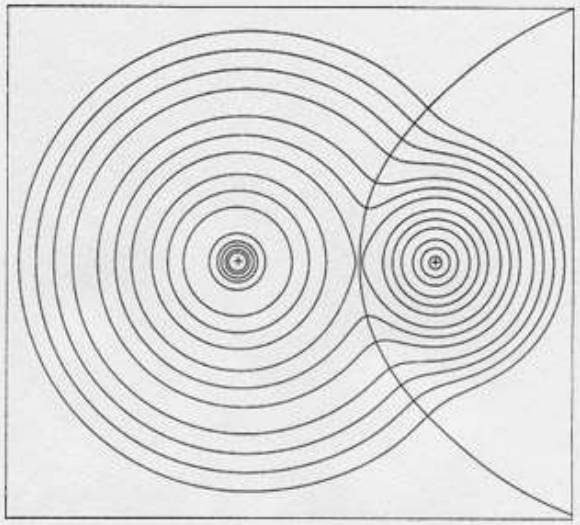
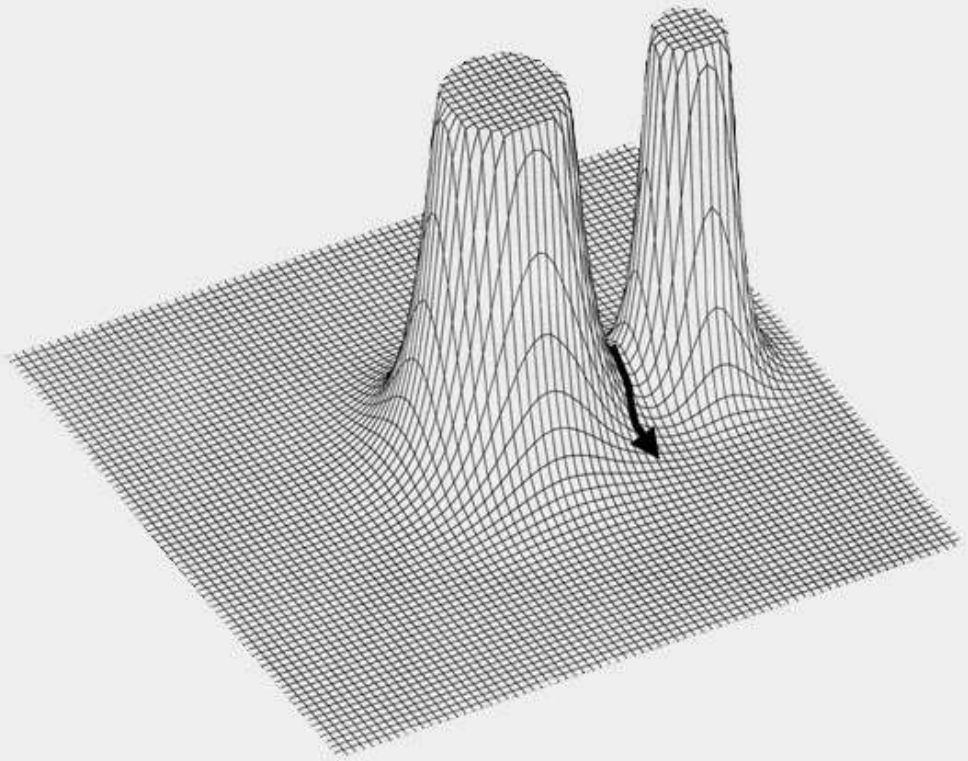
Bonding, and Lewis Dot Structures

- Chapter 8

Dubai

Debyes



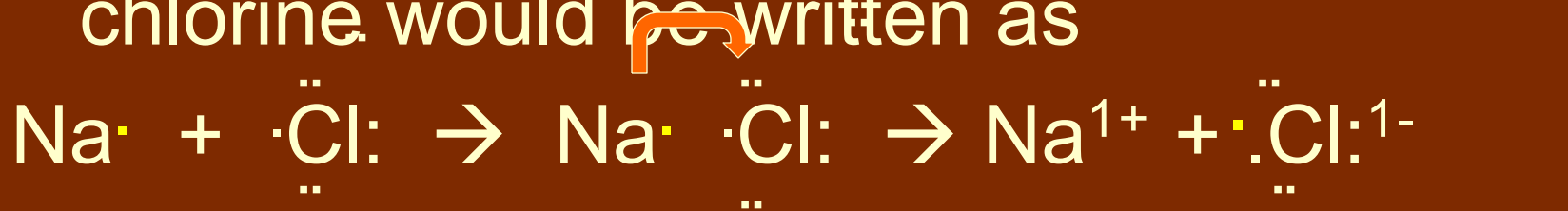


Debyes are a unit of charge separation, within chemical bonds

- μ=Qr
- Magnetic moment=charge separation * distance
- 1 Debye = $3.34 * 10^{-30}$ coulomb*meters
- Charge/electron=$1.60*10^{-19}$ coulombs
- See sample exercise 8.5

Lewis Dot Diagram Method

- Write the element symbol.
- Use dots to show the *valence electrons* (alone or in pairs) around the symbol.
- Sodium would be Na with one dot.
- Chlorine would be Cl with seven dots.
- Our previous reaction of sodium with chlorine would be written as



Lewis Dot Diagrams (Practice)

Element	Electron Configuration	Lewis Dot Diagram
Li	$[He]2s^1$	
Be	$[He]2s^2$	
B	$[He]2s^22p^1$	
C	$[He]2s^22p^2$	
N	$[He]2s^22p^3$	
O	$[He]2s^22p^4$	
F	$[He]2s^22p^5$	
Ne	$[He]2s^22p^6$	
Al	$[Ne]3s^23p^1$	
P	$[Ne]3s^23p^3$	

Practice doing this! Remember, show only the valence electrons.

Check the validity of the proposed Lewis structure

- Total number of valence electrons must be the same in the compound and the isolated elements
- Total number of unbonded pairs must be the same around each element center
- Every electron must be part of a pair (either a shared pair or an unshared pair)
- If unpaired electrons remain in adjacent elements, after the formation of single bonds, consider the possibility that a double or triple bond might form

Strengths and weaknesses of Lewis Dot model

- Strengths
  - Allows you to predict which elements form bonds with which elements in a chemical compound
  - Allows you to predict the formation of double and triple bonds
- Weaknesses
  - Electrons are shown as point charges, when they should be difuse clouds
  - Bond angles are all shown as 90^{o}, which is inaccurate

Practice Drawing Lewis structures for the following:

- KI
- $CHCl_3$
- C_3H_8
- C_2H_4

Remember, Lewis Dots structures are just models, and there are numerous exceptions

- Elements in Group 2, and Group 3 don't have an octet of electrons.
- Elements in periods 4 and beyond had d electrons, more than a full octet.
- The most stable compounds always have an even number of electrons. But there are exceptions (like NO) with a lone unpaired electron in one of the shells.
- Some compounds (like benzene) can not be drawn with a single lewis dot structure. A pair of resonance structures must be shown.