Chemistry 20	Unit 2
Lesson 3 - Charles' Law and Absolute Temperature	84 mins

Comparing Measurements

1) Is 20g twice as heavy as 10g? 2) Is 500L twice as big as 250L? 3) Is 20C twice as hot as 10C?	YES. (scale starts at 0) YES. (scale starts at 0) NO. (Scale does not start at 0)

Absolute Temperature

- Temperature of a Gas when the volume of that gas is 0
- Motion STOPS entirely

The Kelvin

- -273.15 C = 0.00 K

$T_C + 273.15 = T_K$

$T_C = T_K - 273.15$

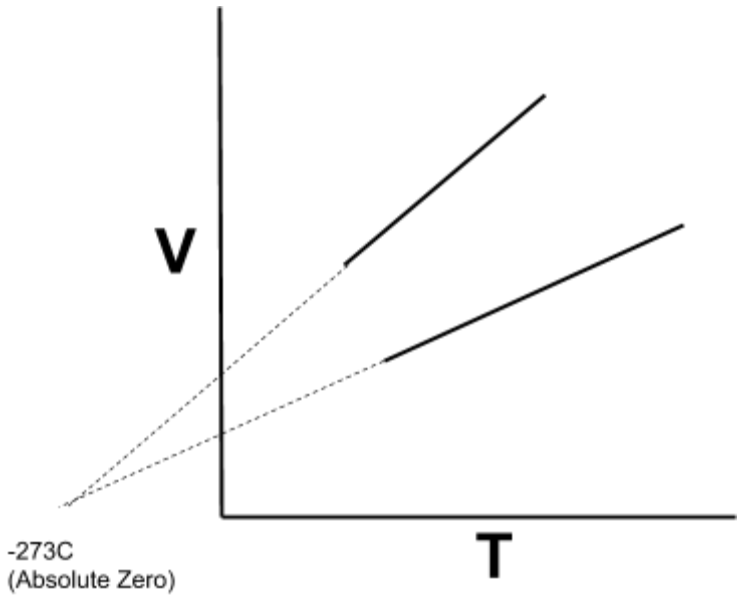
Eg. T_C = -4.0 C T_K = ???

- dsa

$T_K = T_C + 273.15$

= -4.0 + 273.15 = 269.15 K

= 269.2 K (Sig Figs)



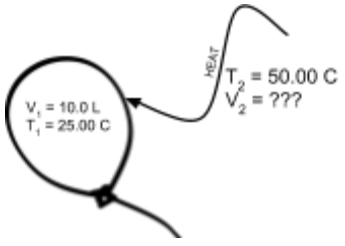
Charles' Law

- At a constant P, V and T of gases are Directly proportional
- As temperature increases, volume increases
- Temperature in K

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

(*Units MUST MATCH)**
(Temperature must be measured in K)

Eg.



$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$
$$V_2 = \frac{V_1}{T_1} \times T_2$$
$$V_2 = \frac{10.0L}{(298.15)} \times (323.15)$$
$$V_2 = 10.8\ L$$

Chemistry 20 - Unit 2 - Absolute Temperature and Charles' Law

Name: _____

Complete all of the following problems to the best of your ability. Ensure that you write legibly and that your name is on this assignment. Show all of your work, including the formulas used and the substitution of numerical values. If you have any questions, please refer to your textbooks and notes. Good luck!

You may find the following formulas useful:

$$T_K = T_{°C} + 273.15$$
$$T_{°C} = T_K - 273.15$$
$$V_1/T_1 = V_2/T_2$$

1. Convert each of the following Celsius temperatures to Kelvin.
   a. 18.65 °C.
   b. 200.18 °C.
   c. 88.96 °C.
   d. -44.23 °C.
   e. -16.98 °C.
   f. -10.0 °C.

2. Convert each of the following Kelvin temperatures to Celsius.
   a. 0.00 K.
   b. 45.0 K.
   c. 32.68 K.
   d. 114.592 K.
   e. 345.678 K.
   f. 890.12 K.

3. In a test of Charles' Law, a gas inside a cylinder with a moveable piston is heated. The initial volume of gas in the cylinder is 0.30 L at 25 °C. What will be the final gas volume (*in mL*) when the temperature is increased to 315 °C?

4. If 15 mL of butane gas at 0 °C is warmed to 25 °C, calculate its final volume *in kL*.

5. A gas sample with a volume of 2.05 L is removed from a refrigerator at 5.0 °C and allowed to warm up to 21.0 °C on a kitchen counter. What volume *in litres* will the gas occupy at 21.0 °C?

6. If 1.5 L of gas in a saucepan is heated from 22.0 °C to 100.0 °C, what is its final volume *in nL*?

7. A balloon containing helium gas at 20.00 °C has a volume of 7.50 L. Calculate the volume of the balloon after it rises 10 km into the upper atmosphere, where the temperature is -36.00 °C. Do you believe this gas volume is accurate? Why or why not?

8. Carbon dioxide produced by yeast in bread dough causes the dough to rise, even before it is baked. During baking, the carbon dioxide gas expands. Predict the final volume of 0.10 L of carbon dioxide in bread dough that is heated from 25 °C to 190 °C at a constant pressure.