ME 223

FLUID MECHANICS & MACHINERY

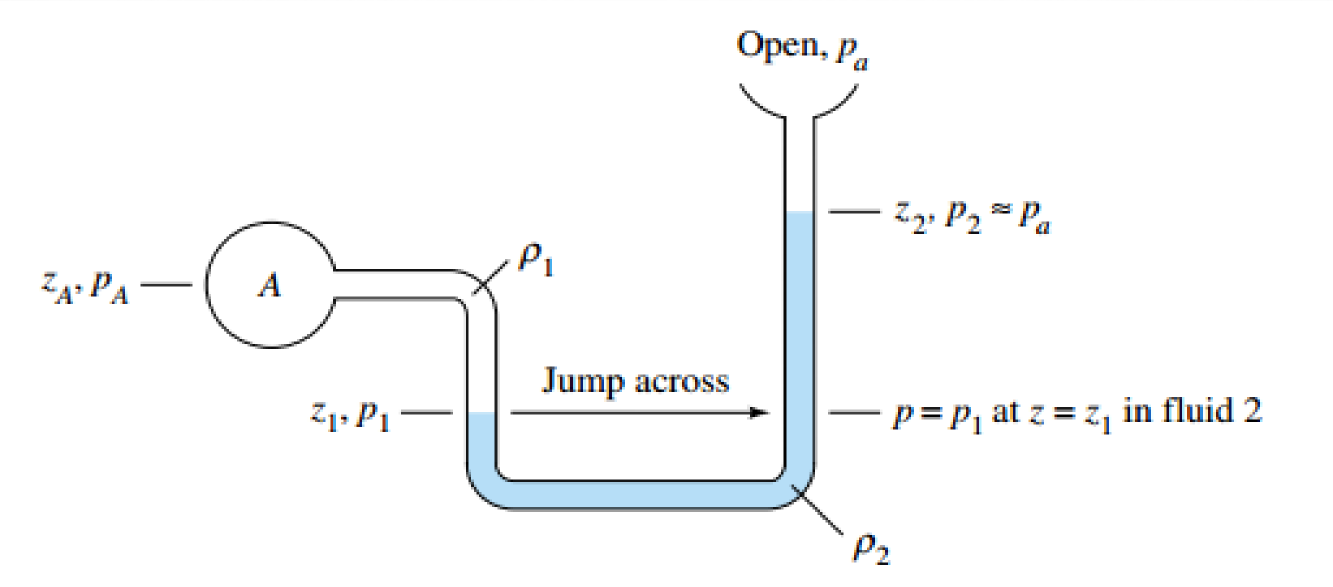
MANOMETRY

Lecture 2

MD. Rakib Hossain
Lecturer
Department of Mechanical Engineering, BUET.

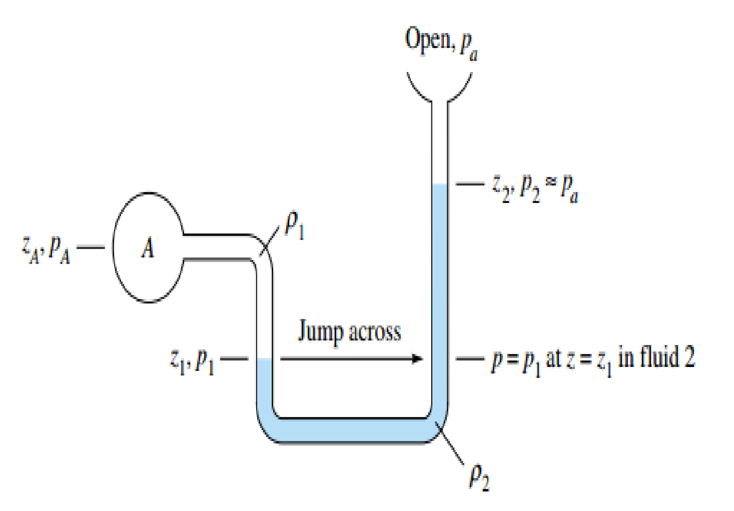
Manometers

Manometers are instruments that use columns of liquids to measure pressures.



Simple open manometer for measuring p_A relative to atmospheric pressure.

The manometric fluid (ρ_2) is chosen different from the chamber fluid (ρ_1) to isolate the chamber fluid from the environment and to suitably scale the length of the open tube.



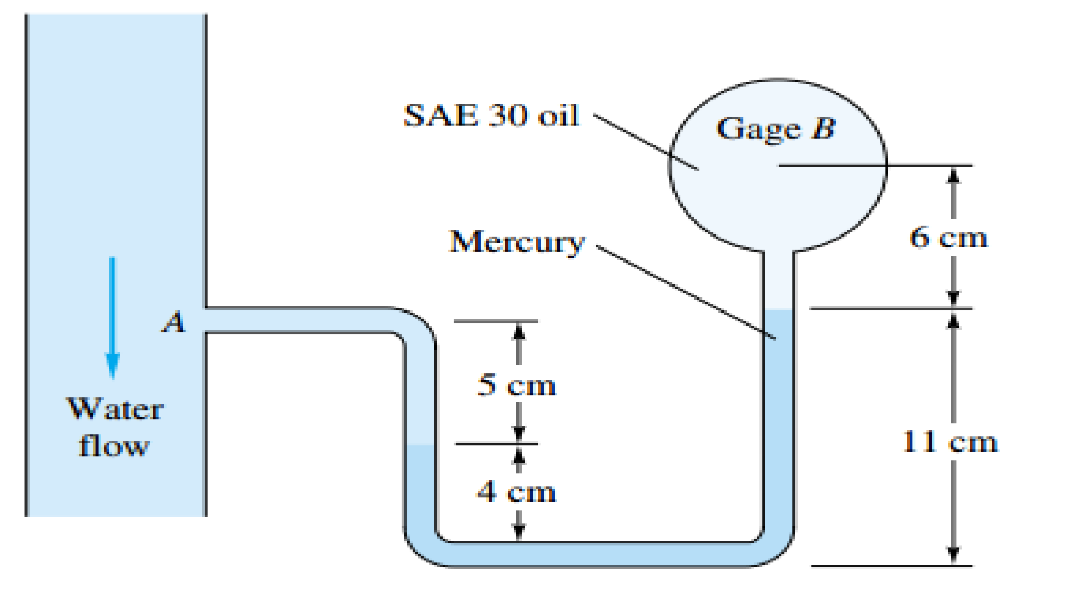
Here, one can begin at A, apply the basic hydrostatic formula "down" to z_1, jump across fluid 2 to the same pressure p_1, and then use the basic hydrostatic formula "up" to level z_2.

The physical reason that we can "jump across" at section I is that a continuous length of the same fluid connects these two equal elevations.

Any two points at the same elevation in a continuous mass of the same static fluid will be at the same pressure.

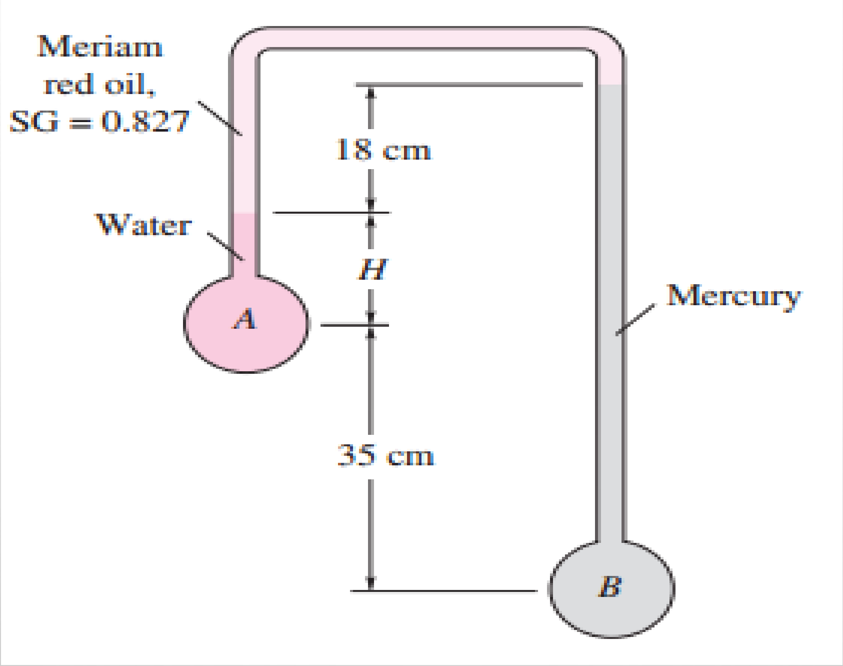
Problem 1:

Pressure gage B is to measure the pressure at point A in a water flow. If the pressure at B is 87 kPa, estimate the pressure at A, in kPa. Assume all fluids are at 20°C. See Fig. Given, $\gamma_{H_2O} = 9790\frac{N}{m^3}$, $\gamma_{Hg} = 133100\frac{N}{m^3}$, $\gamma_{oil} = 8720\frac{N}{m^3}$.



Problem 2:

For the inverted manometer of Fig. below, all fluids are at 20℃. If $p_B - p_A = 97\ Kpa$, what must the height H be in cm? Given, $\gamma_{H_2O} = 9790 \frac{N}{m^3}$, $\gamma_{Hg} = 133100 \frac{N}{m^3}$, $\gamma_{oil} = 8096 \frac{N}{m^3}$.



Problem 3:

In Fig. determine the gage pressure at point A in Pa. Is it higher or lower than atmospheric?