**Stuff to MEMORIZE before the AP exam**

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| **Name** | **Polyatomic ion** |
| Ammonium | NH4+ |
| Acetate | C2H3O2- |
| Bromate | BrO3- |
| Chlorate | ClO3- |
| Chlorite | ClO2- |
| Cyanide | CN- |
| Dihydrogen phosphate | H2PO4- |
| Hypochlorite | ClO- |
| Hydrogen carbonate (bicarbonate) | HCO3- |
| Hydrogen sulfate (bisulfate) | HSO4- |
| Hydroxide | OH- |
| Iodate | IO3- |
| Nitrate | NO3- |
| Nitrite | NO2- |
| Perchlorate | ClO4- |
| Permanganate | MnO4- |
| Thiocyanate | SCN- |
| Carbonate | CO32- |
| Chromate | CrO42- |
| Dichromate | Cr2O72- |
| Oxalate | C2O42- |
| Selenate | SeO42- |
| Silicate | SiO32- |
| Sulfate | SO42- |
| Sulfite | SO32- |
| Phosphate | PO43- |
| Phosphite | PO33- |

* **Solubility rules**

1. All common compounds of Group 1 and ammounium ions are soluble.
2. All nitrates, acetates, and chlorates are soluble.
3. All binary compounds of the halogens (other than F) are soluble, EXCEPT those of Ag, Hg(I), and Pb.
4. All sulfates are soluble, EXCEPT for Ca, Ba, Sr, Ammonium, and the alkali metals.
5. Except for rule 1, carbonates, oxides, silicates, and phosphates are insoulbe.

* **Assigning oxidation numbers**

1. Oxidation of any element in its free state (uncombined with another element) is zero (Fe, Na, Cl2, O2…)
2. The oxidation number of oxygen is always -2 except in peroxides (H2O2) it is -1.
3. The oxidation number of hydrogen is always +1 except when bonded to a metal (NaH) it is -1.
4. The sum of all of the oxidation numbers is zero if the compound is neutral. If it is not neutral, the sum of the oxidation numbers equals the overall charge.

* **Electrochemistry**

1. LEO goes GER or OIL RIG
2. Oxidation: lose electrons, charge goes up, happens at the anode
3. Reduction: gain electrons, charge goes down, happens at the cathode.
4. Electrons flow from the anode to the cathode.
5. Negative spectator ions flow through the salt bridge from the cathode to the anode.
6. The higher the reduction potential, the more likely it is to be reduced.
7. V = J/C and A = C/sec
8. Round Faraday’s constant (96, 485) to 100,000 for non-calculator multiple choice questions.

* **Intermolecular Forces** –

1. IMFs - Forces BETWEEN molecules that keep solids together.
2. Strong IMFs mean HIGH BP, MP, Hvap, Hfus and LOW vapor pressure

|  |  |  |
| --- | --- | --- |
| Network Covalent | Multidirectional covalent bonds  (C: graphite/diamond, Si, SiO2 – sand) | Strongest |
| Ionic Salts  (electrostatic attraction) | Forces between adjacent ions of opposite charge (Na+ and Cl-) |  |
| Metallic | Forces between positive metal nuclei and a “sea of electrons” (Cu, Ag) |  |
| Hydrogen bonding | Forces between adjacent molecules with H on one and either N, O, or F on the other molecule. (H2O, NH3) |  |
| Dipole – dipole | Forces between adjacent polar molecules (CO, PH3) |  |
| London Dispersion Forces | Exists in all interactions, but is the ONLY force between adjacent nonpolar molecules. (Temporary polarity from lopsided electrons by chance.) (CO2, Cl2) | Weakest |

* **Ligands/complex ions**

1. Common ligands: NH3, H2O, OH-, CN-, Cl-
2. Central ions: transition metals and Al3+
3. There are usually twice the number of ligands as the charge on the central ion

* **Orders for Kinetics and graphs that give a straight line**

|  |  |  |
| --- | --- | --- |
| 0 Order | 1st order | 2nd order |
| [R] vs. time | ln[R] vs. time | 1/[R] vs. time |
| Slope = -k | Slope = -k | Slope = k |

* **Strong Acids:** HCl hydrochloric acid **Strong Bases**: Group 1 or 2 metals bonded to hydroxide

HBr hydrobromic acid

HI hydroiodic acid **Note**: Strong acids and bases dissociate COMPLETELY and

HClO4 perchloric acid therefore do not have Ka or Kb values.

H2SO4 sulfuric acid

HNO3 nitric acid

* **Products favored (spontaneous) Reactions ∆H ∆S Spontaneous? Note:** ∆S in J
  + ∆G < 0 - + at all temps ∆G and ∆H in KJ
  + Eo > 0 + + at high temps
  + Keq > 1 - - at low temps

+ - no temps