

# Boyle's Law, Charles' Law, and the Absolute Temperature Scale -Practice

Name: \_\_\_\_\_

You may find the following formulas useful:

$$P_1 V_1 = P_2 V_2$$

$$V_1/T_1 = V_2/T_2$$

$$T_K = T_{\text{C}} + 273.15$$

$$T_{\text{C}} = T_K - 273.15$$

1. Convert each of the following Celsius temperatures to Kelvin.

a. 27.65 °C.

+273.15 300.80K

b. 190.18 °C.

463.33K

c. 68.96 °C.

342.11K

d. -34.23 °C.

238.92K

e. -17.94 °C.

255.21K

f. -12.05 °C.

261.10K

2. Convert each of the following Kelvin temperatures to Celsius.

a. 0.10 K.

-273.05°C

b. 45.01 K.

-228.14°C

c. 72.68 K.

-200.47°C

d. 154.59 K.

-118.56°C

e. 245.67 K.

-27.48°C

f. 610.12 K.

336.97°C

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 0.630 L at ~~35.00 °C~~. In mL, what will be the final volume when the temperature is increased to ~~345.00 °C~~?

618.15K      308.15K

1.26 x 10<sup>3</sup> mL

4. If 17.50 mL of argon gas at -12.50 °C is warmed to 27.56 °C, calculate its final volume in nL.

2.019 x 10<sup>7</sup> nL

5. Pressure cookers have tightly fitting lids to trap air while food is being heated. If a 2.50 x 10<sup>-9</sup> GL pressure cooker is heated from 30.00 °C to 125.00 °C, what is the final volume of the gas inside? What may happen to the pressure cooker as a result?

Might Explode....  
but for sure not constant P.

3.28 L  
3.28 x 10<sup>-9</sup> GL

6. A balloon containing krypton gas at  $34.00\text{ }^{\circ}\text{C}$  has a volume of  $8600\text{ mL}$ . In ML, calculate the volume of the balloon after it rises  $15\text{ km}$  into the upper atmosphere, where the temperature is  $-46.00\text{ }^{\circ}\text{C}$ . Is this volume valid? Why or why not?

↑  
No ... Not  
constant Pressure.

$$6.36\text{ L}$$

$$6.36 \times 10^{-6}\text{ ML}$$

7. 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  $0.15\text{ L}$  of carbon dioxide in bread dough that is heated from  $35.0\text{ }^{\circ}\text{C}$  to  $145.0\text{ }^{\circ}\text{C}$  at constant pressure.

$$0.20\text{ L}$$

8. A  $3.5\text{ L}$  party balloon at a pressure of  $134.6\text{ kPa}$  is taken to the planet Venus where the atmospheric pressure is  $92.0\text{ atm}$ . Assuming that the balloon maintains a constant temperature, what is its new volume?

$$0.051\text{ L}$$

$$5.1 \times 10^{-2}\text{ L}$$

9. A small helium canister contains  $310\text{ mL}$  of gas at a pressure of  $2.0\text{ atm}$ . All of the helium is released into a new cylinder with a measured final pressure of  $3500\text{ Torr}$ . What is the new volume of the gas?

$$1.3 \times 10^2\text{ mL}$$

$$0.13\text{ L}$$

10. A weather balloon containing  $45.0\text{ L}$  of helium at  $1.03\text{ atm}$  is released and rises. Assuming that the temperature is constant, find the pressure exerted on the balloon when its volume becomes  $1.08 \times 10^5\text{ mL}$ .

$$0.429\text{ atm}$$

11. A sample of methane with a volume of  $28.5\text{ mL}$  at a pressure of  $778.00\text{ Torr}$  is released into the upper atmosphere by some bored astronauts. In  $\text{kPa}$ , what is the pressure in the upper atmosphere if the methane sample expands to a volume of  $4.50\text{ L}$ ?

$$0.657\text{ kPa}$$