Chapter 6: Quantities in Chemical Reactions

October 3, 2022

Chemistry Department, Cypress College

Class Annoucements

Lecture

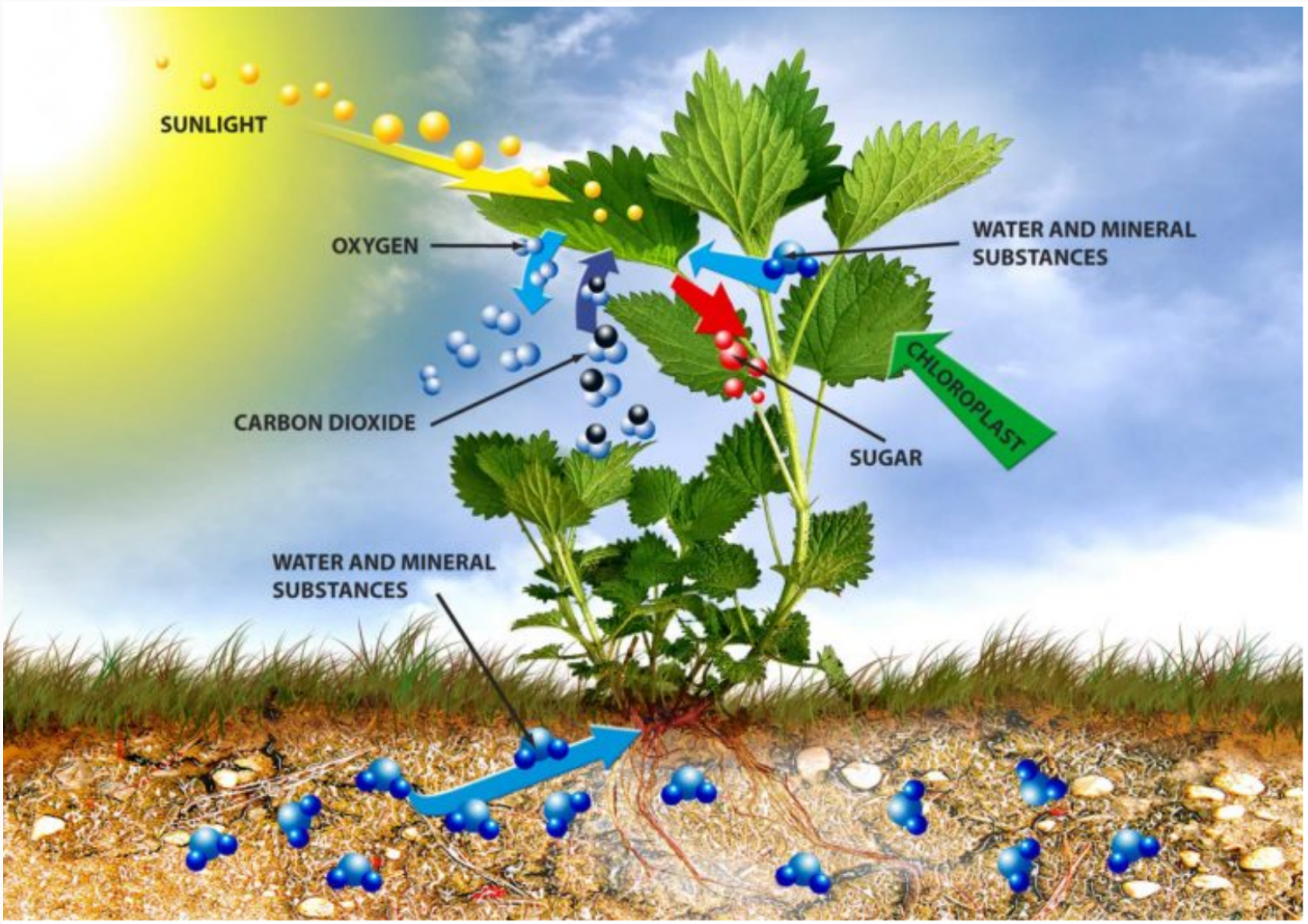
- Keep submitting the homework assignment on time ($\sim 1-2$ hours grace period)
- Go over homework 4 - present and get 1 EC point
- Quiz submissions are slacking (Quiz 5 due tonight at 11:59pm)
- Homework and Quiz will be released Fri, Oct 7 at 3pm

Outline

Stoichiometry: Relationship Between Reactants and Products

- Mole-mole Conversion
- Mass-mass Conversion

Balanced Chemical Equation: Photosynthesis



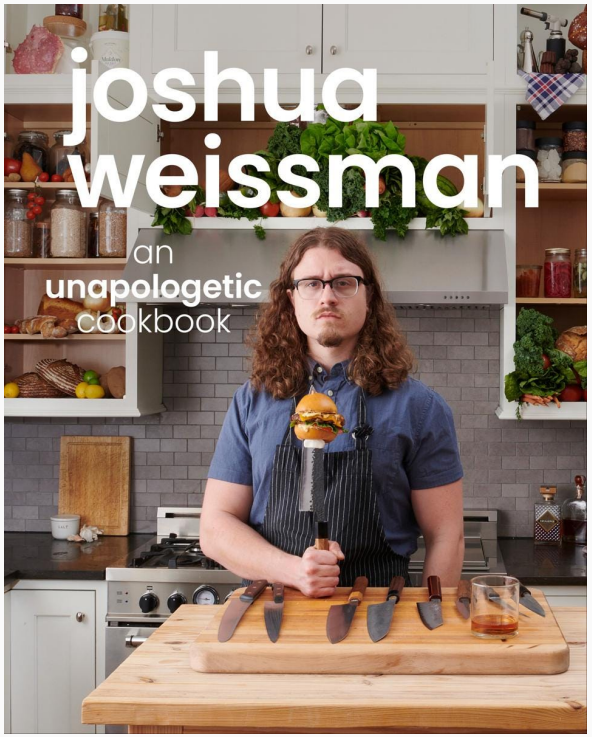
Meaning of a Balanced Equation

Photosysnthesis Chemical Equation

$$6CO_2(g) + 6H_2O(l) \rightarrow C_6H_{12}O_6(s) + 6O_2(g) \qquad (1)$$

- Balanced chemical equation satisfies the conservation of mass
- Coefficients in front of the molecules represent the relative moles of reactants and products
- Hence, moles of reactants and products are not necessarily equal
- **Q:** Are the mols of atoms from the reactant and product sides equal?

What can be accomplished with a balanced equation?



- Analogy: Cookbook recipe- Popeyes Chicken but better
- Provides the means to determine how much product is produced for a given amount of reactants
- Relate to molar masses, number of molecules, amount of moles and masses

Example: Mole-mole Conversion

If 1.14 mol of $CO_2(g)$ was formed by combustion of $C_3H_8(g)$, how many moles of $H_2O(g)$ were also formed?

Determine: What is given and what is the question asking?

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$$1.14\text{mol } CO_2 \times \frac{4\text{mol } H_2O}{3\text{mol } CO_2} = 1.52\text{mol } H_2O$$

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Pure methanol (CH_3OH) is used as a fuel for race cars in the Indy Racing Leauge and in the Championship Auto Racing Teams. Given that 1.00 gal of methanol contains 94.5 mol, how many moles of oxygen will react with 1.00 gal of methanol?

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$$CH_3OH(l) + O_2(g) \rightarrow CO_2(g) + H_2O(g)$$

$$94.5\text{mol } CH_3OH \times \frac{3\text{mol } O_2}{2\text{mol}CH_3OH} = 142\text{mol } O_2$$

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Suppose we have 9.20g Na(s). How many grams of Cl_2(g) should react with this amount of Na(s)?

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Q: What is the quantity needed to convert between mols and grams?