$$P_{bottom} = 0.97(bar) + \left\{ \frac{(60kg)(9.8\ m/s^2)}{0.04\ m^2} + (1558\ kg/m^3)(9.8\ m/s^2)(1.8\ m) \right\}$$

$$\left[\left(\frac{1N/m^2}{1kg/m.s^2} \right) \left(\frac{1bar}{10^5\ N/m^2} \right) \right] = 1.3918 \quad bars$$

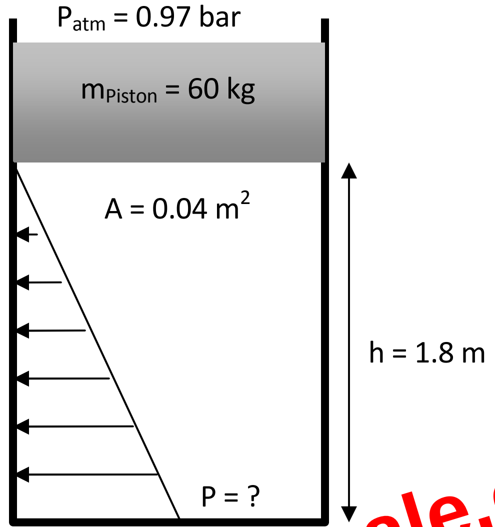

Fig. 12: Sketch for example 2.

Temperature

Temperature is a pointer for the direction of energy transfer as heat.

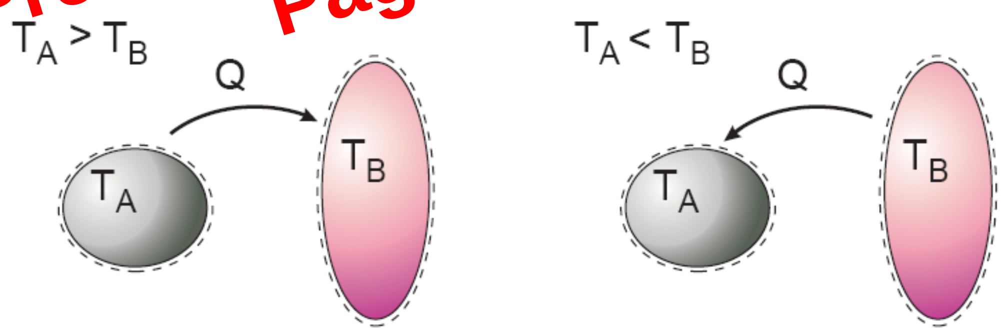

Fig. 13: Heat transfer occurs in the direction of higher-to-lower-temperature.

When the temperatures of two bodies are the same, *thermal equilibrium* is reached. The equality of temperature is the only requirement for thermal equilibrium.

<u>The 0th law of thermodynamics</u>: states that if two bodies are in thermal equilibrium with a third body, they are also in thermal equilibrium with each other.

The 0th law makes a thermometer possible.

In accordance with the 0th law, any system that possesses an equation of state that relates temperature T to other accurately measurable properties can be used as a thermometer e.g. an ideal gas obeys the equation of state:

$$T = \frac{PV}{mR}$$

Experimentally obtained Temperature Scales: the *Celsius* and *Fahrenheit* scales, are based on the melting and boiling points of water. They are also called two-point scales.

Conventional thermometry depends on material properties e.g. mercury expands with temperature in a repeatable and predictable way

Thermodynamic Temperature Scales (independent of the material), the Kelvin and Rankine scales, are determined using a constant volume gas thermometer.