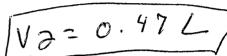
Charles' Law Worksheet

The temperature inside my refrigerator is about 40 Celsius. If I place a 1) balloon in my fridge that initially has a temperature of 220 C and a volume of 0.5 liters, what will be the volume of the balloon when it is fully cooled V=0.5 $T_1 = 295$ $V_2 = X$ $T_2 = 277$ by my refrigerator?

$$\frac{0.5}{295} \times \frac{1}{277}$$



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

$$\frac{0.4}{293} = \frac{x}{523}$$

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

$$T_2 = 33$$

$$\frac{250}{292} = \frac{1}{333}$$

A soda bottle is flexible enough that the volume of the bottle can change 4) even without opening it. If you have an empty soda bottle (volume of 2 L) at room temperature (25 °C), what will the new volume be if you put it in your freezer (-4 °C)? T, = 298 V= -X T2 = 209

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

$$\frac{27}{291} = \frac{x}{311}$$

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

Assume that the initial temperature of the balloon is 25 °C.
$$V_1 = 2$$
 00 $T_2 = 1$

$$\frac{2.3}{298} = \frac{460}{X}$$
 $2.3x = 119,200$

I have made a thermometer which measures temperature by the 7) compressing and expanding of gas in a piston. I have measured that at 100°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?

1. Four liters of carbon dioxide have a pressure of 1.5 atmospheres. If the original pressure was .9 atmospheres, what was the original volume?

$$9V_1 = (1.5)(4)$$

2. 8 liters of a gas have a pressure of 760 torr. If the volume was originally 6 liters, what was the original pressure?

$$\left[P_1 = X \right] V_1 = 6 \\
 \left(X = (760)(8) \right)$$

3. 1,000 cubic inches of air are under a pressure of 50 kilopascals. What is the volume if the pressure is increased to 130 kilopascals?

4. 3 gallons of argon were at a pressure of 14 pounds per square inch. A pressure change then reduces the volume to 2.2 gallons. What is the new pressure?

 $(14)(3) = P_2(2.2)$

5. A gas occupies 12.3 liters at a pressure of 40.0 mm Hg. What is the volume when the pressure is increased to 60.0 mm Hg? P1=40 V1=12-3 P2= 60 V2=X

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6. If a gas at 25.0 °C occupies 3.60 liters at a pressure of 1.00 atm, what will be its volume at a pressure of 2.50 atm?

7. A gas occupies 1.56 L at 1.00 atm. What will be the volume of this gas if the pressure
becomes 3.00 atm? $P_1 = 1.00$ $V_1 = 1.56$ $P_2 = 3.00$ $V_2 = X$
$(1)(1.56) = (3)(V_2)$ $(V_2 = 0.52 L)$
8. A gas occupies 11.2 liters at 0.860 atm. What is the pressure if the volume becomes 15.0 L. $P_1 = 0.660$ $V_1 = 1.2$
(0.86c) (11.2) = (Pd) (15.0) Pg = 0.64entym
9. 13. A gas occupies 4.31 liters at a pressure of 0.755 atm. Determine the volume if the pressure is increased to 1.25 atm. $P_1 = 0.755$ $V_1 = 9.30$ $P_2 = 1.25$ $V_3 = X$
(0.755) (4.31) = (1.25) (V2) V2= 2.60 L
10. A sample of gas has a volume of 12.0 L and a pressure of 1.00 atm. If the pressure of gas is increased to 2.00 atm, what is the new volume of the gas?
P=1.00 V1=12-0 P=2-00 V2=X
$(1)(12) = (2.00)(V_0)$
[Vz=6]

Combined Gas Law Problems

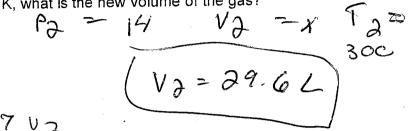
Use the combined gas law to solve the following problems:

If I initially have a gas at a pressure of 12 atm, a volume of 23 liters, and a temperature of 200 K, and then I raise the pressure to 14 atm and increase the temperature to 300 K, what is the new volume of the gas?

$$V_1 = 23 T_1 = 200$$

 $\frac{(14)(V_2)}{300}$

1.38 = 0.046667 V2



A gas takes up a volume of 17 liters, has a pressure of 2.3 atm, and a 2) temperature of 299 K. If I raise the temperature to 350 K and lower the pressure to 1.5 atm, what is the new volume of the gas? $P_1 = 2.3$ V = 17 = 17 = 350

$$\frac{(2.3)(17)}{399} = \frac{(1.5)(V_0)}{350} \qquad \frac{(V_0 - 30.50)}{(0.13076923 - V_0.0042857)}$$

A gas that has a volume of 28 liters, a temperature of 45 0 C, and an 3) unknown pressure has its volume increased to 34 liters and its temperature decreased to 35 °C. If I measure the pressure after the change to be 2.0 atm, what was the original pressure of the gas?

$$\frac{(P_1)(26)}{316} = \frac{(2.0)(34)}{308} = \frac{347}{2} = \frac{308}{308}$$

$$\frac{(P_1)(26)}{316} = \frac{(2.0)(34)}{308} = \frac{0.08805031P, = 0.23077920}{P_1 = 2.51 \text{ atm}}$$

A gas has a temperature of 14 $^{\circ}$ C, and a volume of 4.5 liters. If the temperature is raised to 29 $^{\circ}$ C and the pressure is not changed, what is the new volume of the gas? the new volume of the gas? V2= X T2 -30) P, = 1 V, = 9.5T, = 267 Paz (

28712 1359

5) If I have 17 liters of gas at a temperature of 67 °C and a pressure of 88.89
atm, what will be the pressure of the gas if I raise the temperature to 94 C and decrease the volume to 12 liters?
$\begin{array}{cccccccccccccccccccccccccccccccccccc$
$\frac{(88-89)(17)}{367} = \frac{(P_2)(12)}{367} + 4.4445 = (P_2)(0.0326925)$
570 /P2-136.6
6) I have an unknown volume of gas at a pressure of 0.5 atm and a temperature of 325 K. If I raise the pressure to 1.2 atm, decrease the
temperature to 320 K, and measure the final volume to be 48 liters, what
was the initial volume of the gas? $V_1 = 0.5 \text{ V}_1 = \text{ Y} \qquad V_1 = 325 \text{ P}_2 = 1.2 \text{ V}_3 = 4873 = 326$
(0.5) (V.) _ (1-2) (98) 0.00153846 V = 0.18
325 - 320 [V=117 L]
7) If I have 21 liters of gas held at a pressure of 78 atm and a temperature of
900 K, what will be the volume of the gas if I decrease the pressure to 45 atm and decrease the temperature to 750 K?
P=78 V=21 T=900 P=45 V=-X)T2 = 750
(78)(21) (45)(V2) 0.06 V2 - 1.87.
900 750 [V2=30.3 L]
8) If I have 2.9 L of gas at a pressure of 5 atm and a temperature of 50 °C, what will be the temperature of the gas if I decrease the volume of the gas
to 2.4 L and decrease the pressure to 3 atm?
? 25 V = 29 T, = 323 P2 = 3 V2 = 24 12 = Y
$(5)(2-9)$ $(3)(2.4)$ $(4.5.7)_2 = 2,325.6$
323 Ta= 160.38 K
9) I have an unknown volume of gas held at a temperature of 115 K in a container with a pressure of 60 atm. If by increasing the temperature to
225 K and decreasing the pressure to 30 atm causes the volume of the
gas to be 29 liters, how many liters of gas did I start with? $\sqrt{2} - 29 \sqrt{1} + 20 \sqrt{5}$
1=60 V1=X T1=115 P2=30 N2=0/ 12=005
(60) (V1) - (30) (29) 00
115 = 225 0.52173913U,=3.869
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