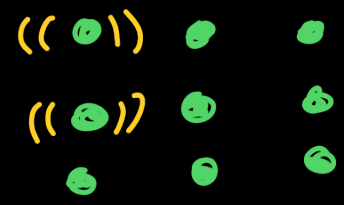
Homework 20

N1.

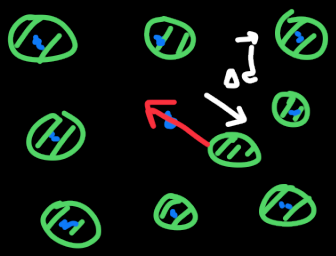
Melting: molecules are bound to a spot



$\Delta KE \simeq 0$

crystal

Why are they bound?



small displacement: $\Delta\vec{d}$

$\rightarrow$ force $\vec{F}_{EM}$

$$\boxed{W_{EM} = -F_{EM} \cdot \Delta d}$$

$$W_{EM} = -\Delta E_{pot}$$ ← same for EM here

$$\Delta E_{pot} = \Delta PE_{int} = +F_{EM} \cdot \Delta d$$

$$\Downarrow$$

$$\Delta PE_{int} > 0$$

N3

$t_w = 10°C$

$m_w = 1kg$

$t_f = 0°C$

$m = ?$

$$\Delta E_w = m_w c \cdot \Delta t$$

$$\boxed{\Delta t = -10°C}$$

$$\Delta E_{melt} = \lambda \cdot m$$

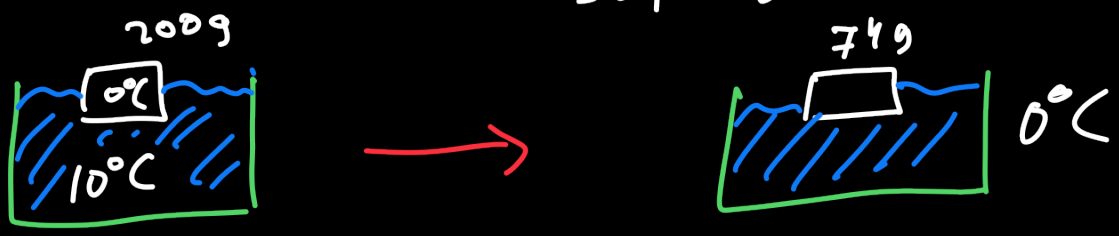
$$\Delta E_w + \Delta E_{melt} = 0$$

$$\Rightarrow \quad \lambda \cdot m = - m_w c \cdot \Delta t$$

$$m = - m_w \cdot \frac{c \cdot \Delta t}{\lambda}$$

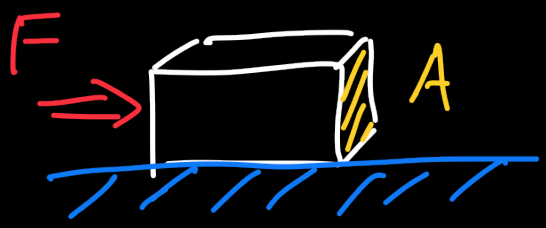
$$m = 1kg \cdot \frac{4200 \frac{J}{kg \cdot °C}}{334 \cdot 10^3 \frac{J}{kg}} \cdot 10°C$$

$$\Rightarrow \quad m = \frac{42}{334} kg \simeq 125g$$



Classwork

Pressure



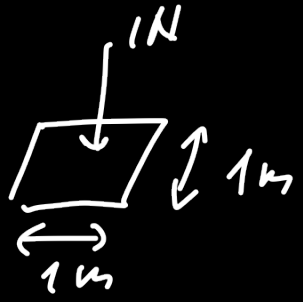
$$P = \frac{F}{A}$$

When pressure is important?

- submarines
- walking on sand or snow

Pressure: (Pascals)

$$1\ Pa = 1\ \frac{N}{m^2}$$



Ex. 1. $m = 60\ kg$

$A = 30cm \times 10cm.$

$$p = \frac{F}{2 \cdot A} = \frac{mg}{2A}$$

$$\Rightarrow p = \frac{60 \cdot 10\ N}{600\ cm^2} = 1\ \frac{N}{cm^2}$$

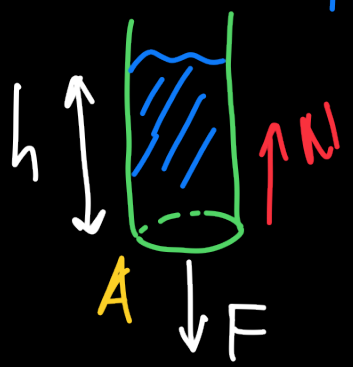
$$cm = 10^{-2}\ m \Rightarrow (cm)^2 = 10^{-2} \cdot 10^{-2}\ m^2 = 10^{-4}\ m^2$$

$$p = 1\ \frac{N}{10^{-4}\ m^2} = 10{,}000\ Pa = 10\ kPa$$

Pressure in liquids and gases

fluids (liquids and gases)

liquid. ρ, h, A



$F = m_w \cdot g$

$m_w = \rho \cdot V =$

$= \rho \cdot A \cdot h$

$F = \rho \cdot A \cdot h \cdot g$

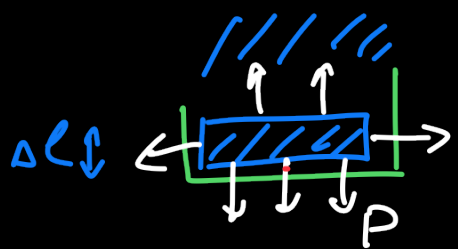
$p \cdot A = N = F = \rho A g h$

at the bottom: $\boxed{p = \rho \cdot g \cdot h}$

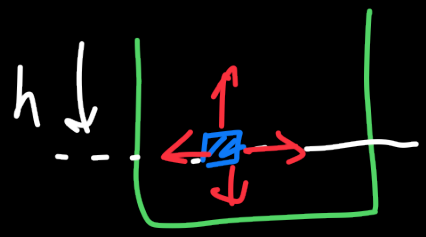
Pressure is independent of cross-sectional area A:

$$p = \rho \cdot g \cdot h$$

ρ density, h depth.

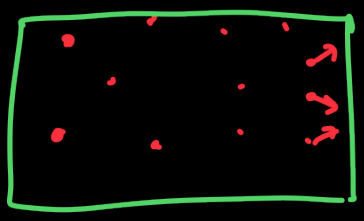


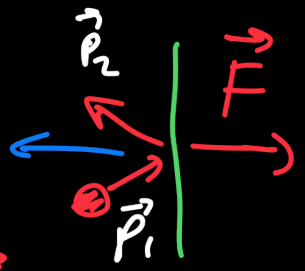
Gases and liquids press in all directions equally (at a given point)



$p = \rho \cdot g \cdot h$

Gas:





$$F = p \cdot A_1$$

$\Delta \vec{p} \neq 0$

$\Downarrow$

$\vec{F} \neq 0$