Chapter 04 Homework

Part A multiple choice (select the one that is best in each case. 1point/question)

1. Which of the following statements is true ?

A) Electrolyte solutions conduct electricity because electrons are moving through the solution.

B) If you add a nonelectrolyte to an aqueous solution that already contains an electrolyte, the electrical conductivity will not change.

C) When acetone, CH_3COCH_3, is dissolved in water, a conducting solution results.

D) When ammonium nitrate, NH_4NO_3, dissolves in water, the solution is weakly conducting and basic in nature.

2. If you have an aqueous solution that contains 1.5 moles of $MgCl_2$, how many moles of ions are in the solution?

A) 1.0 B) 1.5 C) 2.0 D) 4.5 E) 3.0

3. If you were to draw diagrams representing aqueous solutions of (a) $NiSO_4$, (b) $Ca(NO_3)_2$, (c) Na_3PO_4, (d) $Al_2(SO_4)_3$, how many anions would you show if each diagram contained six cations?

A) 6,12,3,9 B) 6,3,18,9 C) 6,12,2,9 D) 6,12,3,18 E) 6,12,3,9

4. What happens when you mix an aqueous solution of magnesium nitrate with an aqueous solution of sodium hydroxide?

A) There is no reaction; all possible products are soluble.

B) Only magnesium nitrate precipitates.

C) Only magnesium hydroxide precipitates.

D) Both magnesium hydroxide and sodium nitrate precipitate.

E) Nothing; magnesium nitrate is not soluble and it stays as a precipitate.

5. Given a set of species below, which can be classified as strong bases?

$Mg(OH)_2$, $Ca(OH)_2$, $Al(OH)_3$, $Sr(OH)_2$, $Ba(OH)_2$

A) $Ca(OH)_2$, $Sr(OH)_2$, $Ba(OH)$ B) $Mg(OH)_2$, $Ca(OH)_2$, $Ba(OH)_2$

C) $Mg(OH)_2$, $Ca(OH)_2$, $Sr(OH)_2$ D) $Ca(OH)_2$, $Al(OH)_3$, $Ba(OH)_2$

E) $Ca(OH)_2$, $Al(OH)_3$, $Sr(OH)_2$

6. Which of these substances, when dissolved in water, is a strong electrolyte?

A) ammonia B) hydrofluoric acid C) folic acid

D) calcium chloride E) sucrose

7. Which is the correct net ionic equation for the reaction of phosphorous acid (H_3PO_3) and potassium hydroxide (KOH)? Note that phosphorous acid is a diprotic acid.

A) $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$

B) $H_3PO_3(aq) + KOH\ (aq) \rightarrow KH_2PO_3(aq) + H_2O(l)$

C) $H_3PO_3(aq) + 2KOH\ (aq) \rightarrow K_2HPO_3(aq) + 2H_2O(l)$

D) $H_3PO_3(aq) + 2OH^-(aq) \rightarrow HPO_3^{2-}\ (aq) + 2H_2O(l)$

E) $H_3PO_3(aq) + 3OH^-(aq) \rightarrow PO_3^{3-}\ (aq) + 3H_2O(l)$

8. In which compound the oxidation state of sulphur is +2?

A) H_2S B) S_8 C) SCl_2 D) Na_2SO_3 E) $CuSO_4$

9. An experiment showed that aqueous solution of iron(II) chloride oxidize magnesium metal. The net ionic equation is shown below

$Mg(s) + Fe^{2+}\ (aq) \rightarrow Mg^{2+}\ (aq) + Fe(s)$.

What's the reaction patter?

A) oxidation-reduction reaction

B) displacement reaction

C) exchange reaction

D) metathesis reaction

E) both A) and B)

Chapter 04 Homework

B **10.** Which of the following metal will not be oxidized by $Pb(NO_3)_2$?
A) Zn B) Cu C) Fe D) Co E) Ba

B **11.** Which of the following solutions is the most basic?
A) 0.600 M NaCl B) 0.150 M CsOH
C) 0.100 M $Sr(OH)_2$ D) 0.200 M glucose ($C_6H_{12}O_6$)

D **12.** Which of the following statements is true?
A) Sulfuric acid is a ~~mono~~protic acid.
B) HCl is a weak acid.
C) Methanol is a base.
D) NH_3 contains no OH^- ions, and yet its aqueous solutions are basic.
E) HF is a strong acid.

D **13.** Which of the following statements is true?
A) If a substance is oxidized, there must be more oxygen in the substance.
B) If a substance is oxidized, it must lose at least one electron and form an anion.
C) Reduction occurs if the oxidation number of an element increases.
D) Oxidation and reduction must occur together in a reaction.

Part B: Short Answer --Write legibly and show all work for all steps in the problem. (10 points)

14. Will precipitation occur when the following solutions are mixed? If so, write a balanced chemical equation for the reaction and indicate state for each substance. (a) Na_2CO_3 and $AgNO_3$, (b) K_2CO_3 and NH_4NO_3, (c) Na_2S and $FeCl_3$, (d) $FeSO_4$ and $Pb(NO_3)_2$.

15. What is the oxidation number of the boldfaced element in ((a) **S**O_3, (b) Ag**P**F_6, (c) H**N**O_3, (d) **O**F_2.

16. A sample of 70.5 mg of potassium phosphate is added to 15.0 mL of 0.0500 *M* silver nitrate, resulting in the formation of a precipitate. (**a**) What's the reaction type? (**b**) Write the molecular equation for the reaction. (**c**) What is the limiting reactant in the reaction? (**d**) Calculate the percent yield, if you obtain 84.2 mg of Ag_3PO_4.

Chapter 04 Homework Answer Sheet

Name: [illegible] **Student ID:** 12311410 **Instructor:** _____ **Score:** _____

Part A multiple choice (13 points)

1-5: BDCAA

6-10: DDCEB

11-13: BDD

Part B short question (12 points)

14 (4 points)

(a) $Na_2CO_{3(aq)} + 2AgNO_{3(aq)} \longrightarrow Ag_2CO_{3(s)} + 2NaNO_{3(aq)}$

(b) No precipitation.

(c) $3Na_2S_{(aq)} + 2FeCl_{3(aq)} \longrightarrow 6NaCl_{(aq)} + Fe_2S_{3(s)}$

(d) $FeSO_{4(aq)} + Pb(NO_3)_{2(aq)} \longrightarrow Fe(NO_3)_{2(aq)} + PbSO_{4(s)}$.

15 (4 points)

(a) $\overset{+6}{S}O_3$ (b) $Ag\overset{+5}{P}F_6$ (c) $H\overset{+5}{N}O_3$ (d) $\overset{+2}{O}F_2$

16 (4 points)

(a) exchange reaction (复分解).

(b) $K_3PO_{4(aq)} + 3AgNO_{3(aq)} \longrightarrow Ag_3PO_{4(s)} + 3KNO_{3(aq)}$

(c) K_3PO_4 的摩尔数 $= \frac{70.5 \times 10^{-3}\,g}{212.27\,g/mol} = 3.32 \times 10^{-4}\,mol.$

$AgNO_3$ 的摩尔数 $= 0.05\,mol/L \times 15 \times 10^{-3}\,L = 7.5 \times 10^{-4}\,mol.$

$3.32 : 7.5 > 1 : 3. \Rightarrow AgNO_3$ is limited.

(d) Ag_3PO_4 的理论摩尔数 $= 7.5 \times 10^{-4}\,mol \div 3 = 2.5 \times 10^{-4}\,mol.$

$$\text{percent yield} = \frac{80.2 \times 10^{-3}\,g}{2.5 \times 10^{-4}\,mol \times 418.57916\,g/mol} \times 100\% = 80.46\%.$$