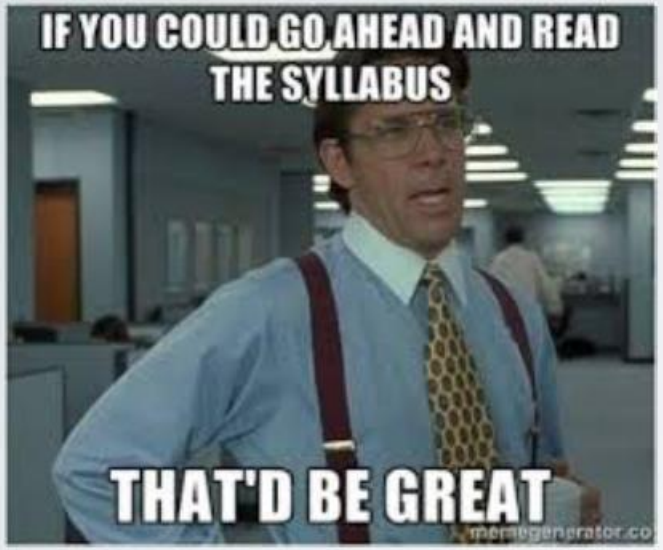
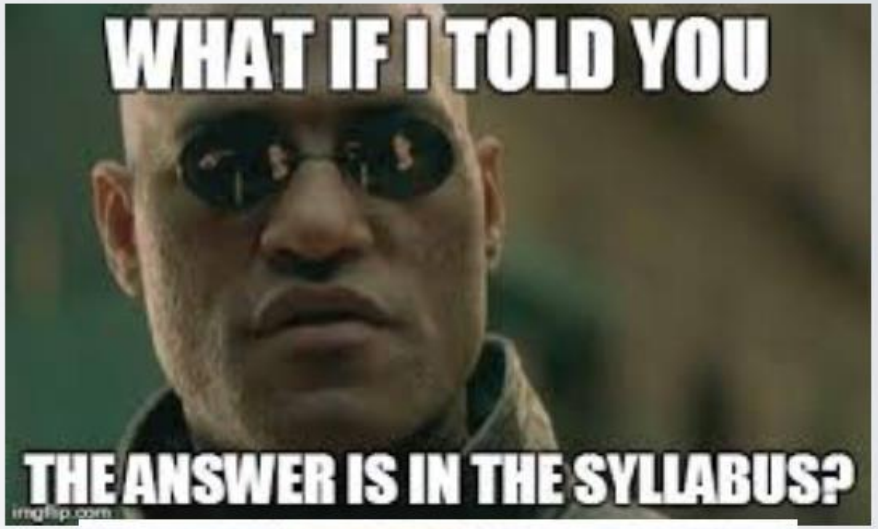
CHEM 200

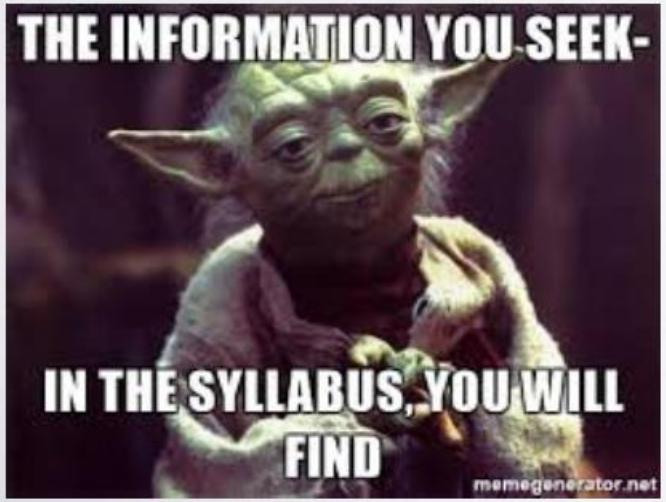
ALL EMAILS SENT TO
CHEM200@SDSU.EDU

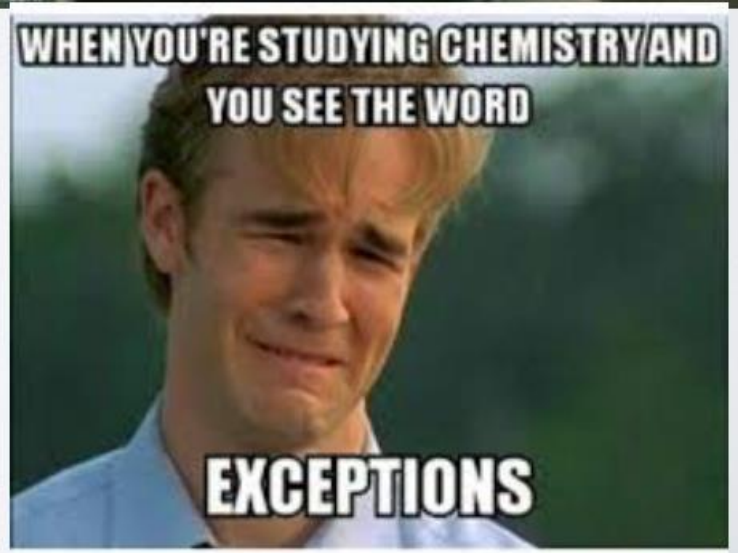
OFFICE HOURS HELD VIRTUALLY THROUGH THE MSLC.
TUES 9.00 AM TO 11.00 AM

PLEASE READ THE SYLLABUS









IMPORTANT ANNOUNCEMENTS

1. Email chem200@sdsu.edu ONLY unless its regarding lab or discussion which then you need to email your respective TA.

2. Follow the directions in adding OWL that Theresa provided you in Module 1.0 > Adding OWL (READ). She made a video and has a pdf file with directions.

3. **There is no course key for OWL.**

4. **Read the announcements and emails that Theresa, Megan, or your TAs sends out.**

5. Again read the syllabus. A lot of questions are being asked that are in the syllabus. For example, emailing when the lab will be and what will take place can be answered by the syllabus. In the syllabus there is a lab schedule, read, use it, and print it out.

6. And for good measure read the announcements before sending out emails. The majority (98%) of questions can be answered by: the syllabus, videos Theresa has made, and in the announcements.

UPCOMING IMPORTANT DATES

- Safety Quiz due **Friday, February 3rd at 11:59 pm** (in OWL Lab & Canvas), *must pass with >60% to do in-person labs*
- How to write a lab notebook and prelab due **Sunday, February 5th at 11:59 pm**
- Volumetric Prelab due **Sunday, February 5th at 11:59 pm**
- Volumetric Lab Report due **Sunday, February 5th at 11:59 pm**
- Chapter 1-4 Chapter Problem Sets in OWL Lecture due **Thursday, February 9th at 11:59 pm** (**Start Now)**
- Chapter 1-4 Chapter Assessments in OWL Lecture is **Thursday, February 9th at 11:59 pm** (**Start Now**); 2 chances, no time limit
- Exam 1 starts at **3 pm Friday, February 10th and will close on Saturday, February 11th at 3pm** in OWL Lecture; Chapters 1-4. You have 24hrs. *Only 2 hrs once you start; be sure to give yourself a full 2 hr time slot.*

SUPPLEMENTAL INSTRUCTION (SI)

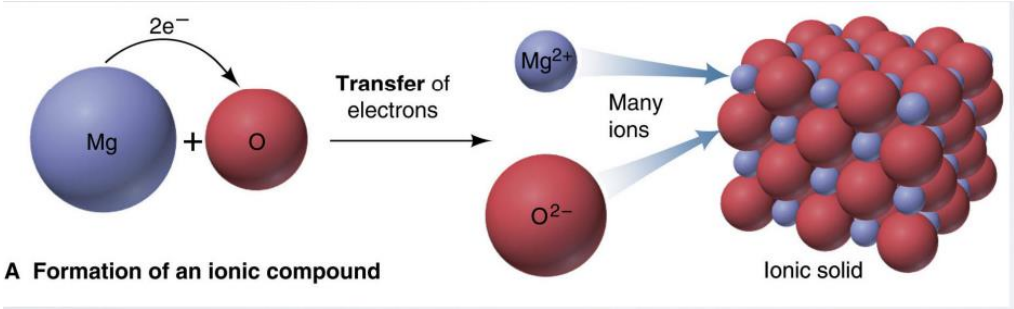
- Study sessions lead by former CHEM 200/202 students that excelled in the previous semesters class.
- Occur 15+ times a week.
- Free to access, no reporting to faculty.

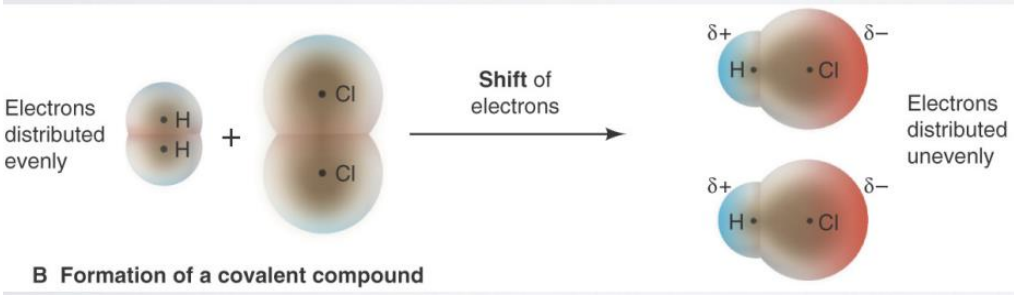
THE MATH AND SCIENCE LEARNING CENTER (MSLC)

Students are encouraged to make use of The Mathematics and Statistics Learning Center (MSLC) for free STEM tutoring, located in the Love Library, Room 328. For a full list of courses tutored, please visit the MSLC website: https://mlc.sdsu.edu/ .

The MSLC is supported by your student success fee. We strongly encourage you to use this wonderful, free resource. Some students believe that they shouldn't need to ask for help, but research has shown that the average grade for students who attend the MLC is almost one full grade higher than those who don't seek such support.

REDOX REACTIONS





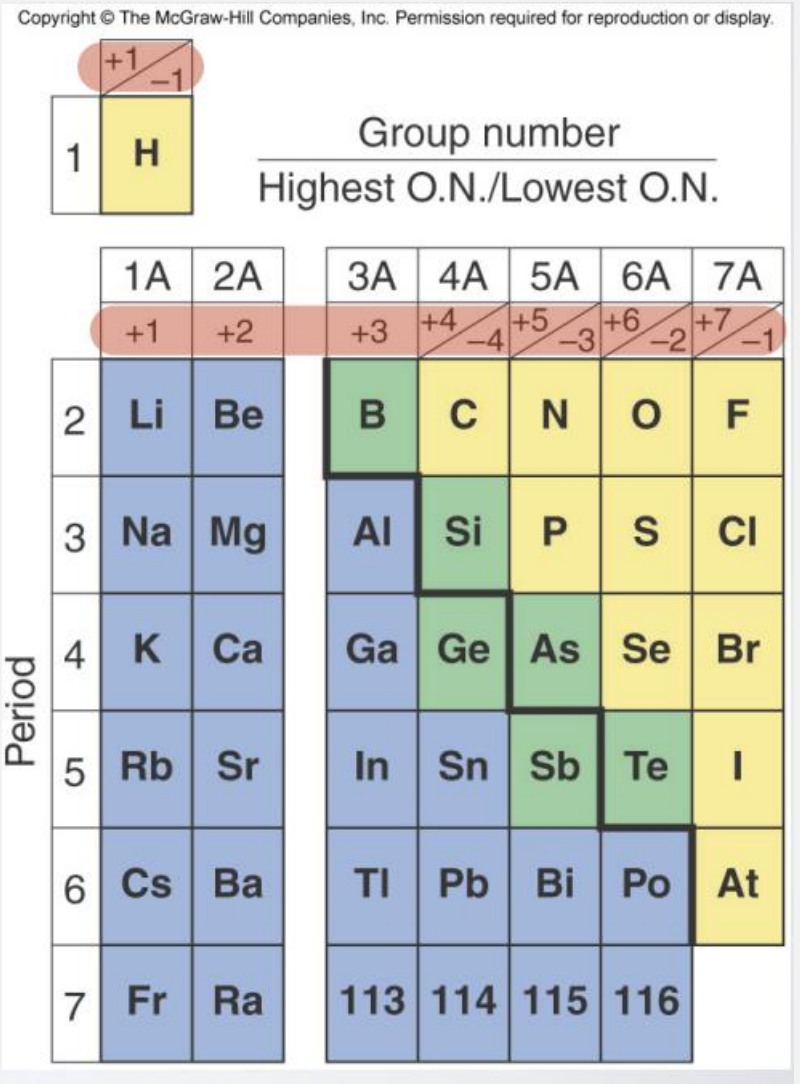
OXIDATION NUMBER: KEEPING TRACK OF YOUR ELECTRONS

General Rules

1. For an atom in its elemental form (e.g. Na, O_2, Cl_2,...) the O.N. = 0.
2. For a monoatomic ion (e.g. Br^-, Cu^{2+},...) the O.N. = ion charge.
3. The sum of the O.N. values for atoms in a compound equals zero. For polyatomic ions the sum equals the charge of the ion.

Specific Rules

1. For Group 1(A)1 - O.N. is +1 in all compounds
2. For Group 2(A)2 - O.N. is +2 in all compounds
3. For hydrogen - O.N. is +1 when bound to nonmetals
4. For fluorine - O.N. is -1 when bound to metals & boron
5. For oxygen - O.N. is -1 when in peroxides (e.g. H_2O_2)
   - O.N. is -2 for all others (except with fluorine)
6. For Group 7(A)17 - O.N. is -1 when with metals, nonmetals (except O) & for other halogens lower in group



FIND THE OXIDATION NUMBER OF EACH ATOM IN THE COMPOUND

(a) H_2S
(b) SO_3^{2-}
(c) Na_2SO_4
(d) KNO_3
(e) AlH_3
(f) NH_4^+
(g) $H_2PO_4^-$

REDOX REACTION VOCABULARY

$$2\,Mg_{(s)} + O_{2_{(g)}} \rightarrow 2\,MgO_{(s)}$$

Half reactions

$$2\,Mg \rightarrow 2\,Mg^{2+} + 4\,e^{-}\ (\text{oxidation})$$

$$O_2 + 4\,e^{-} \rightarrow 2\,O^{-}\ (reduction)$$

OIL RIG = "oxidation is loss, reduction is gain"

REDOX REACTION VOCABULARY

$$2\,Mg_{(s)} + O_{2_{(g)}} \rightarrow 2\,MgO_{(s)}$$

Magnesium is oxidized by Oxygen = Oxygen is the "oxidizing agent"

Oxygen is reduced by Magnesium = Magnesium is the "reducing agent"

The oxidation number of oxygen is decreasing (reducing)

The oxidation number of magnesium is increasing

$$Sn_{(s)} + 2\ H^{+}_{(aq)} \rightarrow Sn^{2+}_{(aq)} + H_{2\,(g)}$$

Identify the atom that is oxidized, the atom, that is reduced, the oxidizing agent and the reducing agent.

FIND THE OXIDATION NUMBER FOR CARBON

$Na_2C_2O_4$

$$Zn + NiO_2 + 4H^+ \rightarrow Ni^{2+} + Zn^{2+} + H_2O$$

Write the half reactions.

Identify the atom that is oxidized, the atom, that is reduced, the oxidizing agent and the reducing agent.

TYPES OF REDOX REACTIONS

Combination

$$A + B \rightarrow AB$$

Decomposition

$$AB \rightarrow A + B$$

Displacement

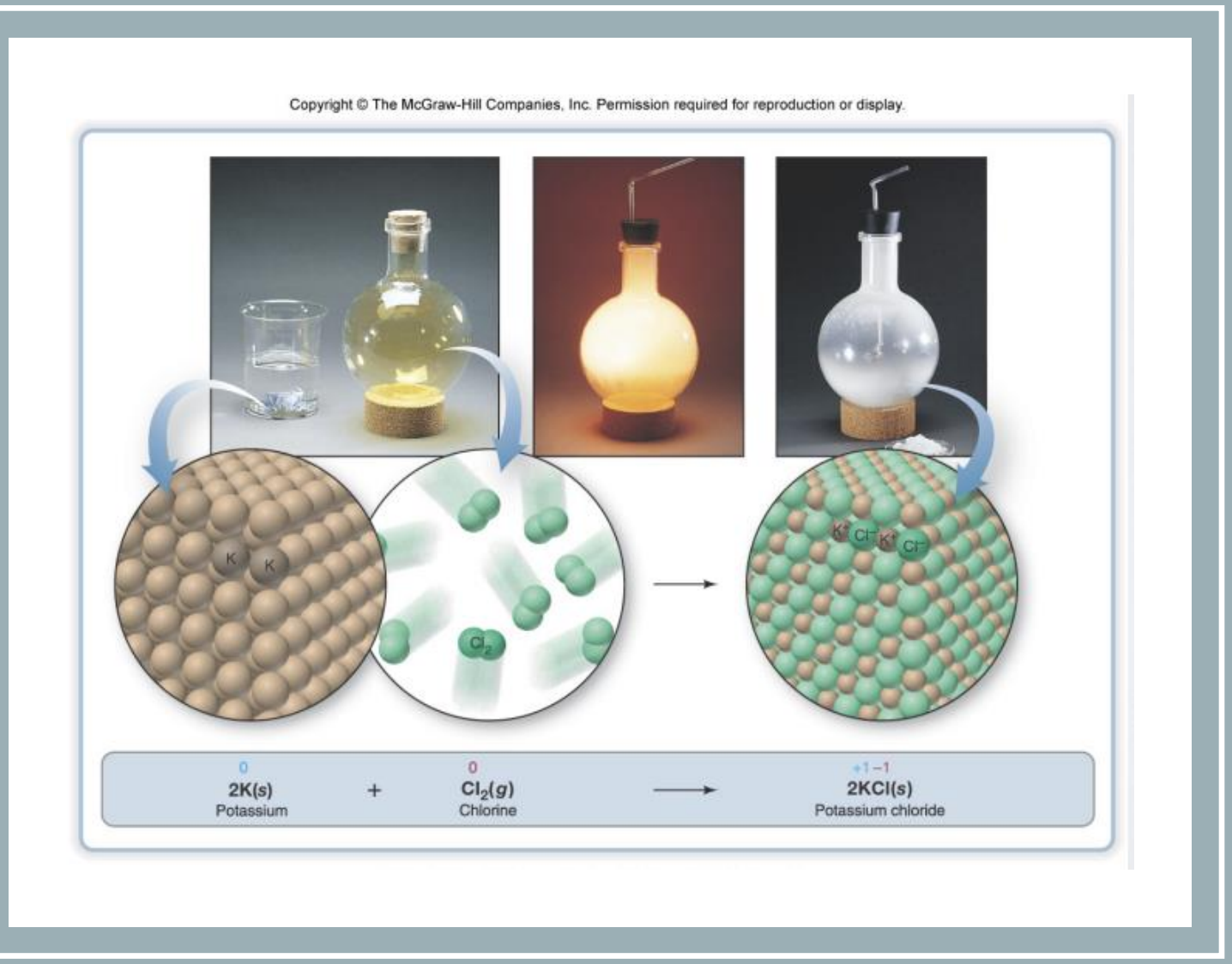
$$A + BC \rightarrow B + AC$$

$$AB + CD \rightarrow AD + CB$$

Combustion

$$X + O_2 \rightarrow Combustion\ products^*$$

*If the compound contains only C, H and O, the combustion products will be CO_2 and H_2O



COMBINATION REACTIONS

The formation of an ionic compound is an example of a combination redox reaction

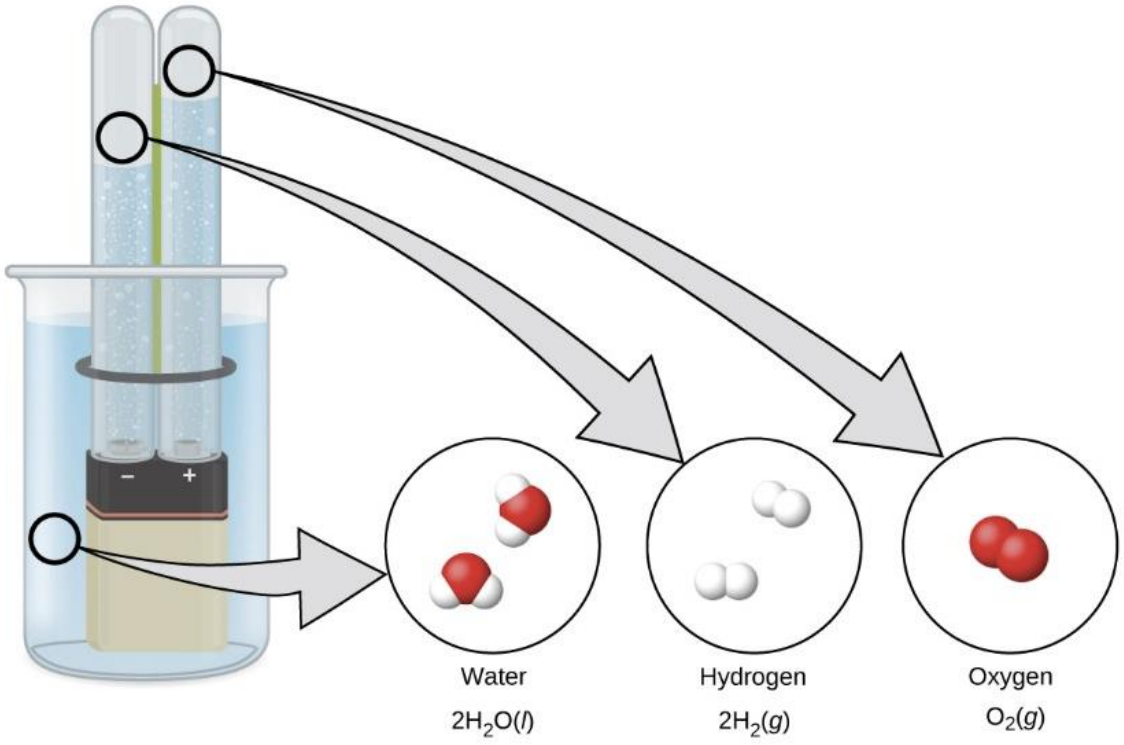


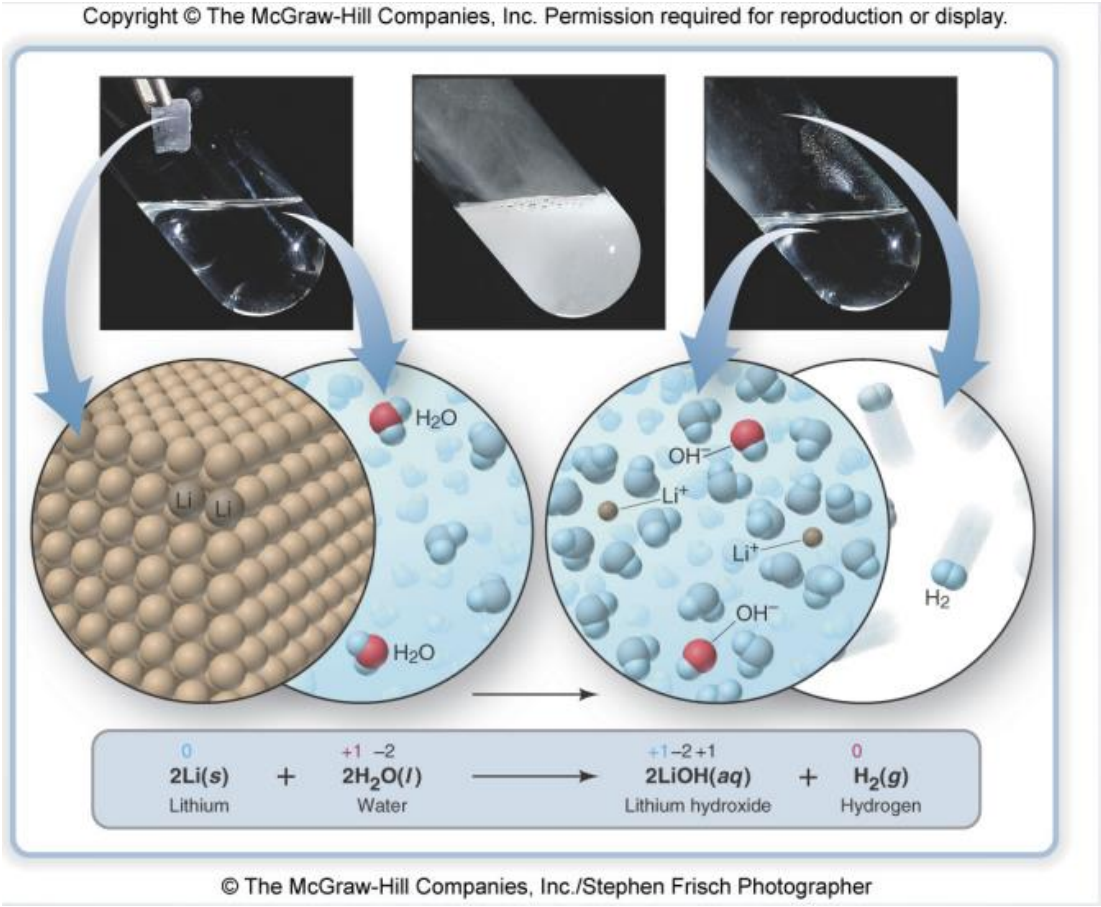
Figure 1.15 The decomposition of water is shown at the macroscopic, microscopic, and symbolic levels. The battery provides an electric current (microscopic) that decomposes water. At the macroscopic level, the liquid separates into the gases hydrogen (on the left) and oxygen (on the right). Symbolically, this change is presented by showing how liquid H_2O separates into H_2 and O_2 gases.

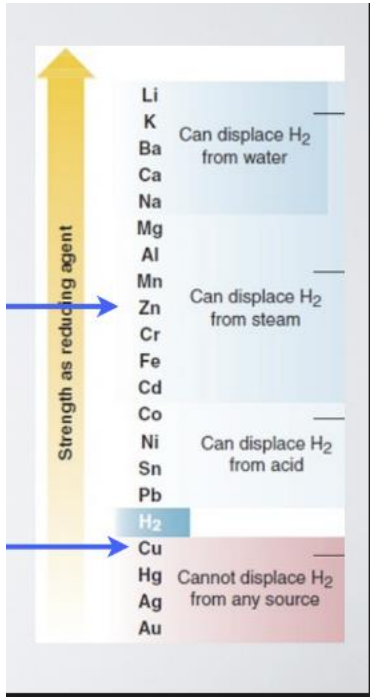
DECOMPOSITION REACTION

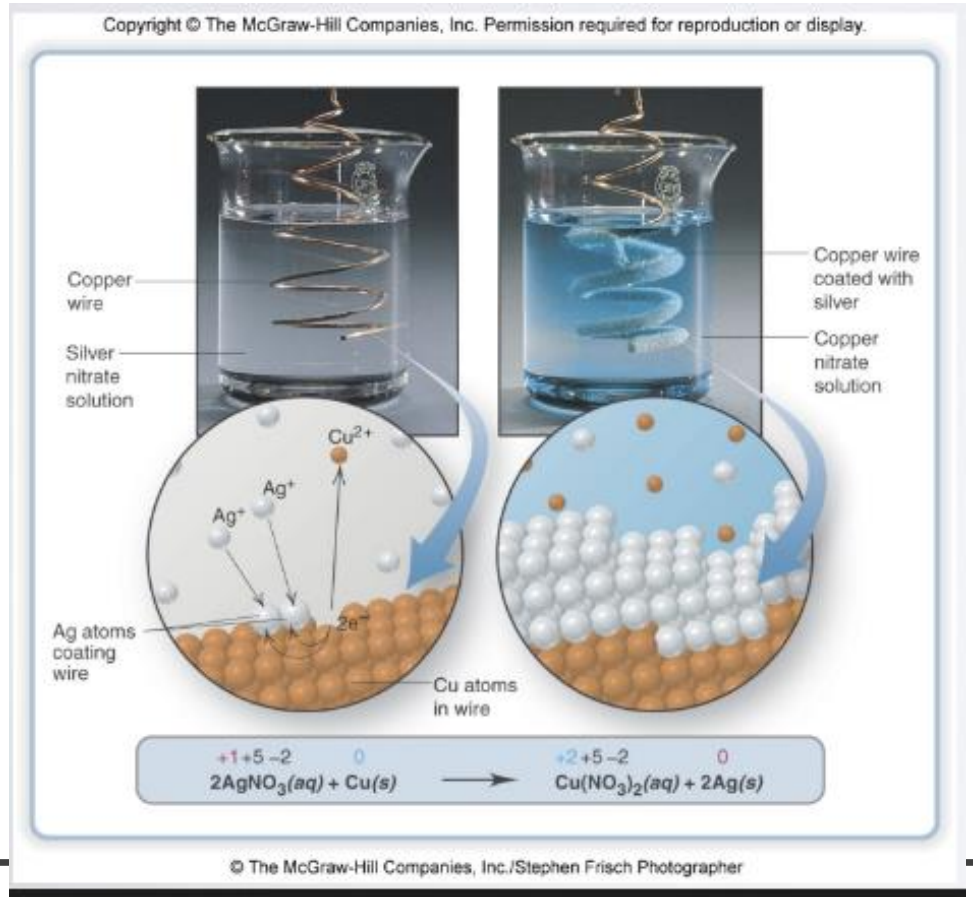
The electrolysis of water is an example of a decomposition redox reaction

DISPLACEMENT REACTION

The "Alkali Metals", form their corresponding metal hydroxide when they react with water. This is one example of a single displacement reaction





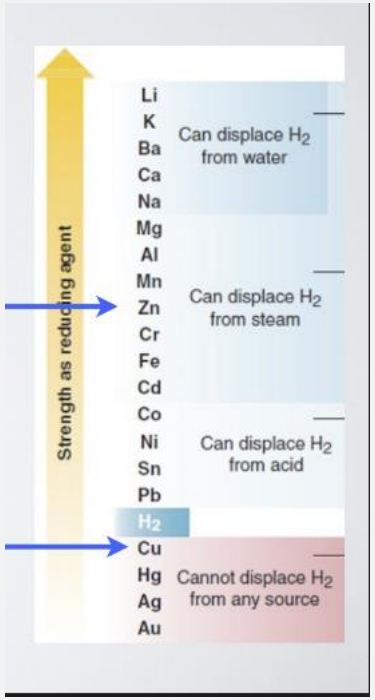


$$Zn_{(s)} + Cu(NO_3)_{2\,(aq)} \rightarrow Cu_{(s)} + Zn(NO_3)_{2\,(aq)}$$

The activity series: predicting if a reaction will occur

Since Zn is more reactive than Cu, it can displace the Cu from the copper nitrate. Solid copper will form.

PREDICT IF THE REACTION WILL OCCUR



$$Mg_{(s)} + HCl_{(aq)} \rightarrow ???$$

$$Cd_{(s)} + NaNO_{3(aq)} \rightarrow ???$$

COMBUSTION REACTIONS

A compound gets OXIDIZED by oxygen to produce combustion products

$$2\,CO_{(g)} + O_{2(g)} \rightarrow 2\,CO_{2(g)}$$

$$\_\_\_C_4H_{10(g)} + \_\_\_O_{2(g)} \rightarrow \_\_\_H_2O_{(g)} + \_\_\_\,CO_{2(g)}$$

$$C_6H_{12}O_{6(s)} + 6\,O_{2(g)} \rightarrow 6\,H_2O_{(g)} + 6\,CO_{2(g)}$$

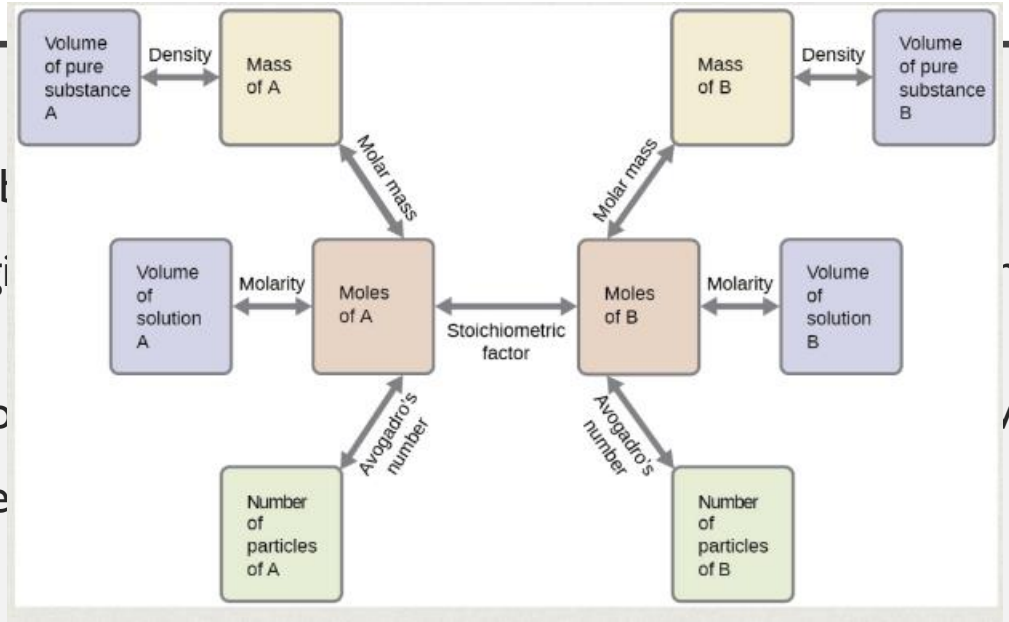
STOICHIOMETRY

Using Chemical Equations to determine amounts of products and/or reactants that are participating in chemical reactions.

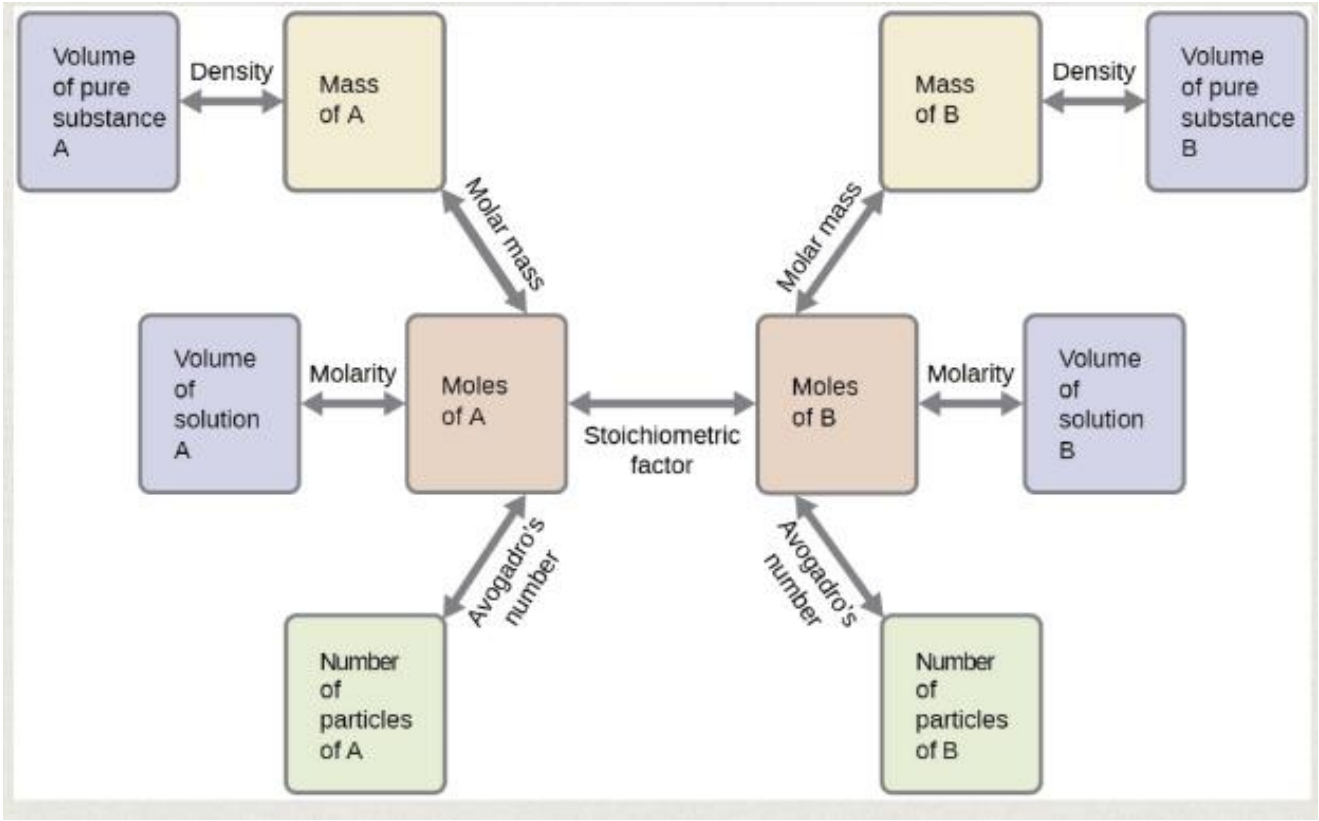
Important to write and balance the chemical equations to determine the mole ratios of the chemical species.

SOLVING STOICHIOMETRY PROBLEMS

1. Write and b
2. Using the gi nown substance
3. Use the mo wn substance
4. When nece



SOLVING STOICHIOMETRY PROBLEMS



STOICHIOMETRY EXAMPLE

How many molecules of carbon dioxide are produced when 88 g of propane (C_3H_8) undergoes combustion. How many grams of carbon dioxide are produced?

1. Write the balanced equation
2. Use the given information to find the number of moles of known substance
3. Use the mole ratio to find the number of moles of unknown
4. Convert number of moles to the desired unit (molecules)
5. Convert number of moles to the desired unit (grams)

STOICHIOMETRY EXAMPLE

How many molecules of carbon dioxide are produced when 88 g of propane (C_3H_8) undergoes combustion. How many grams of carbon dioxide are produced?

1. Write the balanced equation

$$C_3H_{8(g)} + 5\,O_{2(g)} \rightarrow 3\,CO_{2(g)} + 4\,H_2O_{(g)}$$

STOICHIOMETRY EXAMPLE

How many molecules of carbon dioxide are produced when 88.0 g of propane (C_3H_8) undergoes combustion. How many grams of carbon dioxide are produced?

2. Use the given information to find the number of moles of known substance

$$88.0\ g\ of\ C_3H_8\left(\frac{1\ mole}{44.10\ g}\right) = 2.00\ moles\ C_3H_8$$

$$C_3H_{8(g)} + 5\,O_{2(g)} \rightarrow 3\,CO_{2(g)} + 4\,H_2O_{(g)}$$

STOICHIOMETRY EXAMPLE

How many molecules of carbon dioxide are produced when 88 g of propane (C_3H_8) undergoes combustion. How many grams of carbon dioxide are produced?

3. Use the mole ratio to find the number of moles of unknown

$$2.00\ moles\ C_3H_8 \left(\frac{3\ mole\ CO_2}{1\ mole\ C_3H_8}\right) = 6.00\ moles\ CO_2$$

STOICHIOMETRY EXAMPLE

How many molecules of carbon dioxide are produced when 88.0 g of propane (C_3H_8) undergoes combustion. How many grams of carbon dioxide are produced?

4. Convert number of moles to the desired unit (molecules)

$$6.00\ mole\ CO_2 \left(\frac{6.022\ \times 10^{23} molecules}{1\ mole} \right) = 3.61 \times 10^{24}\ molecules\ of\ CO_2$$

STOICHIOMETRY EXAMPLE

How many molecules of carbon dioxide are produced when 88.0 g of propane (C_3H_8) undergoes combustion. How many grams of carbon dioxide are produced?

4. Convert number of moles to the desired unit (grams)

$$6.00\ mole\ CO_2 \left(\frac{44.01\ g}{1\ mole} \right) = 264\ g\ of\ CO_2$$

STOICHIOMETRY EXAMPLE: AS A SINGLE CALCULATION

How many molecules of carbon dioxide are produced when 88.0 g of propane (C_3H_8) undergoes combustion. How many grams of carbon dioxide are produced?

$$88.0\ g\ of\ C_3H_8\left(\frac{1\ mole\ C_3H_8}{44.10\ g}\right)\left(\frac{3\ mole\ CO_2}{1\ mole\ C_3H_8}\right)\left(\frac{6.022\times10^{23} molecules}{1\ mole\ CO_2}\right) = 264\ g\ of\ CO_2$$

$$88.0\ g\ of\ C_3H_8\left(\frac{1\ mole\ C_3H_8}{44.10\ g}\right)\left(\frac{3\ mole\ CO_2}{1\ mole\ C_3H_8}\right)\left(\frac{44.01\ g}{1\ mole\ CO_2}\right) = 3.61\times10^{24}\ molecules\ of\ CO_2$$