Electron Configurations- SPDF

I: Electrons

A. The number of electrons is equal to the atomic number

B. The maximum number of electrons each energy level can hold

Sublevel	s	p	d	f
Number of electrons	2	6	10	14

C. Expanded Periodic Table- See other sheet

II: The Rules

A. **Aufbau Principle**- Electrons enter orbitals of lowest energy first

1. 1s,2s,2p,3s,3p,4s,3d,4p,5s,4d,5p,6s,4f,5d,6p,7s,5f,6d ,7p….
2. See diagram- each box can hold 2 electrons as long as they are of opposite spin states.

B. **Pauli Exclusion Principle**- an orbital may describe at most two electrons. Electrons in the same orbital must have opposite spin + ½ and -1/2.

C. **Hunds Rule**- When electrons occupy orbitals of equal energy electrons enter each orbital until all orbitals contain one electron- then they begin to pair up! Hunds rule makes sense because electrons repel each other strongly due to the negative charges. This repulsion forces the electrons

into separate orbitals with a sublevel. A simple view of this is that spinning electrons produces a magnetic field if the spins are aligned with the same spin, the magnetic fields add to the repulsion of the negative charges is the spins are opposite each other, however, the magnetic fields will attract, thus reducing the repulsive effects.

III: Exceptions to the Rules-

A. Filled orbitals are more stable than partially filled sublevels

B. Half filled levels are not as stable as filled levels --- but they are more stable other configurations.

a. Example- Chromium should be
$1s^2,2s^2,2p^6,3s^2,3p^6,3d^4,4s^2$
But it is really

b. $1s^2,2s^2,2p^6,3s^2,3p^6,3d^5,4s^1$
This gives chromium a half filled d level which is more stable.

c. These exceptions account for the weird chemical behaviors of the transition metals- the atoms need to keep the energy of it's electrons as low as possible.

IV: Abbreviated Electronic Configurations- When atoms react the first point of contact is the outer electrons- the inner core electrons in fact play little to no role in chemical reactions- therefore it is the outer electrons that are of interest. You can abbreviate the core electrons by referring to the previous noble gas configuration.

A. Example: Potassium can be abbreviate [Ar] $4s^1$