Chapter 4 – Reactions in Aqueous Solutions – End of Chapter problems (pages 158 – 164): 44, 45, 50, 54, 60, 62, 64, 72, 74, 78, 80, 86, 93, 98, 114, 118, 126, 128, 132, 142, 149, 152.

I. Solutions

A. Solution - ____.

1. Solute – substance with ___________ amount; substance being ___________
2. Solvent – substance with ___________ amount; substance doing the ___________
3. Aqueous solution – solvent is ___________, most common for us

B. Electrolyte – substance when dissolved in water ___________ ___________

1. substance splits into ___________ which "___________" the charge
2. ___________, positive ion, is attracted to ___________ electrode (___________)
3. ___________, negative ion, is attracted to ___________ electrode (___________)
4. this movement acts as an ___________ ___________
5. ionic substances "___________" into ___________
6. molecular substances "___________" and form ___________; examples are ___________ and some ___________

   a. $HCl + H_2O \rightarrow H_3O^+ + Cl^-$
      the H_3O^+ is the ___________ ion and is many times represented as H^+ (I like the hydronium ion)

C. Nonelectrolyte – substance when dissolved in water ___________ ___________ ___________

D. ___________ dissolves many ___________ substances due to the ___________ and ___________ regions of molecular water (dipole, hydrogen bonding, intermolecular attractive forces)

1. ___________ – water surrounds ions aligning ___________ regions around ___________ ions and ___________ regions around ___________ ions.

E. Some solution formations are "___________" and use a ___________ arrow to represent that the reaction can move ___________ AND ___________. When a solution process is reversible it reaches an ___________ (the rate of the ___________ reaction ___________ the rate of the ___________ reaction). When a solution process is ___________ the solute is not ___________ dissociated or ionized. The ___________ arrow represents ___________ dissociation or ionization.

2. Precipitation Reactions

A. Two aqueous solutions mix and an ___________, ___________, product is formed, called a ___________
B. Double replacement reactions also known as ___________ reactions

C. __________ is the __________ amount of a solute that will dissolve in a __________ amount of solvent at a specific __________.

D. To determine which product is a __________, check __________ tables looking for __________ or __________ soluble products

E. All __________ substances are strong __________ but are not __________ soluble…Hmm what does THAT mean?

F. __________ Equation – the equation that uses complete whole unit formulas (molecular formulas) for each reactant and product

1. $AgNO_{3(aq)}$ + $NaCl_{(aq)}$ ➔ $AgCl_{(s)}$ + $NaNO_{3(aq)}$

G. __________ or __________ __________ Equation – the equation that shows __________ dissolved substances as __________

1. $Ag^+_{(aq)} + NO_3^-{}_{(aq)} + Na^+_{(aq)} + Cl^-_{(aq)}$ ➔ $AgCl_{(s)} + Na^+_{(aq)} + NO_3^-{}_{(aq)}$

H. __________ __________ Equation – only shows ions that are __________ in the reaction (da Playas). Does not show the __________ ions (ions that sit on side lines and don't __________ in chemical reaction).

1. $Ag^+_{(aq)} + Cl^-_{(aq)}$ ➔ $AgCl_{(s)}$
2. The $Na^+_{(aq)}$ and $NO_3^-{}_{(aq)}$ are the __________ ions

3. Acid – Base Reaction

A. __________ Acids – substances that produce H^+ in aqueous solution

B. __________ Bases – substances that produce OH^- in aqueous solution

C. __________ Acids – substances that donate a proton in aqueous solution

D. __________ Bases – substances that accept a proton in aqueous solution

a. $HCl_{(g)} + H_2O_{(l)}$ ➔ $H_3O^+_{(aq)} + Cl^-_{(aq)}$

ACID BASE ACID BASE

E. Acid Properties

1. ____
2. ____________________________________ (indicators)
3. ____
4. React with __________ and hydrogen __________ (__________) to produce __________ __________
5. Aqueous solution is __________

F. Base Properties

a. __________ taste (__________)
b. Feel __________
c. Cause color __________ in plant __________
d. Aqueous solution is __________

G. __________ acids have __________ proton / hydrogen to donate

H. __________ Acids have __________ protons / hydrogens to donate

a. Protons / hydrogens are donated __________ at a time

I. __________ Acids have __________ protons / hydrogens to donate again one at a time.

J. Strength of Acids

a. Strong acids __________ donate proton and are also __________ electrolytes
b. The stronger the __________ the __________ the acid, Hmmm why is this so?

c. Strength of ___________ – when the ratio of ___________ to ___________ is _____:______ or greater the acid is ___________.

d. Organic acids are ___________

K. Strength of Bases

a. Metallic bases are ___________

b. Non-metallic bases are ___________

L. Acid – Base Neutralization Reaction

a. Reaction of acid and base in which ___________ donated protons are ___________.

b. General reaction

i. Acid + Base $\rightarrow$ ___________ + ___________

ii. The salt is not ___________ salt. A salt is the product of an acid base reaction consisting of the ___________ of acid and the ___________ of the base.

c. Example reaction

i. $HCl_{(aq)} + KOH_{(aq)} \rightarrow KCl_{(aq)} + HOH_{(l)}$ ($HOH = H_2O$)

ii. $H^+_{(aq)} + Cl^-_{(aq)} + K^+_{(aq)} + OH^-_{(aq)} \rightarrow K^+_{(aq)} + Cl^-_{(aq)} + HOH_{(l)}$

iii. $H^+_{(aq)} + OH^-_{(aq)} \rightarrow HOH_{(l)}$

4. Oxidation – Reduction Reactions

A. ___________ transfer reactions

B. Oxidation is the ___________ of electrons

C. Reduction is the ___________ of electrons

D. ___________ – Oxygen Is Loss Reduction Is Gain

E. ___________ agent is the substance that has been ___________

F. ___________ agent is the substance that has been ___________

G. ___________ reactions can be written in ___________ – reactions showing the ___________ and ___________ more specifically.

a. $2Mg_{(s)} + O_{2(g)} \rightarrow 2MgO_{(s)}$

b. OX: $2Mg \rightarrow 2Mg^{+2} + 4e^-$ (each Mg lost $2e^-$)

c. RED: $O_2 + 4e^- \rightarrow 2O^{-2}$ (each O gained $2e^-$)

d. The number of electrons lost ___________ ___________ the number of electrons gained

H. The number of ___________ transferred is determined using ___________ ___________, also called ___________ ___________.

a. ___________ number – represents the number of ___________ that have been lost or gained. If electrons are ___________ the number is ___________ (__), if electrons ___________ then it is ___________ (__). Sign must ___________ be included and this signed number must be written directly ___________ the chemical symbol.

b. But of course ___________ must be followed.

i. Free elements' oxidation numbers are ___________ since it has neither lost nor gained any electrons.

ii. The oxidation number for monatomic ions is ___________ to its charge

iii. The oxidation number for oxygen is usually ___________ except in peroxide where it is ___________.

iv. The oxidation number for hydrogen is usually ___________ unless combined with a metal then it is ___________.
v. Fluorine is ALWAYS ___________.
vi. In ___________ molecules the sum of the oxidation numbers of the components is equal to ___________.
vii. In ___________ ions the sum of the oxidation numbers of the ___________ is ___________ to its ___________.

I. Types of REDOX Reactions
  a. ___________ / ___________ / ___________ reactions
    i. The single elements either ___________ or ___________ electrons to form the compound.
  b. ___________ Reactions
  c. ___________ ___________ Reactions
    i. Must use ___________ ___________ to determine if single element is ___________ enough to replace ___________ in ___________. (See figure 4.16 page 139)
    ii. Halogen activity series is ___________ on ___________ ___________.
  d. ___________ Reactions
    i. One element is ___________ oxidized and reduced
      1. $2H_2O_{2(aq)} \rightarrow 2H_2O_{(l)} + O_{2(g)}$
      2. Oxygen in hydrogen peroxide is _____; in water is _____ thus has been ___________; in elemental oxygen is _____ thus has been ___________.

5. Concentrations of Solutions
  A. The amount of ___________ present in a given amount of ___________ or ___________.
  B. For now we use ___________ = moles of ___________ per liter of ___________
    a. This only refers to the amount of ___________ that is actually originally ___________ in water.
  C. How to make a ___________ solution from ___________ solute
    a. Calculate amount of ___________ needed to make the desired ___________
    b. Measure the ___________ of ___________ needed and transfer to ___________ flask
    c. Fill flask _____ with ___________ ___________ and ___________ until solid is ___________
    d. Add enough ___________ to fill flask to ___________ ___________
    e. Knowing the amount of water added is ___________ necessary
  D. How to make a Molar solution from ___________ solution
    a. ___________ – determine amount of more ___________ solution needed to make ___________ concentration of ___________ solution.
    b. Easiest way is to use ___________ = ___________

6. Gravimetric Analysis
  A. Analytical technique based on measurement of ___________
    a. Like ___________ ___________ ___________

b. Sample of substance of unknown composition is dissolved in water and then reacts to form a know precipitate. That known precipitate is massed. Knowing the formula and mass of the precipitate the mass of the component from unknown can be calculated and then the formula of the original unknown can be determined. Sounds pretty easy, huh.

7. Acid Base Titration
   A. Solution of ___________ concentration (___________) is mixed with sample of ___________ concentration.
   B. Basically ___________ ___________ ___________
   C. To perform this reaction ___________ must be used to determine the ___________ point – all acid and base ___________ react
8. REDOX Titration
   A. Same as ___________ – ___________ titration except ___________ point is where the reducing agent is ___________ oxidized by the oxidizing agent
   B. Complete reaction
   C. ___________ are usually one of the ___________ turning colors as oxidized or reduced.