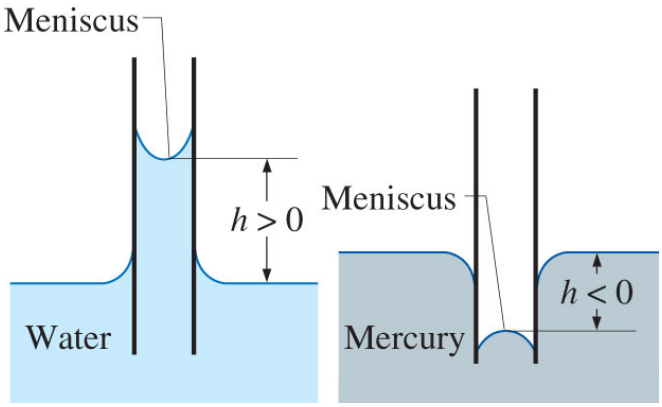
Today, we will:

- Continue discussion about capillary action (Chapter 2)
- Begin Chapter 3 – Pressure and Fluid Statics
- Discuss different kinds of pressure measurement (absolute, gage, vacuum)
- Derive the equation of fluid statics (hydrostatic pressure relation)

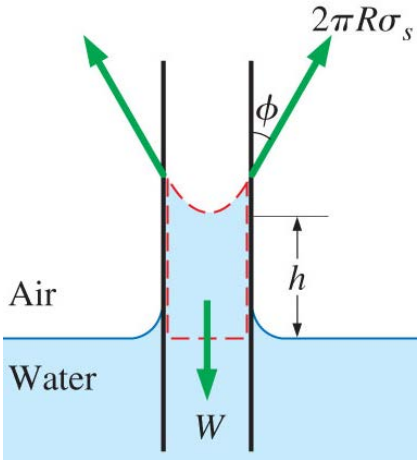
3. Other (miscellaneous) properties (continued)

d. surface tension, σ_s (continued)

The combined effects of surface tension and contact angle lead to ***capillary action*** – the rise (or fall) of liquids in small-diameter capillary tubes, as illustrated here:

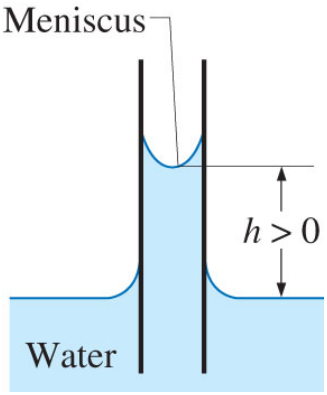


We can predict the rise height h as a function of contact angle and surface tension, along with other parameters like inner tube diameter, liquid density, and gravitational constant:



Example: Prediction of capillary rise in a tube

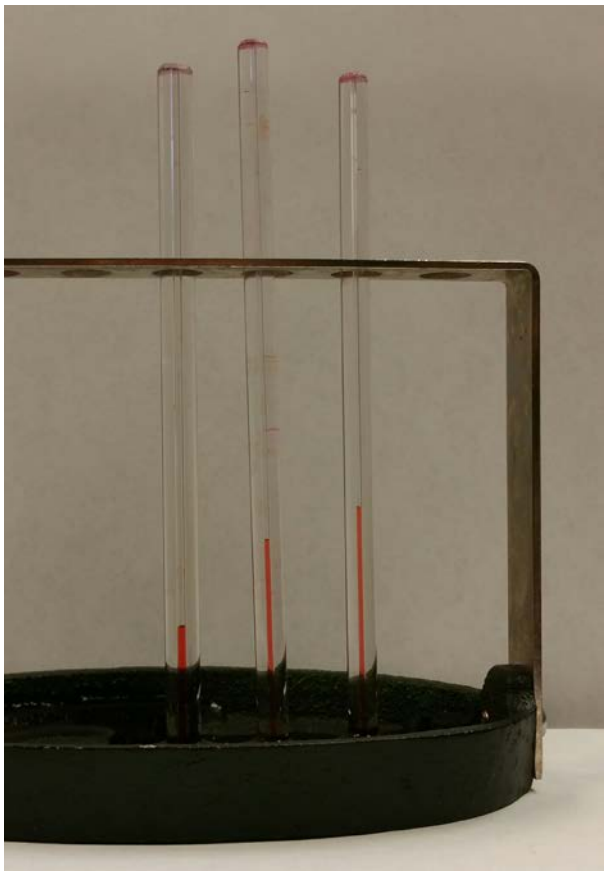
Given: A glass capillary tube of inner diameter 1.3 mm is pushed vertically into a cup of water. The contact angle between glass and water is nearly 0^o. The surface tension of the water is 0.073 N/m.



The equation for capillary rise is $h = \frac{4\sigma_s}{\rho g D}\cos\phi$.

To do: Calculate capillary rise h in units of cm.

Solution: Note that ρ_{water} = 1000 kg/m^3 and g = 9.807 m/s^2.



II. PRESSURE AND FLUID STATICS (Chapter 3)

A. Pressure, *P*

1. Some basics

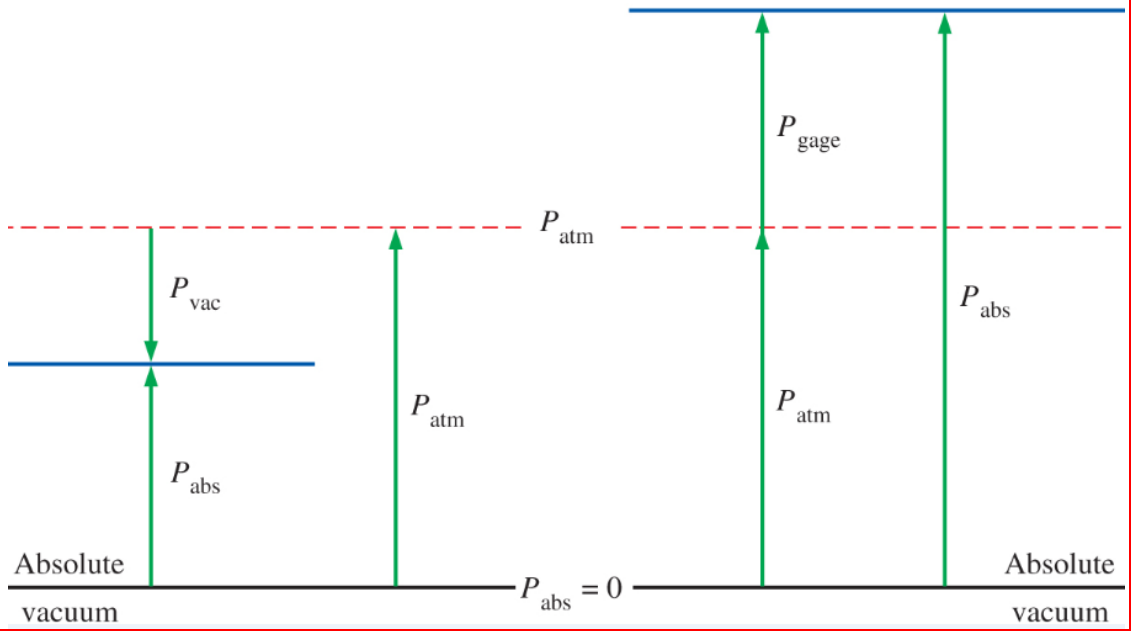
2. Dimensions and units

B. Types of Pressure Measurement

1. Absolute pressure

2. Gage pressure

3. Vacuum pressure



C. Equation of Fluid Statics

Consider a small fluid element of dimensions *dx*, *dy*, and *dz* as sketched here.