Name _____ Date _____ Class _____

Solving Gas Problems Using the Ideal Gas Law

Use with Chapter 13, Section 13.2

Problem

Calculate the number of moles of gas contained in a 2.0-L container at 200.0 K with a pressure of 120 kPa.

Step 1. Analyze the problem.

Known Variables

$V = 2.0\ \text{L}$ $T = 200.0\ \text{K}$

$P = 120\ \text{kPa}$ $R = 8.314\ \text{L}\cdot\text{kPa}/(\text{mol}\cdot\text{K})$

Unknown Variable

$n = ?\ \text{mol}$

Step 2. Solve for the unknown.

Divide both sides of the ideal gas law equation by RT to solve for n.

$$PV = nRT \qquad n = \frac{PV}{RT}$$

Substitute the known values into the rearranged equation.

$$n = \frac{(120\ \text{kPa})(2.0\ \text{L})}{\left(\frac{8.314\cdot\text{L}\cdot\text{kPa}}{\text{mol}\cdot\text{K}}\right)(200.0\ \text{K})}$$

Multiply and divide numbers and units to solve for n.

$$n = \frac{(120\ \text{kPa})(2.0\ \text{L})}{\left(\frac{8.314\cdot\text{L}\cdot\text{kPa}}{\text{mol}\cdot\text{K}}\right)(200.0\ \text{K})} = 0.14\ \text{mol}$$

Step 3. Evaluate the answer.

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MATH SKILLS TRANSPARENCY WORKSHEET 21

Solving Gas Problems Using the Ideal Gas Law

Use with Chapter 13, Section 13.2

1. What four variables does the ideal gas law describe?

2. What is the equation for the ideal gas law?

3. What is the first step in solving a combined gas law problem?

4. What numerical value of the gas constant, R, is used to solve this problem? Explain your answer.

5. What unit remains at the end? Is this the desired unit? Of what quantity is it a unit?

6. In step 3, how would you evaluate the answer to see whether or not it is reasonable?

7. If you were asked to find the molar mass of a gas in an ideal gas law problem, what form of the ideal gas law equation would you use? Show how this equation is derived from the original form of the ideal gas law equation.

8. What is Avogadro's principle and how does it relate to the ideal gas law?

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