Today's Lecture - Chap 1

- Atomic Structure
- Ionic Bonding
- Covalent Bonding
- Lewis Structures
- Resonance Structures

Atomic Structure - location of electrons in an atom

Wave Equation for H atom - solution gives location of electrons (orbitals)

<table>
<thead>
<tr>
<th>Quantum#</th>
<th>Name</th>
<th>Physical Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>Principle Quantum#</td>
<td>Average distance from nucleus ('Shell')</td>
</tr>
<tr>
<td>l</td>
<td>Orbital Angular Momentum Quantum#</td>
<td>Shape of orbital</td>
</tr>
<tr>
<td>m_e</td>
<td>Magnetic Quant.</td>
<td>direction of orbital</td>
</tr>
<tr>
<td>m_s</td>
<td>Spin Quantum#</td>
<td>direction of e - spin</td>
</tr>
</tbody>
</table>

- An orbital is where there is high probability of finding the electron(s).

When \( l = 0 \): S orbital (asphere)

When \( l = 1 \): P orbitals ('dumbbell' shapes)

\( n \) tells us total # of possible Energy states = \( 2n^2 \) = # of microstates or places where electron can reside

- Wave eqn. only describes an H atom with one electron
  but can be used as an approximation for other atoms

-Aufbau or Build-up principle - using the H atom model and filling it with electrons to model other atoms
H: 1s
He: 1s²
Li: 1s²2s
C: 1s² 2s² 2p²

Lithium would be much more stable with a 1s² e⁻ configuration, so its chemistry is dominated by its forming an ion by losing an e⁻: Li⁺: 1s²

2p

1 1 1

2s

1 1

1s

Hund's rule: when 2 or more orbitals have the same energy, e⁻'s will occupy different orbitals with spins parallel (one up, one down).

Pauli Exclusion Rule: no two e⁻'s have exactly the same set of quantum numbers (in the same atom).

**Ionic Bonding**

Li⁺ + F⁻ → LiF
Na⁺ + Cl⁻ → NaCl
Mg²⁺ + 2Cl⁻ → MgCl₂

- no directionality
- form crystal structures
- bond in correct ratio to become neutral

**Covalent Bonding** - atoms form bonds by sharing e⁻'s so as to achieve a full outer shell (or at least a more stable e⁻-config.)
- directional bonds along orbitals

**Lewis Structures** - bonds form by 2 atoms sharing a pair of electrons

ex: CH₄ - methane