

### Gas Law Problems #1

Name \_\_\_\_\_

Make the following conversions. Show all of your work.

Note the following:

$$K = {}^\circ C + 273.15 \quad 1 \text{ cm}^3 = 1 \text{ mL} \quad 1000 \text{ mL} = 1 \text{ L} = 1 \text{ dm}^3$$

$$1.00 \text{ atm} = 760.0 \text{ mmHg} = 760 \text{ torr} = 101.325 \text{ kPa} = 101,325 \text{ Pa}$$

#### Pressure Conversions

1. A gas sample has a pressure of 800.0 mmHg. What is the pressure of this gas in atmospheres?
  
2. A gas has a pressure of 732 torr. What is the pressure in Pa?
  
3. A tank of oxygen is under a pressure of about  $4.00 \times 10^3$  kPa. Express this pressure in millimeters of mercury.

#### Boyle's Law Problems

4. A gas occupies 12.3 liters at a pressure of 40.0 mmHg. What is the volume when the pressure is increased to 60.0 mmHg?
  
5. 500.0 mL of a gas is collected at 745.0 mmHg. What will the volume be at standard pressure?
  
6. A container of oxygen has a volume of 30.0 mL and a pressure of 4.00 atm. If the pressure of the oxygen gas is reduced to 2.00 atm and the temperature is kept constant, what is the new volume of the oxygen gas?
  
7. A 40.0 L tank of ammonia has a pressure of 8.00 atm. Calculate the volume of the ammonia if its pressure is changed to 12.0 atm while its temperature remains constant.
  
8. You are now wearing scuba gear and swimming underwater at a depth of 66.0 ft. You are breathing air at 3.00 atm and your lung volume is 10.0 L. Your scuba gauge indicates that your air supply is low so, to conserve air, you make a terrible and fatal mistake: you hold your breath while you surface. What happens to your lungs?  
\*Note: Atmospheric pressure at sea level is 1.00 atm.

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#### Charles's Law Problems

9. 600.0 mL of air is at 20.0  $^{\circ}\text{C}$ . What is the volume at 60.0  $^{\circ}\text{C}$ ?
  
10. A gas occupies 900.0 mL at a temperature of 27.0  $^{\circ}\text{C}$ . What is the volume at 132.0  $^{\circ}\text{C}$ ?
  
11. You are given 300.0 mL of a gas at 17.0  $^{\circ}\text{C}$ . What is its volume at 10.0  $^{\circ}\text{C}$ ?
  
12. A gas occupies 1.00 L at standard temperature. What is the volume at 333.0  $^{\circ}\text{C}$ ?
  
13. What volume change occurs to a 400.0 mL gas sample as the temperature increases from 22.0  $^{\circ}\text{C}$  to 30.0  $^{\circ}\text{C}$ ?

#### Gay-Lussac's Law Problems

14. If a gas is cooled from 323.0 K to 273.15 K and the volume is kept constant, what final pressure would result if the original pressure was 750.0 mmHg?
  
15. If a gas in a closed container is pressurized from 15.0 atmospheres to 16.0 atmospheres and its original temperature was 25.0  $^{\circ}\text{C}$ , what would the final temperature of the gas be?
  
16. A 30.0 L sample of nitrogen inside a metal container at 20.0  $^{\circ}\text{C}$  is placed inside an oven whose temperature is 50.0  $^{\circ}\text{C}$ . The pressure inside the container at 20.0  $^{\circ}\text{C}$  was 3.00 atm. What is the pressure of the nitrogen after its temperature is increased?
  
17. The temperature of a sample of gas in a steel container at 30.0 kPa is increased from -100.0  $^{\circ}\text{C}$  to  $1.00 \times 10^3$   $^{\circ}\text{C}$ . What is the final pressure inside the tank?
  
18. Calculate the final pressure inside a scuba tank after it cools from  $1.00 \times 10^3$   $^{\circ}\text{C}$  to 25.0  $^{\circ}\text{C}$ . The initial pressure in the tank is 130.0 atm.

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#### Avogadro's Law Problems

19. A 25.5-liter balloon holding 3.5 moles of carbon dioxide leaks. If we are able to determine that 1.9 moles of carbon dioxide escaped before the container could be sealed, what is the new volume of the container?
  
20. If Sample #1 contains 2.98 moles of hydrogen at 35.1°C and 2.3 atm in a 32.8 L container. How many moles of hydrogen are in a 45.3-liter container under the same conditions?

#### Ideal Gas Law Problems

21. If I have 4 moles of a gas at a pressure of 5.6 atm and a volume of 12 liters, what is the temperature in degrees Celsius?
  
22. If I have an unknown quantity of gas at a pressure of 121.6 kPa, a volume of 31 liters, and a temperature of 87°C, how many moles of gas do I have?
  
23. If I contain 3 moles of gas in a container with a volume of 60 liters and at a temperature of 400 K, what is the pressure inside the container?
  
24. If I have 7.7 moles of gas at a pressure of 0.09 atm and at a temperature of 56°C, what is the volume of the container that the gas is in?
  
25. If I have 17 moles of gas at a temperature of 67°C, and a volume of 88.89 liters, what is the pressure of the gas?