Answer on Question#38368 - Chemistry - Physical Chemistry

Question:

A 2.0 L gas sample at 20 Calvin degree must be cooled to what temperature for the volume to change to 1.0 L? Show at least two different ways to solve this problem.

Answer:

1) Assume that the pressure in system is constant.

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

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

$$T_2 = \frac{20\ K \cdot 1\ l}{2\ l} = 10\ K = -263\ \text{C}$$

2) The second option requires changes in pressure. There is no data about pressure. Assume that it increases by 4 times.

$$\frac{p_1 V_1}{T_1} = \frac{p_2 V_2}{T_2}$$

$$T_2 = \frac{p_2 V_2 T_1}{p_1 V_1} = \frac{4 \cdot 1 \cdot 20\ K}{2} = 40\ K = -233\ \text{C}$$