# GCS Unit Plan Template

| Unit Author | |
|---|---|
| Teacher(s) Name | Teri Campbell |
| School | GCHS |

## Unit Overview

**Unit Title** **Unit 4**

**Balancing Equations, the Mole and Stoichiometry**

### Unit Summary

Students will also learn how to identify, balance and write chemical equations.

Students will learn how to make conversions from grams to moles to liters to atoms,ions,molecules, formula units. They will do this using guided practice and group work.

Students will then use the molar coefficients in balanced equations along with their knowledge of unit conversions to convert from the value of one substance to another.

### Subject Area

Chemistry

### Grade Level

10-11

### Approximate Time Needed

22 x 90 minutes

## Unit Foundation

### Targeted Content Standards and Benchmarks

Chem 1.2.4 Interpret the name and formula of compounds using the IUPAC convention
Chm.2.2.2 Analyze the evidence of chemical change.
Chm.2.2.3 Analyze the law of conservation of matter and how it applies to various types of chemical equations (synthesis, decomposition, single replacement, double replacement, and combustion).
Chem 2.2.4 Analyze the stoichiometric relationships inherent in a chemical reaction.
Chem 2.2.5 Analyze quantitatively the composition of a substance(empirical formula, molecular formula, percent composition and hydrates.

### Student Objectives/Learning Outcomes

Chm.1.2.4

- Know names and formulas for these common laboratory acids: HCl, HNO3, H2SO4, HC2H3O2, (CH3COOH)

Chm.2.2.2

Students should be able to determine if a chemical reaction has occurred based on the following criteria:

- Precipitate formation (tie to solubility rules)
- Product testing - Know the tests for some common products such as oxygen, water, hydrogen and carbon dioxide: burning splint for oxygen, hydrogen or carbon dioxide, and lime water for carbon dioxide. Include knowledge and application of appropriate safety precautions.
- Color Change – Distinguish between color change as a result of chemical reaction, and a change in color intensity as a result of dilution.

Chm.2.2.3

• Write and balance chemical equations predicting product(s) in a reaction using the reference tables.

Chm.2.2.4

• Interpret coefficients of a balanced equation as mole ratios.

• Use mole ratios from the balanced equation to calculate the quantity of one substance in a reaction given the quantity of another substance in the reaction. (given moles, particles, mass, or volume and ending with moles, particles, mass, or volume of the desired substance)

Chm.2.2.5

• Calculate empirical formula from mass or percent using experimental data.
• Calculate molecular formula from empirical formula using molecular weight.
• Determine percentage composition by mass of a given compound.
• Perform calculations based on percent composition.
• Determine the composition of hydrates using experimental data.

**Cross-Curricular Connections**

Math – equations
English – writing lab papers

**Curriculum-Framing Questions**

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|---|---|
| **Essential Question** | Why do you think it is important for industrial chemists to understand how to use stoichiometry in their professions?<br>What is a situation when you or your parent/guardian have used the concept of "limiting reactants" in daily life? |
| **Unit Questions** | How did Avogadro determine that 1 mol of any substance = to 6.02 x $10^{23}$?<br>How does the law of conservation of mass, matter and energy govern all aspects of chemistry? |
| **Content Questions** | What is a mole and why is it used in Chemistry?<br>What is stoichiometry? |

**Assessment Plan**

**Unit Details**

**Prerequisite Skills**

Basic Math Skills and dimensional Analysis

**Instructional Procedures**

Day 1

1- Review writing the formulas for ionic and covalent compounds
2- Introduce students to the acids they need to know the name and formula for.
3- Categorizing Chemical Equations as single or double replacement, synthesis, decomposition, combustion
4- Learn how to use the packet to help i.d. equations

Day 2

1- Review a few homework problems and collect homework
2- Begin writing and balancing equations
3- Group work activity
Homework - worksheet on balancing equations

Days 3 & 4

1- Review balancing equations homework
2- Continue working problems writing and balancing equations
3- Predicting products or reactants in an incomplete chemical equation.
Homework – study guide

Day 5
Test on formula/name writing and writing and balancing chemical equations

Day 6
1- introduction to the mole
2- calculating molar mass of an element or compound
3- learning how to make conversions using the conversion factor...
1 mol = molar mass = 22.4 L = Avogadro's number
Homework - worksheet with conversions

Day 7
Continue practicing conversions
Quiz on conversions

Day 8
Calculating % composition
Practice problem worksheet

Day 9
Quiz on % composition
Calculating empirical formula
Practice problems

Day 10
Review empirical formula
Quiz on empirical formula
Calculating molecular formula

Day 11
Review molecular formula
Study guide group work

Day 12
Test on The Mole

Day 13
Lab Single Replacement Reaction
Lab Empirical Formula Lab

Day 14
Stoichiometry
Mole->Mole and Vol->Vol conversions

Day 15
Review one step problems
Quiz
Vol <->Mol and Mass<->Vol

Day 16
Review 2 step pblms
Quiz
Mass<->Vol and Mass<->Mass

Day 17
Review 3 step pblms
Conversions involving Avogadro's Number

Day 18
Review all Stoichiometry pblms
Honors Limiting Reactants

Day 19
Quest on Stoichiometry
Review for unit test

Day 20
Unit test

Day 21
Limiting reactants lab

| **Accommodations for Differentiated Instruction** | |
|---|---|
| **Special Needs Students** | Concentrated tutoring in small groups with the teacher and student leaders, |
| | |
| **Gifted/Talented Students** | Complete limiting reactant problems |

**Materials and Resources Required For Unit**

**Technology – Hardware** (Click boxes of all equipment needed)

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| X Interactive Technology | ☐ Student Response System/Clickers | ☐ Cell Phone |
| ☐ Computer(s)/iPads, etc. | ☐ Printer | ☐ Video Camera |
| ☐ Digital Camera | X Projection System | ☐ Video Conferencing Equip. |
| X DVD Player | ☐ Scanner | ☐ Document Camera |
| X Internet | X Television | ☐ Other |

**Technology – Software** (Click boxes of all software needed.)

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|---|---|---|
| ☐ Database/Spreadsheet | ☐ Image Processing | ☐ Web Page Development |
| ☐ Desktop Publishing | ☐ Internet Web Browser | ☐ Word Processing |
| ☐ E-mail | ☐ Multimedia | ☐ Other |
| X Web-Based Encyclopedia | | |

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| **Printed Materials** | Textbook Merrill and Prentice Hall and worksheets associated with each<br>Teacher made worksheets<br>*Current Science* |
| **Supplies** | Copper, iron filings, copper (II) sulfate, aluminum  other basic lab equipment |
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**Internet and Additional Resources**

*List additional resources for the lesson/unit plan or related lesson plans that map to the Common Core Standards in the lesson/unit plan.*

| Common Core Standard | Resource |
|---|---|
| | http://www.glenoaks.edu/facultystaff/FacultyWebSites/SarahSimmons/Documents/NSC-130%20Stoichiometry%20Worksheet.pdf |
| | http://dsc.discovery.com/tv-shows/mythbusters/videos/savage-stoichiometry.htm |
| | http://www.teachertube.com/viewVideo.php?video_id=159573 |
| | http://funtchemistry.blogspot.com/2013/03/stoichiometry-winter-2013.html |
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## *Unit Plan Reflection*

*Describe any adaptations or "tweaks" to the resource or lesson plan that were needed:*
*What do you plan to do differently the next time you teach this unit?:*

*This unit took two additional days because students required me move a slower pace. The honors students, with the addition of limiting reactant and percent yield equations, also required extended time. The change will be reflected in next semester's unit plans.*

*I will also add https://www.khanacademy.org/science/mcat/physical-processes/stoichiometry/v/stoichiometry as a website resource.*