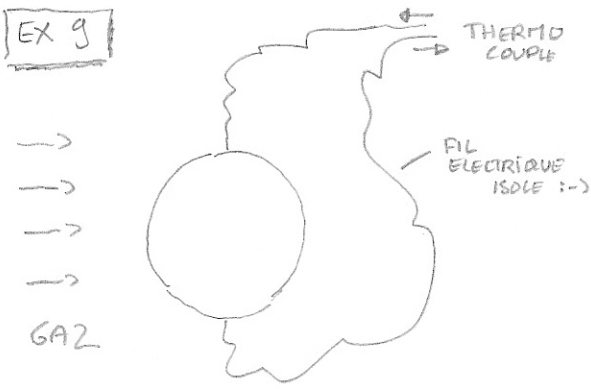
EX 9



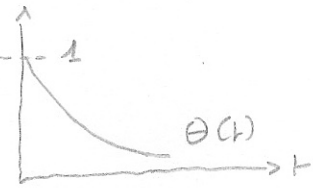
1

$$\rho c V \frac{dT_m}{dt} = -hS(T_m - T_\infty)$$

V : VOLUME SPHERE ; S : SURFACE SPHERE

$$\Theta(t) = \frac{T_m(t) - T_\infty}{T_0 - T_\infty}$$

$$\Theta(0) = 1$$



$$\frac{d\Theta}{dt} = -\frac{hS}{\rho c V}\Theta$$

$S = 4\pi R^2$; $V = 4\pi R^3/3$

$$\frac{6S}{8500 \times 320 \times 0{,}0012} = 0{,}1195 \left[\frac{1}{s}\right]$$

$$\boxed{\Theta(t) = \exp(-0{,}1195\, t)}$$

2

$$\Theta(t) = 0{,}01$$

$$\boxed{t = \frac{\ln(0{,}01)}{-0{,}1195} = 38{,}5 \text{ [sec]}}$$

3

$$\rho c \frac{\partial T}{\partial t} = -\nabla \cdot q + \underbrace{\quad}_{=0}$$

EN INTEGRANT SUR LA SPHERE

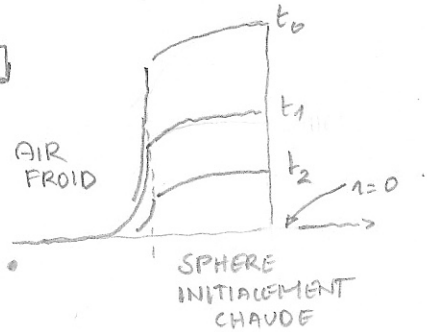
$$\rho c \iiint \frac{\partial T}{\partial t} = -\iiint \nabla \cdot q$$

$\frac{\partial T}{\partial t} \approx \frac{\partial T_m}{\partial t}$ EN APPROXIMANT T PAR T_m SUR LA SURFACE !

$$= -\iint_{\partial\Omega} q \cdot n \, dS = h(T_m - T_\infty)$$

VALABLE SI BIOT PETIT UNIQUEMENT :-)

4



$$Bi = \frac{hL}{k} = \frac{\frac{6S}{3S}}{\frac{0.012}{6}} \quad (L = V/S = R/3 :-)$$

$$0.00037$$

PETIT < 0.1

APPROXIMER $T(x, t)$ PAR $T_m(t)$ EST LEGITIME !