Ideal Gas Law

1. Use the ideal gas law equation to calculate the unknown quantity in each of the following sets of measurements.

	P	V	n	T
a.	.0477 atm	15,200 L	? mol	-15°C
b.	? kPa	.119 mL	.000350 mol	0°C
c.	500.0 kPa	250. mL	.120 mol	? °C
d.	19.5 atm	?	4.7 E4 mol	300.°C

2. Use the ideal gas law equation to calculate the unknown quantity in each of the following sets of measurements.

	P	V	m	M	T
a.	.955 atm	3.77 L	8.23 g	? g/mol	25 °C
b.	105.0 kPa	50.0 mL	? g	48.2 g/mol	0 °C
c.	.782 atm	? L	3.20 E-3 g	2.02 g/mol	-5 °C
d.	? atm	2.00 L	7.19 g	159.8 g/mol	185 °C
e.	107.2 kPa	26.1 mL	.414 g	? g/mol	45 °C

3. Determine the volume of one mole of an ideal gas at 25 °C and .915 kPa.

4. Calculate the unknown quantity in each of the following sets of measurements.

	P	Molar mass	Density	T
a.	1.12 atm	? g/mol	2.40 g/L	2°C
b.	7.50 atm	30.07 g/mol	? g/L	20°C
c.	97.4 kPa	104.09 g/mol	4.37 g/L	? °C
d.	? atm	77.95 g/mol	6.27 g/L	66°C

5. What pressure in atmospheres will 1.36 kg of N_2O gas exert when it is compressed in a 25.0 L cylinder and stored in an outdoor shed where the temperature can reach 59 °C during the summer?

6. Aluminum chloride sublimes at high temperatures. What density will the vapor have at 225 °C and .939 atm pressure?

7. An unknown gas has a density of .0262 g/mL at a pressure of .918 atm and a temperature of 10 °C. What is the molar mass of the gas?

8. A large balloon contains 11.7 g of helium. What volume will the helium occupy at an altitude of 10000 m, where the atmospheric pressure is .262 atm and the temperature is – 50. °C?

9. A student collects ethane by water displacement at a temperature of 15 °C (vapor pressure of water is 1.5988 kPa) and a total pressure of 100.0 kPa. The volume of the collection bottle is 245 mL. How many moles of ethane are in the bottle?

10. A reaction yields 3.75 L of nitrogen monoxide. The volume is measured at 19 °C and at a pressure of 1.10 atm. What mass of NO was produced by the reaction?

11. A reaction has a theoretical yield of 8.83 g of ammonia. The reaction gives off 10.24 L of ammonia measured at 52 °C and 105.3 kPa. What was the percent yield of the reaction?

12. An unknown gas has a density of .405 g/L at a pressure of .889 atm and a temperature of 7°C. Calculate the molar mass.

13. A paper label has been lost from an old tank of compressed gas. To help identify the unknown gas, you must calculate its molar mass. It is known that the tank has a capacity of 90.0 L and weighs 39.2 kg when empty. You find its current mass to be 50.5 kg. The gauge shows a pressure of 1780 kPa at a temperature of 18 °C. What is the molar mass of the gas in the cylinder?

14. What is the pressure inside a tank that has a volume of 1.20 E3 L and contains 12.0 kg of HCl gas at a temperature of 18 °C?

15. What pressure in kPa is exerted at a temperature of 20.0°C by compressed neon gas that has a density of 2.70 g/L?

16. A tank with a volume of 698 mL contains 1.50 g of neon gas. The maximum safe pressure that the tank can withstand is 450. kPa. At what temperature will the tank have that pressure?

17. The atmospheric pressure on Mars is about 6.75 millibars (1 bar=100 kPa = .9869 atm), and the nighttime temperature can be about – 75°C on the same day that the daytime temperature goes up to -8°C. What volume would a bag containing 1.00 g of hydrogen gas have at both the daytime and nighttime temperatures?

18. What is the pressure in kPa of 3.95 mol of chlorine gas if it is compressed in a cylinder with a volume of 850. mL at a temperature of 15 °C?

19. What volume in mL will .00660 mol of hydrogen gas occupy at a pressure of .907 atm and a temperature of 9°C?

20. What volume will 8.47 kg of sulfur dioxide gas occupy at a pressure of 89.4 kPa and a temperature of 40 °C?

21. A cylinder contains 908 g of compressed helium. It is to be used to inflate a balloon to a final pressure of 128.3 kPa at a temperature of 2°C. What will the volume of the balloon be under these conditions?

22. The density of dry air at 27°C and 100.0 kPa is 1.162 g/L. Use this information to calculate the molar mass of air (calculate as if air were a pure substance).