

Topics: Chemical Equations  
Reading, Typing, Balancing  
Chapter reading:

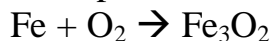
**1 A chemical reaction equation: definition**

- a. Species: reactant(s) & product(s)
- b. How to say it: equation reading

**2 Equation reading and verbal writing: rules**

- Be precise when writing: nomenclature, transition metals, organic compounds
- Be vivid when reading

Example



- The correct way to read: iron metal react with oxygen [gas] to form [brown] iron (III) oxide
  - The correct way to write: Iron + Oxygen  $\rightarrow$  Iron (III) oxide
- The WRONG way to say: f e plus o 2 to create f e 3 o 2! NO!!!!!!!!!!

**3 Equation balancing: acceptable set of coefficients & checking**

Rule to follow: conservation of number of atoms & their identities (mass conservation)  
What you put in will be the same of what you will get out, although reshuffled.

#### **4 Equation balancing: arithmetic coefficients**

- a.** Chose a starter element that only occurs in one species on either side
  - If more than one elements can be a starter, chose the one will ‘drag in’ and integrate more other element(s)
- b.** Balance the starter element
- c.** Bar the whole compound(s) on both sides this element within
- d.** Chain-out another element based on what has been barred and balanced
- e.** Keep barring the compound once an element within is balancing, and chaining-out
- f.** Arrange the final answer in the simplest acceptable form
- g.** Polyatomic ions usually don’t split, so can be treat as an entity or element Z

## **5 Equation balancing: algebraic method through unknown X**

Combustion

- Use the arithmetic method above
- Balancing the O the last by assuming X

## 6 Equation balancing: algebraic method through unknown X

Complex REDOX reaction

- a. Chose a starter element that only occurs in one species on either side
  - If more than one elements can be a starter, chose the one will 'drag in' and integrate more other element(s)
- b. Balance the starter element
- c. Bar the whole compound(s) on both sides this element within
- d. Chain-out another element based on what has been barred and balanced
- e. Keep barring the compound once an element within is balancing, and chaining-out
  
- f. If running out of leads through 'chaining-out', meaning an unbalanced element will occur in more than one species on side (therefore, it is unbalance-able) an unknown X need to be assume to be balance that element
- g. Again use algebra reasoning to chain out all the reminder elements but one, and find all the coefficients, some with algebraic expressions
- h. Use the last back-up unbalanced element, usually O although at times but could be H, to set up an equation and then solve for X
- i. Plug X back to the algebraic coefficients, and rearrange the whole set to the simplest acceptable form

**7 Equation typing: compound categorization**

a. Oxide: with a metal [M]O or a nonmetal [NM]O

b. Sulfide: usually with a metal [M]S

c. Acid: with hydrogen ion: oxo-acid or simply binary

d. Base: with hydroxide ion

e. Salt: formed by the reaction of an acid and a base

**8 Equation typing: chemical reactions: reference lab 8 P1**

a. Synthesis

b. Decomposition

**c. Single displacement**

**d. Double displacement**

**e. Neutralization**

**f. Combustion**

