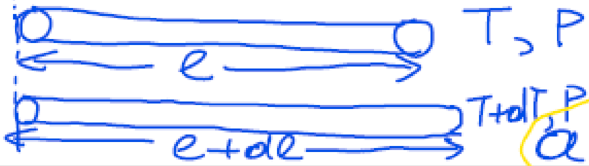
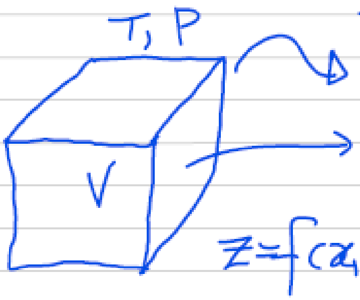
22/3/2021 σελ. 1



η P είναι σταθερή.

$$\alpha \equiv \frac{1}{\ell}\frac{d\ell}{dT}\Big|_P = \frac{1}{\ell}\left(\frac{\partial \ell}{\partial T}\right)_P$$



$$V+dV \Rightarrow \beta \equiv \frac{1}{V}\frac{dV}{dT}\Big|_P = \frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_P$$

$$z=f(x,y) \qquad \frac{dz}{dx}\Big|_y = \left(\frac{\partial z}{\partial x}\right)_y$$

$$\alpha(T,P) = \frac{1}{\ell(T)}\frac{d\ell}{dT}\Big|_P \Rightarrow \ell(T'), \quad \ell(T), \; P$$

$$\alpha(T,P)\,dT = \frac{d\ell}{\ell(T)} \Rightarrow \int_T^{T'} \alpha(T,P)\,dT = \int_{\ell(T)}^{\ell(T')} \frac{d\ell}{\ell} \Rightarrow$$

$$\int_T^{T'} \alpha(T)\,dT = \Big[\ln(\ell)\Big]_{\ell(T)}^{\ell(T')} = \ln\left(\frac{\ell(T')}{\ell(T)}\right) \Rightarrow$$

$$\boxed{\ell(T') = \ell(T)\exp\left(\int_T^{T'} \alpha(T)\,dT\right)} \longleftarrow$$

$$\underline{\alpha(T) \approx \alpha_0}, \quad \int_T^{T'} \alpha_0\,dT = \alpha_0(T'-T)$$

$$\ell(T') = \ell(T)\exp\left(\alpha(T'-T)\right)$$

$$\Delta T = T'-T$$

$$\ell(T') = \ell(T)\exp(\alpha\,\Delta T)$$

$$\alpha \sim 10^{-5}/K \qquad \Delta T \sim 10^2, \; \alpha\Delta T \sim 10^{-3}$$

$$\exp(10^{-3}) = \exp(\underline{0.001}) \cong 1 + \underline{0.001}$$

$$\exp(x) \cong 1 + x + \dots \quad |x| \ll 1.$$

22/3/2021 σελ. 2

$\ell(T')=\ell(T)e^{a\Delta T}$, εάν $a\Delta T<<1$ τότε $e^{a\Delta T}=1+a\Delta T$

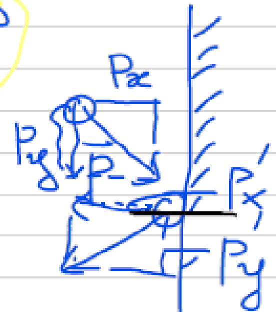
$\boxed{\ell(T')=\ell(T)(1+a\Delta T)}$

$\boxed{V(T')=V(T)(1+\beta\Delta T)}$ $\beta\Delta T<<1$

$T=300K$ ή $T=300°K$ $\Theta=30°C$

30C.

$dW=dK$ $d\vec{\Omega}=\vec{F}dt=d\vec{p}$



$dW=\vec{F}\cdot d\vec{x}$, $d\vec{x}=0\Rightarrow dW=0$

$\Rightarrow dK=0$

$\bar{v}=\sqrt{\overline{v^2}}$ $\frac{1}{2m}(p_x^2+\cancel{p_y^2})=\frac{1}{2m}(p_x'^2+\cancel{p_y'^2})$ $p_y'=p_y$

$\Rightarrow p_x'=\pm p_x \Rightarrow \boxed{v_x'=\pm v_x}$

$\boxed{v_x'=-v_x}$

$(v_x)_i$: $(v_x)_i>0 \rightarrow 2m(v_x)_i=$

0 $(v_x)_i<0 \rightarrow 0$

$m(v_x)_i^2+m(-v_x)_i^2\neq$

$pV=\frac{2K}{3}$ → #σωματ

$pV=Nk_BT \leftarrow \frac{2K}{3}=Nk_BT \Rightarrow K=\frac{3}{2}Nk_BT$

17/3/2021 σελ.1

1 διάσταση

$$\cancel{\tfrac12}\cancel{m_1} v_1^2 + \cancel{\tfrac12}\cancel{m_2} v_2^2 = \cancel{\tfrac12}\cancel{m_1} v_1'^2 + \cancel{\tfrac12}\cancel{m_2} v_2'^2 , \quad m_1 = m_2$$

$$v_1^2 + v_2^2 = v_1'^2 + v_2'^2 \Rightarrow \underline{v_1^2 - v_1'^2 = v_2'^2 - v_2^2}$$ ΑΔΕ

ΑΔΟ $dt \to 0$ $d\vec{\Omega} = \vec{F}\cdot dt \to 0$ $d\vec{p} = 0$

$$\cancel{m} v_1 + \cancel{m} v_2 = \cancel{m} v_1' + \cancel{m} v_2' \Rightarrow v_1 - v_1' = v_2' - v_2 \quad (1)$$

$$\cancel{(v_1 - v_1')}(v_1 + v_1') = \cancel{(v_2' - v_2)}(v_2' + v_2) \quad (2)$$

$$v_1 + v_1' = v_2' + v_2 \quad (2'), \quad (1)+(2') \Rightarrow 2v_1 = 2v_2' \Rightarrow \boxed{v_2' = v_1} \quad (3)$$

$$(3) \Rightarrow (2) \Rightarrow \boxed{v_1' = v_2}$$

$$\cancel{\tfrac12}\cancel{m} v_1^2 = \cancel{\tfrac12}\cancel{m} v_1'^2$$

$$v_1'^2 = v_1^2 \Rightarrow$$

$$v_1' = \pm\sqrt{v_1^2} \qquad \boxed{v_1' = \pm v_1} \qquad v_1' = v_1 \qquad v_1' = -v_1$$

$$d\vec{\Omega} = \vec{F}_{12}\cdot dt + \vec{F}_{21}\, dt = \underline{(\vec{F}_{12} + \vec{F}_{21})\, dt}$$

$\vec{F}_{12} + \vec{F}_{21} \to 0$ 3ος Ν. Newton