Answer key

11/03/25

Ch.8

Chemical Bonding

What is an ionic bond? What makes up ionic compounds?

↑ cations (+)

Ionic bonding = attraction blw ions → anions (−)

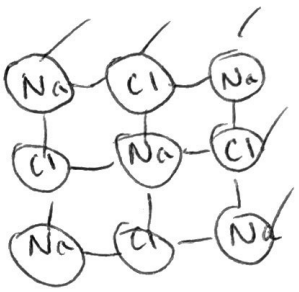
- Metal + nonmetal

What is the role of electrons in ionic bonding?

Transfer e^- = give + take e^-

to obtain stability

What does a lattice structure show?



Shows a crystalline solid structure

- opposite charges attract
- In shape of a cube

Increase →

↑ 1− 2−

What factors affect lattice structure?

Size + charge of ions

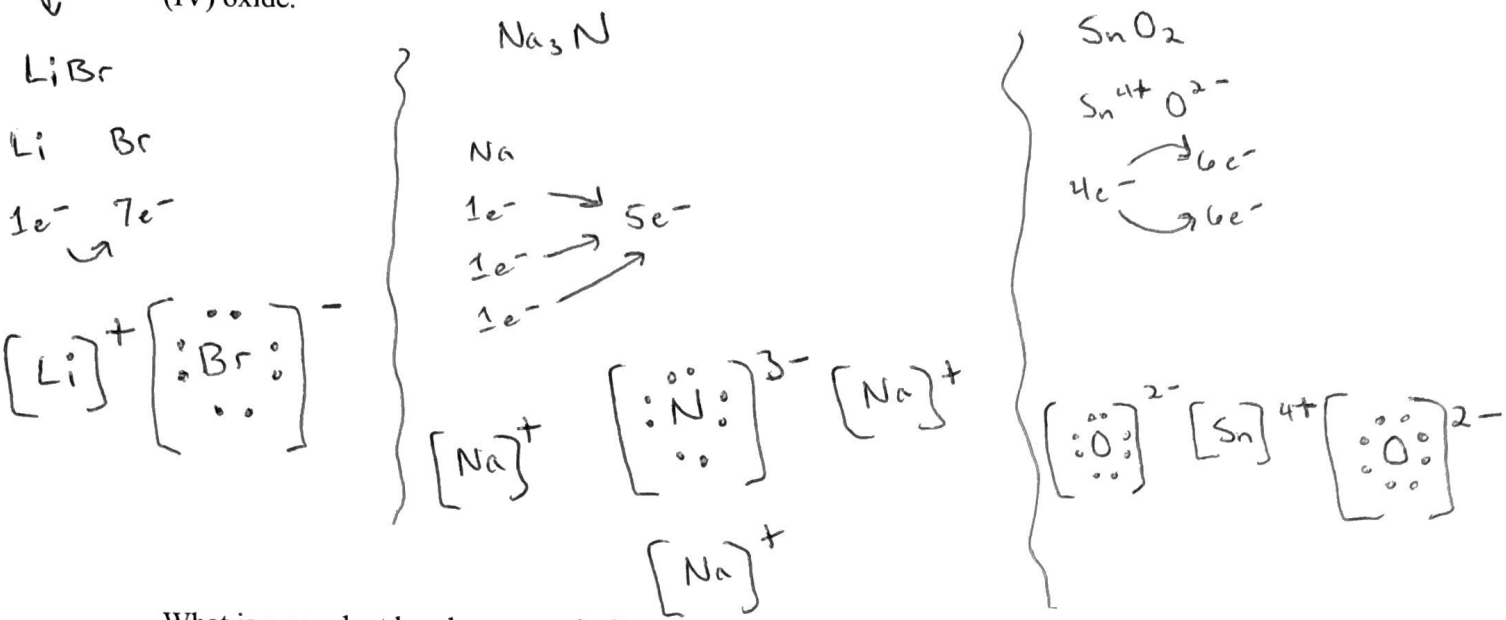
- smaller ion = greater lattice E (requires more E to separate ions)
- Attraction increases w/ greater ion charge
  ↳ greater lattice E

What is the octet rule?

When an element wants 8 valence e^-

Ionic

Draw the lewis structures for the following compounds: lithium bromide, sodium nitride, and tin (IV) oxide.



What is a covalent bond composed of?

2 or more nonmetals

What is the role of electrons in covalent bonds?

Share valence e⁻

Electronegativity ↑ Increase

Will ionic or covalent compounds have a higher melting point?

Ionic = M + NM
covalent = NM + NM

Ionic cmpds

Do covalent compounds conduct electricity when dissolved in water?

nonelectrolytes

No

Are ionic or covalent compounds more soluble?

Ionic cmpds

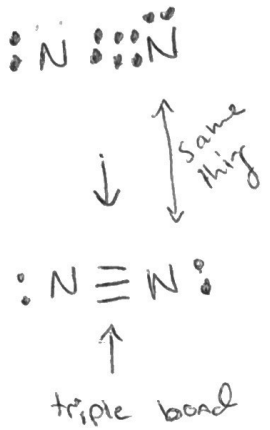
↑

Strong electrolytes = completely dissociate

Draw the following lewis dot structures for N_2, NCl_3, C_2H_4, and NH_4Cl.

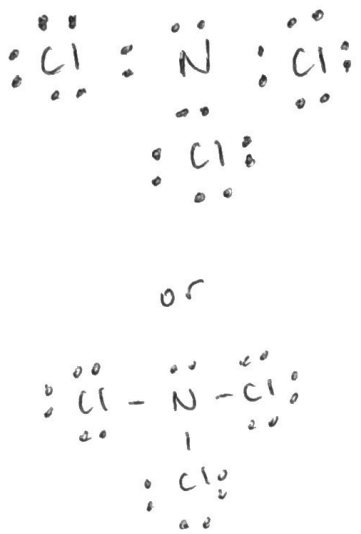
N_2

$5+5=10e^-$



NCl_3

$5+3(7)=26e^-$

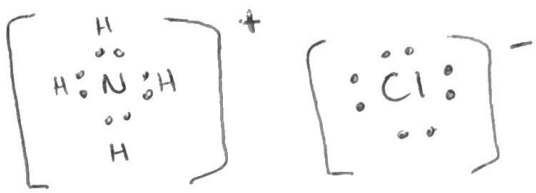


NH_4Cl

$NH_4^+ Cl^-$

$5+4(1) \quad 7e^- + 1 = 8e^-$

$=8e^-$



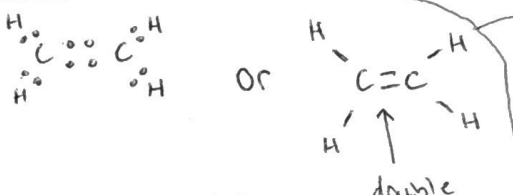
1) Add up valence e⁻

2) Arrange e⁻ so that each element has 8 e⁻

2a) Form multiple bonds (if needed)

C_2H_4

$2(4)+4(1)=12e^-$



What are the exceptions to the octet rule?

H = wants 2e⁻

He + Li = wants 2e⁻

Be = wants 2e⁻ or 4e⁻ → 2 bonds

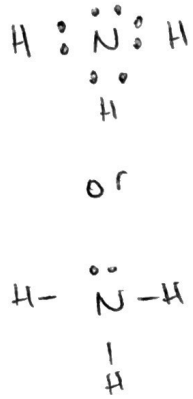
B = can have 6e⁻ → 3 bonds

S + P = can have 8, 10, or 12e⁻ → 4, 5, or 6 bonds

Draw the lewis dot structures for the following compounds: NH_3, PBr_5, $BeCl_2$

NH_3

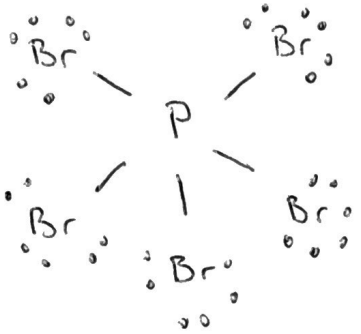
$5+3(1)=8e^-$



or

PBr_5

$5+5(7)=40e^-$

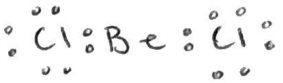


$- = 2e^-$

↑ single bonds

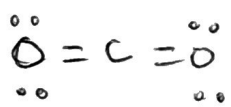
$BeCl_2$

$2+2(7)=16e^-$



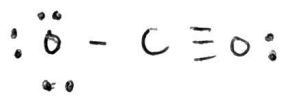
Assign the formal charges for the C and Os in CO_2 with two double bonds between the C and O, and assign the formal charges between the C and Os with a single bond and triple bond between the C and O. Determine which compound is significant.

Formal charge = valence e^- - (lone pair e^-) - 1/2 (bonding e^-)



C: $4-0-\frac{1}{2}(8)=0$

O: $6-4-\frac{1}{2}(4)=0$



C: $4-0-\frac{1}{2}(8)=0$

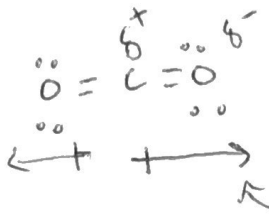
$-$O: $6-6-\frac{1}{2}(2)=-1$

$\equiv$ O: $6-2-\frac{1}{2}(6)=+1$

More significant b/c more formal charges ≠ 0

Determine whether or not the compound is polar or nonpolar without looking at the electronegativity values.

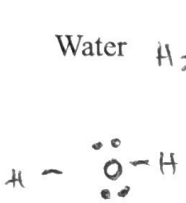
Carbon dioxide CO_2



Nonpolar cmpd
- symmetrical

Polar bonds but nonpolar molecule

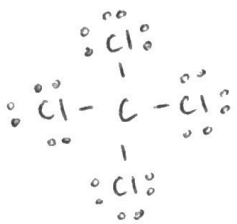
Water H_2O



Polar
- Lone pairs on central atom
- Not symmetrical

Carbon tetrachloride

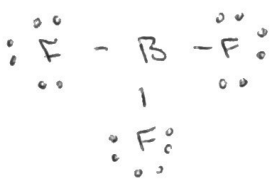
CCl_4



Nonpolar
- symmetrical

Boron trifluoride

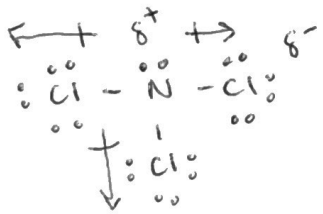
BF_3



Nonpolar
- symmetrical
- No ~~none~~ lone pairs

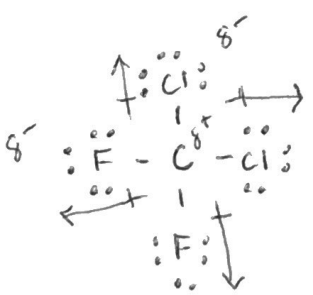
Nitrogen trichloride

NCl_3



Polar
- Lone pair on N

CCl_2F_2



Polar
- Not symmetrical
↳ Different electronegativity values

Increasing →

↑ Ionization E

Electronegativity

e⁻ affinity

Increasing ←

↓ Atomic Radius

↓ Ionic radius

0.0 - 0.2	nonpolar
0.2 - 2.0	polar
> 2.0	Ionic

F — P

↙ electronegativity

4.0 - 2.0 = 2.0

O or O^{2-}

↖ bigger

$Mg + Mg^{+}$

↑

bigger

$Mg^{2+} + O^{2-}$

↖ bigger