Equations and Conversion Factors for Chapters 10 & 11

Note: the curvy volume symbol in the book is not in a standard font; below, V = velocity and $\mathcal{V}$ = volume.

$$W = m\,g$$

$$A_{circle} = \frac{\pi}{4} d^2$$

$$\mathcal{V}_{\text{sphere}} = \frac{\pi d^3}{6}$$

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

$$F_{film} = \frac{\mu A V}{l}$$

$$\Delta P_{droplet} = \frac{2\sigma_s}{R}$$

$$\Delta P_{soap\,bubble} = \frac{4\sigma_s}{R}$$

$$h = \frac{2\sigma_s}{\rho g R}\cos\phi$$

$$F_R = P_{avg} A$$

$$P = \rho g h$$

$$F_B = \rho_{fluid} g \mathcal{V}$$

$$y_P = y_C + \frac{I_{xx,c}}{\left(y_C + \frac{P_0}{\rho g \sin\theta}\right) A}$$

Ignoring P_0:

$$y_P = y_C + \frac{I_{xx,c}}{y_C A}$$

Rectangle:

$$I_{xx,c} = \frac{b h^3}{12}$$

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

$$\text{N} = \frac{\text{kg m}}{\text{s}^2}$$

$$\text{W} = \frac{\text{N m}}{\text{s}}$$

$$\text{J} = \text{N m}$$

$$^\circ\text{C} + 273 = \text{K}$$

$$\rho_{water} = 1000 \frac{\text{kg}}{\text{m}^3}$$

$$g = 9.81 \frac{\text{m}}{\text{s}^2}$$

$$P_0 = 1\,\text{atm} = 101\,\text{kPa}$$

Metric prefixes

n	=	nano-	=	10^{-9}	k	=	kilo-	=	10^{3}
μ	=	micro-	=	10^{-6}	M	=	mega-	=	10^{6}
m	=	milli-	=	10^{-3}	G	=	giga-	=	10^{9}
c	=	centi-	=	10^{-2}	T	=	tera-	=	10^{12}

Types of Problems

- General knowledge: types of flow, cavitation, boundary layer, why concrete canoes float, why it's hard to clap your hands underwater, etc.
- Static pressure & resultant force on a submerged flat or curved surface. Location of resultant force.
- Capillary tube
- Buoyancy
- Surface tension on a droplet or bubble
- Block on a ramp, with or without oil