Name _____ Date _____ Class _____

MATH SKILLS TRANSPARENCY MASTER 20

Solving Gas Problems Using the Combined Gas Law

Use with Chapter 13, Section 13.2

How can you solve gas problems using the combined gas law?

Problem

A gas at 100.0 kPa and 25.0°C fills a flexible container with an initial volume of 2.00 L. If the temperature is raised to 60.0° and the pressure increased to 320.0 kPa, what is the new volume?

Step 1. Analyze the problem.

Known Variables

$P_1 = 100.0$ k Pa $\qquad P_2 = 320.0$ kPa

$T_1 = 25.0°C \qquad T_2 = 60.0°C \qquad V_1 = 2.00$ L

Unknown Variable

$V_2 = ?$ L

Step 2. Solve for the unknown.

Add 273 to the Celsius temperature for T_1 and T_2 to obtain the kelvin temperature.

$$T_1 = 273 + 25.0°C = 298 \text{ K}; \qquad T_2 = 273 + 60.0°C = 333 \text{ K}$$

Multiply both sides of the equation for the combined law by T_2 and divide by P_2 to solve for V_2.

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \qquad V_2 = V_1\left(\frac{P_1}{P_2}\right)\left(\frac{T_2}{T_1}\right)$$

Substitute the known values into the rearranged equation; multiply and divide numbers and units to solve for V_2.

$$V_2 = 2.00 \text{ L}\left(\frac{100.0 \text{ kPa}}{320.0 \text{ kPa}}\right)\left(\frac{333 \text{ K}}{298 \text{ K}}\right) = 0.698 \text{ L}$$

Step 3. Evaluate the answer.

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MATH SKILLS TRANSPARENCY WORKSHEET 20

Solving Gas Problems Using the Combined Gas Law

Use with Chapter 13, Section 13.2

1. Describe how pressure relates to volume and temperature in the combined gas law.

2. How does volume relate to temperature in the combined gas law?

3. What is the equation for the combined gas law?

4. Kelvin temperature is used in the combined gas law, not Celsius. How are Celsius degrees converted to Kelvin degrees?

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

6. How is the equation for the combined gas law rearranged before solving it?

7. What is done to similar units in the numerator and the denominator in the final solving step?

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

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