$$C_2 = 3,26 \text{ mol/L}$$

Relation de la dilution

$$C_1 \cdot V_1 = C_2 \cdot V_2$$

$$V_1 = \frac{C_2 \cdot V_2}{C_1}$$

A.N

$$V_1 = \frac{3,26 \times 100}{16,31}$$

$$V_1 = 20 \text{ mL}$$

Partie II:

1 a

$$P \cdot V = n \cdot R \cdot T \rightarrow K$$

$\begin{matrix} \text{Pa} & \text{m}^3 & \text{mol} & \text{J} \cdot \text{K}^{-1} \cdot \text{mol}^{-1} \end{matrix}$

2 a

$$n=1 \Rightarrow V=V_m$$

$$P \cdot V_m = R \cdot T$$

$$V_m = \frac{R \cdot T}{P}$$

A.N

$$V_m = \frac{8,314 \times (20+273)}{10^5}$$

$$V_m = 24,36 \text{ L/mol}$$

3

$$n(x) = \frac{V(x)}{V_m}$$

A.N

$$n(x) = \frac{2}{24,36}$$

$$n(x) = 8,21 \cdot 10^{-2} \text{ mol}$$

d

$$P = \text{cte} \text{ et } n = \text{cte}$$

$$\frac{P}{n} = \frac{R \cdot T}{V} = \text{cte}$$

$$\frac{R \cdot T}{V} = \text{cte}$$

$$\frac{R \cdot T_1}{V_1} = \frac{R \cdot T_2}{V_2}$$

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$$T_2 = \frac{V_2 \cdot T_1}{V_1}$$

$$T_2 = \frac{5}{2} \times (20+273)$$

$$T_2 = 732,5 \text{ K}$$

2

2-4

V = cte et n = cte (T et P varie)

$$\frac{V}{n} = \frac{R \cdot T}{P} = \text{cte}$$

2-2

etat i etat f

$$\frac{R \cdot T_i}{P_i} = \frac{R \cdot T_f}{P_f}$$

$$\frac{P_f}{P_i} = \frac{T_f}{T_i}$$

$$P_f = P_i \cdot \frac{T_f}{T_i}$$

A.N

$$P_f = 1,14 \cdot 10^5 \text{ Pa}$$

3

$$d = \frac{M_{\text{gaz}}}{M_{\text{air}}} \text{ et } M_{\text{air}} = e_{\text{air}} \times V_m$$

$$M_{\text{gaz}} = 16 \text{ g/mol}$$