Chemistry 141 Name

Dr. Cary Willard

Quiz 4A (20 points) February 24, 2009

1. (14 points) Suppose that 250.0 mL of 0.7443 M potassium phosphate were added to 375.0 mL of 0.4299 M copper(II) nitrate. Write and balance the equation for the reaction that occurs. Use an IE table to solve the problem.

$$250.0 mL×\frac{0.7443 mmol K\_{2}PO\_{4}}{1 mL }=186.1 mmol K\_{2}PO\_{4} $$

$$375.0 mL×\frac{0.4299 mmol Cu(NO\_{3})\_{2}}{1 mL }=161.2 mmol K\_{2}PO\_{4}$$

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | x = 93.05 |  | x = 53.73 |  |  |  |  |
|  | 2 K3PO4*(aq)* | + | 3 Cu(NO3)2*(aq)* | 🡪 | 6 KNO3*(aq)* | + | Cu3(PO4)2*(s)* |
| I | 186.1 mmol |  | 161.2 mmol |  | 0 mmol |  | 0 mmol |
|  | *-2x* |  | *-3x* |  | *+6x* |  | *+x* |
| E | 186.1-2x=78.6 mmol |  | 161.2-3x= 0 mmol |  | 6x=322.4 mmol |  | x=53.7 mmol |

1. Which reactant is limiting?

Copper(II) nitrate Cu(NO3)2

1. What is the value of x?

53.73 mmol

1. What is the identity of the solid that is formed? Cu3(PO4)2 How many grams of this substance are produced?

$$53.7 mmol Cu\_{3}(PO\_{4})\_{2}×\frac{380.6 mg Cu\_{3}(PO\_{4})\_{2}}{1 mmol Cu\_{3}(PO\_{4})\_{2}}×\frac{1 g}{1000 mg}=20.4 g Cu\_{3}(PO\_{4})\_{2}$$

1. Determine the number of moles and the concentrations of the following ions in solution

Mol K+1 = 0.5582 mol [K+1] = 0.8931 M

Mol Cu+2 = 0 mol [Cu+2] = 0 M

Mol PO4-3 = 0.0786 mol [PO4-3] = 0.1258 M

Mol NO3-1 = 0.3224 mol [NO3-1] = 0.5158 M

1. (6 points) Write the conventional, total ionic, and net ionic equations for the reaction that occurs between aqueous ammonia and nickel(II) nitrate.

NH3 + Ni(NO3)2 🡪 ??

2 NH4OH*(aq)* + Ni(NO3)2*(aq)* 🡪 2 NH4NO3*(aq)* + Ni(OH)2

Really

Conventional

2 NH3*(aq)* + 2 H2O*(l)* + Ni(NO3)2*(aq)* 🡪 2 NH4NO3*(aq)* + Ni(OH)2*(s)*

Total ionic

2 NH3*(aq)* + 2 H2O *(l)* + Ni+2*(aq)* + 2 NO3-1*(aq)* 🡪 2 NH4+1 *(aq)* + 2 NO3-1*(aq)* + Ni(OH)2*(s)*

Net ionic

2 NH3*(aq)* + 2 H2O *(l)* + Ni+2*(aq)* 🡪 2 NH4+1 *(aq)* + Ni(OH)2*(s)*

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Quiz 4B (20 points) February 24, 2009

1. (14 points) Suppose that 250.0 mL of 0.5952 M potassium phosphate were added to 375.0 mL of 0.7442 M copper(II) nitrate. Write and balance the equation for the reaction that occurs. Use an IE table to solve the problem.

$$250.0 mL×\frac{0.5952 mmol K\_{2}PO\_{4}}{1 mL }=148.8 mmol K\_{2}PO\_{4} $$

$$375.0 mL×\frac{0.7442 mmol Cu(NO\_{3})\_{2}}{1 mL }=279.1 mmol K\_{2}PO\_{4}$$

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | x = 74.40 |  | x = 93.03 |  |  |  |  |
|  | 2 K3PO4*(aq)* | + | 3 Cu(NO3)2*(aq)* | 🡪 | 6 KNO3*(aq)* | + | Cu3(PO4)2*(s)* |
| I | 148.8 mmol |  | 279.1 mmol |  | 0 mmol |  | 0 mmol |
|  | *-2x* |  | *-3x* |  | *+6x* |  | *+x* |
| E | 148.8-2x=0 mmol |  | 279.1-3x= 57.1 mmol |  | 6x=446.4 mmol |  | x=74.4 mmol |

1. Which reactant is limiting?

Potassium phosphate or K3PO4

1. What is the value of x?

74.4

1. What is the identity of the solid that is formed? Cu3(PO4)2 How many grams of this substance are produced?

$$74.4 mmol Cu\_{3}(PO\_{4})\_{2}×\frac{380.6 mg Cu\_{3}(PO\_{4})\_{2}}{1 mmol Cu\_{3}(PO\_{4})\_{2}}×\frac{1 g}{1000 mg}=28.3 g Cu\_{3}(PO\_{4})\_{2}$$

1. Determine the number of moles and the concentrations of the following ions in solution

Mol K+1 = 0.4464 mol K+ [K+1] = 0.7142 M

Mol Cu+2 = 0.0571 mol Cu+2 [Cu+2] = 0.0914 M

Mol PO4-3 = 0 mol PO4-2 [PO4-3] = 0 M

Mol NO3-1 =0.5606 mol NO3-1 [NO3-1] = 0.8970 M

1. (6 points) Write the conventional, total ionic, and net ionic equations for the reaction that occurs between aqueous ammonia and vanadium(III) nitrate.

NH3 + V(NO3)3 🡪 ??

3 NH4OH*(aq)* + V(NO3)3*(aq)* 🡪 3 NH4NO3*(aq)* + V(OH)3

Really

Conventional

3 NH3*(aq)* + 3 H2O*(l)* + V(NO3)3*(aq)* 🡪 3 NH4NO3*(aq)* + V(OH)3*(s)*

Total ionic

3 NH3*(aq)* + 3 H2O *(l)* + V+3*(aq)* + 3 NO3-1*(aq)* 🡪 3 NH4+1 *(aq)* + 3 NO3-1*(aq)* + V(OH)3*(s)*

Net ionic

3 NH3*(aq)* + 3 H2O *(l)* + V+3*(aq)* 🡪 3 NH4+1 *(aq)* + V(OH)3*(s)*