$\frac{V_1}{T_1} = \frac{V_2}{T_2}$ $\quad$ $\_^{\circ}C + 273 = \_K$ $\quad$ Key

# Charles' Law Worksheet

1) The temperature inside my refrigerator is about $4^0$ Celsius. If I place a balloon in my fridge that initially has a temperature of $22^0$ C and a volume of 0.5 liters, what will be the volume of the balloon when it is fully cooled by my refrigerator?

$V_1 = 0.5L$
$T_1 = 295k$
$V_2 = ?$
$T_2 = 277K$

$$\frac{(0.5L)(277K)}{295k} = 0.47L$$

2) A man heats a balloon in the oven. If the balloon initially has a volume of 0.4 liters and a temperature of 20 $^0$C, what will the volume of the balloon be after he heats it to a temperature of 250 $^0$C?

$V_1 = 0.4L$
$T_1 = 293K$
$V_2 = ?$
$T_2 = 523K$

$$\frac{(0.4L)(523K)}{293K} = 0.71L$$

3) On hot days, you may have noticed that potato chip bags seem to "inflate", even though they have not been opened. If I have a 250 mL bag at a temperature of 19 $^0$C, and I leave it in my car which has a temperature of $60^0$ C, what will the new volume of the bag be?

$V_1 = 250mL$
$T_1 = 292K$
$V_2 = ?$
$T_2 = 333K$

$$\frac{(250mL)(333K)}{292K} = 285.10mL$$

4) A soda bottle is flexible enough that the volume of the bottle can change even without opening it. If you have an empty soda bottle (volume of 2 L) at room temperature (25 $^0$C), what will the new volume be if you put it in your freezer (-4 $^0$C)?

$V_1 = 2L$
$T_1 = 298K$
$V_2 = ?$
$T_2 = 269K$

$$\frac{(2L)(269K)}{298K} = 1.81L$$

5) Some students believe that teachers are full of hot air. If I inhale 2.2 liters of gas at a temperature of $18^0$ C and it heats to a temperature of $38^0$ C in my lungs, what is the new volume of the gas?

$V_1 = 2.2L$
$T_1 = 291K$
$V_2 = ?$
$T_2 = 311K$

$$\frac{2.2L}{291K} = \frac{V_2}{311K} \quad = 2.35L$$

6) How hot will a 2.3 L balloon have to get to expand to a volume of 400 L? Assume that the initial temperature of the balloon is 25 $^0$C.

$V_1 = 2.3L$
$T_1 = 298K$
$V_2 = 400L$
$T_2 =$

$$\frac{2.3L}{298K} = \frac{400L}{T_2} \quad = 51826.09K$$

$$T_2 = \frac{(400L)(298K)}{2.3L}$$

7) I have made a thermometer which measures temperature by the compressing and expanding of gas in a piston. I have measured that at $100^0$ C the volume of the piston is 20 L. What is the temperature outside if the piston has a volume of 15 L? What would be appropriate clothing for the weather?

$V_1 = 20L$
$T_1 = 373K$
$V_2 = 15L$
$T_2 =$

$$\frac{(15L)(373K)}{20L} = 279.75K,$$

Cold