Chemistry 141 Name key

Dr. Cary Willard

Quiz 3a February 16, 2010

1. (6 points) Balance the following reaction in acid.

Ag(s) + NO3-1(aq) 🡪 Ag+1(aq) + NO(g)

 [Ag(s) 🡪 Ag+1(aq) + 1e-1] 3

 [NO3-1(aq) + 4 H+1(aq) + 3 e-1 🡪 NO(g) + 2H2O(l)]

3Ag(s) + NO3-1(aq) + 4H+1(aq) + ~~3e~~~~-1~~ 🡪 3Ag+1(aq) + NO(g) + 2H2O(l)+ ~~3e~~~~-1~~

3 Ag(s) + NO3-1(aq) + 4 H+1(aq) 🡪 3 Ag+1(aq) + NO(g) + 2H2O(l)

1. (4 points) Balance the following half reaction in basic solution.

Cl2(g) 🡪 ClO2-1(aq)

~~4 H~~~~2~~~~O(l)~~ + Cl2(g) 🡪2 ClO2-1(aq) + ~~8H~~~~+1~~~~(aq)~~ + 6e-1

~~8H~~~~+1~~~~(aq)~~ + 8OH-1(aq) 🡪4 ~~8~~H2O(l)

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Cl2(g) + 8OH-1(aq) 🡪2 ClO2-1(aq) +4 H2O(l)+ 6e-1

1. (5 points) Predict the products of the following double displacement reaction. Write the equation for complete balanced reaction, the total ionic equation, and the net ionic equation.

KHCO3 + H3PO4 🡪

3 KHCO3(aq) + H3PO4(aq) 🡪 K3PO4(aq) + 3 H2CO3(aq) (or 3 H2O(l) + 3CO2(g))

Total ionic equation

3 K+1(aq) + 3HCO3-1 (aq) + H3PO4(aq) 🡪 3K+1(aq)+ PO4-3(aq) + 3 H2O(l) + 3CO2(g)

Net ionic equation

3HCO3-1 (aq) + H3PO4(aq) 🡪 PO4-3(aq) + 3 H2O(l) + 3CO2(g)

1. (5 points) Given the following equation, determine how many grams of aluminum oxide could be produced from the reaction of 150.0 grams of aluminum and 75.00 grams of oxygen gas. Use an I Δ E diagram and give the amount of any excess reagents remaining at the end of the reaction.

4 Al(s) + 3 O2(g) 🡪 2 Al2O3(s)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | x=1.389 mol |  | x=0.781 mol |  |  |
|  | 4 Al(s) | + | 3 O2(g)  | 🡪 | 2 Al2O3(s) |
| I | 5.555 mol |  | 2.344 mol |  | 0 mol |
| ∆ | -4x |  | -3x |  | +2x |
| E | 5.555-4x=2.431 mol |  | 2.344-3x=0 mol |  | 2x = 1.562 mol |

$$150.0 g Al×\frac{1 mol Al}{27.00 g Al}=5.555 mol Al$$

$$75.00 g O\_{2}×\frac{1 mol O\_{2}}{32.00 g O\_{2}}=2.344 mol O\_{2}$$

$$2.431 mol Al×\frac{27.00 g Al}{1 mol Al}=65.61 g Al remain$$

$$1.562 mol Al\_{2}O\_{3}×\frac{102.0 g Al\_{2}O\_{3}}{1 mol Al\_{2}O\_{3}}=159.3 g Al\_{2}O\_{3} produced$$

Mass Al2O3 produced 65.61 g

Excess reagent Al

mass remaining 159.3 g g

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Quiz 3b February 16, 2010

1. (6 points) Balance the following reaction in acid.

Cu(s) + NO3-1(aq) 🡪 Cu+2(aq) + NO(g)

 [Cu(s) 🡪 Cu+2(aq) + 2e-1] 3

 [NO3-1(aq) + 4 H+1(aq) + 3 e-1 🡪 NO(g) + 2H2O(l)]2

3Cu(s) + 2NO3-1(aq) + 8H+1(aq) + ~~6e~~~~-1~~ 🡪 3Cu+2(aq) + 2NO(g) + 4H2O(l)+ ~~6e~~~~-1~~

3 Cu(s) + 2 NO3-1(aq) + 8 H+1(aq) 🡪 3 Cu+2(aq) + 2 NO(g) + 4H2O(l)

1. (4 points) Balance the following half reaction in basic solution.

Cl2(g) 🡪 ClO3-1(aq)

~~6 H~~~~2~~~~O(l)~~ + Cl2(g) 🡪2 ClO3-1(aq) + ~~12H~~~~+1~~~~(aq)~~ + 10e-1

~~12H~~~~+1~~~~(aq)~~ + 12OH-1(aq) 🡪6 ~~12~~H2O(l)

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Cl2(g) + 12OH-1(aq) 🡪2 ClO3-1(aq) +6 H2O(l)+ 10e-1

1. (5 points) Predict the products of the following double displacement reaction. Write the equation for complete balanced reaction, the total ionic equation, and the net ionic equation.

NaHCO3 + H3PO4 🡪

3 NaHCO3(aq) + H3PO4(aq) 🡪 Na3PO4(aq) + 3 H2CO3(aq) (or 3 H2O(l) + 3CO2(g))

Total ionic equation

3 Na+1(aq) + 3HCO3-1 (aq) + H3PO4(aq) 🡪 3Na+1(aq)+ PO4-3(aq) + 3 H2O(l) + 3CO2(g)

Net ionic equation

3HCO3-1 (aq) + H3PO4(aq) 🡪 PO4-3(aq) + 3 H2O(l) + 3CO2(g)

1. (5 points) Given the following equation, determine how many grams of aluminum oxide could be produced from the reaction of 120.0 grams of aluminum and 60.00 grams of oxygen gas. Use an I Δ E diagram and give the amount of any excess reagents remaining at the end of the reaction.

4 Al(s) + 3 O2(g) 🡪 2 Al2O3(s)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | x=1.111 mol |  | x=0.625 mol |  |  |
|  | 4 Al(s) | + | 3 O2(g)  | 🡪 | 2 Al2O3(s) |
| I | 4.444 mol |  | 1.875 mol |  | 0 mol |
| ∆ | -4x |  | -3x |  | +2x |
| E | 4.444-4x=1.944 mol |  | 1.875-3x=0 mol |  | 2x = 1.250 mol |

$$120.0 g Al×\frac{1 mol Al}{27.00 g Al}=4.444 mol Al$$

$$60.00 g O\_{2}×\frac{1 mol O\_{2}}{32.00 g O\_{2}}=1.875 mol O\_{2}$$

$$1.944 mol Al×\frac{27.00 g Al}{1 mol Al}=52.49 g Al remain$$

$$1.250 mol Al\_{2}O\_{3}×\frac{102.0 g Al\_{2}O\_{3}}{1 mol Al\_{2}O\_{3}}=127.5 g Al\_{2}O\_{3} produced$$

Mass Al2O3 produced 52.49 g

Excess reagent Al

mass remaining 127.5 g g