Chemistry 20 - Unit 2 - Ideal Gas Law

Name: _____

You may find the following formulas and constants useful:

$$PV = nRT$$

760.000 mmHg = 101.325 kPa = 1.00000 atm

1000 mL = 1.000 L

$R = 8.31451\ LkPa/molK$ ← NOTE UNITS

$m = Mn$ $d = \frac{m}{V}$

1. What is the volume of 2.50 mol of methane gas (CH_4) at 25.0 C and 95.00 kPa?

V=6.52L

2. What is the mass of 3302.94 mL of carbon dioxide at 30.0 C and 194 kPa?

m=11.2g

3. What is the volume of 33.25 g of butane gas (C_4H_{10}) at -253.99 C and 10.934 kPa?

V=8.268L

4. To what temperature must 23.840 g of hydrogen gas be heated at 120.00 kPa to occupy a volume of 345 L?

T=422K

5. What is the mass of 39.88 L of oxygen gas at 39.84 C and 93.48 kPa?

m=359.8g

6. What is the mass of 210.0 mL of gas assuming it is oxygen at SATP?

7. What is the molar mass of 214 g of gas, requiring a volume of 19.03 L at STP?

$M = 252 g/mol$

8. If a steel cylinder with a volume of 1.50 L containers 10.0 moles of oxygen, under what pressure is the oxygen, if the temperature is 27.0 C?

$P = 1.66 \times 10^4 kPa$

9. A gas was found to have a density of 1.76 mg/L at 24.0 C and a pressure of 98.8 kPa. What is its molecular mass? (Reminder: $d = \frac{m}{V}$)

$M = 0.0440 g/mol$

10. How many millilitres of nitrogen, N_2, would have to be collected at 99.19 kPa and 28 C to have a sample containing 0.015 moles of N_2?

$V = 3.8 \times 10^2 mL$

11. The pressure exerted on a diver by the water increases by about 100 kPa for every 10 m of depth. A scuba diver uses air at the rate of 8 L/min at a depth of 10 m where the pressure is 200 kPa (100 kPa due to the atmosphere and 100 kPa due to the water pressure) and a temperature of 8 C. If the diver's 10 L air tank is filled to a pressure of $2.1 \times 10^4 \ kPa$ at a dockside temperature of 32 C, how long can the diver remain safely submerged?

2 hr Max!

12. You want to send chlorine gas, Cl_2, safely from Edmonton to LLB. Chlorine gas is very poisonous and corrosive. You have a 500 L truck cylinder that will withstand a pressure of 100 atm. The cylinder will be kept at 2.00 C throughout the trip. How many moles of chlorine gas can you safely ship?

$2.21 \times 10^4 mol$