Problem Set 11-5

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Name

1. What volume is occupied by .056 moles of a gas at 20° C and 600 mm Hg ?

2. At what temperature (in degrees Celsius) will 50.125 g of CO_2 occupy 35.0 liters at a pressure of 800 mm Hg ?

3. What pressure will cause 25.0 g. of NH_3 to occupy 30.0 liters when the temperature is 25°C ?

4. What volume is occupied by 125.6 g. of SO_2 gas at a temperature of 20°C and a pressure of 650 mm Hg.

5. At what temperature (°C) will 18.5 g of N_2 occupy 25.6 liters at a pressure of 550 mm Hg ?

6. What pressure will cause 45.6 g.of CH_4 to occupy 65.0 liters at 15°C ?

Problem Set 11-5

Name

1. What volume is occupied by .056 moles of a gas at 20° C and 600 mm Hg ?

293 K

$R = 62.4 \frac{L\ mmHg}{mol\ K}$

$.056\ mol \left| \frac{22.4}{1\ mol} \right. = 1.2544\ L\ @STP \left(\frac{293}{273}\right)\left(\frac{760}{600}\right) = 1.7\ L$

273 → 293 760 → 600

$PV = nRT$

$V = \frac{nRT}{P} = \frac{.056\ mol\ (62.4)\ (293\ K)}{600\ mmHg}$

$V = 1.7\ L$

2. At what temperature (in degrees Celsius) will 50.125 g of CO_2 occupy 35.0 liters at a pressure of 800 mm Hg ?

$50.125\ g\ CO_2 \left| \frac{1\ mol\ CO_2}{44\ g\ CO_2} \right| \frac{22.4\ L\ CO_2}{1\ mol\ CO_2} = 25.52\ L\ @STP$

$25.52\ L \left(\frac{760}{800}\right)\left(\frac{X}{273}\right) = 35.0\ L$

$X = 394\ K = 121°C$

273 → X 760 → 800

$PV = nRT$

$T = \frac{PV}{nR} = \frac{800\ (35.0\ L)}{1.139\ mol\ (62.4)}$

$= 393.95\ K = 121°C$

3. What pressure will cause 25.0 g. of NH_3 to occupy 30.0 liters when the temperature is 25°C ?

$25.0\ g\ NH_3 \left| \frac{1\ mol\ NH_3}{17\ g\ NH_3} \right| \frac{22.4\ L}{1\ mol\ NH_3} = 32.94\ L\ @STP$

$32.94\ L \left(\frac{298}{273}\right)\left(\frac{760}{X}\right) = 30\ L$

$X = 911\ mm\ Hg$

273 → 298 760 → X

$PV = nRT$

$P = \frac{nRT}{V} = \frac{1.47\ mol\ (62.4)\ (298)}{30.0\ L}$

$= 912\ mm\ Hg$

4. What volume is occupied by 125.6 g. of SO_2 gas at a temperature of 20°C and a pressure of 650 mm Hg.

$25.6\ g \left| \frac{mol}{64\ g} \right| \frac{22.4\ L}{mol} = 43.96\ L\ @STP \left(\frac{298}{273}\right)\left(\frac{760}{650}\right)$

$= 56\ L$

273 → 298 760 → 650

$125.6\ g\ SO_2 \left| \frac{mol}{64\ g} \right.$

$PV = nRT$

$V = \frac{1.9625\ (62.4)\ (293)}{650}$

$= 55\ L$

5. At what temperature (°C) will 18.5 g of N_2 occupy 25.6 liters at a pressure of 550 mm Hg ?

$18.5\ g\ N_2 \left| \frac{1\ mol\ N_2}{28\ g\ N_2} \right| \frac{22.4\ L}{1\ mol} @STP = 14.8\ L$

$14.8\ L \left(\frac{760}{550}\right)\left(\frac{X}{273}\right) = 25.6\ L$

$X = 342\ K = 69°C$

760 → 550

$PV = nRT$

$T = \frac{PV}{nR} = \frac{550\ (25.6)}{62.4\ (.6607\ mol)}$

$= 69°C$

6. What pressure will cause 45.6 g of CH_4 to occupy 65.0 liters at 15°C ?