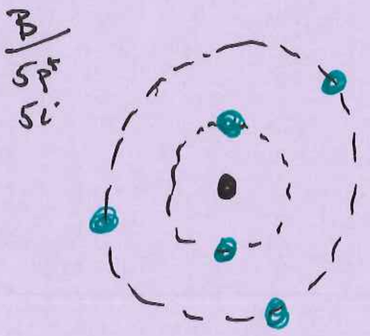
Shell -vs- Quantum Mechanical Model

Intro: The shell model is really just Bohr's model of an atom and is useful when making predictions but the Quantum Mechanical Model is the currently "BEST" model of an atom

Bohr Model



(*) No matter which model Coulomb's Law is still the Basis for describing interaction between p^+/e^-

- Model is one dimensional
- e^- follow specific paths
- only needed one quantum number (n) to describe e^- location

n = energy shell #

Problem: Atoms are 3-D objects so to properly describe location you need 3 coordinates

3 coordinates, AKA. Quantum Numbers are:

n cannot be zero! ⟹ (1) principal quantum #, n (shell #)

values are 0 to n-1 ⟹ (2) Angular quantum #, l (shape of orbital) ex ○ or 8

values are $-l$ to $+l$ ⟹ (3) magnetic quantum #, m_l (orientation of orbital)

The 4^{th} quantum # exists and is described by Pauli's exclusion principle (orbitals hold $2e^-$ max with opp. spin)

only 2 values can be $+\frac{1}{2}$ or $-\frac{1}{2}$ ⟹ (4) ~~Spin~~ Spin, m_s

(*) Also don't forget electrons are not just particles but also waves

↳ Schrodinger equation is used to solve the wave function and how the wave changes over time

↳ Don't worry ... Computers do this for us :)
And help us determine
- structure
- relative reactivity

Brief example of assigning quantum #'s [this wont be on AP test!]

for $n = 2$

	n	l	m_l
2s region	2	0	0
2p region	2	1	-1
	2	1	0
	2	1	1

2s region → 2, 0, 0, $+\frac{1}{2}$ / 2, 0, 0, $-\frac{1}{2}$

each row represents a unique electron

each row here (like 2s above) will each have a row with $+\frac{1}{2}$ an $-\frac{1}{2}$

↳ so 6 rows total for the 6 e^- locations