

Chemical Reactions

Chapter 14 – 2

Chemical Formulas and
Equations



Essential Questions

- How are chemical equations interpreted, written and balanced?
- How does a balanced equation show the law of conservation of mass?



Definitions

- Chemical formula – chemical symbols & numbers to represent a substance
- Chemical equation – uses chemical symbols and formulas as a shortcut to describe a chemical reaction
- Reactant – a substances or molecule that participates in a chemical reaction



Definitions, continued

- Product – what is made during the chemical reaction
- Law of conservation of mass (or matter)- mass is neither created or destroyed in ordinary chemical or physical changes
- Subscript - number (representing atoms) written below and to the right of a chemical symbol



Physical Properties

- color
- melting point
- boiling point
- electrical conductivity
- specific heat
- density
- state (solid, liquid, or gas)



Physical Changes

- melting
- boiling
- condensation

No change occurs in the identity of the substance

Examples:

Ice , rain, and steam are all water



Chemical Changes

- Atoms in the reactants are rearranged to form one or more different substances
- Old bonds are broken; new bonds form

Examples:

Fe and O₂ form rust (Fe_2O_3)

Ag and S form tarnish (Ag_2S)



Prefixes

- di – means two
- mono – means one; no prefix means one atom
- Tri – means three



Writing formulas for Covalent Compounds

- Covalent compounds are two nonmetals
- Use prefixes to represent a number (tells how many atoms)
- Study table on page 393



Writing formulas for Ionic Compounds

- Ionic compounds are formed by a metal and a nonmetal
- Charge must be zero
- Ex: magnesium (Mg) has two valence electrons, so has a charge of +2; chlorine needs one val. el. to make a full set, so its charge is -1. Therefore you need 2 chlorine ions to equal zero:



Writing a Chemical Equation

Chemical symbols give a “before-and-after” picture of a chemical reaction

Reactants – what you start with

Product – what you get



Carbon **reacts** with
oxygen

to form

carbon
dioxide



Law of Conservation of Mass

- All chemical equations **MUST** be balanced because...
- The Law of Conservation of Mass (or Matter) states that mass is neither created nor destroyed in physical or chemical changes



Reading A Chemical Equation

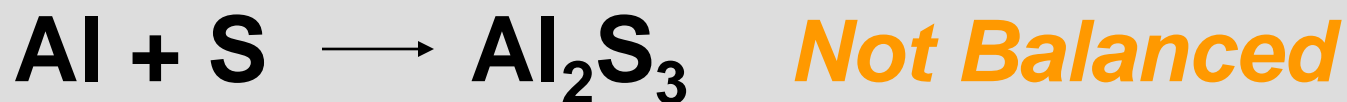


Four molecules of NH_3 react with five molecules O_2 **to produce** four molecules NO and six molecules of H_2O



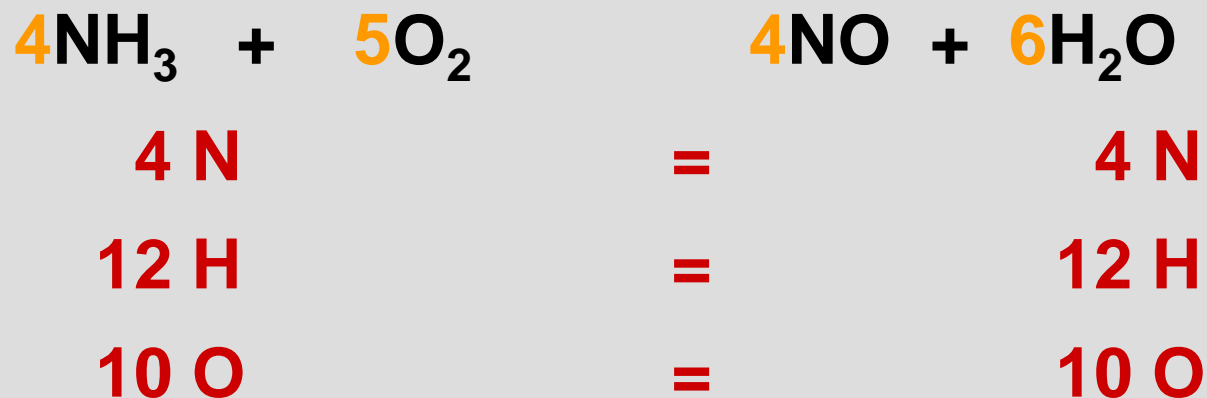
Balanced Equations

Same numbers of each type of atom on each side of the equation

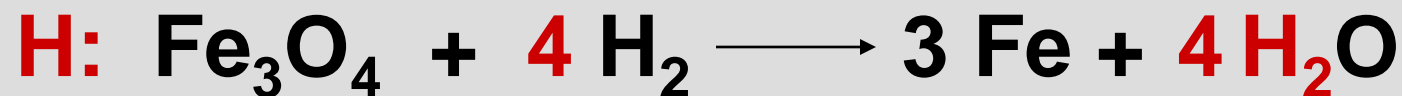
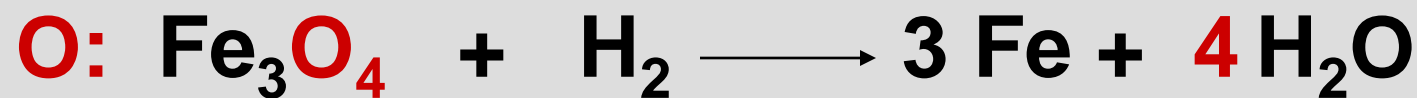
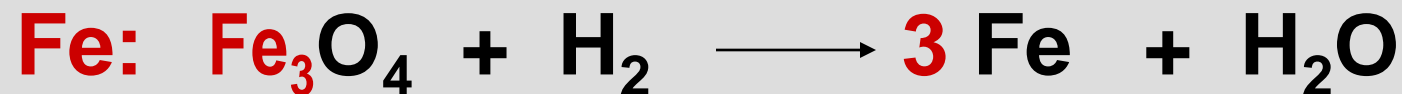
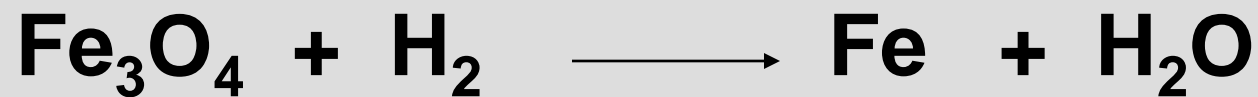


Balancing Equations w/ Coefficients

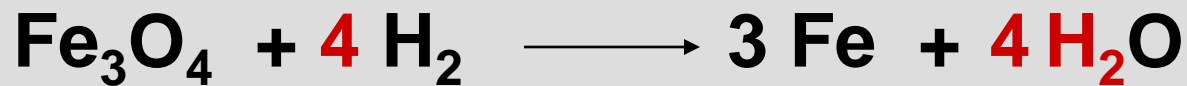
Coefficients *in front* of formulas
balance each type of atom; they are
multiplied to any subscripts



Steps in Balancing an Equation



Brain Check (Mini Quiz)



1. Number of H atoms in 4 H₂O

a) 2

b) 4

c) 8

2. Number of O atoms in 4 H₂O

a) 2

b) 4

c) 8

3. Number of Fe atoms in Fe₃O₄

a) 1

b) 3

c) 4

