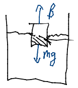
$B = \rho_{fluid} V_{displaced}\, g \uparrow$

submerged object $V_{displaced} = V_{object}$

floating



$V_{displaced}$

$mg = \rho_{obj} V_{obj}\, g$

$B = \rho_{fluid} V_{disp.}\, g$

At equilibrium, $mg = B$

$\rho_{obj} V_{obj} = \rho_{fluid} V_{disp.}$

$V_{disp.} = V_{obj.} \dfrac{\rho_{obj}}{\rho_{fluid}}$ < 1

if fluid is water, this ratio is "specific gravity"

e.g. ice in water

$\rho_{ice} = 920\ \mathrm{kg/m^3}$ $\rho_{water} = 1000\ \frac{kg}{m^3}$

$V_{underwater}$ $V_{displaced} = V_{obj} \dfrac{920}{1000} = 92\%\, V_{obj}$

92% of ice is underwater

ρ_{object} is average density of ~~"under water" part of~~ object

boat

ρ_{boat} is average of ρ of its material + ρ of air inside

When ice melts, does water level

A) rise B) stay same C) fall

$V_{reading}$

initial $V_{reading} = V_{\substack{initial\\water}} + V_{displaced}$

$V_{disp} = V_{ice} \dfrac{\rho_{ice}}{\rho_{water}} = \dfrac{m_{ice}}{\rho_{water}}$

$V_r = V_i + \dfrac{m_{ice}}{\rho_{water}}$

final $V_{reading} = V_{\substack{initial\\water}} + V_{melt}$

$= V_i + \dfrac{m_{melt}}{\rho_{water}}$

$m_{ice} = m_{melt}$

$= V_i + \dfrac{m_{ice}}{\rho_{water}}$

$\therefore$ $\boxed{\text{water level stays the same}}$

Fluids in Motion

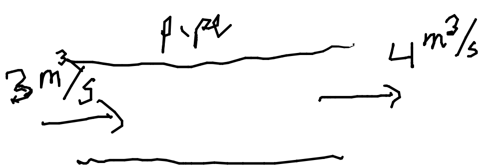
laminar flow turbulent flow

smooth, steady motion

chaotic messy <u>hard</u>

Flux (liquids)

phi $\rightarrow$ $\Phi = \dfrac{\text{volume}}{\text{second}}$ flowing through a pipe, etc.



if fluid is incompressible this won't last long — where is extra water coming from?

flux into a pipe = flux out of the pipe