Example for Steps to Calculate Gas Law Problems

A balloon has a volume of 2.45L and is at a temperature of 32.5°C. If the temperature was increased to 65.0°C, what is the new volume? Assume pressure and number of moles is constant. (Hint: Charles’ Law problem)

**Step 1 : How many conditions in the problem?**

Usually, if there is an action verb (increasing, heating, compressing, etc), it is an indication of two conditions. Also, read the question and if the balloon is going through some change, there are two conditions.

So, for this problem there are two conditions.

**Step 2 : What (parameters) is being held constant in the problem?**

Pressure and number of moles. (for this example, it says it in the problem)

Usually, if they don’t say anything about losing or gaining mole or particles, then you can assume that number of moles is held constant (n). That is also true when they don’t say anything about the any other parameter.

**Step 3 : Determine the correct math equation?**

1. *Obtain Original Charles’ Law Equation*

 $\frac{V\_{1}}{T\_{1}}= \frac{V\_{2}}{T\_{2}}$

1. *Write parameter at original condition, make ( --- ) and then put in other original condition parameters.*

$V\_{2}= V\_{1}(\frac{}{T\_{1}}) $

1. *Fill in the blank spaces in the (---) with condition 2 (or new condition) parameters to obtain equation to solve for.*

$V\_{2}= V\_{1}(\frac{T\_{2}}{T\_{1}}) $

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**Step 4 : Write down known information(s) and unknown (Convert to appropriate units).**

V1 = 2.45L

T1 = 32.5°C Convert to K, K = 273 + 32.5°C = 305.5K (keep it like this even if breaks sig fig)

T2 = 65.0°C Convert to K, K = 273 + 65.0°C = 338.0K (keep it like this even if breaks sig fig)

V2 = ?

**Remember here, since all Gas laws problems are ratios, you don’t have to change units unless you don’t have same units for each type of parameter. (P1 = ## atm and P2= ##psi, then need to convert one into other.)**

**REMEMBER, TEMPERATURE MUST BE IN K THOUGH (no °C)**

**Step 5 : Plug in known information into Equation to solve for unknown (i.e. P**2**).**

$$P\_{2}= 2.45L(\frac{338.0K }{305.5K})$$

**Step 6 : Do math (as per rules you have been following all year including N+1 )**

P2 = 2.710L

**Step 7 : Get answer in correct units & sig fig and check answer.**

P2 = 2.71L

*Check Answer:* Look at Step 5 equation, you see that the (---) value is greater than one so the final volume of the gas needs to be greater than original. This should make sense since we know if we increase temperature (holding pressure and number of moles constant: Charles’ Law) the volume must increase too, directly proportional.

**IMPORTANT: IF YOU DID NOT CHANGE TEMPERATURE INTO KELVIN, YOUR ANSWER WOULD SIMPLY BE TWICE THE VOLUME OR 4.90L , THAT IS INCORRECT SINCE CORRECT ANSWER IS 2.71L .**