Adult Basic Education

Level II Science

Science 2013
Chemical Science

Study Guide

Suggested Resources: *Discovering Science 9*

Level II Science Courses
Science 2011 Life Science
Science 2012 Physical Science
Science 2013 Chemical Science
Science 2014 Electricity
Science 2015 Earth Science

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To the Student

Introduction to Science 2013

This course is intended to help you acquire the basic knowledge of Chemical Science that will prepare you for study in one of the Level III profiles (Degree and Technical, Business-Related College and General College).

You may/may not have to complete all ABE Level II Science courses. You are only required to complete sufficient Level II Science courses to ensure success in one of the Level III graduation profiles. For example, if you intend to complete the Degree-Technical Profile (Academic) in Level III, you may need to complete more Level II Science courses than if you intend to complete the General College Profile (General) in Level III.

Science 2013: Chemical Science is divided into two units. The outcomes for this course are given below. By completing the **Required Work** in this Study Guide, you will fulfill the outcomes for this course.

The first unit, ***Physical and Chemical Properties,*** will cover the following course outcomes:

1.01 Define the term "matter".
1.02 Investigate materials and describe them in terms of their physical properties and chemical properties.
1.03 List examples of physical and chemical properties. Examples include: physical (colour, melting/boiling points) and chemical (combustibility and reactivity).
1.04 Compile and display data collected during an investigation of the physical and chemical properties of materials.

The second unit, ***Atomic Theory***, will cover the following course outcomes:

2.01 Define the term "atom".
2.02 Define "atomic theory".
2.03 Distinguish between a theory and law.
2.04 Describe the contribution of at least one of the following scientists to the development of current atomic theory: Democritus, Aristotle, Dalton, Thomson, Rutherford, and Bohr.
2.05 Distinguish among protons, neutrons and electrons.
2.06 Identify and write the chemical symbol for at least five common elements.
2.07 Define the term "element".
2.08 Recognize that elements are represented by an internationally agreed upon system of symbols.
2.09 Identify the periodic table as a listing of all known elements.

2.10 Define the term “period” as related to the periodic table.
2.11 Define the term “family” as related to the periodic table.
2.12 Distinguish between atomic mass and atomic number for an element.

To the Student

Use of Science Study Guides

Before beginning this course, ensure you have the text(s) and any other resources needed.

Your Study Guide is organized as follows:

Required Work	**Suggested Resources/Notes**
The left-hand column guides you through the material you must complete in order to successfully complete the course. You will see three headings in this left-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. **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 "**Suggested Resources/Notes**" column will indicate any additional information you need to complete the assignment. These assignments frequently relate the science content to a practical application.	This right-hand column provides you with information on the resources needed for the course. It also draws your attention to assignments and core labs that will be evaluated as part of your final course mark. Other notes may be included here such as helpful suggestions, safety precautions, etc.

To the Student

Recommended Evaluation

Written Notes	20%
Labs/Assignments/Test(s)	30%
Final Exam (entire course)	50%
	100%

The overall pass mark for the course is 50%.

Note: The evaluation scheme recommended above is presented as a suggestion. Institutions may choose an alternate evaluation scheme in order to meet the individual needs of adult learners.

Unit 1: Physical and Chemical Properties

Required Work	**Suggested Resources/Notes**
Writing: 1. Read pages 16-19 in *Discovering Science 9*, and then complete the following items: a) Define the term "matter" and give two examples. b) Define "element" and give two examples. c) Explain and give examples of physical properties. d) Explain and give examples of chemical properties. e) Classify the following as chemical or physical properties: • Cotton balls are soft. • Water boils at 100 degrees Celsius. • Diamonds can be used to cut glass. • Sugar dissolves in water. • Propane is a gas. • Propane burns in air. 2. Read <u>1-2B: A Chemical Family</u> on page 19 of *Discovering Science 9*. Scan the table included with this activity, and then complete the following items: a) Draw the table and fill in the information in your notebook. Make the table as neat as possible. b) Which of the properties listed in the table are chemical properties and which are physical properties? c) Three metals commonly used in coins—copper, silver and gold—are considered to be a chemical family. List three reasons to explain why. d) Do you think aluminum belongs to the same chemical family as iron? List reasons for and against.	The **Glossary** on pages 502-509 may be helpful in defining terms.

Unit 2: Atomic Theory

Required Work	**Suggested Resources/Notes**
Writing:	
1. Read pages 24-29 in *Discovering Science 9*, and then complete the following items:	The **Glossary** on pages 502-509 may be helpful in defining terms.
a) Define the term "atom".	
b) What is atomic theory?	
c) How does a scientific theory differ from a scientific law?	
d) What is the difference between Dalton's model of the atom and Thomson's model?	
e) What did Rutherford discover in his famous gold foil experiment?	
f) Define the term "subatomic particle", and state the three subatomic particles in a typical atom.	
g) Identify the subatomic particle or particles described in each of the following: • has a positive charge • is the most massive • has a negative charge • gives the nucleus its electric charge • is in the region surrounding the nucleus • has no electric charge • has the least amount of mass • is in the nucleus along with protons	See **Table 1.3: Subatomic Particles** on page 28 of the text for help with g).

Unit 2: Atomic Theory

Required Work	**Suggested Resources/Notes**
Writing: 2. Read pages 38-43 in *Discovering Science 9*, and then complete the following items: a) Approximately how many elements are there? b) Explain, using an example, how chemicals are represented using a chemical symbol. c) Use **Table 2.1** on page 40 of the text to complete the following: • List the symbols of the four gases whose element symbols have only one letter. • List the names of both elements that are liquids at room temperature. • Write the symbols of any four solids whose symbols have only one letter. • List the names of any four solids whose symbols have two letters. • In the Table, which two elements are named after places? 3. Read pages 48-53 in *Discovering Science 9*, and then complete the following items: a) What is the periodic table and who is credited for developing it? b) List two pieces of information besides an element's name and symbol that are recorded on a typical periodic table.	See **Table 2.1**, p. 40.

Unit 2: Atomic Theory

Required Work	**Suggested Resources/Notes**
c) Use the periodic table on page 50 of the text, to find the atomic number for each of the following: • helium • oxygen • iron • gold • uranium • mendelevium	See **Figure 2.12** in the top right hand corner on page 49 of the text for help with item c).
d) Use the periodic table on page 50 of the text, to find the atomic mass for each of the following: • lithium • silicon • iron • copper • mercury	
e) Define the following terms as they relate to the periodic table: • period • chemical family	

Unit 2: Atomic Theory

Required Work	**Suggested Resources/Notes**
Assignment 2 Read 2-2A Understanding the Periodic Table on page 49 of the text, and then complete the following: a) Copy the table given in this exercise into your notebook. b) Use the periodic table on page 50 of the text to find the atomic number, atomic mass, element name, and/or symbol. Round off the atomic mass to estimate the mass number. Use the information contained in the section entitled "The Periodic Table" on page 49 to fill in missing blanks.	Ask your instructor if you are unsure about rounding the atomic mass numbers. The following example may help: Titanium (Ti) has an atomic mass number of 47.9. This can be rounded to 48. The six bullets on page 49 will help you understand the relationships between atomic number, mass number, and the number of protons, neutrons, and electrons. This assignment will be submitted to your instructor, and is part of your evaluation for this course