

# Gas Stoichiometry

## Chem Worksheet 14-5

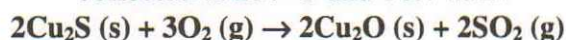
Name \_\_\_\_\_

Use your knowledge of *Stoichiometry* and the *Ideal Gas Law* to solve the following problems. The chemical equations given are all balanced.

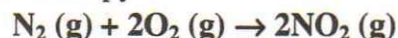
1. What volume of  $O_2$  is produced when 28.5 g of hydrogen peroxide ( $H_2O_2$ ) decomposes to form water and oxygen at  $150^\circ C$  and 2.0 atm?



2. This reaction uses 18.2 g of copper (I) sulfide ( $Cu_2S$ ). What volume of sulfur dioxide gas would be collected at  $237^\circ C$  and 10.7 atm?



3. When 62.7-g nitrogen and excess oxygen react they generate nitrogen dioxide. If the  $NO_2$  is collected at 625 K and 0.724 atm, what volume will it occupy?



4. What volume of hydrogen gas is evolved from a reaction between 0.52 g of Na and water? The gas is collected at  $20.^\circ C$  and 745 mmHg.



5. At what pressure is the nitrogen gas sample that is collected when 48.4 g of  $NaN_3$  decomposes? The temperature of the gas is  $25^\circ C$  and the volume is 18.4 L.



6. When 2.4-g zinc is added to hydrochloric acid, 450 mL of hydrogen gas forms at a temperature of  $32^\circ C$ . What is the pressure of the gas?



7. The following reaction forms 6.41 L of oxygen at a temperature of  $18.7^\circ C$  and a pressure of 731 torr, what mass of  $KClO_3$  must have decomposed?

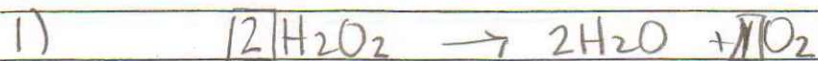


8. What mass of  $CaSO_3$  must have been present initially to produce 14.5 L of  $SO_2$  gas at a temperature of  $12.5^\circ C$  and a pressure of 1.10 atm?



28.5g

? vol



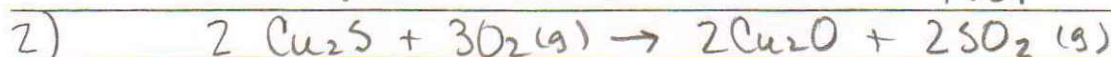
$$\frac{28.5\text{g H}_2\text{O}_2}{34.02\text{g}} \times \frac{1\text{mol H}_2\text{O}_2}{1} = .838\text{mol H}_2\text{O}_2 \quad \frac{1\text{mol O}_2}{2\text{mol H}_2\text{O}_2} = .419\text{mol O}_2$$

$$PV = nRT \quad (2.0\text{atm}) V = (.419\text{mol})(.0821)(423\text{K})$$

$$V = 7.28\text{L O}_2$$

18.2g

? vol



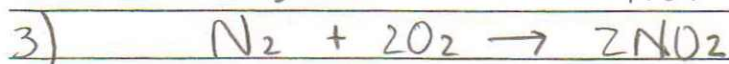
$$\frac{18.2\text{g Cu}_2\text{S}}{159.17\text{g}} \times \frac{1\text{mol Cu}_2\text{S}}{1} = .114\text{mol Cu}_2\text{S} \quad \frac{2\text{mol SO}_2}{2\text{mol Cu}_2\text{S}} = .114\text{mol SO}_2$$

$$PV = nRT \quad (10.7\text{atm}) V = (.114\text{mol})(.0821)(510\text{K})$$

$$V = .446\text{L SO}_2$$

62.7g

? vol



$$\frac{62.7\text{g N}_2}{28.02\text{g}} \times \frac{1\text{mol N}_2}{1} = 2.24\text{mol N}_2 \quad \frac{2\text{mol NO}_2}{1\text{mol N}_2} = 4.48\text{mol NO}_2$$

$$PV = nRT \quad (.724\text{atm}) V = (4.48\text{mol})(.0821)(625\text{K})$$

$$V = 318\text{L NO}_2$$

.52g

? vol



$$\frac{.52\text{g Na}}{22.99\text{g}} \times \frac{1\text{mol Na}}{1} = .0226\text{mol Na} \quad \frac{1\text{mol H}_2}{2\text{mol Na}} = .0113\text{mol H}_2$$

$$PV = nRT \quad \left( \frac{745\text{mm}}{760\text{mm}} \times 1.930\text{atm} \right) V = (.0113\text{mol})(.0821)(293\text{K})$$

$$V = .277\text{L}$$



48.4g

? Press



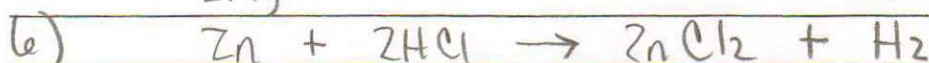
$$\frac{48.4\text{g NaN}_3}{65.02\text{g}} \left| \frac{1\text{mol NaN}_3}{1\text{mol NaN}_3} \right| = .744\text{mol NaN}_3 \left| \frac{3\text{mol N}_2}{2\text{mol NaN}_3} \right| = 1.12\text{mol N}_2$$

$$PV = nRT \quad P(18.4\text{L}) = (1.12\text{mol})(.0821)(298\text{K})$$

$$P = 1.49\text{atm}$$

2.4g

? Press



$$\frac{2.4\text{g Zn}}{65.39\text{g}} \left| \frac{1\text{mol Zn}}{1\text{mol Zn}} \right| = .0367\text{mol Zn} \left| \frac{1\text{mol H}_2}{1\text{mol Zn}} \right| = .0367\text{mol H}_2$$

$$PV = nRT \quad P(.450\text{L}) = (.0367\text{mol})(.0821)(305\text{K})$$

$$P = 2.04\text{atm}$$

? mass

6.41L



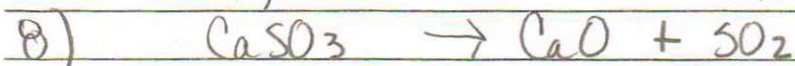
$$PV = nRT \quad \left( \frac{731\text{torr}}{760\text{torr}} \right) (6.41\text{L}) = n(.0821)(305\text{K})$$

$$(0.2), 246\text{mol} = n$$

$$\frac{.246\text{mol O}_2}{3\text{mol O}_2} \left| \frac{2\text{mol KClO}_3}{3\text{mol O}_2} \right| = .164\text{mol KClO}_3 \left| \frac{122.55\text{g}}{1\text{mol KClO}_3} \right| = 20.1\text{g KClO}_3$$

? g

14.5L



$$PV = nRT \quad (1.10\text{atm})(14.5\text{L}) = n(.0821)(286\text{K})$$

$$(\text{SO}_2) .679\text{mol} = n$$

$$\frac{.679\text{mol SO}_2}{1\text{mol SO}_2} \left| \frac{1\text{mol CaSO}_3}{1\text{mol SO}_2} \right| = .679\text{mol CaSO}_3 \left| \frac{120.15\text{g}}{1\text{mol CaSO}_3} \right| = 81.6\text{g CaSO}_3$$