Chapter 3 Homework Key

3.30 Which formulas represent ionic compounds and which represent covalent compounds?

a. C_3H_8 ⇒ all nonmetals = Covalent

b. ClBr ⇒ all nonmetals = Covalent

c. CuO ⇒ Cu metal = ionic

d. CH_4O ⇒ all nonmetals = Covalent

3.36 How many protons and electrons are present in each ion?

a. K^+ $19p^+$ with 1 less e^- = $18e^-$

b. S^{2-} $16p^+$ with 2 extra e^- = $18e^-$

c. Mn^{2+} $25p^+$ with 2 less e^- = $23e^-$

d. Fe^{2+} $26p^+$ with 2 less e^- = $24e^-$

e. Cs^+ $55p^+$ with 1 less e^- = $54e^-$

f. I^- $53p^+$ with 1 extra e^- = $54e^-$

3.42 Give the ion symbol for each ion.

a. barium ion — Ba is group 2A = Ba^{2+}

b. iron (II) — Roman numeral gives charge = Fe^{2+}

c. oxide — oxygen is group 6A = O^{2-}

d. ferrous — -ous ending is low charge state = Fe^{2+}

e. lead (IV) — Roman numeral gives charge = Pb^{4+}

3.52 How many protons and electrons are contained in each polyatomic ion?

⟹ Look for <u>total</u> e⁻ <u>not</u> valence e⁻ here.

a. NH_4^+

Protons

N 7 = 7

H 1×4 = +4

$11p^+$

e⁻

N 7 = 7

H 1×4 = +4

11

− 1 for + charge

$10e^-$

b. CN^-

Protons

N 7

C 6

$13p^+$

e⁻

one more than protons for − charge

$14e^-$

c. CO_3^{2-}

Protons

C 6 = 6

O 8×3 = 24

$30p^+$

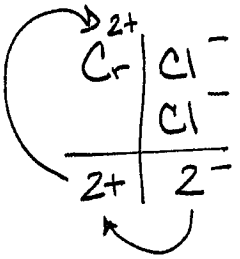
e⁻

+ 2 more than protons for 2- charge

$32e^-$

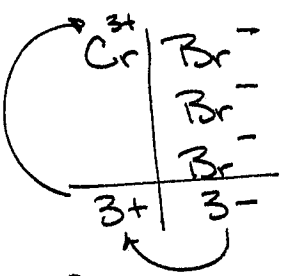
3.74 Name each ionic compound.

a. $CrCl_2$



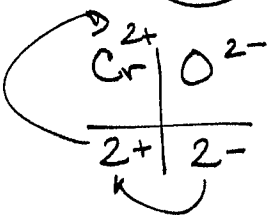
Chromium (II) Chloride
or
Chromous Chloride

b. $CrBr_3$



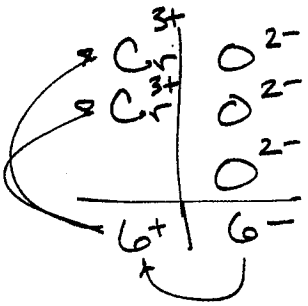
Chromium (III) bromide
or
Chromic bromide

c. CrO



Chromium (II) oxide
or
Chromous oxide

d. Cr_2O_3



Chromium (III) oxide
or
Chromic oxide

3.78 Write formulas to illustrate the difference between each pair of compounds.

a. Lithium sulfite
Li^+ SO_3^{2-}
Li_2SO_3

Lithium sulfide
Li^+ S^{2-}
Li_2S

b. Sodium carbonate
Na^+ CO_3^{2-}
Na_2CO_3

Sodium hydrogen carbonate
Na^+ HCO_3^-
$NaHCO_3$

c. Calcium phosphate
Ca^{2+} PO_4^{3-}
$Ca_3(PO_4)_2$

Calcium dihydrogen phosphate
Ca^{2+} $H_2PO_4^-$
$Ca(H_2PO_4)_2$

3.82 Write a formula from each name.

a. Copper(I) Sulfite

Cu^{+} SO_3^{2-}

Cu_2SO_3

b. Aluminium nitrate

Al^{3+} NO_3^{-}

$Al(NO_3)_3$

c. tin(II) acetate

Sn^{2+} $C_2H_3O_2^{-}$

$Sn(C_2H_3O_2)_2$

d. lead(IV) carbonate

Pb^{4+} CO_3^{2-}

$Pb(CO_3)_2$

e. Zinc hydrogenphosphate

Zn^{2+} HPO_4^{2-}

Zinc always 2+ Memorize

~~$Zn(HP$~~

$ZnHPO_4$ no parenthesis needed?

f. Manganese dihydrogen phosphate

Mn^{2+} $H_2PO_4^{-}$

Guessing as to the Mn Charge state. Mn comes in +2, +3, +4, +6, and +7. A roman numeral should have been given by the book.

$Mn(H_2PO_4)_2$

g. aluminium bicarbonate

Al^{3+} HCO_3^{-}

$Al(HCO_3)_3$

h. Chromous Cyanide

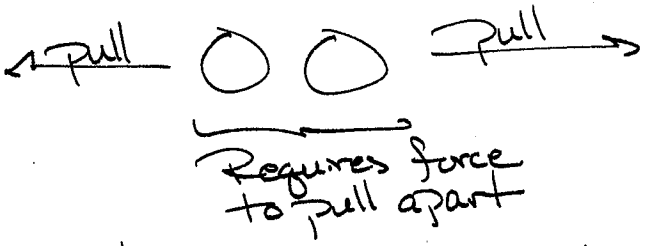
Cr^{2+} CN^{-}

$Cr(CN)_2$

3.83 Would you expect the gas in the atmosphere to be composed of ionic compounds or Covalent molecules? Explain your choice.

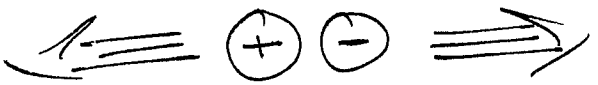
⇒ Tough question to answer at this point. the answer requires knowledge of intermolecular forces, the attractive forces between molecules.

Molecules have attractive forces between them. It takes energy to pull 2 molecules away from each other.



The particles with strong attractive forces tend to be solids and liquids, while those with weaker forces tend to be gasses.

Ionic compounds are held together with <u>very strong</u> electrostatic attractions.



Large force Required

= Solid material with <u>high</u> melting point

Molecular compounds are held to one another by much weaker forces discussed in chapter 4.

neutral
Small force Required

= Possibility of being a gas

3.90 Which compound or element has the lowest boiling point: Cl_2, KI or LiF?

Strength of intermolecular forces ↑ : Ionic → High Boiling pt ↑ ; Covalent → low Boiling pt

LiF ⇒ Metal Li = ionic
KI ⇒ Metal K = ionic
} High Boiling/Melting pt.

Cl_2 ⇒ all nonmetals = Covalent = lower Boiling pt.