

Name :

## Honors Chemistry

Section:

Charles' Law Problems

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Standard Temperature and Pressure (STP):  $0^{\circ}\text{C}$ , 1 atm (or equivalent)  
 $\text{K} = ^{\circ}\text{C} + 273$

Remember to follow the general strategy:

List what you know

Set up the problem

Estimate and calculate

### Charles's Law

1. A gas has a volume of  $10.0\text{ m}^3$  at standard temperature. Assuming no pressure change, what volume will the gas occupy if the Kelvin temperature is doubled? If the original Kelvin temperature is halved? ( $20.0\text{m}^3$ ,  $5.00\text{m}^3$ )
2. Chlorine gas in a balloon occupies  $250.0\text{ cm}^3$  at  $10.0^{\circ}\text{C}$ . What will its volume be at  $60.0^{\circ}\text{C}$ ? ( $294\text{ cm}^3$ )
3. Calculate the final volume when a  $75.0\text{ mL}$  sample of hydrogen is cooled from  $20.0^{\circ}\text{C}$  to  $-10.0^{\circ}\text{C}$  at constant pressure. ( $67.3\text{ cm}^3$ )
4. A sample of gas has a volume of  $100.0\text{ mL}$  at  $27.0^{\circ}\text{C}$ . What is its volume at standard temperature? ( $91.0\text{ cm}^3$ )
5.  $300.0\text{ cm}^3$  of nitrogen at  $15.0^{\circ}\text{C}$  is heated at constant pressure to  $38.0^{\circ}\text{C}$ . What is the new volume of the nitrogen? ( $324\text{ cm}^3$ )
6. A gas occupies a volume of  $560\text{ cm}^3$  at a temperature of  $120^{\circ}\text{C}$ . To what Celsius temperature must the gas be lowered, if it is to occupy  $400.0\text{cm}^3$ ? Assume a constant pressure. ( $8.0^{\circ}\text{C}$ )

### Gay-Lussac's Law

7. A sample of nitrogen at  $82^{\circ}\text{C}$  exerts a pressure of  $123.1\text{ kPa}$ . What would be the pressure of the nitrogen at  $21.0^{\circ}\text{C}$ ?
8. A cylinder of oxygen exerts a pressure of  $1.8$  atmospheres at  $19.2^{\circ}\text{C}$ . At what temperature will the pressure become  $3.6$  atmospheres?
9. A soccer ball contains a confined sample of air. The pressure of the air is  $1862\text{ torr}$  at  $23.0^{\circ}\text{C}$ . What will be the pressure in the ball at  $38.5^{\circ}\text{C}$  (a very hot afternoon!)?
10. An automobile tire has a pressure of  $210.0\text{kPa}$  at  $20.0^{\circ}\text{C}$ . What will be the tire pressure after driving, if the tire temperature rises to  $35.0^{\circ}\text{C}$ ?

Name :

## Honors Chemistry

Section :

Combined Gas Law Problems

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Standard Temperature and Pressure (STP):  $0^{\circ}\text{C}$ , 1 atm (or equivalent)

$$K = ^{\circ}\text{C} + 273$$

Remember to follow the general strategy:

List what you know

Set up the problem

Estimate and calculate

1. A gas occupied  $550.0\text{ cm}^3$  at a pressure of  $9.95 \times 10^4\text{ Pa}$  and a temperature of  $21^{\circ}\text{C}$ . Several days later it was measured at a pressure of  $9.78 \times 10^4\text{ Pa}$  and temperature of  $15^{\circ}\text{C}$ . What volume did the gas occupy under these new conditions?
2. A  $47.0\text{ cm}^3$  volume of nitrogen was collected at a temperature of  $18^{\circ}\text{C}$  and a pressure of  $98.5\text{ kPa}$ . What volume will the gas occupy at standard conditions?
3. A sample of gas occupies  $75.0\text{ mL}$  at  $97.0\text{ kPa}$  and  $18^{\circ}\text{C}$ . Calculate its volume at  $105.2\text{ kPa}$  and  $150^{\circ}\text{C}$ .
4. Calculate the volume of a gas at STP if  $502\text{ mL}$  of the gas are collected at  $29.7^{\circ}\text{C}$  and  $96.0\text{ kPa}$ .
5. A balloon of helium occupies  $6.84\text{ L}$  at  $796\text{ mm Hg}$  and  $65^{\circ}\text{C}$ . What is its volume at STP?
6. An  $3.25\text{ L}$  sample of neon gas at  $23^{\circ}\text{C}$  exerts a pressure of  $850\text{ kPa}$ . If the gas is compressed to  $1.52\text{ L}$  and the temperature is raised to  $233^{\circ}\text{C}$ , what will the new pressure be?