**Quiz 8A**

# Directions: Answer each of the following questions. Be sure to use complete sentences where appropriate. For full credit be sure to show all of your work. Where appropriate answers should be boxed for clarity, written to the correct number of significant figures, and, include the proper units.

1. Consider the reaction of manganese and oxygen to produce manganese(VI) oxide (18 points).
	1. If 4.8 moles of Mn react with 8.5 mol O2 complete the following table using the unbalanced equation:

|  |  |  |  |
| --- | --- | --- | --- |
|  | 2 Mn  (s) + | 3 O2 (l) → | 2 MnO3 (s) |
| I | 4.8 mol Mn | 8.5 mol O2 | 0 mol  |
| C | -2x | -3x | +2x |
| E | 4.8 mol – 2x =4.8 mol – 2(2.4 mol) =0 mol  | 8.5 mol – 3x =8.5 mol – 3(2.4 mol) =1.3 mol  | 2x = 2(2.4 mol) =4.8 mol  |

* 1. Determine the liming reagent by comparing the theoretical mole ratio to the actual mole ratio:

|  |  |  |
| --- | --- | --- |
| Theoretical mole ratio$$\frac{2 mol Mn}{3 mol O\_{2}}=\frac{0.667 mol Mn}{1 mol O\_{2}}$$ | Actual mole ratio$$\frac{4.8 mol Mn}{8.5 mol O\_{2}}=\frac{0.565 mol Mn}{1 mol O\_{2}}$$ | Limiting reagent isMn |

* 1. What does x equal?

$$4.8 mol-2x=0 mol$$

$$4.8 mol=2x$$

$$x=2.4 mol $$

* 1. How many grams of manganese(VI) oxide is produced?

$$4.8 mol MnO\_{3}×\frac{102.935 g MnO\_{3}}{1 mol MnO\_{3}}=494.088 g MnO\_{3}≈490 g MnO\_{3}$$

* 1. What is the percent yield if 367.2 g of manganese(VI) oxide is produced?

$$\%yield=\frac{m\_{actual}}{m\_{theoretical}}×100=\frac{367.2 g}{490 g}×100=74\%$$

* 1. How many grams of the excess reagent remains at the end of the reaction?

$$1.3 mol O\_{2}×\frac{31.998 g O\_{2}}{1 mol O\_{2}}=42 g O\_{2}$$

1. What is the name and formula of the substance that is being decomposed in the “Measurement of the Gas Constant and Molar Volume of Oxygen Gas” experiment (2 points)?

Potassium chlorate, KClO3

**Quiz 8B**

# Directions: Answer each of the following questions. Be sure to use complete sentences where appropriate. For full credit be sure to show all of your work. Where appropriate answers should be boxed for clarity, written to the correct number of significant figures, and, include the proper units.

1. What is the name and formula of the catalyst in the Measurement of the Gas Constant and Molar Volume of Oxygen experiment (2 points)?

Manganese(IV) oxide, MnO2

1. Consider the reaction of chromium and oxygen to produce chromium(III) oxide (18 points).
	1. If 4.8 moles of Cr react with 8.5 mol O2 complete the following table using the unbalanced equation:

|  |  |  |  |
| --- | --- | --- | --- |
|  | 4 Cr  (s) + | 3 O2 (l) → | 2 Cr2O3 (s) |
| I | 4.8 mol Cr | 8.5 mol O2 | 0 mol  |
| C | -4x | -3x | +2x |
| E | 4.8 mol – 4x =4.8 mol – 4(1.2 mol) =0 mol  | 8.5 mol – 3x =8.5 mol – 3(1.2 mol) =4.9 mol  | 2x = 2(1.2 mol) =* 1. mol
 |

* 1. Determine the liming reagent by comparing the theoretical mole ratio to the actual mole ratio:

|  |  |  |
| --- | --- | --- |
| Theoretical mole ratio$$\frac{4 mol Cr}{3 mol O\_{2}}=\frac{1.33 mol Cr}{1 mol O\_{2}}$$ | Actual mole ratio$$\frac{4.8 mol Cr}{8.5 mol O\_{2}}=\frac{0.565 mol Cr}{1 mol O\_{2}}$$ | Limiting reagent isCr |

* 1. What does x equal?

$$4.8 mol-4x=0 mol$$

$$4.8 mol=4x$$

$$x=1.2 mol $$

* 1. How many grams of chromium(III) oxide is produced?

$$2.4 mol Cr\_{2}O\_{3}×\frac{151.989 g Cr\_{2}O\_{3}}{1 mol Cr\_{2}O\_{3}}=364.7736 g Cr\_{2}O\_{3}≈360 g Cr\_{2}O\_{3}$$

* 1. What is the percent yield if 295.7 g of chromium(III) oxide is produced?

$$\%yield=\frac{m\_{actual}}{m\_{theoretical}}×100=\frac{295.7 g}{360 g}×100=81\%$$

* 1. How many grams of the excess reagent remains at the end of the reaction?

$$4.9 mol O\_{2}×\frac{31.998 g O\_{2}}{1 mol O\_{2}}=156.7902 g O\_{2}≈160 g O\_{2}$$