SOL Items to Review:

Equipment:

used to measure: graduated cylinder, graduated pipet (volumetric)

used for storage: beakers & flasks

probe ware: temperature + pH

Safety:

ADD ACID to water, never the reverse

Rinse/Wash to remove chemicals from skin. Use the safety shower for large amounts.

For a small fire cover the flame to extinguish.

For a large fire - leave and call for help.

If a person is on fire:

- Stop, drop and roll
- Use fire blanket
- Use safety shower

Never use cracked or broken glass ware.

Conversion equalities: (most common, this is not all of them)

GM KHD bdcmmn

1000	ml = 1	L	1000	mg = 1	g
1	Kg = 1000	g	100	cm = 1	m
1	m = 10	dm	1000	mm = 1	m

1 mole = 6.022×10^{23} atoms or molecules = 22.4 L (of gas) = molar mass (in grams - from PT)

Conversion Set-up:

$$\text{amount given} \times \frac{\#\ \text{needed label}}{\#\ \text{given label}}$$

come from equality

2sf

54 mm = ? m

$$54\text{mm} \times \frac{1\text{ m}}{1000\text{ mm}} = 5.4 \times 10^{-2}\text{ m}$$

Formulas:

$D = \frac{m}{V}$ $\quad \%\text{ error} = \left|\frac{(\text{measured} - \text{accepted})}{\text{accepted}}\right| \times 100$ $\quad \%\text{ yield} = \frac{\text{actual}}{\text{theoretical}} \times 100$ (actual ← from lab; theoretical ← from stoich.)

master equation:

$$\text{amt. given} \times \frac{1\text{ mol given}}{\text{molar mass or } 22.4\text{ L given}} \times \frac{\#\text{ mol needed}}{\#\text{ mol given}} \times \frac{22.4\text{ L or molar mass needed}}{1\text{ mol needed}} =$$

(# mol given / # mol given: # are the coefficients)

$\text{Energy} = \text{mass} \cdot \Delta T \cdot C_p$ $\quad (\Delta T = \text{final} - \text{initial})$

$\text{Energy} = \text{mass or moles} \times \text{Heat of } \frac{\text{fusion}}{\text{vapor.}}$

* watch for labels!

$C_{p_{H_2O}} = 1\ ^{cal}/_{g^\circ C} = 4.184\ ^{J}/_{g^\circ C}$

$V_1P_1 = V_2P_2$ $\quad \frac{V_1}{T_1} = \frac{V_2}{T_2}$ $\quad \frac{V_1P_1}{T_1} = \frac{V_2P_2}{T_2}$ $\quad PV = nRT$ $\quad PV_{mm} = gRT$

* Temp → K $\quad ^\circ C + 273 = K$ (Gas Laws only)

$P_{TOTAL} = P_1 + P_2 + P_3 + \ldots$

$M = \frac{n\text{ of solute}}{L\text{ of solution}}$ (molarity) $\quad m = \frac{n\text{ of solute}}{Kg\text{ of solvent}}$ (molality) $\quad n = \#\text{ of moles}$

$1.0 \times 10^{-14} = [H_3O^+][OH^-]$ $\quad pH = -\log[H_3O^+]$

$[H_3O^+]$ = hydronium

$[OH^-]$ = hydroxide

$14 = pH + pOH$

$[H_3O^+] = 1.0 \times 10^{-6}\ M$ $\quad pH = 6$

$2.3 \times 10^{-12}\ M$ $\quad pH =$

(-) LOG (2.3 EE (-) 12) enter

Scientists:

Atomic

Democritus - theory of "atomos"

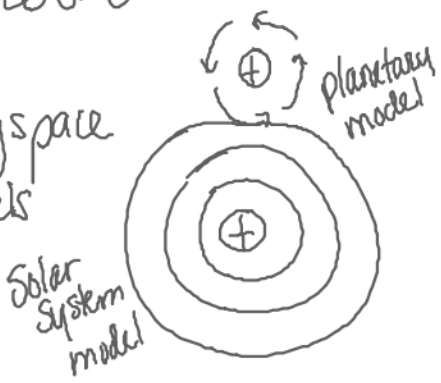
Dalton - Father of the A.T.O.M. - Solid Sphere

Thomson - Cathode ray tubes - found the electron - plum pudding

Millikan - oil experiment - charge + size of e^-

Rutherford - gold foil - ⊕ nucleus
atom mostly empty space

Bohr - atomic line spectrum - energy levels
(H + He)



Quantum Scientists

Planck - quanta (packet of energy)

Einstein - photon / photoelectric effect

Compton - collided e^- & photon

DeBroglie - both mass + wave behavior

Heisenberg - cannot measure speed & location at the same time

Pauli - e^- in an orbital have opposite spin ↑↓

Aufbau - energy levels overlap - e^- fill 1st avail. position
$d(n-1)$ $f(n-2)$

Hund - all ↑ in a group before ↓ (sublevel)

*n = energy level

Atomic Structure

	location	mass a.m.u.	charge	How to find #
Proton	nucleus	1	1+	Atomic #
Neutron	nucleus	1	none	Mass # − Atomic # = # of neutrons
electron	e⁻ cloud energy level shell	0	1−	if neutral P = e⁻ if charged Charge = P − e⁻

Carbon-13

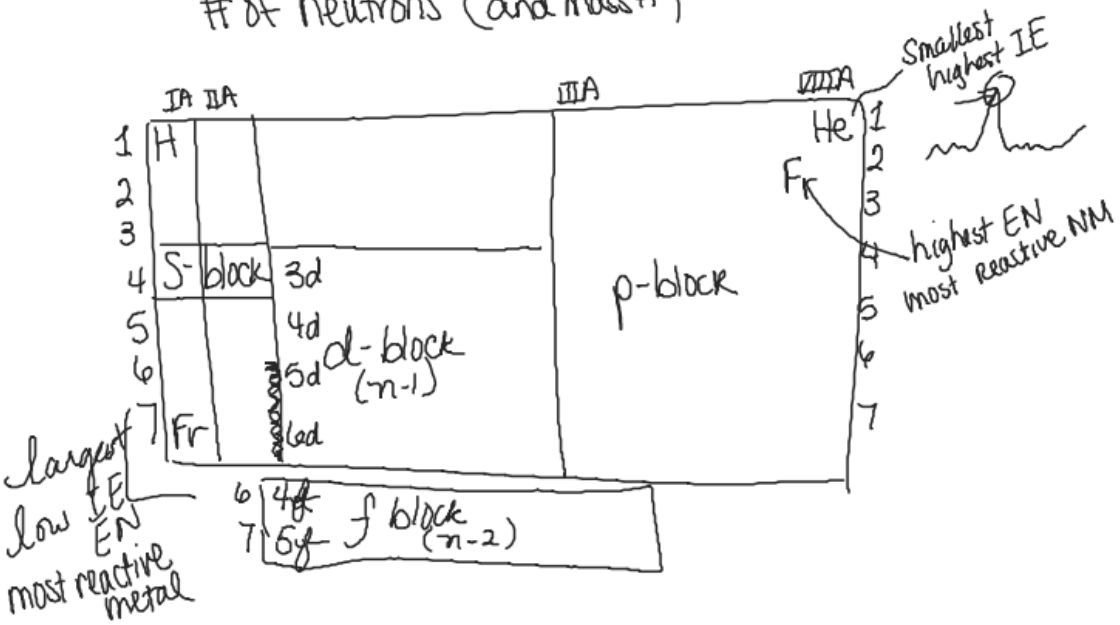
$^{13}_{6}C$ ← mass #

mass # = P + N

a.m.u. = atomic mass unit

Ion – an atom that has lost/gained e⁻ & has a charge

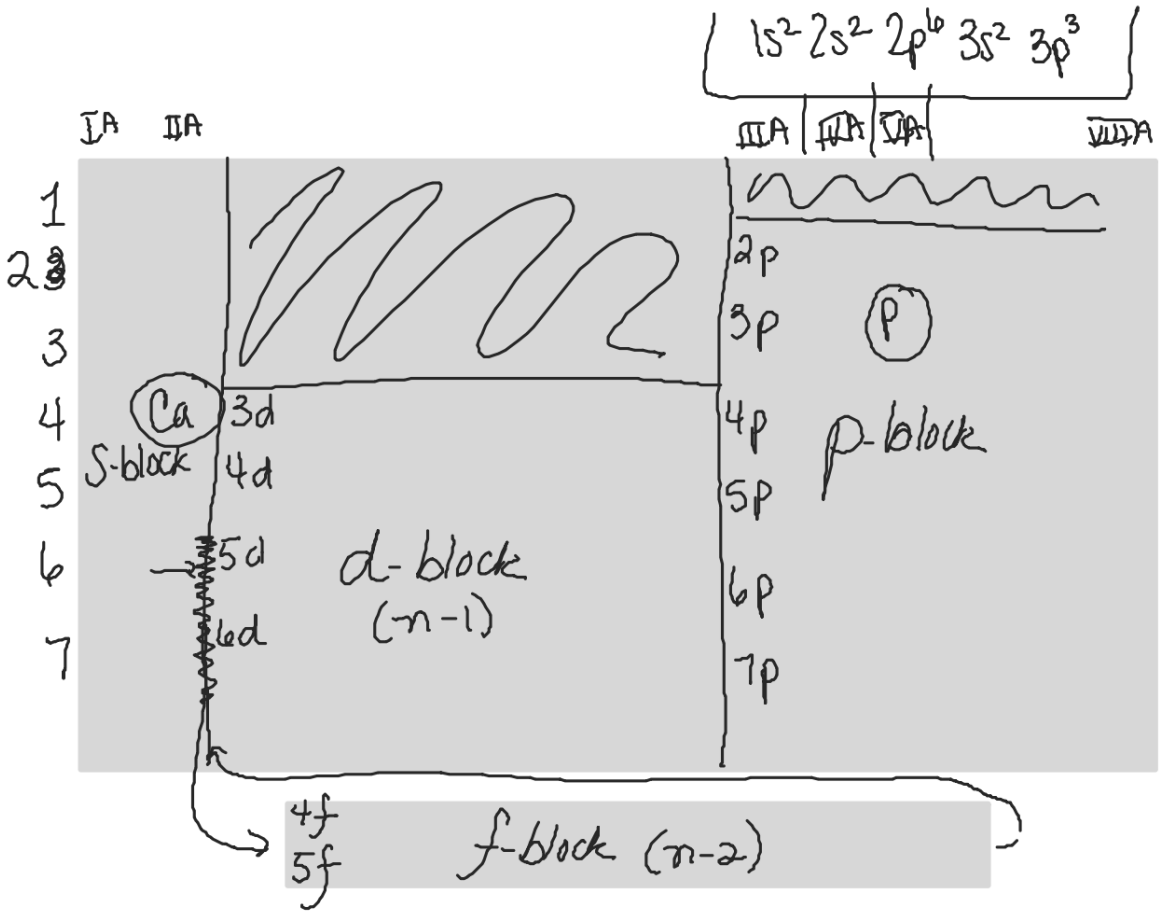
Isotope – atoms of the same element that have different # of neutrons (and mass #)



Organic C + H

Saturated (all single bonds, max H)

unsaturated (double + triple bonds or other elements present)


$1s^2 2s^2 2p^6 3s^2 3p^3$
IA
IIA
IIIA
VIIIA
1
2
3
4
5
6
7
Ca
S-block
3d
4d
5d
6d
d-block
(n-1)
2p
3p
P
4p
5p
6p
7p
p-block
4f
5f
f-block (n-2)