Name: _____
Hour: ____ Date: _____

Chemistry: *The Ideal Gas Law*

Directions: *Solve each of the following problems. Show your work, including proper units, to earn full credit.*

1. If 3.7 moles of propane are at a temperature of 28°C and are under 154.2 kPa of pressure, what volume does the sample occupy?

2. A sample of carbon monoxide at 57°C and under 0.67 atm of pressure takes up 85.3 L of space. What mass of carbon monoxide is present in the sample?

3. At –45°C, 71 g of fluorine gas take up 6843 mL of space. What is the pressure of the gas, in kPa?

4. At 971 mm Hg, 145 g of carbon dioxide have a volume of 34.13 dm^3. What is the temperature of the sample, in °C?

5. At 137°C and under a pressure of 3.11 atm, a 276 g sample of an unknown noble gas occupies 13.46 L of space. What is the gas?

Answers: 1. 60.0 L 2. 59 g CO 3. 517.6 kPa 4. –112°C 5. radon

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1. If 3.7 moles of propane are at a temperature of 28°C and are under 154.2 kPa of pressure, what volume does the sample occupy?

$PV = nRT \quad (154.2\,kPa)V = (3.7\,mol)(8.314)(301\,K)$

$V = 60.\,L$

2. A sample of carbon monoxide at 57°C and under 0.67 atm of pressure takes up 85.3 L of space. What mass (? mol) of carbon monoxide is present in the sample?

$PV = nRT \quad (.67\,atm)(85.3\,L) = n\,(.0821)(330\,K)$

$2.1\,mol = n$

$\frac{2.1\,mol\,CO}{1} \left| \frac{28.01\,g}{1\,mol\,CO} \right. = 59\,g\,CO$

3. At –45°C, 71 g of fluorine gas take up 6843 mL of space. What is the pressure of the gas, in kPa?

$PV = nRT \quad P(6.843\,L) = (1.9\,mol)(8.314)(228\,K)$

$P = 526 \rightarrow 530\,kPa$

$\frac{71\,g\,F_2}{1} \left| \frac{1\,mol\,F}{38.00\,g} \right. = 1.9\,mol\,F_2$

4. At 971 mm Hg, 145 g of carbon dioxide have a volume of 34.13 dm^3. What is the temperature of the sample, in °C?

$PV = nRT \quad \left(\frac{971\,mmHg}{760\,mmHg}\right)(34.13\,dm^3) = (3.29\,mol)(.0821)T$

$\frac{145\,g\,CO_2}{1} \left| \frac{1\,mol}{44.01\,g} \right. = 3.29\,mol\,CO_2$

$161\,K = T$

$161\,K - 273 = -112°C = T$

5. At 137°C and under a pressure of 3.11 atm, a 276 g sample of an unknown noble gas occupies 13.46 L of space. What is the gas?

$PV = nRT \quad (3.11\,atm)(13.46\,L) = n\,(.0821)(410\,K)$

$1.24\,mol = n$

$\frac{276\,g}{1.24\,mol} = \frac{X\,g}{1\,mol}$

$X = 222\,g$ radon

Answers: 1. 60. L 2. 59 g CO 3. 517.6 kPa 4. –112°C 5. radon