Chemistry
Ideal Gas Law Problems

Name:

Hour:

R = 0.082 $^{(atm)(L)}/_{(mol)(K)}$ = 8.31 $^{(kPa)(L)}/_{(mol)(K)}$ = 62.4 $^{(mmHg)(L)}/_{(mol)(K)}$

STP: T = 273K; P = 101.3 kPa = 1.00 atm = 760 mmHg = 760 torr

1. How many moles of a gas will be in a 8.0 L container at 150 kPa and 270 K?

2. What pressure is exerted by 50g of CO_2 in a 1.5L container at 300K?

3. A 100g sample of water vapor in a flexible container is heated to 500K, where the pressure is recorded as 1000mmHg. What is the volume of the container?

4. An 8.25g sample of Ar gas is placed in a 5L container and is found to exert a pressure of 1.00atm at room temperature. What is room temperature, in celsius degrees?

5. If 1.00 moles of any gas occupies a volume of 22.4L at STP, calculate the value of "R" in pressure units of mmHg?

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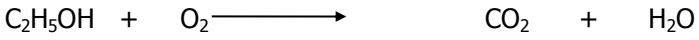
1. Ethanol burns in air according to the following reaction:



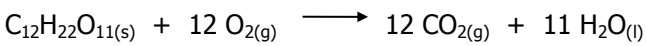
$C_2H_5OH + O_2 \longrightarrow CO_2 + H_2O$

   a) Ethanol is a gas at room conditions (22°C and 100kPa). What volume would 200g of ethanol occupy at these conditions?

   b) Balance the equation and calculate the number of liters of oxygen at 30°C and 105kPa required to burn 200g of ethanol.

2. A sample of a gas that has a mass of 1.41 g occupies 0.5 L at 250K and 2.00 atm.
   What is the *molar mass* of the gas? (remember: the number of grams in one mole)

3. The equation for the metabolic breakdown of table sugar, or sucrose ($C_{12}H_{22}O_{11}$) is the same as that for the combustion of sucrose in air:



$C_{12}H_{22}O_{11(s)} + 12\ O_{2(g)} \longrightarrow 12\ CO_{2(g)} + 11\ H_2O_{(l)}$

   If 2 teaspoons (about 15g) of sucrose consumed, what volume of gas is generated in your body at 100kPa and 37°C?