● **7.** *1. Conversion of the temperature into kelvin:*

$T_1 = 125°C + 273 = 398\ K$

$T_2 = 25°C + 273 = 298\ K$

2. Calculation of the volume:

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$V_2 = \frac{V_1 T_2}{T_1}$$

$$= \frac{500\ dm^3 \cdot 298\ \cancel{K}}{398\ \cancel{K}}$$

$$= 374.37\ dm^3$$

Answer: The hydrogen (H_2) will occupy a volun of 374 dm^2.

● **9.** *1. Conversion of the temperature into kelvin:*

$T = 98°C + 273 = 371\ K$

2. Calculation of the volume:

$$PV = \frac{mRT}{M}$$

$$V = \frac{mRT}{MP}$$

$$= \frac{1.0\ g \cdot 8.31\ (\cancel{kPa} \cdot L)/(\cancel{mol} \cdot \cancel{K}) \cdot 371\ \cancel{K}}{18.015\ g/\cancel{mol} \cdot 103\ \cancel{kPa}}$$

$$= 1.6615\ L$$

Answer: 1.7 L of water vapour will form in the cake.

● **10.** *1. Conversion of the temperature into kelvin:*

$T = 35°C + 273 = 308\ K$

2. Calculation of the volume:

$$PV = nRT$$

$$V = \frac{nRT}{P}$$

$$= \frac{26.5\ mol \cdot 8.31\ (kPa \cdot L)/(mol \cdot K) \cdot 308\ K}{400\ kPa}$$

$$= 169.57\ L$$

Answer: The volume of chlorine (Cl_2) is 170 L.

● **13.** *a)* $T = 45°C + 273 = 318\ K$

b) $T = 67°C + 273 = 340\ K$

c) $T = 350°C + 273 = 623\ K$

● **14.** *a)* $T = 473\ K - 273 = 200°C$

b) $T = 108\ K - 273 = -165°C$

c) $T = 225\ K - 273 = -48°C$

● **22.** *1. Conversion of the temperature into kelvin:*

$T_1 = 20°C + 273 = 293\ K$

2. Calculation of the temperature:

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$T_2 = \frac{V_2 T_1}{V_1}$$

$$= \frac{30\ \cancel{L} \cdot 293\ K}{10\ \cancel{L}} = 879\ K$$

3. Conversion of the temperature into degrees Celsius:

$T_2 = 879\ K - 273 = 606°C$

Answer: The final temperature is 606°C.

● **25.** *1. Conversion of the temperature into kelvin:*

$T_1 = 205°C + 273 = 478\ K$

$T_2 = 25°C + 273 = 298\ K$

2. Calculation of the pressure:

$$\frac{P_1 V_1}{n_1 T_1} = \frac{P_2 V_2}{n_2 T_2}$$

Since $n_1 = n_2$: $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$P_2 = \frac{P_1 V_1}{T_1} \cdot \frac{T_2}{V_2}$$

$$= \frac{350\ kPa \cdot 5.0\ \cancel{L}}{478\ \cancel{K}} \cdot \frac{298\ \cancel{K}}{1.7\ \cancel{L}} = 641.77\ kPa$$

Answer: A pressure of 6.4×10^2 kPa must be exerted.

● **31.** *1. Conversion of the temperature into kelvin:*

$T = 20°C + 273 = 293\ K$

2. Calculation of the pressure:

$$PV = \frac{mRT}{M}$$

$$P = \frac{mRT}{MV}$$

$$= \frac{25\ \cancel{g} \cdot 8.31\ (kPa \cdot \cancel{L})/(\cancel{mol} \cdot \cancel{K}) \cdot 293\ \cancel{K}}{31.998\ \cancel{g}/\cancel{mol} \cdot 2.0\ \cancel{L}}$$

$$= 951.16\ kPa$$

Answer: The pressure of the oxygen (O_2) is 9.5×10^2 kPa.

● **33.** *1. Conversion of the temperature into kelvin:*

$T_1 = 8°C + 273 = 281\ K$

$T_2 = 24°C + 273 = 297\ K$

2. Calculation of the volume:

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

$$V_2 = \frac{P_1V_1}{T_1} \cdot \frac{T_2}{P_2}$$

$$= \frac{4\ \cancel{atm} \cdot 5.0\ mL}{281\ \cancel{K}} \cdot \frac{297\ \cancel{K}}{1\ \cancel{atm}} = 21.1\ mL$$

Answer: The volume of the bubble will be 21 mL.

● **36.** *1. Conversion of the pressure to kPa:*

$$\frac{101.3\ kPa}{760\ mm\ Hg} = \frac{?}{755\ mm\ Hg}$$

$$? = \frac{101.3\ kPa \cdot 755\ \cancel{mm\ Hg}}{760\ \cancel{mm\ Hg}} = 100.63\ kPa$$

2. Conversion of the volume to L:

$$\frac{1\ L}{1000\ mL} = \frac{?}{237\ mL}$$

$$? = \frac{1\ L \cdot 237\ \cancel{mL}}{1000\ \cancel{mL}} = 0.237\ L$$

3. Calculation of the molar mass:

$$PV = \frac{mRT}{M}$$

$$M = \frac{mRT}{PV}$$

$$= \frac{0.548\ g \cdot 8.31\ (\cancel{kPa} \cdot \cancel{L})/(mol \cdot \cancel{K}) \cdot 373\ \cancel{K}}{100.63\ \cancel{kPa} \cdot 0.237\ \cancel{L}}$$

$$= 71.222\ g/mol$$

Answer: The molar mass of the gas is 71.2 g/mol.

■ **46.** $P_1V_1 = P_2V_2$

$$P_1 = \frac{P_2V_2}{V_1}$$

$$= \frac{125\ kPa \cdot \frac{V_1}{2}}{V_1} = 62.5\ kPa$$

Answer: The initial pressure inside the cylinder was 62.5 kPa.

■ **50.** *1. Conversion of the temperature into kelvin:*

$T_1 = 20°C + 273 = 293\ K$

$T_2 = 25°C + 273 = 298\ K$

2. Calculation of the volume:

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

$$V_2 = \frac{P_1V_1}{T_1} \cdot \frac{T_2}{P_2}$$

$$= \frac{25\ \cancel{atm} \cdot 100\ L}{293\ \cancel{K}} \cdot \frac{298\ \cancel{K}}{1.05\ \cancel{atm}} = 2421.58\ L$$

Answer: The volume of the balloon is 2.4×10^3 L.