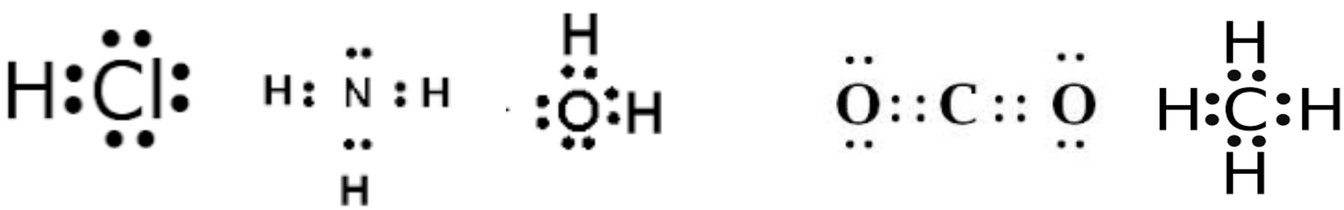
Memorize it Know it List for Regents Chemistry

1. Know the following Lewis dot diagrams and their resulting polarities: All diatomic **(BrINClHOF)** . All non polar molecules because they are symmetrical. Some examples:

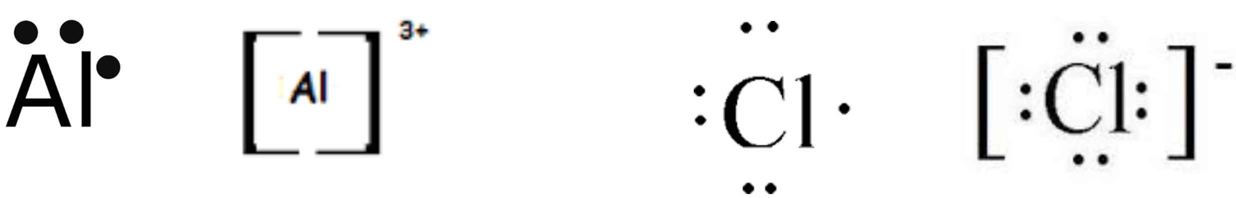
2. Know the following Lewis dot diagrams and their resulting polarities:

H_2O CO_2 HCl NH_3 CH_4



All polar because they are not symmetrical   All nonpolar because they are symmetrical

3. Know how to draw dot diagrams for atoms vs ions. For atoms it's the number of valence electrons. For metal ions not dots just brackets and charge. For nonmetal ions 8 dots brackets and charge.



4. Four types of chemical equations: Single Replacement, Double Replacement, Synthesis, Decomposition

3. Organic Reactions – write them out on flash cards and memorize!
Addition, Substitution ,Combustion

Fermentation, Saponification, Polymerization, Esterification

4. pH scale stuff: Acids < 7 Neutral 7 Bases > 7

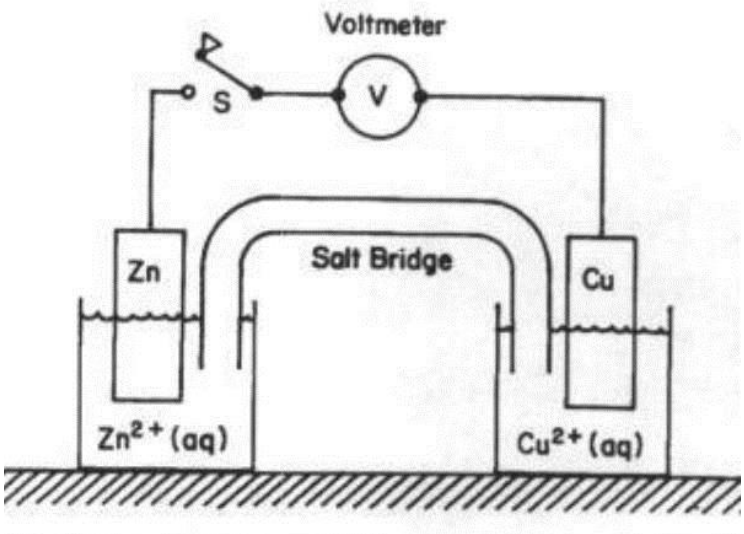
A change of 1 pH unit lower = 10x more acidic (10x more H^+ ion concentration) A change of 2 pH units higher=100x (10x10) less acidic (100x less H^+ ion in solution)

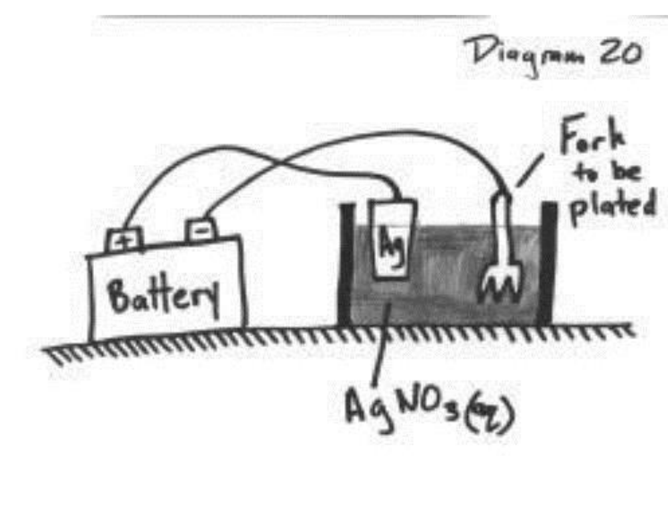
5. Helpful Redox ditties, like “Leo Ger” “Reduction is reduction (of charge value).” For electrochemical cells: “RED CAT” redox at cathode, AN OX oxidation at anode

Voltaic = battery = spontaneous = chemical→ electrical energy More “A”ctive metal “A”node (electrons flow from high to low on table J)

Electrolytic = forced by a battery = non-spontaneous = electrical→chemical energy

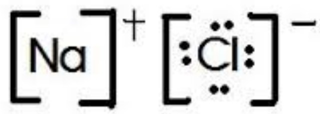
Atoms turn into ions and mass of electrode decreases. Ions turn into atoms and mass increases.





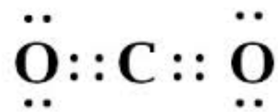
6. Bonding Basics Ionic: Metal /Nonmetal bonding, valence e^- transferred,

Lewis dot diagram uses brackets like:



Covalent: nonmetal/nonmetal bonding, valence e^- shared, (sharing is “c”aring “c” for covalent)

Lewis diagram does not use brackets, like: H:H CO_2



Metallic: metals only, valence e^- in a “sea” of mobile e^-

7. Conductivity – there must be MOBILE (movable) charged particles (ions or electrons) present

- For solutions, the solute must dissolve to produce IONS (electrolyte)
- For liquids, only melted ionic materials conduct
- For metals, conductivity because of the mobile sea of valence e^-

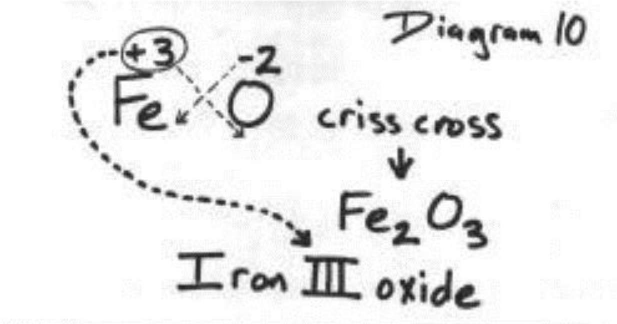
8. Properties based on Bond type:
Ionic: High melting and boiling point, only conduct in aq solution or liquid state. Hard. Malleable and ductile.

Covalent: Low melting and boiling point, never conduct. Soft.

Metallic: High melting and boiling pt. Always conduct. Malleable and ductile.

9. Names: Name first element as stated on reference table. Second element use first syllable and add ide to ending. If more than two elements look up polyatomic ion on table E and use that name.

*****If first element has more than 1 oxidation state listed on periodic table use roman numerals to say which one is used. Ex. $Cu(NO_3)_2$ Copper (II) Nitrate

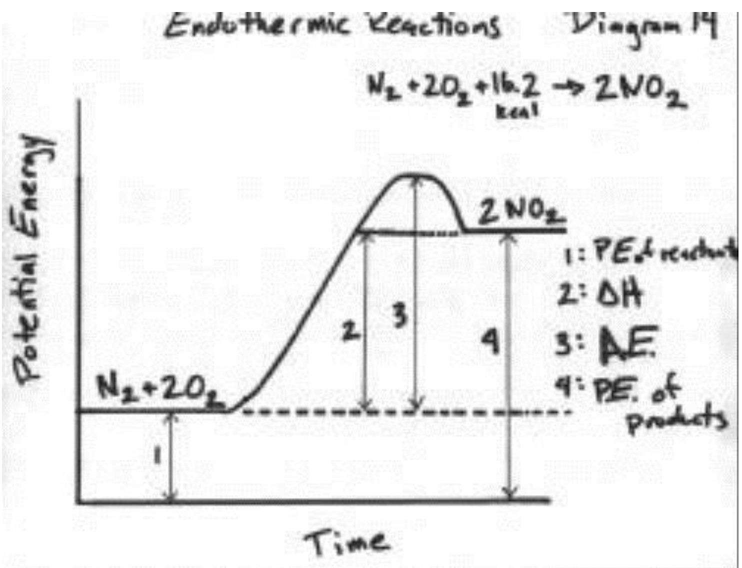


10. Special Group Names
Group 1 = Alkali (one word description for Group 1)
Group 2 = Alkaline Earth (two word description for Group 2)
Group 17 = Halogens
Group 18 = Noble Gases

11. Endothermic vs exothermic

Endothermic:

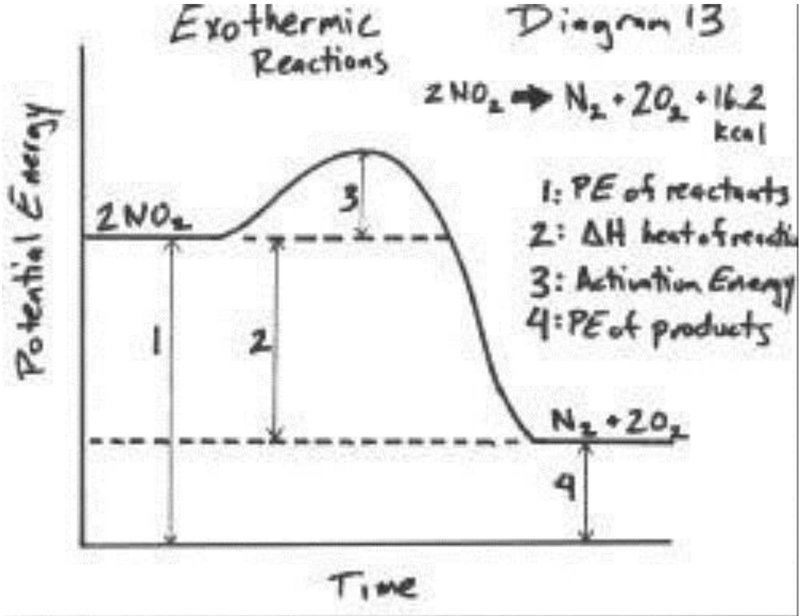
+ΔH, Heat ENTERS (added as a reactant), Heat written into equation as a reactant, If touched, feels cold (draws heat out of you, entering reaction) Temp of surrounding air or solution decreases



Memorize the meaning of all 4 arrows on these diagrams!

Exothermic:

-ΔH, Heat EXITS (released as a product), Heat written into equation as a product, If touched, feels warm (releases heat to you, from the reaction) Temp of surrounding air or solution increases



Use of Table I, hint about Exothermic at bottom

Change in PE diagrams with a catalyst (activation energy decreases)

12. **Electrolytes: ABS**

Acids (table K) Bases (table L) and Salts (ionic compounds) all conduct electricity in aqueous solution because they have ions or charged particles

14. Nuclear:

Artificial transmutation: 2 reactants like fission and fusion. Not spontaneous.

Natural transmutation: 1 reactant like a spontaneous decay.

$^{238}_{92}U \rightarrow ^{234}_{90}Th + ^{4}_{2}He$ Natural Transmutation

$^{9}_{4}Be + ^{1}_{1}H \rightarrow ^{6}_{3}Li + ^{4}_{2}He$ Artificial Transmutation

Table O:

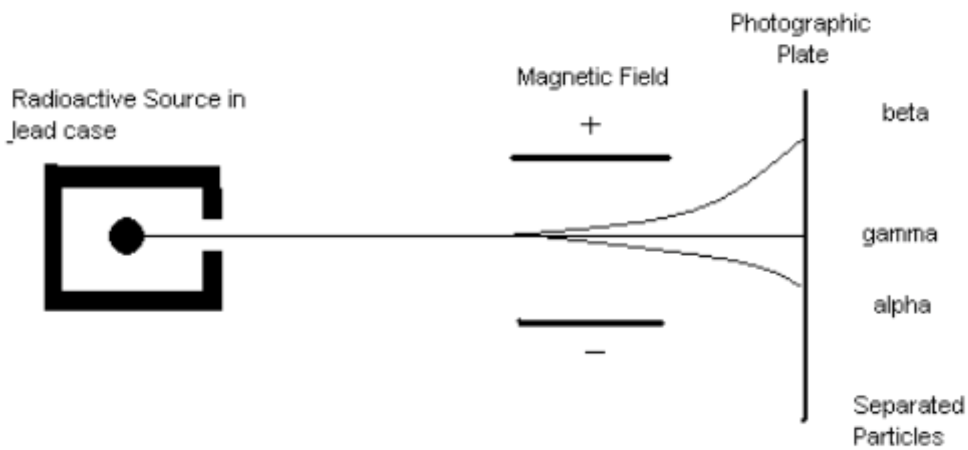
Table O
Symbols Used in Nuclear Chemistry

	Name	Notation	Symbol
Weakest penetrating power-HEAVIEST	alpha particle	$^{4}_{2}He$ or $^{4}_{2}\alpha$	α
	beta particle	$^{0}_{-1}e$ or $^{0}_{-1}\beta$	β^-
Strongest penetrating power-LIGHTEST	gamma radiation	$^{0}_{0}\gamma$	γ
	neutron	$^{1}_{0}n$	n
	proton	$^{1}_{1}H$ or $^{1}_{1}p$	p
	positron	$^{0}_{+1}e$ or $^{0}_{+1}\beta$	β^+

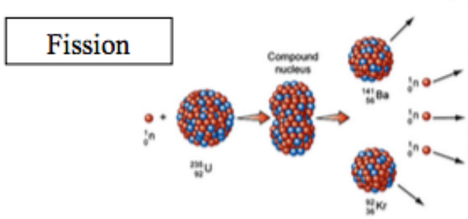
- Number on the upper left is the mass
- Number on the lower left is the charge

Alpha is least penetrating and gamma is most penetrating

Separating Particles based on charge in a magnetic field:

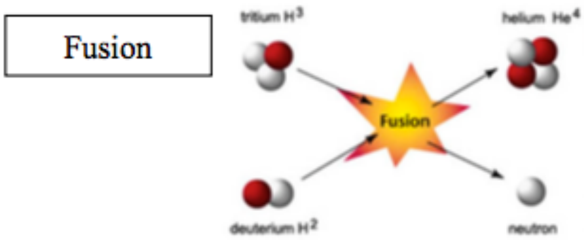


Nuclear Fission: artificial transmutation. Splitting of a radioactive isotope



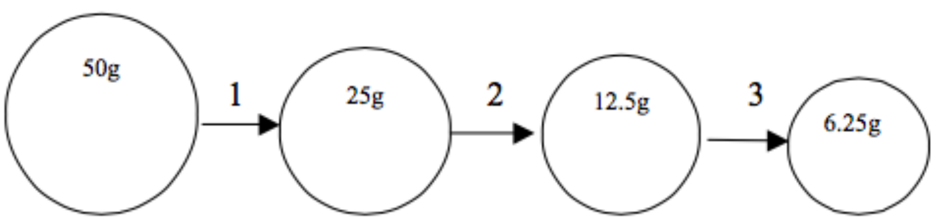
$$^{235}_{92}U + ^{1}_{0}n \rightarrow ^{93}_{36}Kr + ^{140}_{56}Ba + 3^{1}_{0}n$$

Nuclear Fusion: Artificial transmutation. Putting together (fusing) two nuclei. Produces more energy than fission and safer but too costly.



$$^{2}_{1}H + ^{3}_{1}H \rightarrow ^{4}_{2}He + ^{1}_{0}n$$

Half Life: Each radioactive isotope has its own rate of decay. Half-life is the time it takes a sample to decay in half. Table N lists some common half-life rates for some common isotopes. For every problem it's important to determine how many half-lives occurred.



QUESTIONS:

Table N
Selected Radioisotopes

Nuclide	Half-Life	Decay Mode	Nuclide Name
^{198}Au	2.695 d	β^-	gold-198
^{14}C	5715 y	β^-	carbon-14
^{37}Ca	182 ms	β^+	calcium-37
^{60}Co	5.271 y	β^-	cobalt-60

1. What is the half-life?
   - $\frac{\text{Total time elapsed}}{\text{\# half-life series}}$
2. How much total time elapsed?
   - Half-life x # half-life series
3. How many grams will remain after …?
   - Must determine how many half-life series and then half the original amount by that many times (see example above)
4. What fraction remains?

   1→ ½→1/4→ 1/8→1/16→1/32……

Medical Tracers: **Carbon-14 – Date LIVING THINGS** o **Uranium-238 & Lead 206 – Date NON-LIVING THINGS**

Medical: isotopes with very short half-lives can be eliminated by the body quickly.
Technetium-99 – brain tumors o **Iodine-131 – thyroid disorders** o **Radium & Cobalt-60 – treatment of cancer Risks:**