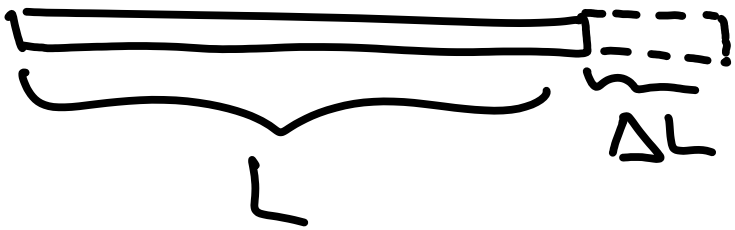
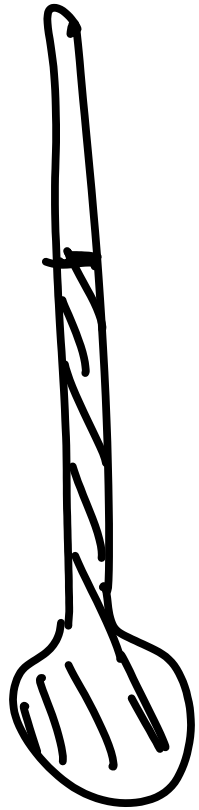
Temperature

Temperature

Heat (Energy)

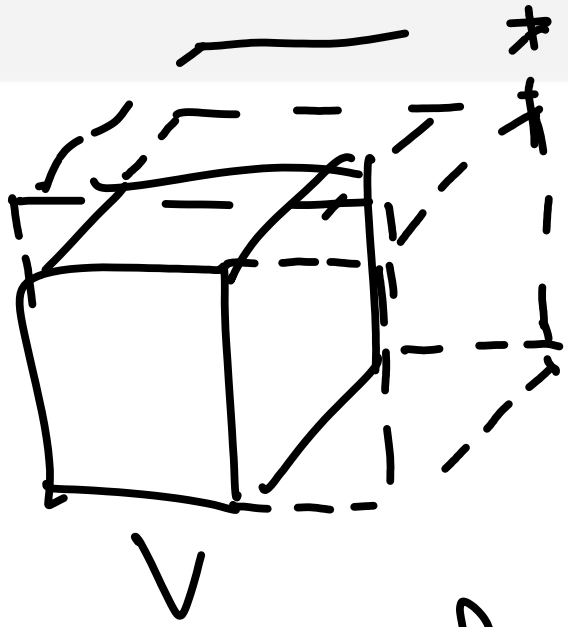




$$\Delta L \propto L \Delta T$$

$$\Delta T = \frac{\Delta L}{L}$$

Department of Physics Fizik Bölümü 1960



$$\frac{\Delta V}{V} \propto \Delta T$$

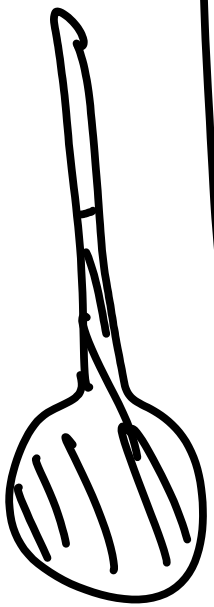
$$\Delta L = \alpha L \Delta T$$

$$\Delta A = \beta A \Delta T$$

$$\Delta V = \gamma V \Delta T$$

$$\gamma = 3\alpha$$

$$\beta = 2\alpha$$



$$V = L^3$$

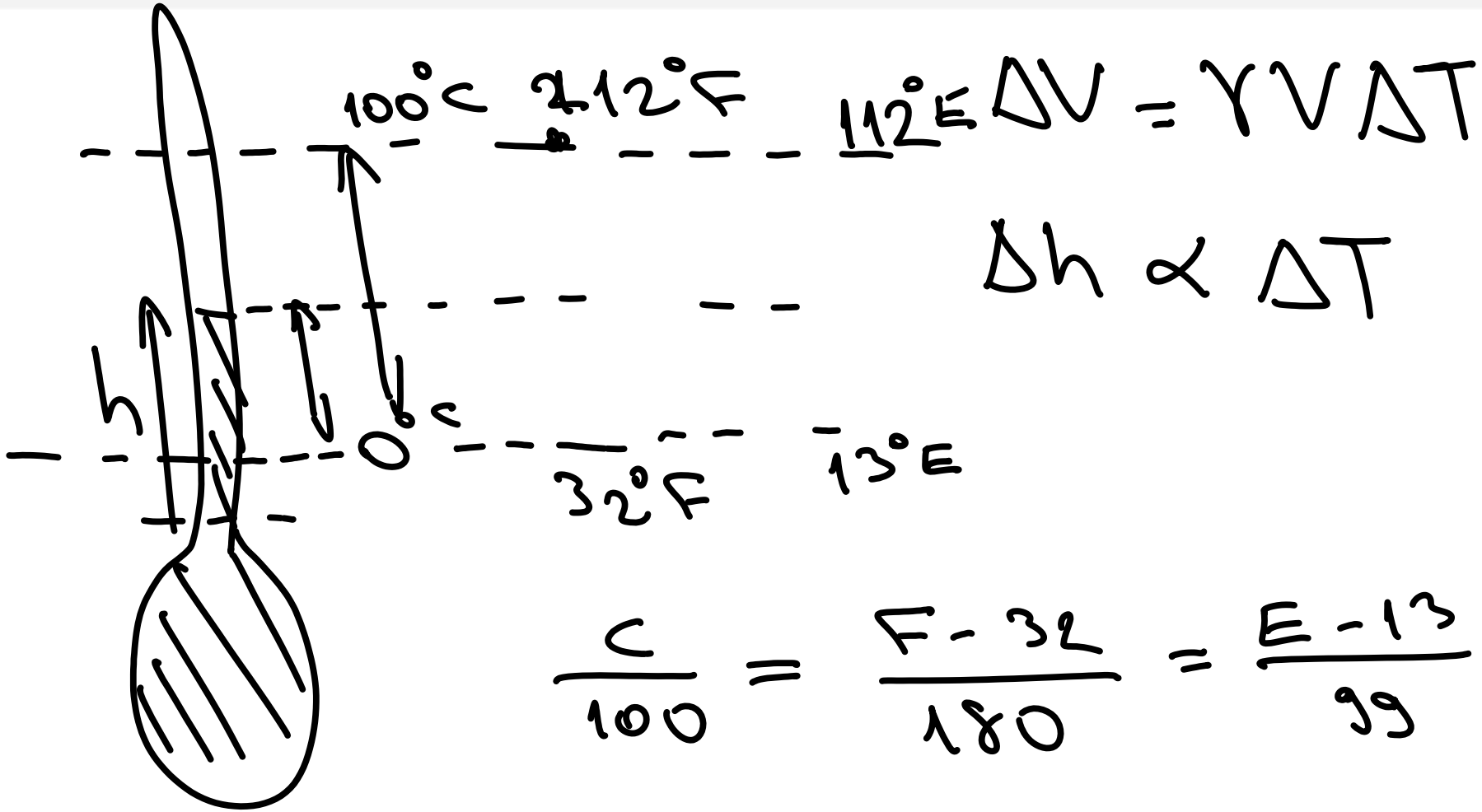
$$\Delta L = \alpha L \Delta T$$

$$\Delta V = \gamma V \Delta T$$

$$\Delta V = V_f - V_i = (L + \Delta L)^3 - (L)^3$$

$$= L^3 + 3\Delta L L^2 + 3(\Delta L)^2 L + (\Delta L)^3 - L^3$$

$$= \gamma V \Delta T$$



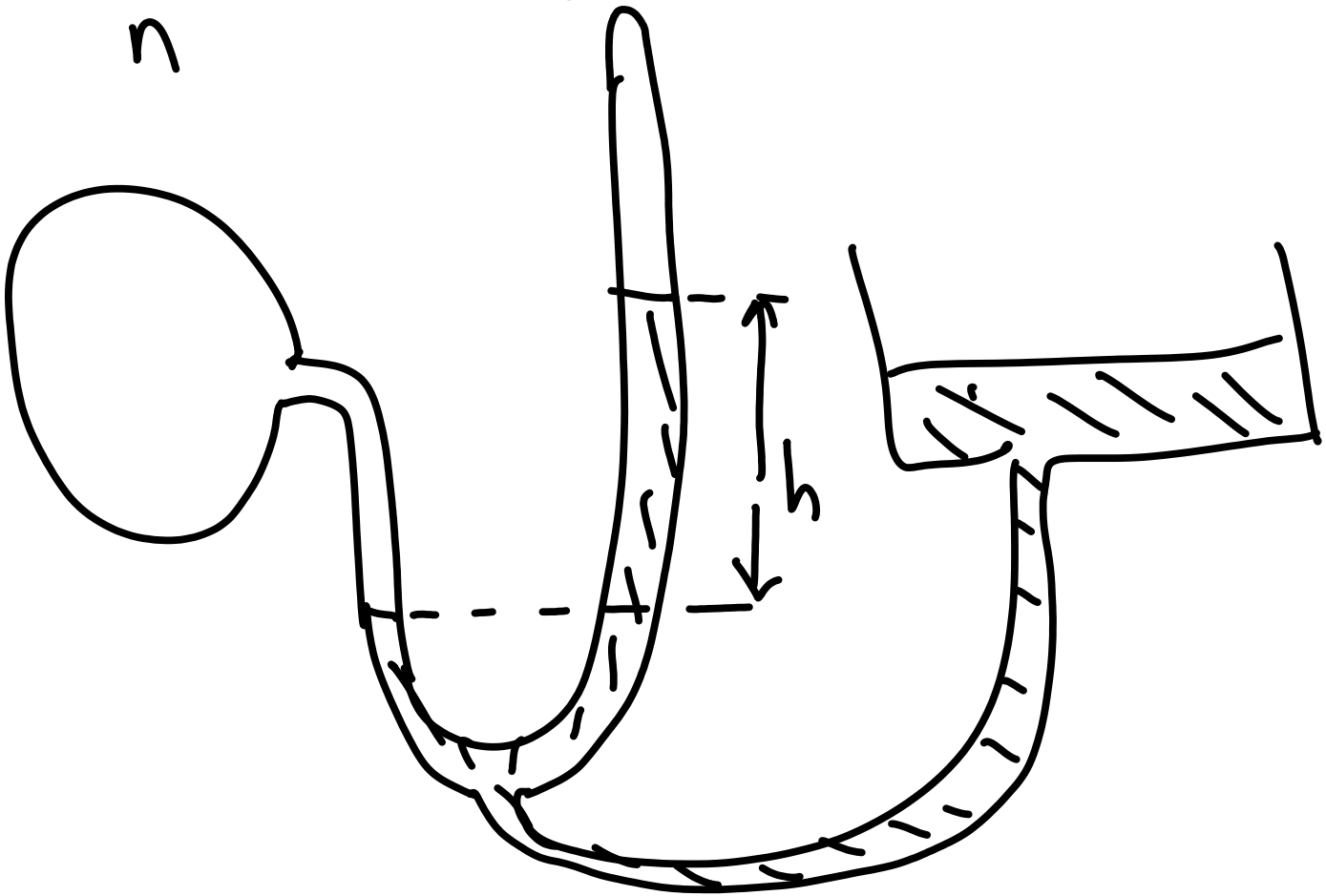
$$\Delta V = \gamma V \Delta T$$

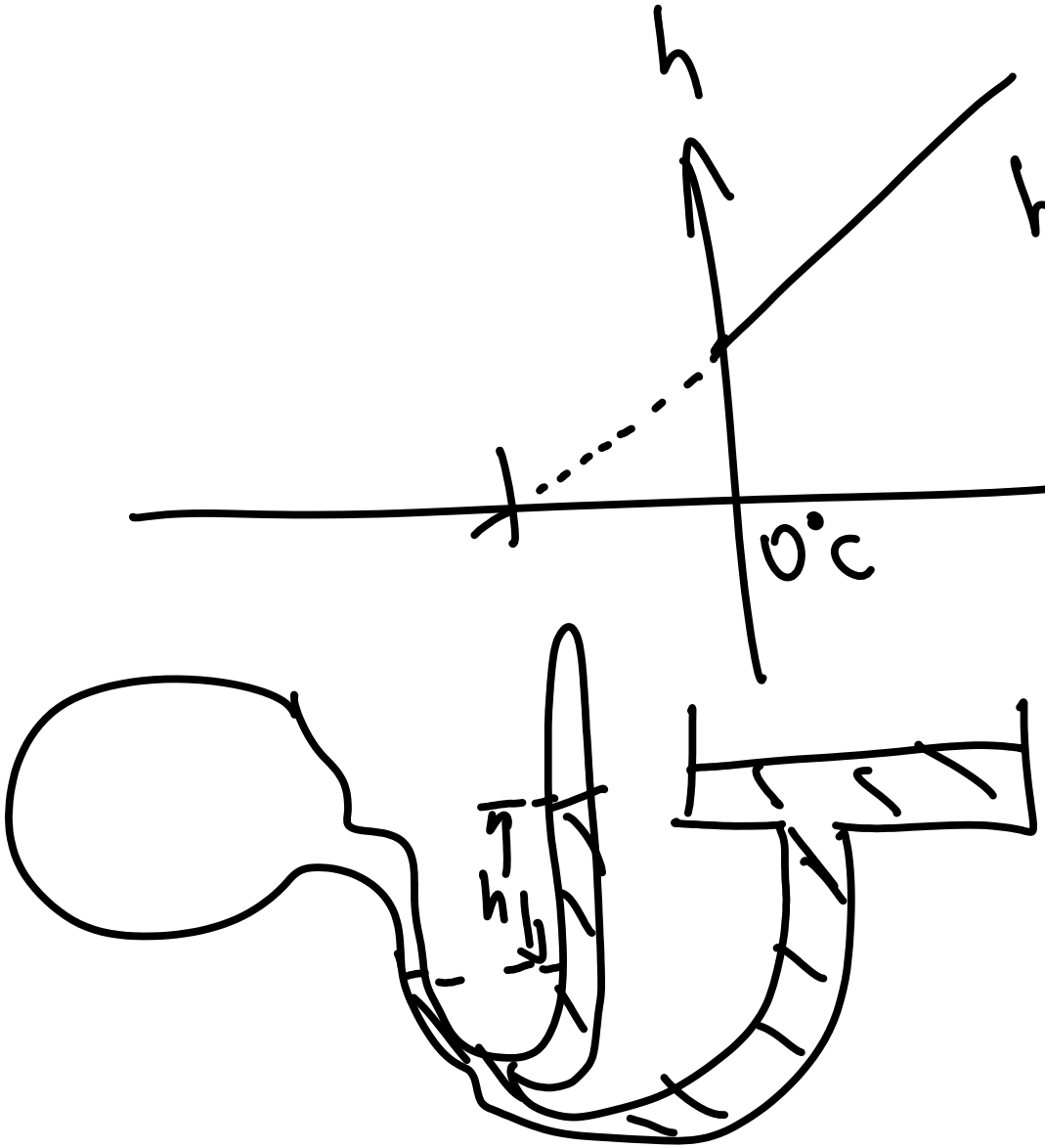
$$\Delta h \propto \Delta T$$

$$\frac{C}{100} = \frac{F-32}{180} = \frac{E-13}{99}$$

Ideal Gas

$$\frac{PV}{n} = \text{constant at constant } T$$





$h = \text{const}\,[T(^\circ\text{C}) + 273.15^\circ\text{C}]$

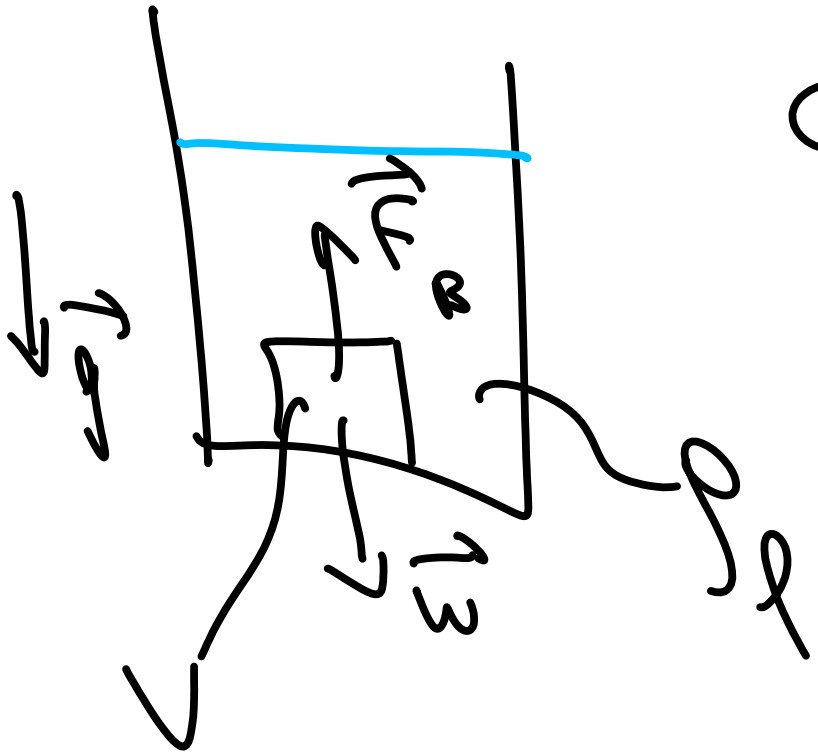
$T(\text{K}) \Leftrightarrow T(^\circ\text{C}) + 273.15\text{K}$

$0^\circ\text{C} \Leftrightarrow 273.15\text{K}$

$100^\circ\text{C} \Leftrightarrow 373.15\text{K}$

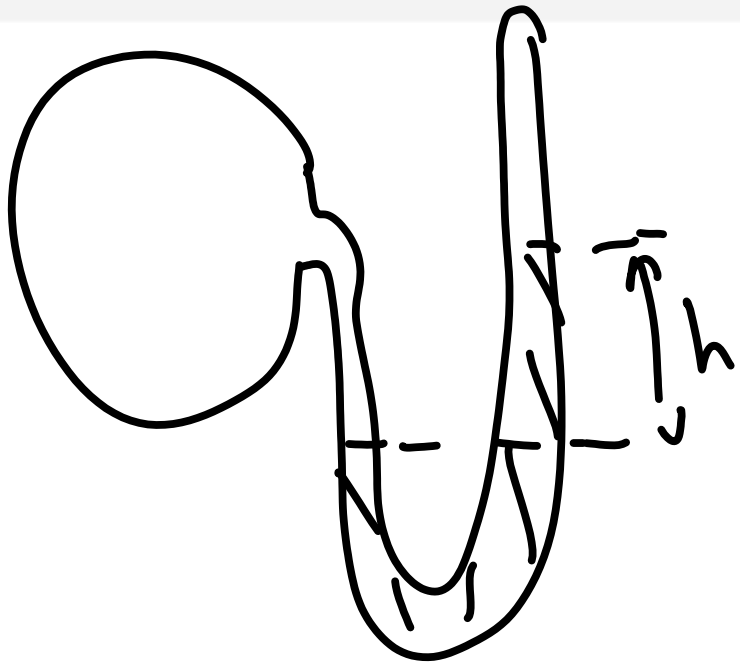
Department of Physics — Fizik Bölümü — 1960

QUIZ 10



$Q: |\vec{F}_B| = ?$

$|\vec{g}| = g$



$h = \text{const}\, T$

$h \propto P$

$\frac{PV}{n} = \text{const}\, T$

$\Rightarrow \frac{PV}{nT} = R$

$PV = nRT$

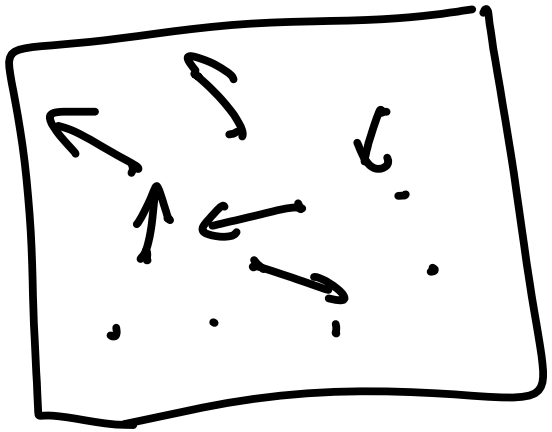
Department of Physics Fizik Bölümü 1960

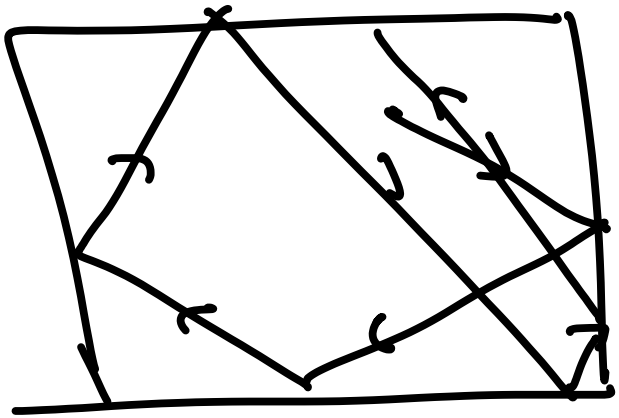
$$PV = nRT \qquad n = \frac{N}{N_A}$$

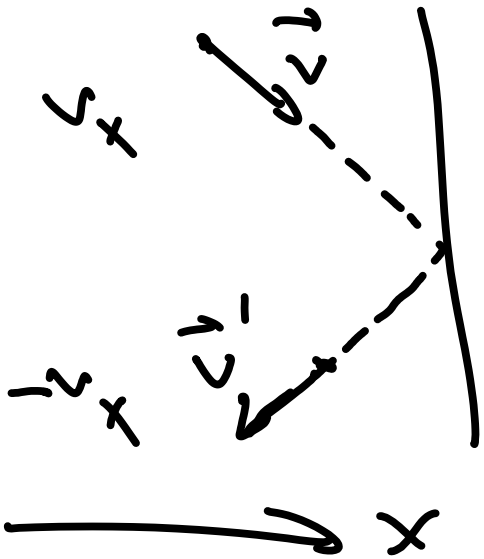
$$N_A = 6.02 \times 10^{23}$$

$$PV = N\left(\frac{R}{N_A}\right)T \equiv N k_B T$$

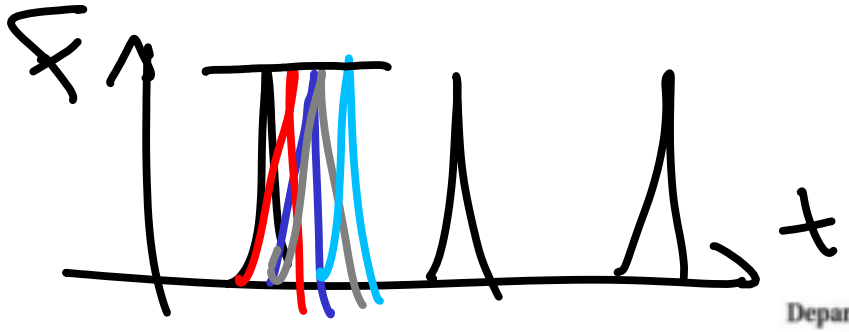
k_B: Boltzman's Constant







$$|\Delta\vec{p}| = m\,2v_x$$

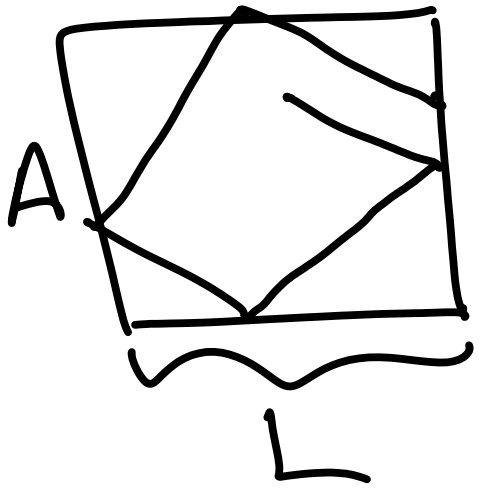


Department of Physics — Fizik Bölümü — 1960

$\langle F \rangle$: average of F

$\langle F_T \rangle = N \langle F_1 \rangle$

$F_1 = \frac{\Delta p}{\Delta t} = \frac{m\, 2v_x}{\frac{2L}{v_x}}$

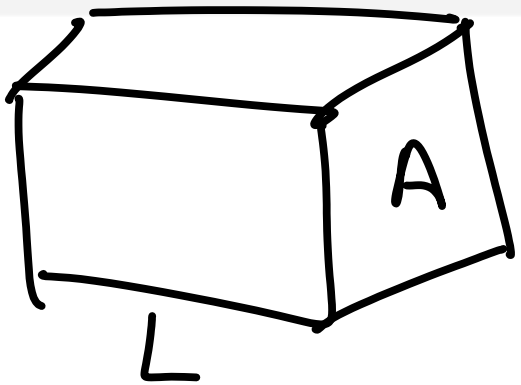


$\Delta t = \frac{2L}{v_x}$

$F_1 = \frac{m v_x^2}{L}$

$\langle F_T \rangle = N \frac{m v_x^2}{L}$

$$\langle F_T \rangle = N m v_x^2 / L$$



$$P = \frac{F}{A} = \frac{N m v_x^2}{AL} = V$$

$$\boxed{PV = N m \overline{v_x^2}}$$

$$PV = N k_B T$$

$$\overline{v_x^2} = \overline{v_y^2} = \overline{v_z^2} = \frac{\overline{v^2}}{3}$$

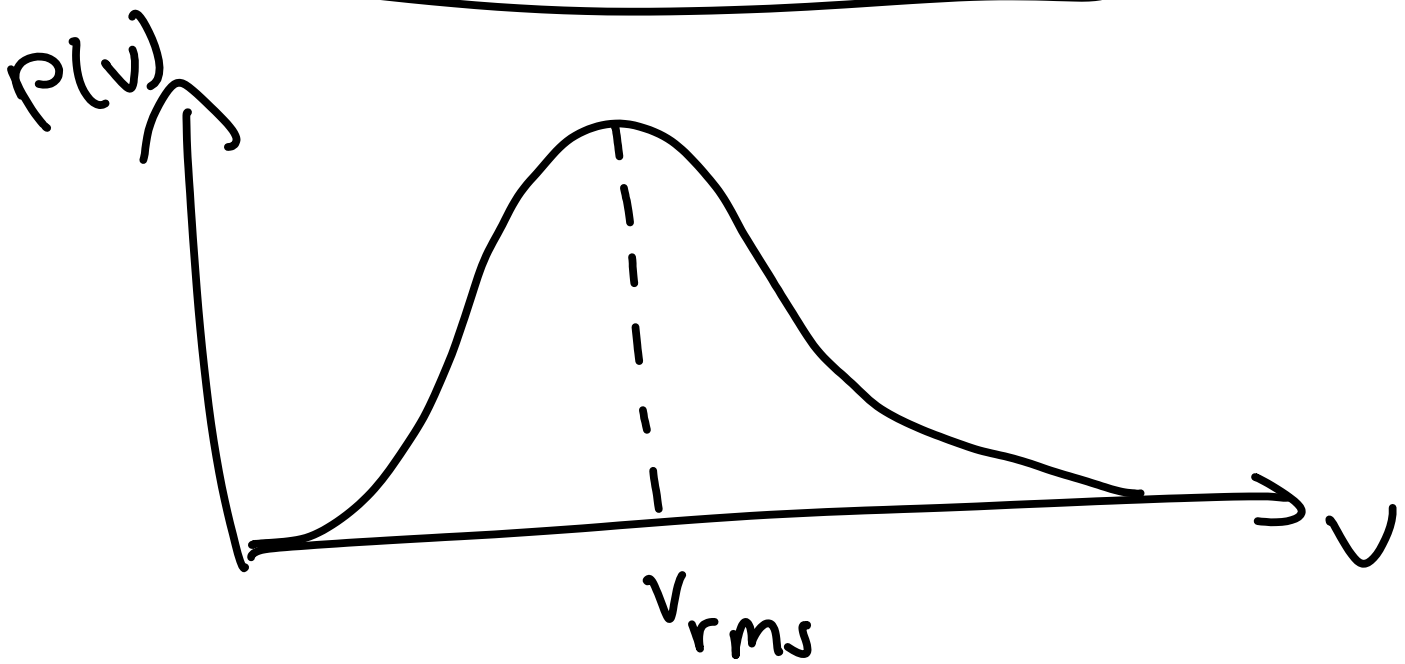
$$PV = N\left(\frac{1}{2} m \overline{v^2}\right)\frac{2}{3}$$

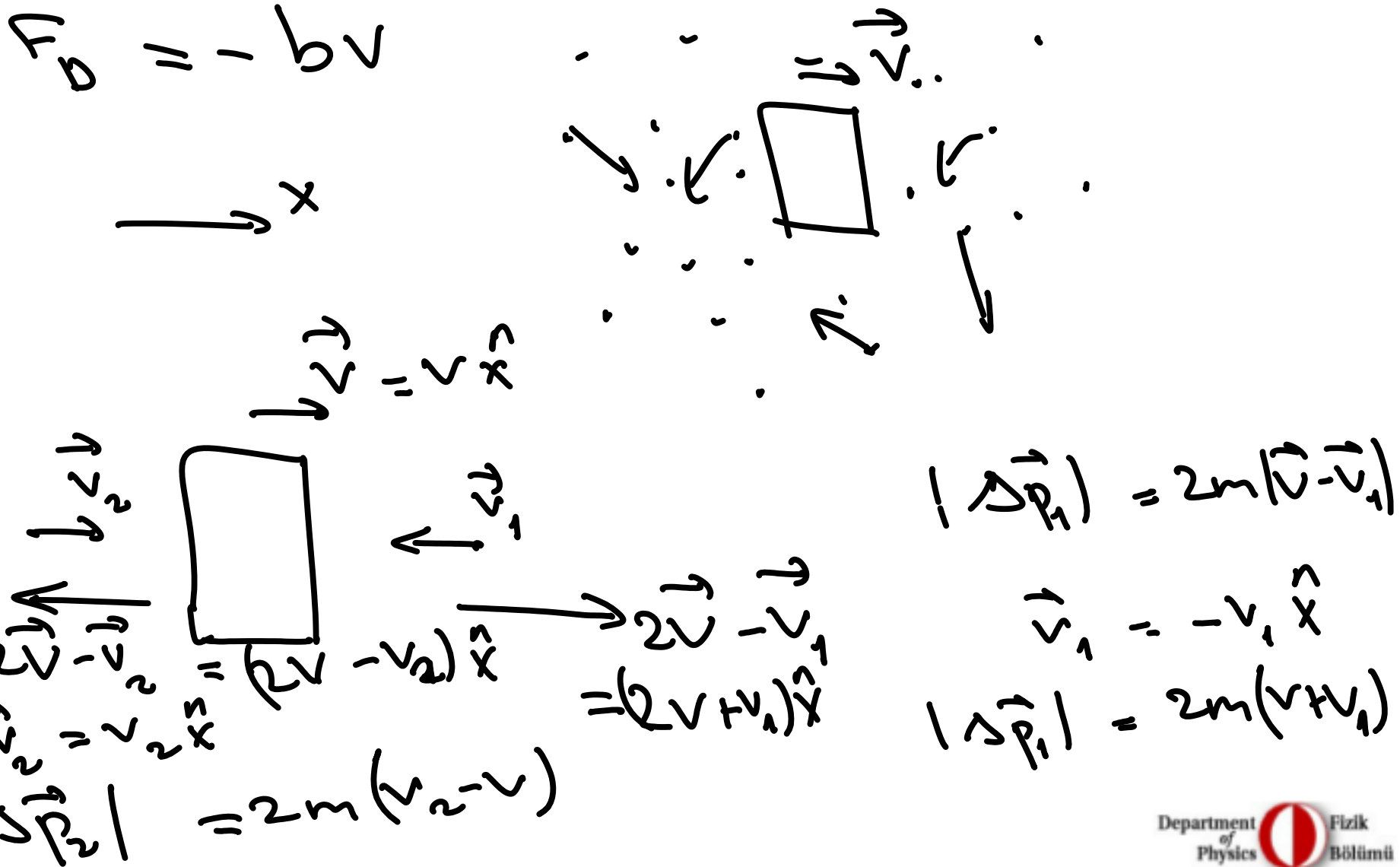
Department of Physics — Fizik Bölümü — 1960

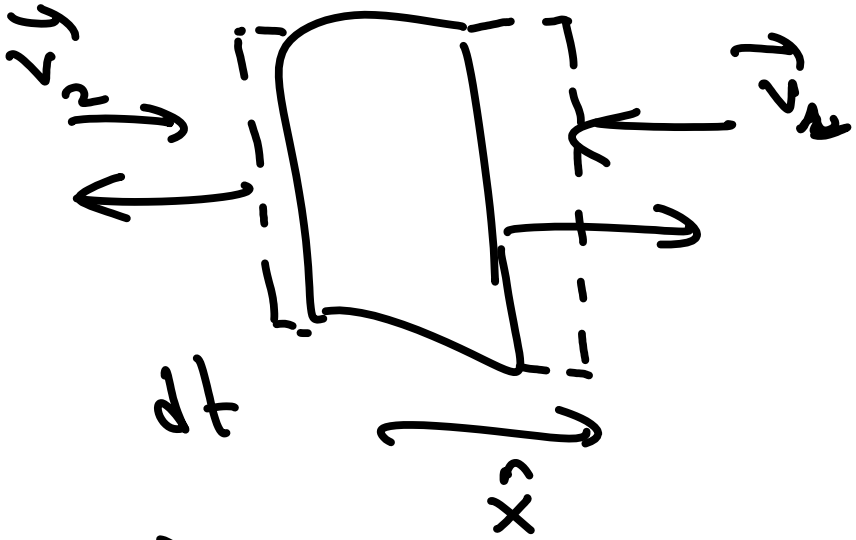
$$PV = N\left(\frac{1}{2}m\overline{v^2}\right)\frac{2}{3} \equiv N k_B T$$

$$\left\langle \frac{1}{2}mv^2 \right\rangle = \frac{3}{2}k_B T$$

$$v_{rms} \equiv \sqrt{\overline{v^2}}$$




$F_D = -bv$
x
$\vec{v} = v\hat{x}$
$\vec{v}_2 = v_2\hat{x}$
$\vec{v}_1$
$2\vec{v} - \vec{v}_2 = (2v - v_2)\hat{x}$
$2\vec{v} - \vec{v}_1 = (2v + v_1)\hat{x}$
$|\Delta\vec{p}_2| = 2m(v_2 - v)$
$|\Delta\vec{p}_1| = 2m(v - v_1)$
$\vec{v}_1 = -v_1\hat{x}$
$|\Delta\vec{p}_1| = 2m(v + v_1)$



$|\vec{v}_1| = |\vec{v}_2|$

$$\Delta\vec{p}_1 = -2m(v+v_1)\hat{x}$$

$$\Delta\vec{p}_2 = +2m(v_2-v)\hat{x}$$

$$\Delta\vec{p}_1+\Delta\vec{p}_2 = 2m(v_2-v)\hat{x} - 2m(v_1+v)\hat{x}$$

$$\Delta\vec{p}_1+\Delta\vec{p}_2 = -4mv\hat{x}$$

$$\Rightarrow \vec{F}_p \propto -\vec{v}$$

Quiz Bonus 1

$\vec{A} = 3\hat{x} + 4\hat{y}$

$\vec{B} = 2\hat{z}$

i) $\vec{A} \cdot \vec{B} = ?$

ii) $\vec{A} + \vec{B} = ?$

Use one FULL page for the Quiz

Department of Physics Fizik Bölümü 1960