Answer on Question #56047 - Chemistry - General chemistry

Question:

Calculate the final temperature, in degrees Celsius, ∘C, for each of the following with n and V constant.

Part A

A sample of helium gas with a pressure of 250 torr at 0∘C is heated to give a pressure of 2500 torr .

Express your answer to two significant figures and include the appropriate units.

T = ???

Part B

A sample of air at 21 ∘C and 800 mmHg is cooled to give a pressure of 610 mmHg .

Express your answer to two significant figures and include the appropriate units.

T = ???

Solution:

Part A

For the isochoric process, the following ratio is valid:

$$\frac{p_1}{T_1} = \frac{p_2}{T_2}$$

Then, if the initial conditions are 273.15 K (0 °C) and 250 torr, the final conditions will be T2 and 2500 torr.

$$T_2 = \frac{p_2 T_1}{p_1} = \frac{2500 \cdot 273.15}{250} = 2.7 \cdot 10^3 K, or\ 2.5 \cdot 10^3 °C$$

Part B

With the same ratio used for the part A p_2 is 610 mm Hg, T_1 is 294.15 K, p_1 is 800 mm Hg:

$$T_2 = \frac{p_2 T_1}{p_1} = \frac{610 \cdot 294.15}{800} = 2.2\ \cdot 10^2 K, or - 49°C$$

Answer: Part A 2.5*10^3 °C, Part B -49 °C