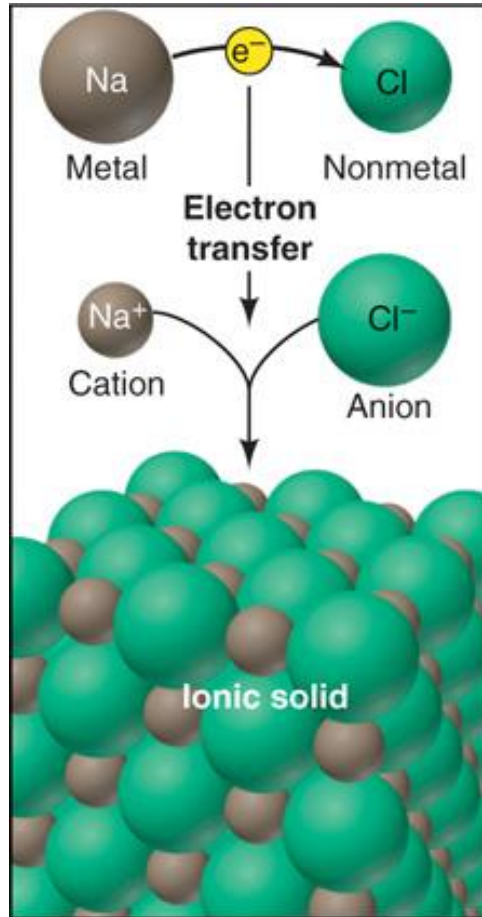
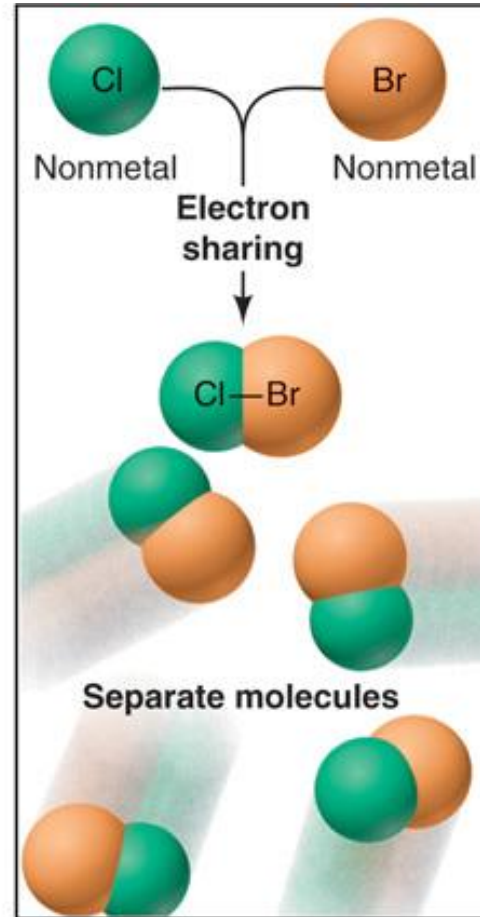


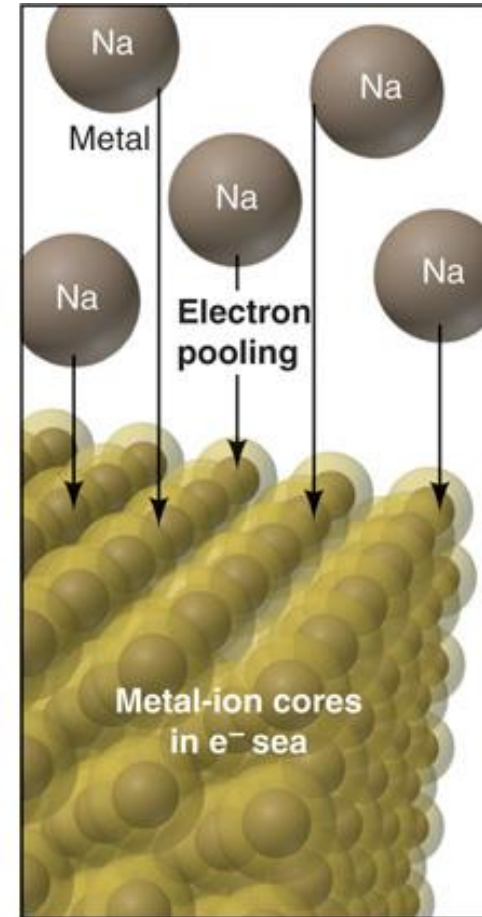
Types of Bonding



A Ionic bonding



B Covalent bonding



C Metallic bonding

Fig. 8.3

Ionic Bonding: Lewis Structures

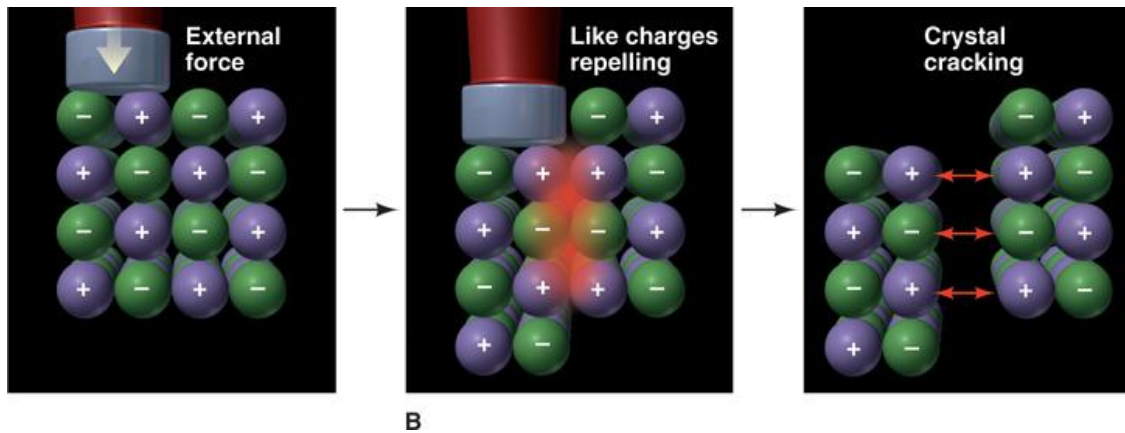
No electrons are shared in an ionic bond. The ions are held together only through electrostatic attractions.

To show ionic bonding in a Lewis structure, simply show the structures of the ions (and their formation)

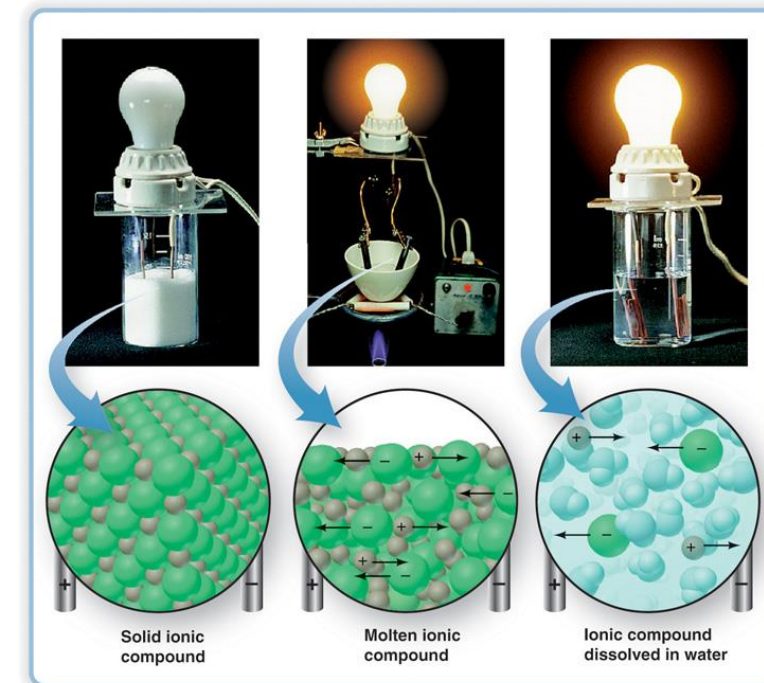
e.g. MgCl_2

Ionic Bonding

- Ionic compounds (which we describe in *formula units*, not molecules!) generally exist in crystals. The nature of the attraction explains some physical properties, such as brittleness:



and conductivity:



Metallic Bonding

Metallic bonding is based on a “sea” of delocalized electrons moving around the (very localized) nuclei:

Since the nuclei are freely sharing electrons, this bonding explains the conductivity and ductility of metals.

Covalent Bonding

In covalent bonds, electrons (two per bond) are shared between two atoms:

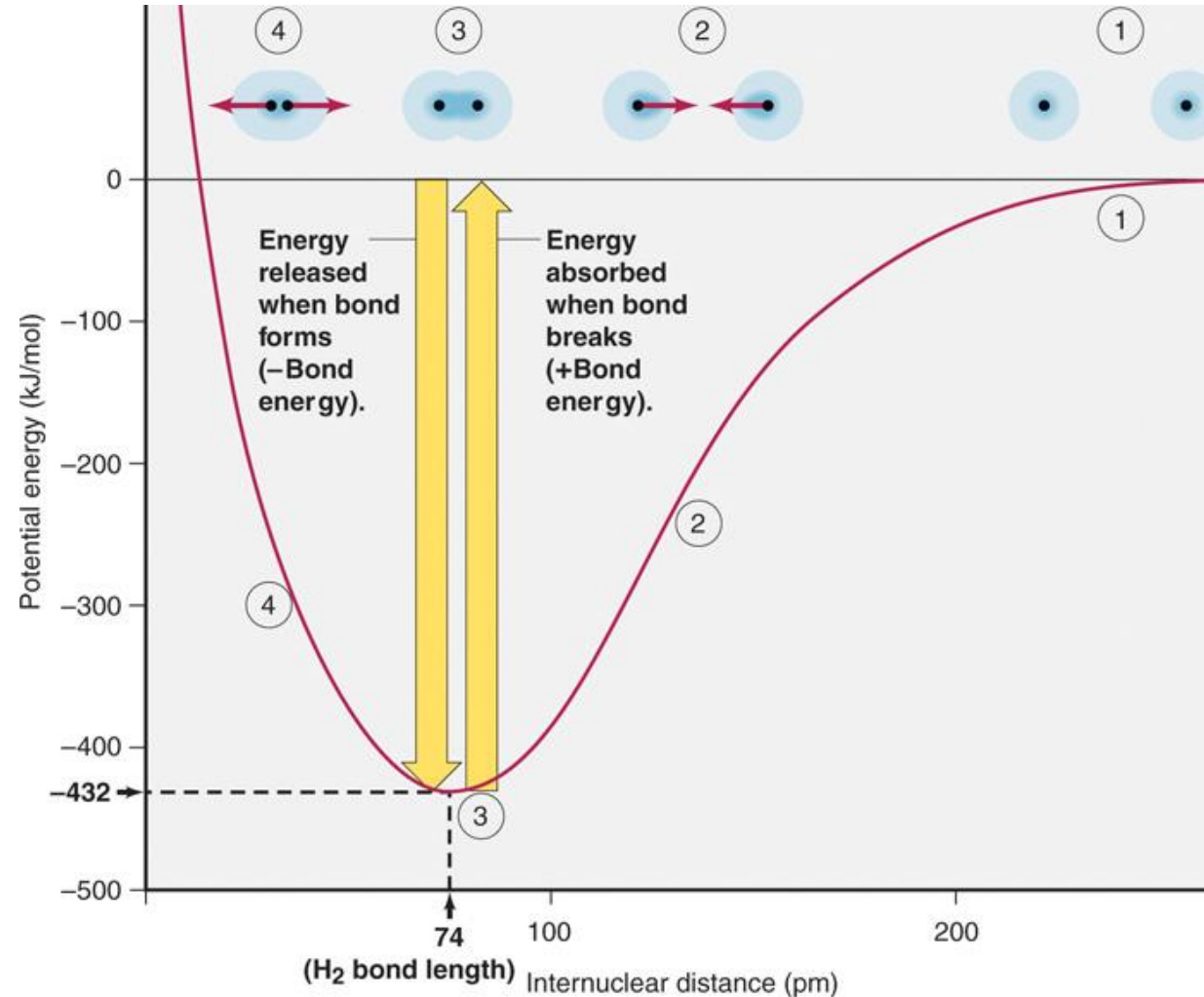


Figure 8.13

The continuum of bonding

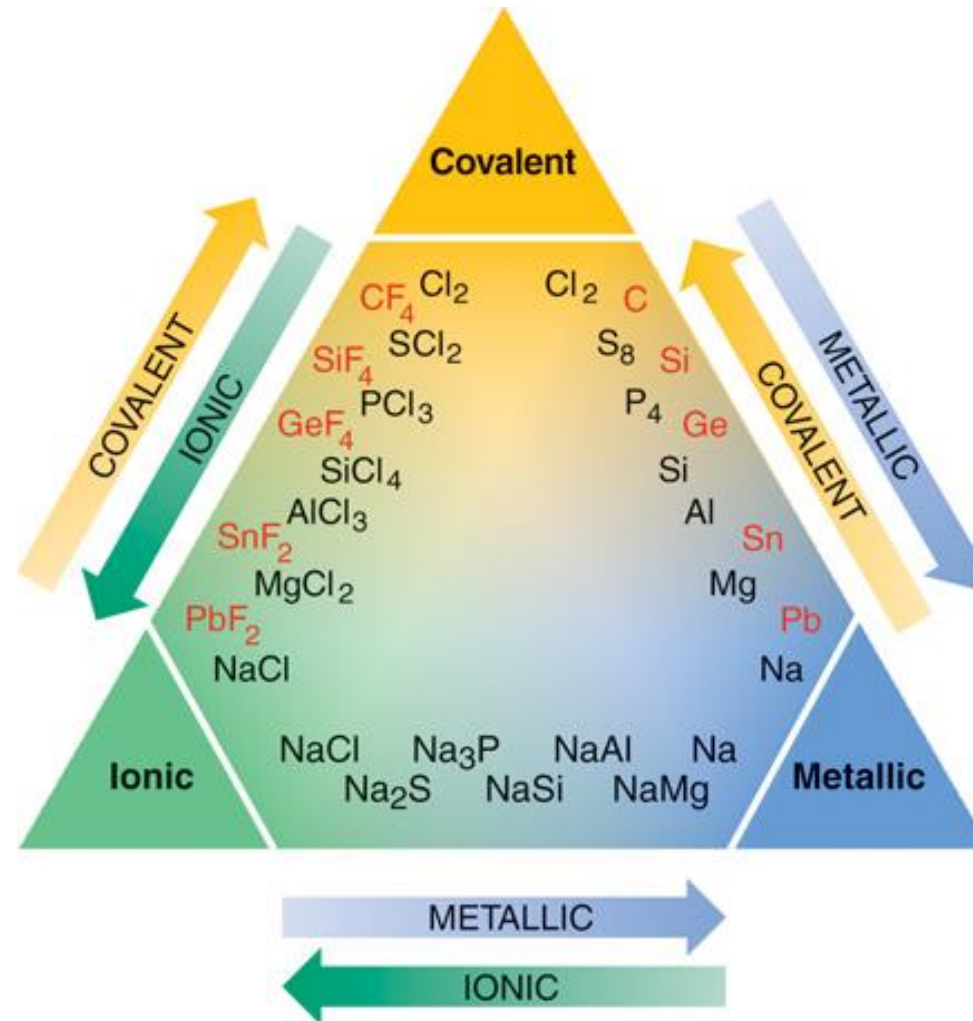


Figure 8.4

Describing Covalent Bonds

Lewis structures:

F_2 :

Bond order:

Bond length:

Bond energy:

Draw the Lewis structure for N₂.

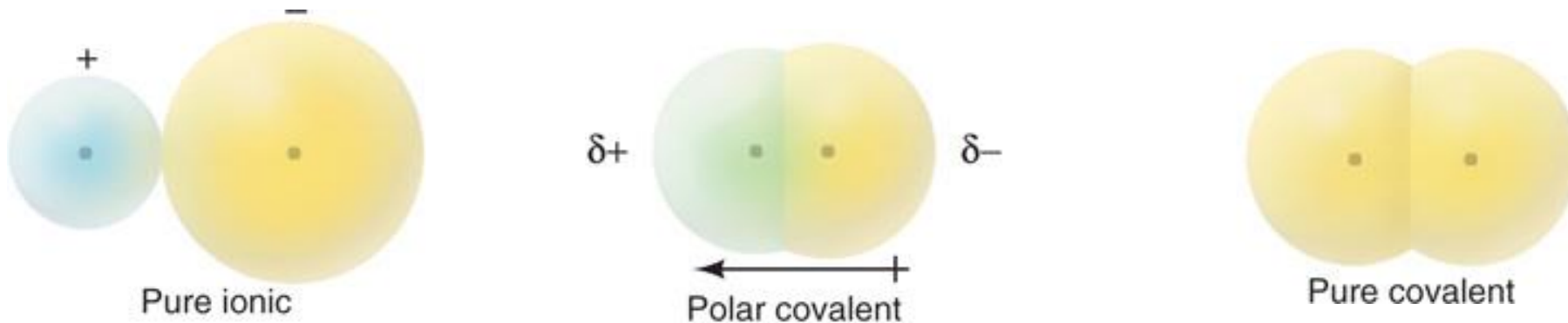
What is the bond order of this molecule?

Electronegativity & Bond Polarity

Covalent bonds where the electrons are not perfectly evenly shared are called **polar bonds** and have a **dipole**.

We can show this with arrows, or with a small delta +/-, meaning 'partial charge':

The ability of an atom to draw electrons towards itself in a covalent bond is **electronegativity**.



Electronegativities on the Pauling scale

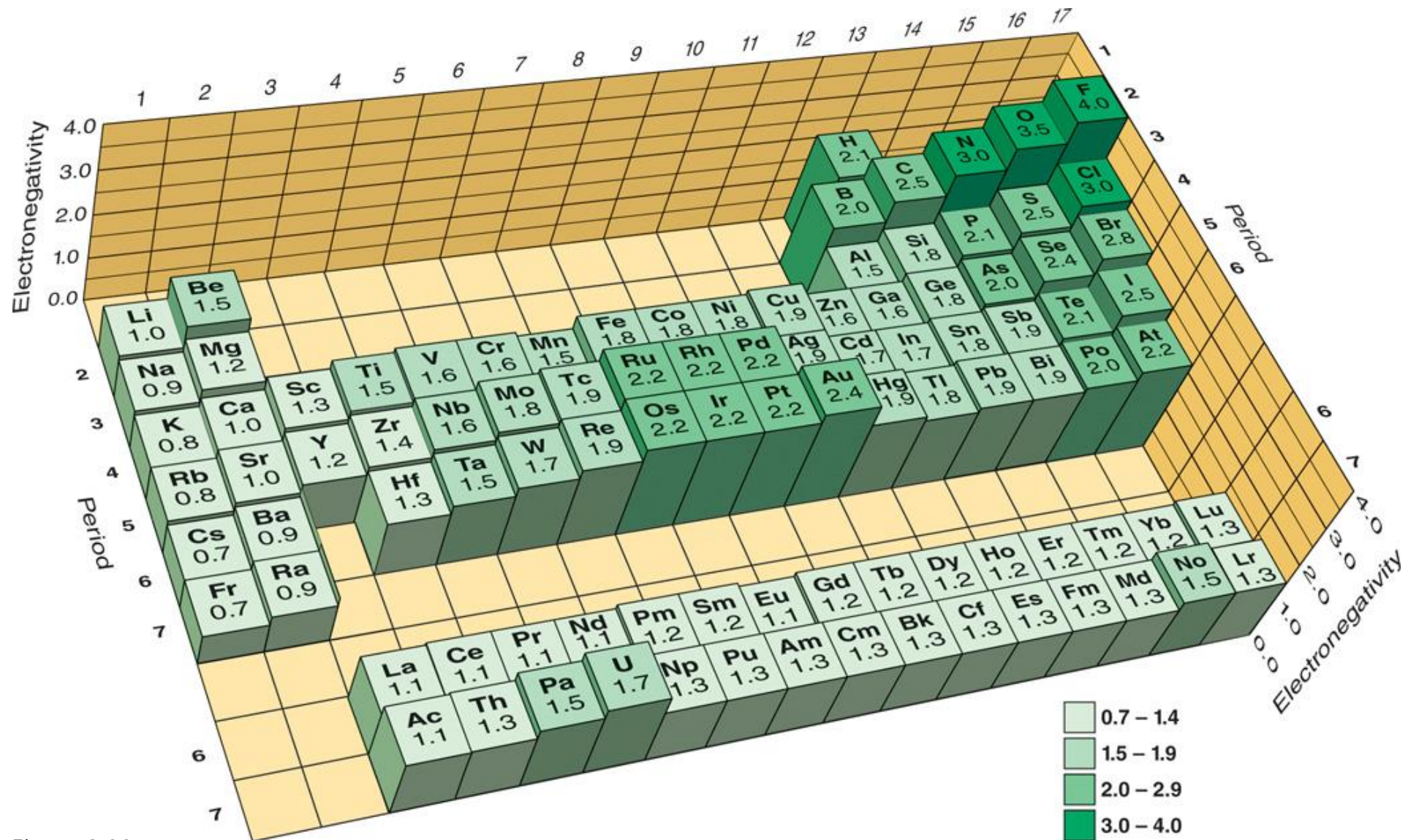
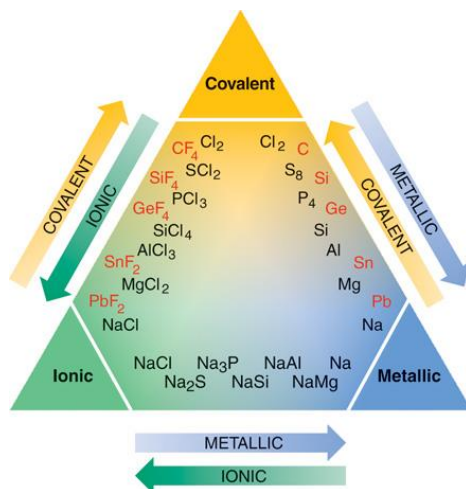


Figure 8.23

What kind of bond will it be?



Though the actual bonding behaviour is a continuum, we have some helpful cutoffs:

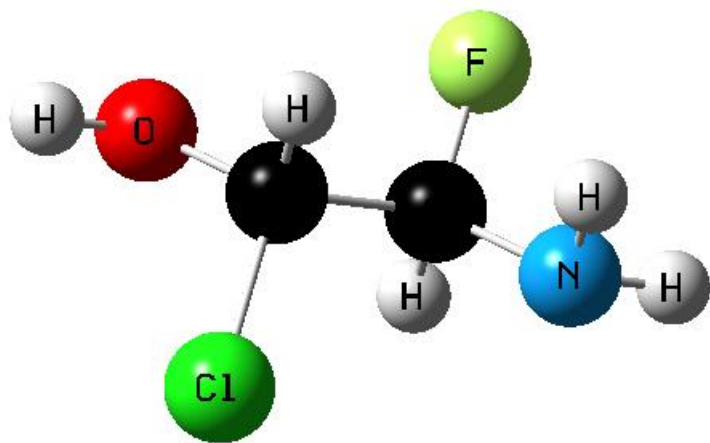
- A difference in electronegativity > 1.7 is (usually) ionic.
- A difference < 0.4 is (usually) nonpolar.
- In between are polar covalent bonds.

MAIN-GROUP ELEMENTS																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 H 1.008		3 Li 6.941	4 Be 9.012									13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
2 He 4.003																	
3 Na 22.99	12 Mg 24.31	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.41	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
4 K 39.10	20 Ca 40.08	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
5 Rb 85.47	38 Sr 87.62																
6 Cs 132.9	56 Ba 137.3																
			72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)

PROPERTY	METAL ATOM	NONMETAL ATOM
Atomic size	Larger	Smaller
Z_{eff}	Lower	Higher
IE	Lower	Higher
EA	Less negative	More negative



Which bond is most polar?



1. C-O
2. C-Cl
3. C-F
4. C-H
5. C-N