CONCEPT: THE IDEAL GAS LAW: MOLAR MASS

Molar Mass

- Recall, *molar mass* represents the mass of a substance divided by the amount of that substance.

Molar Mass

$$M = \frac{m}{n}$$

- ☐ M = Molar Mass of the gas
- ☐ m = Mass of the gas in _____.
- ☐ n = Amount of the gas in _____.

EXAMPLE: Calculate the molar mass of a gas if 2.50 g occupies 0.995 L at 715 torr and 40 ºC.

Ideal Gas Law Derivation

- Besides finding the moles of a gas sample, the Ideal Gas Law can be extended further to find the molar mass of a gas.

Ideal Gas Law Molar Mass (EASY)

Ideal Gas Molar mass Formula

Molar **m**ass **R**eally **T**ests our **V**aluable **P**atience

$$M = \frac{mRT}{PV}$$

Ideal Gas Law Molar Mass (HARD)

Molar mass Formula

$$M = \frac{m}{n}$$

Algebraic Rearrangement

$$M = \text{——}$$

$$n = \text{——}$$

Ideal Gas Molar mass Formula

$$PV = nRT$$

$$PV = RT$$

$$PV = \text{——}$$

$$M = \text{——}$$

EXAMPLE: An unknown gas with mass of 0.1727 g is placed into a 125-mL flask. If its pressure is 0.833 atm at 20.0 ºC, what is the identity of the gas?

a) N_2 b) Ar c) O_2 d) Ne e) CH_4

CONCEPT: THE IDEAL GAS LAW: MOLAR MASS

PRACTICE: To identify a homonuclear diatomic gas, a chemist weighted an evacuated flask with a volume of 3.9 L then filled it with the gas at a pressure of 2.00 atm and 29.0 ºC. The chemist then re-weighted the flask and recorded the difference in mass as 8.81 g. Identify the gas.

PRACTICE: What is the molecular formula of a compound that contains 39.0% carbon, 16.0% hydrogen, and 45.0% nitrogen, if 0.1576 g of the compound occupies 125 mL with a pressure of 0.9820 atm at 295.15 K?