

## Review: Nomenclature and Chemical Equations

### 1. Oxidation Numbers

- charge on an ion based on the number of electrons lost, gained, or shared

List all possible oxidation numbers for the following:

- a) sodium      b) oxygen      c) vanadium      d) sulphur      e) carbonate

### 2. Formula Writing

- use oxidation number to establish charge ion carries when they it reacts

- use zero sum rule or criss-cross to determine formula

Determine the formula when the following elements combine:

- a) lithium and oxygen      b) iron (II) and sulphur  
c) manganese (VI) and sulphate      d) arsenic (III) and dichromate

### 3. Formula to Name

i) name the positive ion first by its elemental name

ii) check periodic table to determine if element has a multiple oxidation number

\* if element does not have a multiple oxidation number, proceed to iii)

\* if element has multiple oxidation numbers, use zero sum rule to determine the oxidation number of the element and write this number in Roman numerals following the element name

iii) name the negative ion (ends in ide if binary, ate or ite if polyatomic)

Write the IUPAC name for the following:

- a) NaCl      b)  $K_2Cr_2O_7$       c)  $SbF_5$       d)  $Pb(S_2O_3)_2$       e)  $NH_4OH$

### 4. Name to Formula

- the name contains all the information needed to write the formula

i) write element symbols with oxidation number

ii) use zero sum or criss-cross to determine subscripts of the formula

Write the formula of the following:

- a) sodium chloride      b) potassium dichromate      c) antimony (V) fluoride  
d) lead (IV) thiosulphate      e) ammonium hydroxide

### 5. Suffix Method

- for ionic compounds when the positive ion has only two oxidation numbers possible

- use Latin stem and ic suffix for higher ON and ous suffix for lower ON

Name the following compounds using both the IUPAC and the Classical suffix method:

- a)  $PbS$       b)  $Au(NO_3)_3$       c)  $Cu_2SO_4$

Write the formula for the following compounds:

- d) ferric nitride      e) stannous cyanide      f) mercuric acetate

### 6. Prefix Method

- covalent compounds

- prefix in the name indicates the subscript in the formula

Name the following compounds using both the IUPAC and the Classical prefix method:

- a) CO      b)  $N_2O_5$       c)  $PCl_5$

Write the formula for the following compounds:

- d) nitrogen triiodide      e) sulphur hexafluoride      f) tetraphosphorous decaoxide

7. Binary and Oxy-Acids

Name the following acids:

- a)  $\text{H}_2\text{S}_{(aq)}$       b)  $\text{H}_3\text{PO}_4_{(aq)}$       c)  $\text{HClO}_4_{(aq)}$       d)  $\text{H}_2\text{SO}_3_{(aq)}$       e)  $\text{HCN}_{(aq)}$       f)  $\text{H}_2\text{CO}_{(aq)}$

Write the formula for the following acids:

- g) hydrobromic acid      h) nitrous acid      i) persulphuric acid      j) iodic acid

8. Balanced Chemical Equations

i) Write a balanced chemical equation for the reaction between aluminum and hydrochloric acid. The products are aqueous aluminum chloride and hydrogen gas.

ii) Balance then classify the following as a synthesis, decomposition, single displacement or double displacement reaction.

- a)  $\underline{\quad} \text{Al} + \underline{\quad} \text{O}_2 \rightarrow \underline{\quad} \text{Al}_2\text{O}_3$   
 b)  $\underline{\quad} \text{Fe}_2\text{O}_3 + \underline{\quad} \text{C} \rightarrow \underline{\quad} \text{Fe} + \underline{\quad} \text{CO}_2$   
 c)  $\underline{\quad} \text{Zn} + \underline{\quad} \text{HCl} \rightarrow \underline{\quad} \text{ZnCl}_2 + \underline{\quad} \text{H}_2$   
 d)  $\underline{\quad} (\text{NH}_4)_2\text{SO}_4 + \underline{\quad} \text{CaCl}_2 \rightarrow \underline{\quad} \text{NH}_4\text{Cl} + \underline{\quad} \text{CaSO}_4$   
 e)  $\underline{\quad} \text{H}_2\text{O} \rightarrow \underline{\quad} \text{H}_2 + \underline{\quad} \text{O}_2$

Answers:

1. a) 1      b) -2      c) 2, 3, 4, 5      d) -2, 2, 4, 6      e) -2
2. a)  $\text{Li}_2\text{O}$       b)  $\text{FeS}$       c)  $\text{Mn}(\text{SO}_4)_3$       d)  $\text{As}_2(\text{C}_2\text{O}_7)_3$
3. a) sodium chloride      b) potassium dichromate      c) antimony (V) fluoride  
 d) lead (IV) thiosulphate      e) ammonium hydroxide
4. a)  $\text{NaCl}$       b)  $\text{K}_2\text{Cr}_2\text{O}_7$       c)  $\text{SbF}_3$       d)  $\text{Pb}(\text{S}_2\text{O}_3)_2$       e)  $\text{NH}_4\text{OH}$
5. a) lead (II) sulphide, plumbous sulphide      b) gold (III) nitrate, auric nitrate  
 c) copper (I) sulphate, cuprous sulphate      d)  $\text{Fe}_3\text{N}_2$       e)  $\text{Sn}(\text{CN})_2$       f)  $\text{Hg}(\text{C}_2\text{H}_3\text{O}_2)_2$
6. a) carbon (II) oxide, carbon monoxide      b) nitrogen (V) oxide, dinitrogen pentoxide  
 c) phosphorus (V) chloride, phosphorus pentachloride      d)  $\text{NI}_3$       e)  $\text{SF}_6$       f)  $\text{P}_4\text{O}_{10}$
7. a) hydrosulphuric acid      b) phosphoric acid      c) perchloric acid      d) sulphurous acid  
 e) hydrocyanic acid      f) hypocarbonous acid      g)  $\text{HBr}_{(aq)}$       h)  $\text{HNO}_2$       i)  $\text{H}_2\text{SO}_5_{(aq)}$       j)  $\text{HIO}_2_{(aq)}$
8. i)  $2 \text{Al} + 6 \text{HCl} \rightarrow 2 \text{AlCl}_3 + 3 \text{H}_2$
- ii) a)  $\underline{4} \text{Al} + \underline{3} \text{O}_2 \rightarrow \underline{2} \text{Al}_2\text{O}_3$       synthesis  
 b)  $\underline{2} \text{Fe}_2\text{O}_3 + \underline{3} \text{C} \rightarrow \underline{4} \text{Fe} + \underline{3} \text{CO}_2$       single displacement  
 c)  $\underline{1} \text{Zn} + \underline{2} \text{HCl} \rightarrow \underline{1} \text{ZnCl}_2 + \underline{1} \text{H}_2$       single displacement  
 d)  $\underline{1} (\text{NH}_4)_2\text{SO}_4 + \underline{1} \text{CaCl}_2 \rightarrow \underline{2} \text{NH}_4\text{Cl} + \underline{1} \text{CaSO}_4$       double displacement  
 e)  $\underline{2} \text{H}_2\text{O} \rightarrow \underline{2} \text{H}_2 + \underline{1} \text{O}_2$       decomposition