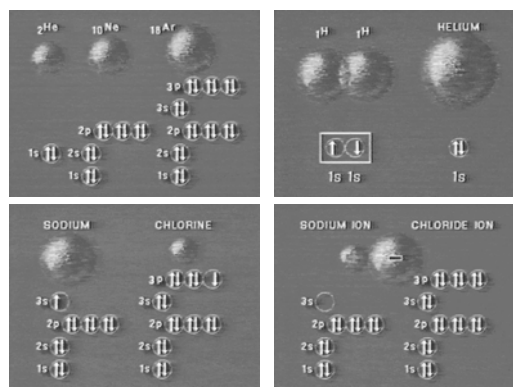


Hybrid Orbitals, Lewis Diagrams, The Octet Rule

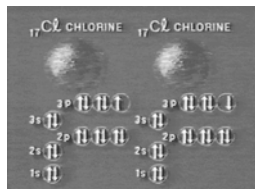
Review

- We can visualize a covalent bond as a balance between attraction and repulsion
- A second way to view the formation of a bond is to consider orbital diagrams
- Video (15 min - stop at HCl)
- Now we can visualize atoms bonding because of the lower energy achieved via the stability of filled valence shells
- The bottom line: atoms gain, lose, or share electrons to obtain noble gas electron configurations

Video: filling subshells



Video: filling subshells



- Draw orbital diagrams for F + F, H + O, Li + F

Hybrid orbitals

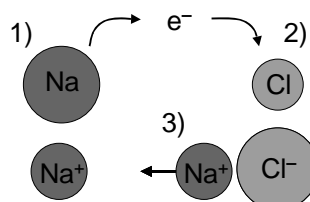
- Two overlapping orbitals form what is known as a hybrid or molecular orbital
- Just as in a s, p, d, or f orbital the electrons can be anywhere in the orbital (even though the electron has started out in one atom, at times, it may be closer to the other nucleus)
- Each hybrid orbital has a specific shape (described in chapter 8)
- You do not need to know shapes
- You need to know that hybrid orbitals exist and that they are formed from overlapping orbitals

Lewis diagrams

- Read Pg. 229. Draw Lewis dot diagrams for Ne, Sb, Rb, F. How many variations of the Lewis diagram for P can be drawn?
- Lewis diagrams follow the octet rule: atoms when forming ions, or bonding to other atoms in compounds have 8 outer electrons
- Q - How can the octet rule be explained?
- A -

Ionic bonding

- Recall: Ionic bonding involves 3 steps:
1) loss of e⁻, 2) gain of e⁻, 3) +ve, -ve attract



This can be represented via Lewis diagrams...

- Read remainder of 7.2 (pg. 230)
- Diagram the reaction between Li + Cl and Mg + O (PE 3)

Covalent bonding

- Covalent bonds can also be shown via Lewis diagrams - E.g draw Lewis diagrams showing the combination of 1) H+Cl, 2) C+Cl, 3) H+O, 4) Mg+F, 5) N+H, 6) Do PE 4 (pg. 234)
- Note bonds can also be drawn with a dash to represent two electrons (read 234-5 upto 7.5)

The octet rule (covalent compounds)

- (Read 7.4 up to PE4 (pg. 232 - 4). Do PE4.)
- Read remainder of 7.4
- Although the octet rule works for most compounds, PCl₅ and SF₆ are examples of exceptions (see pg. 235 for structures)
- Also, it can be difficult to draw the correct bonds for atoms with multiple bonds
- Some clear rules have been established for drawing Lewis structures
- We will see that the rules dictate molecular structure, which dictates shape, which can influence chemical properties of a compound