

2. We take p_3 to be 80 kPa for both thermometers. According to Fig. 18-6, the nitrogen thermometer gives 373.35 K for the boiling point of water. Use Eq. 18-5 to compute the pressure:

$$p_N = \frac{T}{273.16 \text{ K}} p_3 = \left(\frac{373.35 \text{ K}}{273.16 \text{ K}} \right) (80 \text{ kPa}) = 109.343 \text{ kPa}.$$

The hydrogen thermometer gives 373.16 K for the boiling point of water and

$$p_H = \left(\frac{373.16 \text{ K}}{273.16 \text{ K}} \right) (80 \text{ kPa}) = 109.287 \text{ kPa}.$$

(a) The difference is $p_N - p_H = 0.056 \text{ kPa} \approx 0.06 \text{ kPa}$.

(b) The pressure in the nitrogen thermometer is higher than the pressure in the hydrogen thermometer.