

6) Hydrogen balloon at Earth's surface:

$$V_1 = 5.0 \text{ m}^3, T_1 = 27^\circ\text{C} = 300 \text{ K}, P_1 = 1.00 \times 10^5 \text{ Pa}$$

Balloon rises to altitude of 40.0 km

$$V_2 = ? \quad T_2 = -13.0^\circ\text{C} = 260 \text{ K}, P_2 = 0.33 \times 10^3 \text{ Pa}$$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \quad V_2 = \frac{P_1}{P_2} \frac{T_2}{T_1} V_1 = \frac{1.00 \times 10^5 \text{ Pa}}{0.33 \times 10^3 \text{ Pa}} \times \frac{260 \text{ K}}{300 \text{ K}} \times 5.0 \text{ m}^3$$
$$= 1.3 \times 10^3 \text{ m}^3 \quad \textcircled{A}$$