Chemistry 141 Name Key

Dr. Cary Willard

Quiz 3a (20 points) February 14, 2012

All work must be shown to receive credit. Give answer to correct number of significant figures.

1. (6 points) Complete and balance the following chemical reaction. Write the total ionic and net ionic reactions.

H3PO4*(aq)* + KOH*(aq)* 🡪

H3PO4*(aq)* + 3 KOH*(aq)* 🡪 3 H2O*(l)* + K3PO4*(aq)*

3 H+*(aq)* + PO43-*(aq)* + 3 K+*(aq)* + 3 OH-*(aq)* 🡪 3 H2O*(l)* + 3 K+*(aq)* + PO43-*(aq)*

3 H+*(aq)* + 3 OH-*(aq)* 🡪 3 H2O*(l)*

1. (6 points) Elemental phosphorus reacts with chlorine gas according to the equation

P4*(s)* + 6 Cl2*(g)* 🡪 4 PCl3*(l)*

A reaction mixture initially contains 52.43 g P4 and 149.2 g Cl2. Once the reaction has occurred as completely as possible, what mass in grams of PCl3 is produced and what mass of the excess reactant is left?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | X=0.4232 |  | X=0.3507 |  |  |
|  | P4*(s)* | + | 6 Cl2*(g)* | 🡪 | 4 PCl3*(l)* |
| I | 0.4232 mol |  | 2.104 mol |  | 0 mol |
| D | -X |  | -6 X |  | + 4 X |
| E | 0.4232-X=0.4232-0.3507= 0.0725 mol |  | 2.104-6X= 0 mol |  | 4X=4(0.3507 mol)= 1.403 mol |

$$52.43 g P\_{4}×\frac{1 mol P\_{4}}{123.9 g P\_{4} }=0.4232 mol P\_{4}$$

$$149.2 g Cl\_{2}×\frac{1 mol Cl\_{2}}{70.90 g Cl\_{2}}=2.104 mol Cl\_{2}$$

$$1.403 mol PCl\_{3}×\frac{137.3 g PCl\_{3}}{1 mol PCl\_{3}}=192.7 g PCl\_{3} produced$$

$$0.0725 mol P\_{4}×\frac{123.9 g P\_{4}}{1 mol P\_{4}}=8.98 g P\_{4} remain$$

1. (4 points) If 5.2 L of a 8.6 M SrCl2 solution is diluted to 65 L, what is the molarity of the diluted solution?

$$M\_{1}V\_{1}=M\_{2}V\_{2}\rightarrow \rightarrow M\_{2}=M\_{1}\left(\frac{V\_{1}}{V\_{2}}\right)=8.6 M SrCl\_{2}\left(\frac{5.2 L}{65 L}\right)=0.69 M SrCl\_{2}$$

1. (4 points) Find the percent by mass of sodium chloride in a 1.35 M NaCl solution. The density of the solution is 1.12 g/mL.

$$?\%=\left(\frac{g NaCl}{g soln}\right)×100\left(\%\right)=\left(\frac{1.35 mol NaCl}{1 L soln}×\frac{58.44 g NaCl}{1 mol NaCl}×\frac{1 L }{1000 mL}×\frac{1 mL soln}{1.12 g soln}\right)×100=7.04\% NaCl$$

Chemistry 141 Name Key

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Quiz 3b (20 points) February 14, 2012

All work must be shown to receive credit. Give answer to correct number of significant figures.

1. (6 points) Complete and balance the following chemical reaction. Write the total ionic and net ionic reactions.

Al2(SO4)3*(aq)* + AgNO3*(aq)* 🡪

Al2(SO4)3*(aq)* + 6 AgNO3*(aq)* 🡪2 Al(NO3)3*(aq)* + 3 Ag2SO4*(aq)*

2 Al3+*(aq)* + 3 SO42-*(aq)* + 6 Ag+*(aq)* + 6 NO3-*(aq)* 🡪 2 Al3+*(aq)* + 6 NO3-*(aq)* + 6 Ag+*(aq)* + 3 SO42-*(aq)*

Overall no reaction

1. (6 points) Elemental phosphorus reacts with chlorine gas according to the equation

P4*(s)* + 6 Cl2*(g)* 🡪 4 PCl3*(l)*

A reaction mixture initially contains 61.78 g P4 and 157.2 g Cl2. Once the reaction has occurred as completely as possible, what mass in grams of PCl3 is produced and what mass of the excess reactant is left?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | X=0.4986 |  | X=0.3695 |  |  |
|  | P4*(s)* | + | 6 Cl2*(g)* | 🡪 | 4 PCl3*(l)* |
| I | 0.4986 mol |  | 2.217 mol |  | 0 mol |
| D | -X |  | -6 X |  | + 4 X |
| E | 0.4986-X=0.4986-0.3695= 0.1291 mol |  | 2.217-6X= 0 mol |  | 4X=4(0.3695 mol)= 1.478 mol |

$$61.78 g P\_{4}×\frac{1 mol P\_{4}}{123.9 g P\_{4} }=0.4986 mol P\_{4}$$

$$157.2 g Cl\_{2}×\frac{1 mol Cl\_{2}}{70.90 g Cl\_{2}}=2.217 mol Cl\_{2}$$

$$1.478 mol PCl\_{3}×\frac{137.3 g PCl\_{3}}{1 mol PCl\_{3}}=202.9 g PCl\_{3} produced$$

$$0.1291 mol P\_{4}×\frac{123.9 g P\_{4}}{1 mol P\_{4}}=16.00 g P\_{4} remain$$

1. (4 points) If 4.9 L of a 7.1 M SrCl2 solution is diluted to 55 L, what is the molarity of the diluted solution?

$$M\_{1}V\_{1}=M\_{2}V\_{2}\rightarrow \rightarrow M\_{2}=M\_{1}\left(\frac{V\_{1}}{V\_{2}}\right)=7.1 M SrCl\_{2}\left(\frac{4.9 L}{55 L}\right)=0.63 M SrCl\_{2}$$

1. (4 points) Find the percent by mass of sodium chloride in a 1.63 M NaCl solution. The density of the solution is 1.27 g/mL.

$$?\%=\left(\frac{g NaCl}{g soln}\right)×100\left(\%\right)=\left(\frac{1.63 mol NaCl}{1 L soln}×\frac{58.44 g NaCl}{1 mol NaCl}×\frac{1 L }{1000 mL}×\frac{1 mL soln}{1.27 g soln}\right)×100=7.50\% NaCl$$