Adult Basic Education

Science

Chemistry 2102A

Stoichiometry

Study Guide

Prerequisite: Chemistry 1102

Credit Value: 1

Text: *Chemistry.* Mustoe, Jansen, et al; McGraw-Hill Ryerson; 2004.

Chemistry Concentration

Chemistry 1102
Chemistry 2102A
Chemistry 2102B
Chemistry 2102C
Chemistry 3102A
Chemistry 3102B
Chemistry 3102C

Table of Contents

To the Student

I. Introduction to Chemistry 2101A

Chemistry 2102A is the second course in the Chemistry Concentration in the Adult Basic Education program. **Chemistry 1102 is a pre-requisite to Chemistry 2102A**. In Chemistry 1102, you studied chemical reactions and equations. You learned how to name and write formulas for ionic and molecular compounds and acids. This course is an introduction to the quantitative (calculations) aspect of chemistry.

The knowledge and skills that you acquire in this course are essential for the remainder of the ABE Chemistry courses. **Therefore, Chemistry 2102A is a pre-requisite for all other chemistry courses in the chemistry concentration**.

To the Student

II. Use of Science Study Guides

Before beginning this course, ensure you have the text and any other resources needed *(see the information in the Introduction to this course for specifics)*.

As you work through the Study Guide, you will see that it is divided according to the Units listed in the Table of Contents. When you open a unit it will have the following components:

Reading for this Unit:
Here you will find the chapters, sections and pages of the text you will use to cover the material for this unit. Skim the sections of the textbook, look at the titles of the sections, scan the figures and read any material in the margins. Once you have this overview of the unit, you are ready to begin. Do not be intimidated by the content. You will work through the text, section by section, gaining knowledge and understanding of the material as you go.

References and Notes	**Work to Submit**
This left hand column guides you through the material to read from the text. Read any highlighted notes that follow the reading instructions. The symbols ▶▶ direct you to the questions that you should complete when finished a reading assignment..	You come across three (3) headings in this right hand column. **Writing:** This section comprises your notes for the unit. Here you will find either written questions or references to specific questions or problems from your text. You may want to write out each question followed by the answer. This material should be checked by your instructor before moving on to the next unit. Mathematical problems should have their solutions checked as you go. **Laboratory:** This section indicates if there is a Core Lab that should be completed for the unit. Let the instructor know in advance that you will be ready for the lab. A lab report should be submitted for each Core Lab. Your instructor will provide guidelines as to how s/he wants the report written. **Assignment:** This section indicates if there is an assignment that should be completed for the Unit. The information in the "References and Notes" column will indicate how you obtain the assignment. These assignments frequently relate the science content to technology, society and the environment.

III. Recommended Evaluation

Written Notes	10%
Labs/Assignments	20%
Test(s)	20%
Final Exam *(entire course)*	50%
	100%

The overall pass mark for the course is 50%.

Unit 1 - The Mole

To fulfill the objectives of this unit, students should complete the following:

Reading for this unit: *Chemistry*

Chapter 2:	Introduction:	page 42
	Section 2.1:	pages 43 - 46
	Section 2.2:	pages 47 - 54
	Section 2.3:	pages 55 - 65
	Section 2.4:	pages 66 - 74
Chapter 3:	Section 3.2:	pages 87 - 89
	Section 3.3:	pages 95 -97

References and Notes

Read carefully through Section 2.1 of the text and then answer questions 1.1 - 1.4 from the column on the right ▶▶

Note:
You will be doing a lot of calculation in this course. It is very important that you understand how to do each type of problem before moving on to the next.

Read carefully through pages 47 - 49 of the text and then answer the questions 1.5 - 1.6 from the column on the right ▶▶

Work to Submit

Writing:

1.1 Complete question #1 from the Section Review, page 46.

1.2 Complete question #2 from the Section Review, page 46.

1.3 Explain the term atomic mass unit (u).

1.4 Define average atomic mass.

1.5 Define mole.

1.6
a) Define Avogadro's constant. (N_A).
b) What is the difference between Avogadro's constant and Avogadro's number?
c) What is the value of Avogadro's number?

Unit 1 - The Mole

References and Notes	Work to Submit
Read page 50 Converting 'Moles to Number of Particles' and study carefully the Sample Problem, 'Moles to Atoms', page 51. Then answer question 1.7 ▶▶	**Writing:** 1.7 Complete the Practice Problems 5 - 11, pages 51, 52.
Read page 52 'Converting Number of Particle to Moles' and study Sample Problem, 'Molecules to Moles', page 53. Then answer question 1.8 ▶▶	1.8 Complete the Practice Problems 12 - 15, page 53.
Complete the questions indicated in 1.9 for review of what has been covered so far ▶▶	1.9 Complete questions #1, #4 - 8, and #10 from the Section Review, page 54.
Read page 55 and then answer the questions 1.10 - 1.11 from the column on the right ▶▶	1.10 Define molar mass. 1.11 Use the periodic table on the inside back cover of the text to give the molar mass of the following elements: (a) Copper (b) Sodium (c) Lithium
Note: ***Answers to the 'Practice Problems' and 'Section Review' are on page 77. Check your answers and make sure you are clear on how to do each type of problem before you move on.***	

Unit 1 - The Mole

References and Notes	Work to Submit
	Writing:
Read page 56, 'Finding the Molar Mass of Compounds' , and study Sample Problem, 'Molar Mass of a Compound', page 56. Then answer question 1.12 ▶▶	1.12 Complete the Practice Problems 16 - 18, page57.
Read page 57, 'From Number of Particles to Mass', and page 58, 'Converting From Moles to Mass' and study Sample Problem, 'Moles to Mass'. Then answer question 1.13 ▶▶	1.13 Complete the Practice Problems 20 - 23, page 59.
Read page 59, 'Converting From Mass to Moles' , and study Sample Problem, ' Mass to Moles', page 60. Then answer question 1.14 ▶▶	1.14 Complete the Practice Problems 24 - 27, page 60.
Read page 62, ' Converting Between Moles, Mass, and Number of Particles' , and study Sample Problem, ' Particles to Mass ', page 62. Then answer question 1.15 ▶▶	1.15 Complete the Practice Problems 28 - 33, page 63.
Study Sample Problem, ' Mass to Particles' , page 63 - 64. Then answer question 1.16 ▶▶	1.16 Complete the Practice Problems 34 - 37, page 64.
For review, answer the questions indicated in 1.17 ▶▶	1.17 Complete questions 1 - 4 in Section Review, page 65.

Unit 1 - The Mole

References and Notes	Work to Submit
Read pages 66 - 69. Then answer questions 1.18 - 1.19 ▶▶	**Writing:** 1.18 Explain what is meant by STP.
Note: *There are 2 methods shown for solving the problems involving gases. We will use the* ***ratio method****.*	1.19 a) Define molar volume. b) What is the molar volume of a gas at STP?
Study the Sample Problem, ' Moles of Gas', pages 71 - 73. Then answer questions 1.20 - 1.21 ▶▶	1.20 Complete the Practice Problems 38 - 43, page 73. 1.21 Complete questions 1,2 and 4 in Section Review, page 74.
Read pages 87 - 88. Then answer questions 1.22 - 1.24 ▶▶	1.22 a) Define empirical formula b) Define molecular formula. 1.23 Explain why the chemical formula for an ionic compound is its empirical formula. 1.24 What is the empirical formula for each of the following molecular formulas: $C_4H_8O_4$ $C_6H_{12}O_6$ C_2H_2 H_2O
Read pages 95 - 96 and study the Sample Problem, 'Determining a Molecular Formula'. Then answer question 1.25 ▶▶	1.25 Complete Practice Problems 17 and 18, page 97.
See your instructor to discuss any additional work, including review, that may be required for this unit.	

Unit 2 - Quantities in Chemical Reactions

To fulfill the objectives of this unit, students should complete the following:

Reading for this Unit: *Chemistry*

Chapter 4:	Introduction:	page 110
	Section 4.1:	pages 111 - 126
	Section 4.2:	pages 128 - 135

References and Notes	Work to Submit
Read pages 111 - 114. Then answer question 2.1 ▶▶	**Writing:** 2.1 Complete Practice Problems 1 - 3, page 114.
Note: ***Answers to the 'Practice Problems' and 'Section Review' are on page 77. Check your answers and make sure you are clear on how to do each type of problem before you move on.***	
Read page 114 - 115, 'Mole Relationships in Chemical Equations'. Then complete question 2.2 ▶▶	2.2 Complete Practice Problems 4 - 7, page 115.
Read page 116, 'Different Ratios of Reactants', and study Sample Problem, 'Mole Ratios of Reactants', page 116 - 117. Then complete question 2.3 ▶▶	2.3 Complete Practice Problems 8 - 10, page 117.
Read pages 118 - 119. Then complete questions 2.4 - 2.5 ▶▶	2.4 State the Law of Conservation of Mass. 2.5 Define stoichiometry.

Unit 2 - Quantities in Chemical Reactions

References and Notes	Work to Submit
Study Sample Problem, 'Calculations for Reactants', page 120. The complete question 2.6 ▶▶	**Writing:** 2.6 Complete Practice Problems 11 - 14, page121.
Study Sample Problem, 'Calculations for Products and Reactants', pages 121-122. Then complete question 2.7 ▶▶	2.7 Complete Practice Problems 15 - 18, page122 - 123.
Read carefully, 'A General Process for Solving Stoichiometric Problems', page 124 and study Sample Problem, 'Mass and Particle Stoichiometry', pages 124 - 125. Then complete question 2.8 ▶▶	2.8 Complete Practice Problems 19 - 22, page125 - 126.
Note: ***You will NOT be expected to write balanced chemical equations for the exam for this course. As you work through the course, see your instructor to make sure you are given the balanced chemical equation for each problem you are asked to complete.***	
See your instructor to discuss any additional work, including review, that may be required.	

Unit 2 - Quantities in Chemical Reactions

References and Notes	Work to Submit
	Writing:
Read pages 128 - 130 and then write an answer question 2.9 ▶▶	2.9 Define: (a) limiting reactant (b) excess reactant
Study Sample Problem, 'Identifying the Limiting Reactant', page 130. Then complete question 2.10 ▶▶	2.10 Complete Practice Problems 23 - 26, page 131.
Read 'The Limiting Reactant in Stoichiometric Problems', page 133 and study the Sample Problem, 'The Limiting Reactant in a Stoichiometric Problem', page 133 - 134. Then complete question 2.11 ▶▶	2.11 Complete Practice Problems 27 - 30, pages 134 - 135.
	Laboratory:
Read carefully through the lab investigation on page 132. ▶▶	Carry out Investigation 4-A, *'Limiting and Excess Reactants'*. Complete your lab write-up as directed by your instructor.
See your instructor to discuss any additional work, including review, that may be required.	