Ideal Gas Law Practice Problems Name: KEY Period: _____

Advanced/Standard Chemistry
Unit 3 Module 4 Practice Worksheet

The 2 possible values of R: 0.0821 $\frac{L \cdot atm}{K \cdot mol}$ OR 8.31 $\frac{L \cdot kPa}{K \cdot mol}$

Gas Law Word Problem	List all known variables (P, V, T or n) in this problem	List the unknown variable in this problem.	Write the name and formula of the appropriate Gas Law	Set up the gas law formula to solve for the unknown variable	Fill in gas law formula with known quantities and solve for unknown variable.	Final Answer is... (check your work!)
EXAMPLE A student collects 425 mL of oxygen at a pressure of 0.899 atm and a temperature of 24°C. How many moles of oxygen did the student collect?	V = .425 L * P = 0.899 atm T = 297 K ** R*** = 0.0821 $\frac{L \cdot atm}{K \cdot mol}$ *Notice that 425 mL was converted to Liters to use in the Ideal Gas Law **Notice that T is expressed in Kelvin! ***The value of R is consistent with a pressure with atm units	*"How many moles of oxygen did the student collect?"* n = ?	*The Ideal Gas Law applies for these variables* PV = nRT	$\frac{PV}{RT} = n$	$\frac{(0.899\ \cancel{atm})(.425\ L)}{(0.0821\ \cancel{L \cdot atm})(297\ K)} = n$ $\cancel{K \cdot mol}$	n = 0.0157 moles
What is the pressure in kPa of 3.95 mol Cl_2 gas if it is compressed in a cylinder with a volume of 0.850 L at a temperature of 15°C?	n = 3.95 mol V = 0.850 L T = 288 K R = 8.31 $\frac{L \cdot kPa}{K \cdot mol}$	P = ?	*The Ideal Gas Law applies for these variables* $\frac{PV}{V} = \frac{nRT}{V}$	$P = \frac{nRT}{V}$	$\frac{(3.95\ mol)(8.31\ \frac{L \cdot kPa}{K \cdot mol})(288\ K)}{(0.850\ L)}$	P = kPa 11,100 1.11 x 10^4 kPa

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N/A 3SF	P = 1.09 atm n = 0.0881 mol T = 302 K R = 0.0821 L·atm / mol·K	V = ?	*The Ideal Gas Law applies for these variables* PV = nRT	V = nRT / P	$\frac{(0.0881\ mol)(.0821\ \frac{atm \cdot L}{mol \cdot K})(302\ K)}{1.09\ atm}$	V = 2.00 L
N/A 55 + 273.15 = 328.15 3SF	P = 94.9 kPa V = 0.0350 L T = 55°C (Hint: Convert to K) R = 8.31 kPa·L / K·mol	n = ?	*The Ideal Gas Law applies for these variables* PV = nRT PV/RT = nRT/RT	n = PV / RT	$\frac{(94.9\ kPa)(0.0350\ L)}{(8.31\ \frac{kPa \cdot L}{K \cdot mol})(328\ K)}$	n = 0.00121 moles
3SF N/A −20. + 273.15 = 253.15	V = 15.7 L n = 0.815 mol T = -20.°C (Hint: Convert to K) R = 8.31 L·kPa / K·mol	P = ? kPa	*The Ideal Gas Law applies for these variables* PV = nRT PV/V = nRT/V	P = nRT / V	$\frac{(0.815\ mol)(8.31\ \frac{kPa \cdot K}{mol \cdot K})(253\ K)}{15.7\ L}$	P = 109 kPa
3SF N/A 629 mL × 1 L / 1000 mL = 0.629 L	P = 0.500 atm V = 629 mL (Hint: Convert to L) = 0.629 L n = 0.0337 mol R = 0.0821 L·atm / mol·K	T = ? K	PV = nRT PV/nR = nRT/nR	T = PV / nR	$\frac{(0.500\ atm)(0.629\ L)}{(0.0337\ mol)(0.0821\ \frac{L \cdot atm}{mol \cdot K})}$	T = 114 K
3SF N/A 19 + 273.15	P = 0.950 atm n = 0.0818 mol T = 19°C (Hint: Convert to K) R = 0.0821 atm·L / mol·K	V = ? L	PV = nRT PV/P = nRT/P	V = nRT / P	$\frac{(0.0818\ mol)(0.0821\ \frac{atm \cdot L}{mol \cdot K})(292\ K)}{0.950\ atm}$	V = 2.06 L

Combined Gas Law Practice Problems Name: KEY Period: _____

Advanced/Standard Chemistry
Unit 3 Module 3 Practice Worksheet

$P_1 = 0.0036\ atm$ $V_1 = 62\ mL$ $T_1 = 373\ K$
$P_2 = 0.0029\ atm$ $V_2 = 64\ mL$ $T_2 = ?$

Gas Law Word Problem	List all known variables (P, V, T or n) in this problem	List the unknown variable in this problem.	Write the name and formula of the appropriate Gas Law	Set up the gas law formula to solve for the unknown variable	Fill in gas law formula with known quantities and solve for unknown variable	Final Answer is... (check your work!)
EXAMPLE A sample of hydrogen gas has a volume of 65.0 mL at a pressure of 0.992 atm and a temperature of 16°C. What volume will the hydrogen occupy at 0.984 atm and 25°C?	$V_1 = 65.0\ mL$ $P_1 = 0.992\ atm$ $T_1 = 289\ K$ $P_2 = 0.984\ atm$ $T_2 = 298\ K$	*"What volume will the hydrogen occupy"* $V_2 = ?$	*The Combined Gas Law applies here* $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$	$\frac{T_2P_1V_1}{P_2T_1} = V_2$	$\frac{(298\ K)(0.992\ atm)(65.0mL)}{(0.984\ atm)(289\ K)} = V_2$ $(.984 \times 289)$	$V_2 = 67.6\ mL$
A student collects 450. mL of HCl (g) hydrogen chloride gas at a pressure of 100. kPa and a temperature of 17°C. What is the volume of the HCl at 0°C and 101.3 kPa? 17+273.15 0+273.15	$V_1 = 450.\ mL$ $P_1 = 100.\ kPa$ $T_1 = 290.\ K$ $P_2 = 101.3\ kPa$ $T_2 = 273\ K$ 3SF	$V_2 = ?$ $\frac{T_2 \times P_1}{P_2}$	*The Combined Gas Law applies here* $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$	$V_2 = \frac{P_1V_1T_2}{T_1P_2}$ $\frac{T_2}{P_2}$	$V_2 = \frac{(100.kPa)(450.mL)(273K)}{(290K)(101.3kPa)}$	$V_2 = 418\ mL$ 3SF

Gas Law Word Problem	List all known variables (P, V, T, or n) in this problem	List the unknown variable in this problem	Write the name and formula of the appropriate Gas Law	Set up the gas law formula to solve for the unknown variable	Fill in gas law formula with known quantities and solve for unknown variable	Final Answer is... (check your work!)
A sample of ammonia gas (NH_3) occupies a volume of 1.58 L at 22°C and a pressure of 0.983 atm. What volume will the sample occupy at standard temperature (0°C) and pressure (1.00 atm)? 22+273.15 0+273.15	V_1 = 1.58 L P_1 = 0.983 atm T_1 = 295 K P_2 = 1.00 atm T_2 = 273 K 3SF	V_2 = ?	*The Combined Gas Law applies here* $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$	$\frac{P_1V_1T_2}{P_2T_1} = \frac{P_2V_2T_1}{P_2T_1}$ $V_2 = \frac{P_1V_1T_2}{T_1P_2}$	$\frac{(273\ \text{K})(0.983\ \text{atm})(1.58\ \text{L})}{(1.00\ \text{atm})(295\ \text{K})} = V_2$	V_2 = 1.44 L 3SF
A gas at STP (standard temperature and pressure, 0°C and 1.00 atm) occupies 28 cm^3 of space. If the pressure changes to 3.8 atm and the temperature increases to 203°C, find the new volume. 0+273.15 203+273.15	P_1 = 1.00 atm V_1 = 28 cm^3 T_1 = 273 K P_2 = 3.8 atm T_2 = 476 K 2SF	V_2 = ?	$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$	$\frac{P_1V_1T_2}{P_2T_1} = \frac{P_2V_2P_1}{P_2T_1}$ $V_2 = \frac{P_1V_1T_2}{P_2T_1}$	$V_2 = \frac{(1.00\ \text{atm})(28\ \text{cm}^3)(476\ \text{K})}{(3.8\ \text{atm})(273\ \text{K})}$	V_2 = 13 cm^3 2SF