Gas Laws Packet
Ideal Gas Law Worksheet PV = nRT

Use the ideal gas law, "PV-nRT", and the universal gas constant ***R = 0.0821 L*atm / K*mol*** to solve the following problems:

If pressure is needed in kPa then convert by multiplying by *101.3kPa / 1atm* to get ***R =8.31 L*kPa / (K*mole)***

1) 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?

204.6 K

2) If I have an unknown quantity of gas at a pressure of 1.2 atm, a volume of 31 liters, and a temperature of 87 ^{0}C, how many moles of gas do I have?

1.26 mol

3) 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?

1.64 atm

4) If I have 7.7 moles of gas at a pressure of 0.09 atm and at a temperature of 56 ^{0}C, what is the volume of the container that the gas is in?

2311 L

5) If I have 17 moles of gas at a temperature of 67 ^{0}C, and a volume of 88.89 liters, what is the pressure of the gas?

5.4 atm or 540 kPa

6) If I have an unknown quantity of gas at a pressure of 0.5 atm, a volume of 25 liters, and a temperature of 300 K, how many moles of gas do I have?

.5 mol

7) If I have 21 moles of gas held at a pressure of 78 atm and a temperature of 900 K, what is the volume of the gas?

19.8 L

8) If I have 1.9 moles of gas held at a pressure of 5 atm and in a container with a volume of 50 liters, what is the temperature of the gas?

1602 K

9) If I have 2.4 moles of gas held at a temperature of 97 ^{0}C and in a container with a volume of 45 liters, what is the pressure of the gas?

1.62 atm or 164 kPa

10) If I have an unknown quantity of gas held at a temperature of 1195 K in a container with a volume of 25 liters and a pressure of 560 atm, how many moles of gas do I have?

142.7 or 143 mol

11) If I have 0.275 moles of gas at a temperature of 75 K and a pressure of 1.75 atmospheres, what is the volume of the gas?

.97 L

12) If I have 72 liters of gas held at a pressure of 3.4 atm and a temperature of 225 K, how many moles of gas do I have?

13.3 mol

The Ideal and Combined Gas Laws

$PV = nRT$ or $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

Use your knowledge of the ideal and combined gas laws to solve the following problems. If it involves moles or grams, it must be PV = nRT

1) If four moles of a gas at a pressure of 5.4 atmospheres have a volume of 120 liters, what is the temperature?

1973 K

2) If I initially have a gas with a pressure of 84 kPa and a temperature of 35^0 C and I heat it an additional 230 degrees, what will the new pressure be? Assume the volume of the container is constant.

146.7 kPa

3) My car has an internal volume of 2600 liters. If the sun heats my car from a temperature of 20^0 C to a temperature of 55^0 C, what will the pressure inside my car be? Assume the pressure was initially 760 mm Hg.

850.8 or 851 mm Hg

4) How many moles of gas are in my car in problem #3?

108 mol

5) A toy balloon filled with air has an internal pressure of 1.25 atm and a volume of 2.50 L. If I take the balloon to the bottom of the ocean where the pressure is 95 atmospheres, what will the new volume of the balloon be? How many moles of gas does the balloon hold? (Assume T = 285 K)

.0329 L
.13 mol

MIXED GAS LAWS WORKSHEET (modified by Mr. Jasmann)

Created by Tara L. Moore at www.learning.mgccc.cc.ms.us/pk/sciencedocs/gaslawwksheet.htm

Directions: Answer each question below. Then **write the name of the gas law used t**o solve each question in the left margin next to each question.

1. A gas occupies 3.5L at 2.5 mm Hg pressure. What is the volume at 10 mm Hg at the same temperature?

   .875 L

2. A constant volume of oxygen is heated from 100°C to 185°C. The initial pressure is 4.1 atm. What is the final pressure?

   5.03 atm

3. A sample of 25L of NH_3 gas at 10°C is heated at constant pressure until it fills a volume of 50L. What is the new temperature in °C?

   293 C

4. A certain quantity of argon gas is under 16 torr pressure at 253K in a 12L vessel. How many moles of argon are present?

   .012 mol

5. An unknown gas weighs 34g and occupies 6.7L at 2 atm and 245K. What is its molecular weight?

   51.1 g/mol

6. An ideal gas occupies 400ml at 270 mm Hg and 65°C. If the pressure is changed to 1.4 atm and the temperature is increased to 100°C, what is the new volume?

   110.4 mL or .110 L

7. What is the volume of 23g of neon gas at 1°C and a pressure of 2 atm?

   12.8 L

8. If 11 moles of HCl gas occupies 15L at 300°C, what is the pressure in torr?

   26,220 torr

9. The pressure is 6.5 atm, 2.3 mole of Br_2 gas occupies 9.3 L . What is the temperature in °C?

   47 C

10. A 600mL balloon is filled with helium at 700mm Hg barometric pressure. The balloon is released and climbs to an altitude where the barometric pressure is 400mm Hg. What will the volume of the balloon be if, during the ascent, the temperature drops from 24 to 5°C?

983 mL or .983 L

11. An unknown gas has a volume of 200L at 5 atm and -140°C. What is its volume at STP?

2052.6 or 2053 L

12. In an autoclave, a constant amount of steam is generated at a constant volume. Under 1.00 atm pressure the steam temperature is 100°C. What pressure setting should be used to obtain a 165°C steam temperature for the sterilization of surgical instruments?

21.22 kPa

13. Air contains oxygen, nitrogen, carbon dioxide, and trace amounts of other gases. What is the partial pressure of oxygen (P_{O2}) at **101.3kPa of total pressure** if it's known that the partial pressures of nitrogen, carbon dioxide, and other gases are 79.1kPa, 0.040kPa, and 0.94kPa, respectively? What is the name of the gas law used for this?

21.22 kPa

14. Explain why the rates of diffusion of nitrogen gas and carbon monoxide gas are almost identical at the same temperature?

Since their molar masses are the same, their rates of diffusion should be the same according the Graham's law

15. What distinguishes effusion from diffusion? How are these processes similar?

Diffusion is gas moving spontaneously from areas of high concentration to low concentration
Effusion is diffusion of a gas escaping from a tiny opening

16. Which of the gases effuses faster at the same temperature: molecular chlorine, nitrogen dioxide, ammonia or molecular nitrogen gas? And why?

Fastest Slowest since lower masses effuse faster
NH_3 > N_2 > NO_2 > Cl_2

17. Explain what each of the following changes would do to the pressure in a closed container (increase or decrease pressure). A) Part of the gas is removed, B) The container size (volume) is decreased, and C)Temperature is increased.

A. gas removed → decrease in pressure
B. Volume decrease → increase in pressure
C. Temperature increase → increase in pressure

18. Determine the total pressure of a gas mixture that contains oxygen, nitrogen and helium in the following partial pressures of 2.0atm for oxygen, 4.7atm for nitrogen and **253.25kPa** for helium.

9.2 atm or 931.96 kPa