Chemistry 1B-1, Fall 2015   Quiz #1A SOLUTIONS

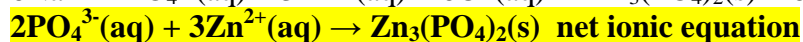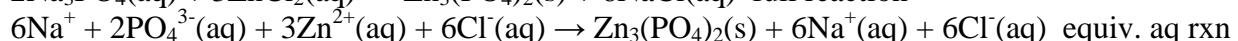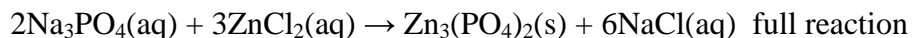**You must show your work for full credit.**

Safety Question (1pt)
Which of the following safety gear should NOT be worn outside of the classroom (for safety reasons)?
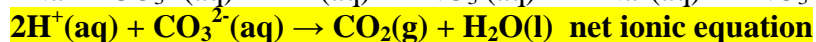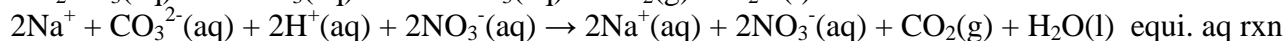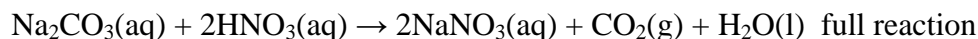a) Long pants   b) nitrile gloves   c) lab coat   d) goggles

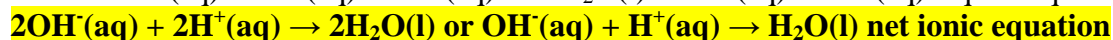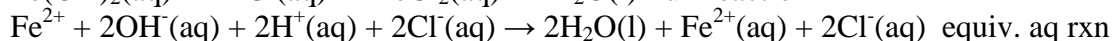**Nomenclature, Electrolytes and Net ionic equations (6 pts)**

1. Give the **net ionic equation** for the reaction (if any) that occurs when aqueous solutions of sodium phosphate and zinc chloride are mixed (1pt). Don't forget state symbols. Students just need to give net ionic equations. Complete reactions, reactions with species in standard states, and net ionic equations given below. NOTE: Based on a comment I made in lecture, I'm not requiring state symbols on this quiz for ions (as can be assumed to be (aq)) but are needed for (s) and (l).

$2Na_3PO_4(aq) + 3ZnCl_2(aq) \rightarrow Zn_3(PO_4)_2(s) + 6NaCl(aq)$ full reaction
$6Na^+ + 2PO_4^{3-}(aq) + 3Zn^{2+}(aq) + 6Cl^-(aq) \rightarrow Zn_3(PO_4)_2(s) + 6Na^+(aq) + 6Cl^-(aq)$ equiv. aq rxn
$2PO_4^{3-}(aq) + 3Zn^{2+}(aq) \rightarrow Zn_3(PO_4)_2(s)$ net ionic equation

2. Give the **net ionic equation** for the reaction (if any) that occurs when aqueous solutions of sodium carbonate and nitric acid are mixed (1pt). Don't forget state symbols.

$Na_2CO_3(aq) + 2HNO_3(aq) \rightarrow 2NaNO_3(aq) + CO_2(g) + H_2O(l)$ full reaction
$2Na^+ + CO_3^{2-}(aq) + 2H^+(aq) + 2NO_3^-(aq) \rightarrow 2Na^+(aq) + 2NO_3^-(aq) + CO_2(g) + H_2O(l)$ equi. aq rxn
$2H^+(aq) + CO_3^{2-}(aq) \rightarrow CO_2(g) + H_2O(l)$ net ionic equation

3. Give the **net ionic equation** for the reaction (if any) that occurs when solid iron(II) hydroxide is added to aqueous hydrochloric acid (1pt). Don't forget state symbols.

$Fe(OH)_2(aq) + 2HCl(aq) \rightarrow FeCl_2(aq) + 2H_2O(l)$ full reaction
$Fe^{2+} + 2OH^-(aq) + 2H^+(aq) + 2Cl^-(aq) \rightarrow 2H_2O(l) + Fe^{2+}(aq) + 2Cl^-(aq)$ equiv. aq rxn
$2OH^-(aq) + 2H^+(aq) \rightarrow 2H_2O(l)$ or $OH^-(aq) + H^+(aq) \rightarrow H_2O(l)$ net ionic equation

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4. Complete the following Table (2pts). 0.5 pts per part

Name	Formula	Type (molecule, ionic compound, acid or ion)
silver carbonate*	Ag_2CO_3	ionic compound
perchloric acid	$HClO_4$	acid
dinitrogen pentoxide	N_2O_5	molecule (or molecular)
cobalt (II) cyanide	$Co(CN)_2$	ionic compound

* silver (I) carbonate is wrong but acceptable as that is how silver +1 is identified in appendix.

5. For aqueous solutions of the compounds below, identify them as strong or weak electrolytes (1pt).

HNO_3 _____strong_____

KOH_____strong_____

NH_3_____weak_____

$AlCl_3$_____strong_____

Equilibrium Questions (3pts)

6. Ethanol fuel can be produced using "syngas" (CO and H_2 made from natural gas and water) using catalysts at elevated temperatures in the equilibrium reaction (chemical equation) given below. Give the corresponding **concentration based equilibrium equation** (1pt).

$$2CO(g) + 4H_2(g) \rightleftharpoons C_2H_5OH(g) + H_2O(g)$$

$$K_C = \frac{[C_2H_5OH(g)][H_2O(g)]}{[CO(g)]^2[H_2(g)]^4}$$

7. Consider the following reaction:
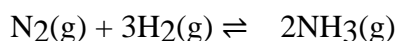
$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

A reaction mixture initially contains 10.0 atm N_2 and 10.0 atm H_2. If the equilibrium pressure of NH_3 is measured to be 6.0 atm, find the equilibrium constant (K_p) for the reaction (2pts).

This requires an ICE table:

	$N_2(g)$	+ $3H_2(g) \rightleftharpoons$	$2NH_3(g)$
intial	10.0 atm	10.0 atm	0.0 atm
change	-x	-3x	+2x
equil.	10.0 – x	10.0 – 3x	2x = 6.0 atm

since 2x = 6.0 atm, x = 3.0 atm and 10.0 – x = 7.0 atm and 10.0 – 3x = 1.0 atm

$$K_P = \frac{[NH_3(g)]^2}{[N_2(g)][H_2(g)]^3} = (6.0 \text{ atm})^2/[(7.0 \text{ atm})(1.0 \text{ atm})^3] = 5.1 \text{ (unitless)}$$

partial credit +1 for successfully using ICE table and + 1 for successfully deriving and solving K_P equation.