**Unit 8 Note-Taking Guide – Reaction Prediction**

Podcast 7.2 B: Special Types of Reactions – Acid-Base Reactions, Combustion Reactions, and Redox Reactions

Acid-Base Reactions: A reaction that involves an Acid and a Base as reactants that will always produce \_\_\_\_\_\_\_\_\_\_\_\_ and a \_\_\_\_\_\_\_\_\_\_\_\_\_ as Products.

* + Chemical Formulas for Acids will begin with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (H2SO4 – Sulfuric Acid)
  + Chemical Formulas for Bases will end with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (KOH – Potassium Hydroxide)
  + Acid-Base Reaction is a specific type of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Reactions

Examples

H2SO4 and KOH

HCl and NaOH

* *Note: Acids and Bases are opposites. One is always used to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the other.*

Combustion Reactions: An element or a compound reacts with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ gas to produce energy in the form of heat and light

* Commonly Involve \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Combustion of Hydrocarbons will ALWAYS produce \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ as products
* Combustion will stop when \_\_\_\_\_\_\_\_\_\_\_\_\_ supply is used up or the fuel runs out

Examples

C2H5OH – Ethanol or Ethyl Alcohol “Flame Writing”

C2H5OH + O2 🡪

CH4 – Methane Gas “Light Your Teacher On Fire”

CH4 + 2O2 🡪

CH3OH – Methanol or Methyl Alcohol “Whoosh Bottle”

CH3OH + O2 🡪

Redox Reactions: A reaction that involves the \_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_ of electrons. It can also deal with the addition of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to a compound.

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – Loss of electrons from a substance or the addition of Oxygen to a compound
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – Gain of electrons to a substance or the Loss of Oxygen to a compound
* Both Processes occur simultaneously. One cannot occur without the other

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* Single-Replacement, Combination, Decomposition, and Combustion Reactions are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Redox Reactions. There is a transfer of electrons in the process.
* Double-Replacement and Acid-Base Reactions are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Redox Reactions. No electrons are exchanged between the different elements, the ions are just trading partners.

*For each statement, classify the change of the underlined element as [O]xidation, [R]eduction, or [N]either:*

1. \_\_\_\_\_ Cu° → Cu2+ + 2e-
2. \_\_\_\_\_ Al3+ + 3e- → Al°
3. \_\_\_\_\_ CH4 → CO2
4. \_\_\_\_\_ NaOH + HCl → NaCl + H2O
5. \_\_\_\_\_ gaining electrons
6. \_\_\_\_\_ oxidation number increases
7. \_\_\_\_\_ Zn° + 2HCl → ZnCl2 + H2
8. \_\_\_\_\_ Mg + ½O2 → MgO

**Podcast 7.4: Predicting Products of Reactions**

Please tell what kind of reaction is taking place. Then predict the products and write the balanced equation.

1. MgCl2 + Al 🡪

2. AlCl3 + Ca 🡪

3. Na2CO3 + HCl 🡪

4. NaCl + Mg(NO3)2 🡪

5. MgCO3 🡪

6. Na2CO3 🡪

7. Ca + Cl2 🡪

8. Na + N2 🡪

9. CH3OH + O2 🡪

**Podcast 7.5A Solubility Rules**

Review: forming ions

Ionic (i.e. salt) refers to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ion plus \_\_\_\_\_\_\_\_\_\_\_ ion

Usually this is a metal + non-metal or metal + polyatomic ion (e.g. NaCl, NaClO**3**, Li**2**CO**3**)

Polyatomic ions are listed on your ion card

(aq) means \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (dissolved in water)

For salts (aq) means the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

NaCl(aq) is the same as: \_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_

Acids form ions: HCl(aq) is \_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_

Bases form ions: NaOH(aq) is \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_

Q - how is charge determined (+1, -1, +2, etc.)?

A –

Example:

F, Cl gain \_\_\_\_\_\_\_\_\_ electron, thus forming \_\_\_\_\_ and \_\_\_\_\_

Ca loses \_\_\_\_\_ electrons, thus forming \_\_\_\_\_

Practice with writing ions

Q - Write ions for Na**2**CO**3**(aq)

A –

Q - Write ions for Ca**3**(PO**4**)**2**(aq) & Cd(NO**3**)**2**(aq)

A –

Q - Write ions for Na**2**S(aq) and Mg**3**(BO**3**)**2**(aq)

A -

*Circle the ionic compounds that are Insoluble (i.e. circle the precipitates):*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| MgF2 | CuSO4 | NH4Cl | Fe(OH)3 | CsF |
| AgCl | CdS | CuF2 | PbSO4 | Ba(OH)2 |
| Na2SO4 | NH4OH | Sr(NO3)2 | Hg2I2 | Na2CrO4 |
| BaCO3 | PbBr2 | CaC2O4 | HC2H3O2 | MgO |

**Podcast 7.5B: Net Ionic Equations**

Types of chemical equations: Equations can be divided into 3 types

1) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, 2) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, 3) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Here is a typical molecular equation:

We can write this as COMPLETE ionic equation (all compounds that are \_\_\_\_\_ are written as ions):

To get the NET ionic equation we cancel out all terms that appear on \_\_\_\_\_ sides:

Equations must be balanced

balance : Both sides of an equation should have the same number of each type of atom

balance: Both sides of a reaction should have the same net charge

Q- When NaOH(aq) and MgCl**2**(aq) are mixed, \_\_\_\_\_\_\_(s) and NaCl(aq) are produced. Write balanced molecular, ionic & net ionic equations.

Identify the Spectators in the following Complete Ionic Equations and write the Net Ionic Equation.

Cu2+(aq) + SO**42–**(aq) + Ba2+(aq) + 2Cl**–**(aq) → Cu2+(aq) + 2Cl**–**(aq) + BaSO**4**(s)

Net:

Fe**3+**(aq) + 3NO**3–**(aq) + 3Li**+**(aq) + 3OH**–**(aq) → 3Li**+**(aq) + 3NO**3–**(aq) + Fe(OH)**3**(s)

Net:

Write the Complete Ionic Equation, cancel out any spectator ions, then write the Net Ionic Equation.

2Na**3**PO**4**(aq) + 3CaCl**2**(aq)→ Ca**3**(PO**4**)**2**(s)+ 6NaCl(aq)

Complete Ionic Equation:

Net:

2Na2S(aq) + 2AgC2H3O2(aq) 🡪 2NaC2H3O2 + Ag2S

Complete Ionic Equation:

Net:

Use the solubility rules to predict the products and write the net ionic equation for the following reactions.

1. Al (s) + H2SO4 (aq) →
2. HCl (aq) + Ba(OH)2 (aq) →
3. Na3PO4(aq) + BaCl2(aq)→