

Adult Basic Education
Level II Science

Science 2012
Physical Science
Curriculum Guide

Suggested Resources: *Discovering Science 7*

Level II Science Courses

Science 2011 Life Science

Science 2012 Physical Science

Science 2013 Chemical Science

Science 2014 Electricity

Science 2015 Earth Science



Table of Contents

To the Instructor.....	3
Introduction to Science 2012.....	3
Curriculum Guide.....	5
Study Guides.....	5
Resources.....	6
Recommended Evaluation.....	7
Unit 1: Heat--Suggestions for Teaching, Learning and Assessment	8
Unit 2: Mixtures and Solutions--Suggestions for Teaching, Learning and Assessment.....	12

To the Instructor

Introduction to Science 2012

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

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

Science 2012: Physical Science is divided into two units. The outcomes for this course are given below. By completing the **Required Work** in the Study Guide, students will fulfill the outcomes for this course.

The first unit, *Heat*, will cover the following course outcomes:

- 1.01 Define “temperature”.
- 1.02 Predict and identify the temperature of various familiar objects. Include:
 - human body temperature
 - temperatures of boiling and freezing water
 - comfortable room temperature
- 1.03 Relate temperature to everyday experiences. Include:
 - daily temperature changes
 - cooking temperatures
 - refrigeration temperatures
 - average temperatures in different geographic areas
- 1.04 Identify scales used in temperature measurement. Include:
 - Celsius
 - Fahrenheit
 - Kelvin
- 1.05 Define the term “matter”.
- 1.06 Define temperature using the Particle Theory of Matter.
- 1.07 Describe the Particle Theory of Matter.
- 1.08 Define the term “kinetic energy”.
- 1.09 Define temperature as a measure of the average kinetic energy of a substance.
- 1.10 Explain how each state of matter reacts to changes in temperature.

- 1.11 Compare the characteristics of the three states of matter in terms of volume and shape.
- 1.12 Describe the three states of matter using the Particle Theory of Matter in terms of the arrangement of particles and the movement of particles.
- 1.13 Use the Particle Theory of Matter to explain expansion and contraction in states of matter.
- 1.14 Explain changes of state using the Particle Theory of Matter. Include: melting, freezing, evaporation.
- 1.15 Compare transmission of heat by conduction, convection and radiation.
- 1.16 List common examples of conduction, convection and radiation.
- 1.17 Define the term “insulator”.
- 1.18 List common examples of insulators.

The second unit, *Mixtures and Solutions*, will cover the following course outcomes:

- 2.01 Define the terms “pure substances” and “mixtures”.
- 2.02 Identify various mixtures that are found in or around homes.
- 2.03 Distinguish between heterogeneous (mechanical) and homogeneous (solution) mixtures.
- 2.04 Define the terms “solute” and “solvent”.
- 2.05 Given an example of a solution and its components. Identify the solute and solvent; for example, air, salt water, etc.
- 2.06 Define the term “concentration”.
- 2.07 Describe the concentrations of solutions.

Students are required to complete one assignment and one core lab in this course. Instructors have flexibility to substitute another assignment and/or core lab if it is felt that the ones included in the Study Guide are inappropriate. The recommended resources for this course contain additional labs and assignments which may be used.

There are a number of Blackline Masters (BLM's) contained on the website accompanying the text that can be useful in conducting lab activities. Instructors are encouraged to preview this material and to exercise professional discretion in how to use it in the ABE classroom. Also, a number of these BLM's may be appropriate for use as assignments, unit reviews and for test/exam construction.

To the Instructor

Curriculum Guide

Each new ABE Level II Science course has a Curriculum Guide for the instructor and a Study Guide for the student. The Curriculum Guide includes the specific curriculum outcomes for the course. Suggestions for teaching, learning and assessment are provided to support student achievement of the outcomes. Some suggestions for teaching, learning and assessment will be repeated in the curriculum guides for the science courses when appropriate. Each course is divided into units. Each unit is presented in the Curriculum Guide as a **two-page layout of four columns** as illustrated in the figure below.

Curriculum Guide Organization The Two-Page, Four-Column Spread

Unit Number – Unit Title		Unit Number – Unit Title	
Outcomes	Notes for Teaching and Learning	Suggestions for Assessment	Resources
Specific curriculum outcomes for the unit.	Suggested activities, elaboration of outcomes, and background information.	Suggestions for assessing students' achievement of outcomes.	Recommended resources that address outcomes.

Study Guide

The Study Guide provides the student with the name of the text(s) required for the course and specifies the sections and pages that the student will need to refer to in order to complete the **Required Work** for the course. It guides the student through the course by assigning relevant reading and providing questions and/or assigning questions from the text or some other resource. Sometimes it also provides important points for students to note. The Study Guide is designed to give students some degree of independence in their work. Instructors should note, however, that there is material in the Curriculum Guide in the *Notes for Teaching and Learning* and *Suggestions for Assessment* columns that is not included in the Study Guide, and instructors will need to review this information and decide how to include it.

To the Instructor

Resources

Recommended student resources for this course:

- *Discovering Science 7*. McGraw-Hill Ryerson. 2008. <http://www.mcgrawhill.ca>
- *Website* (www.discoveringscience.ca)
 - Provides links to sites that support Internet Connect, Explore More Features, and Integrated Research Investigations in the textbook.
 - Links to interesting educational and entertaining sites that support the curriculum.

Recommended instructor resources:

- *Teacher's Resource* (print)
- *Teacher's Resource* (CD-ROM)
 - Contains complete text of print Teacher's Resource in PDF format.
 - Contains modifiable Blackline Masters in both English and French.
 - Contains assessment checklists and rubrics.
- *Computerized Assessment Bank* (CD-ROM) in both English and French
 - Contains 1200 questions
 - Contains a variety of question types
 - All answers are provided
 - User-friendly ExamView software
- *Website* (www.discoveringscience.ca)
 - Contains additional interactive on-line resources for instructors.
 - Contains additional links for instructors.

Note: Instructors may have to adapt the content of these instructor resources to meet the needs of their individual ABE students.

The *Discovering Science* series of texts is a brand new science resource for Newfoundland and Labrador. The student and teacher resources contained in this series are designed to provide 100% alignment with Newfoundland and Labrador's intermediate science curriculum, on which the ABE Level II Science curriculum is based. These resources have been reviewed by Newfoundland and Labrador educators for their usefulness, content, design, relevancy and readability.

The *Teacher's Resource* for this series contains valuable resources for instructors. Like the texts, these resources were developed with the Newfoundland and Labrador intermediate science curriculum in mind as well as the principles of scientific literacy.

Instructors are encouraged to utilize the *Teacher's Resource* and have the flexibility to adapt any material contained in the resources to better meet the needs of adult learners.

Recommended Evaluation

Written Notes	20%
Labs/Assignments/Test(s)	30%
Final Exam (entire course)	<u>50%</u>
	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. The Department of Education has no requirement that a final exam must be given in this course. Instructors/institutions can decide if a final exam is necessary based on their own policies and procedures.

Unit 1: Heat--Suggestions for Teaching, Learning and Assessment

Outcomes	Notes for Teaching and Learning
<p>1.01 Define “temperature”.</p> <p>1.02 Predict and identify the temperature of various familiar objects. Include:</p> <ul style="list-style-type: none"> • human body temperature • temperatures of boiling and freezing water • comfortable room temperature <p>1.03 Relate temperature to everyday experiences. Include:</p> <ul style="list-style-type: none"> • daily temperature changes • cooking temperatures • refrigeration temperatures • average temperatures in different geographic areas <p>1.04 Identify scales used in temperature measurement. Include:</p> <ul style="list-style-type: none"> • Celsius • Fahrenheit • Kelvin <p>1.05 Define the term “matter”.</p> <p>1.06 Define temperature using the Particle Theory of Matter.</p>	<ul style="list-style-type: none"> • Instructors may encourage students to read “A Tour of Your Textbook” located on pages x-xvi of the student textbook. This tour explains in detail the key structural features of the textbook. • Instructors may point out the Internet Connect feature of the textbook. This may be helpful for students. This feature uses www.discoveringscience.ca to learn more about the topic being studied. • The username and password for www.discoveringscience.ca are in the accompanying <i>Teacher’s Resource</i>. • Instructors are encouraged to read and become familiar with pages TR-1 to TR-17 in the <i>Teacher’s Resource</i>. Although the information contained in these pages is written for intermediate science teachers, there is sufficient information presented in these pages to be of use to ABE instructors as well. • The <i>Teacher’s Resource</i> contains notes for teaching and learning. Instructors can read through this material for information to supplement their teaching. Instructors can use their professional judgment in determining what information is useful. • Students will be introduced to many new terms throughout this course. Instructors may wish to have students start a vocabulary list and add to it regularly as they work through this unit. The Glossary can be useful to provide definitions. • Students can be encouraged to prepare Key Word Concept Maps. • Instructors may wish to encourage students to keep work organized, neat and legible. Although not mandatory, students can be encouraged to type all written response work on a computer if resources allow.

Unit 1: Heat--Suggestions for Teaching, Learning and Assessment

Outcomes	Notes for Teaching and Learning
<p>1.07 Describe the Particle Theory of Matter.</p> <p>1.08 Define the term “kinetic energy”.</p> <p>1.09 Define temperature as a measure of the average kinetic energy of a substance.</p> <p>1.10 Explain how each state of matter reacts to changes in temperature.</p> <p>1.11 Compare the characteristics of the three states of matter in terms of volume and shape.</p> <p>1.12 Describe the three states of matter using the Particle Theory of Matter in terms of the arrangement of particles and the movement of particles.</p> <p>1.13 Use the Particle Theory of Matter to explain expansion and contraction in states of matter.</p>	<ul style="list-style-type: none"> • www.discoveringscience.ca contains the following BLM’s under the <i>Discovering Science 7</i> link (Note that instructors need to be registered in order to access this material. Register by following the prompts and provide all required information): <ul style="list-style-type: none"> ○ Unit Summary containing key concepts and terms ○ Word Search Puzzle containing key terms ○ Key Terms Crossword (may contain extra terms) ○ Parts of a Thermometer Diagram ○ Reading a Thermometer Worksheet ○ “Fixed” Temperatures Worksheet ○ Wind Chill Worksheet ○ Weather and Water Worksheet ○ Chapter Reviews ○ Modelling the Particle Theory Observation Chart. ○ Expanding Solids Observation Chart ○ How Low Can It Go? Observation Chart ○ Melting Points and Boiling Points Worksheet ○ Plateau Problem Observation Chart ○ Gases Expanding and Contracting Worksheet ○ Liquids Expanding and Contracting Worksheet ○ Solids Expanding and Contracting Worksheet ○ Learn the Lingo Worksheet ○ Absorb That Energy Observation Chart ○ Hidden Heat Worksheet. ○ When You’re Hot...Observation Chart. ○ Convection Worksheet ○ Insulation and R-Values Worksheet ○ Heat Versus Temperature Worksheet ○ Thermal Energy Transfer Word Search ○ Air-to-Air Heat Pump Worksheet ○ Answer keys to all BLM Worksheets ○ Note: Instructors may have to adapt some of this material. Use of this material is at the discretion of the instructor.

Unit 1: Heat--Suggestions for Teaching, Learning and Assessment
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Outcomes	Notes for Teaching and Learning
1.14 Explain changes of state using the Particle Theory of Matter. Include: melting, freezing, evaporation.	
1.15 Compare transmission of heat by conduction, convection and radiation.	
1.16 List common examples of conduction, convection and radiation.	
1.17 Define the term “insulator”.	
1.18 List common examples of insulators.	

Unit 1: Heat--Suggestions for Teaching, Learning and Assessment

Suggestions for Assessment

- Instructors should ensure that students understand the reading material presented in the text. Although the text is written for students at a junior high reading level, adult learners may have some difficulty understanding the language.
- The *Teacher's Resource* provides an explanation concerning the relationship between assessment and evaluation. Instructors may wish to read page 2 in the *Teacher's Resource* for information on this relationship.
- Instructors should review all written responses completed by students based on the **Required Work** in the Study Guide. Ideally, this should be reviewed prior to students writing any tests/exams. Instructors may discuss both strengths and weaknesses based on this review. It is suggested that instructors allow students to re-do any items that may be incorrect or incomplete.
- Instructors are encouraged to become familiar with the assessment tools provided in the *Teacher's Resource*. Instructors can exercise professional judgement in determining how to integrate these assessment tools in their teaching practice. These assessment tools include such things as rubrics, checklists, observation notes, and self-assessment. These tools are also available on the accompanying website and CD.
- Instructors will find answers to some of the written work assigned in the Study Guide contained in the *Teacher's Resource*.
- Instructors will find Blackline Masters (BLM's) on the website www.discoveringscience.ca. Instructors will have to register in order to gain access to the teacher resources on this site. Follow the prompts and complete all required fields. Instructors can exercise professional judgement in determining how they wish to integrate these BLM's into their teaching.

Recommended resources that address outcomes

- Many of the written response items contained in the Study Guide are based on the **Reading Check** exercises from the text. Instructors may use the **Checking Concepts** and **Understanding Key Ideas** sections in the text for supplemental study and evaluation material.
- See page 2 in the *Teacher's Resource* for information on the relationship between assessment and evaluation.
- See page 6 in the *Teacher's Resource* for information on some suggested assessment methods.
- See page 7 in the *Teacher's Resource* for material on assessment tools.
- Page 11 in the *Teacher's Resource* contains a sample recording keeping tool that instructors may find helpful.
- The username and password for www.discoveringscience.ca are in the accompanying *Teacher's Resource*.

Unit 2: Mixtures and Solutions--Suggestions for Teaching, Learning and Assessment

Outcomes	Notes for Teaching and Learning
2.01 Define the terms “pure substances” and “mixtures”.	<ul style="list-style-type: none"> • Same general comments as for Unit 1.
2.02 Identify various mixtures that are found in or around homes.	<ul style="list-style-type: none"> • Instructors are encouraged to read the notes for teaching and learning contained in the <i>Discovering Science 7 Teacher’s Resource</i>. Instructors can use professional judgment in determining what information is useful. This resource is also available online at www.discoveringscience.ca.
2.03 Distinguish between heterogeneous (mechanical) and homogeneous (solution) mixtures.	<ul style="list-style-type: none"> • www.discoveringscience.ca contains the following BLM’s under the <i>Discovering Science 7</i> link (Note that instructors need to be registered in order to access this material. Register by following the prompts and provide all required information): <ul style="list-style-type: none"> ○ Unit Summary containing key concepts and terms ○ Word puzzles containing key terms ○ Reviewing Physical Properties Worksheet ○ Now You See It Observation Chart ○ Mixture Match-Up Observation Chart ○ Comparing Particles in a Pure Substance and a Mixture ○ A Particle View of the States of Matter Worksheet ○ Examining Three Common Beverages Table of Observations ○ Shine On Observation Chart ○ What Kind of Mixture Observation Chart ○ A Classification of Matter Worksheet ○ From Heterogeneous to Homogeneous Worksheet ○ Chapter Reviews ○ Does It Dissolve Observation Chart ○ Attraction Among Particles Comic Strip ○ How Stains Are removed Worksheet ○ Alternative Cleaners Worksheet ○ Make Your Own Snow Globe Activity ○ Solubility Sequencing Worksheet ○ How Does Temperature Affect Solubility ○ Solubility and Temperature (Core Lab) ○ Concentration of Consumer Products Recording Chart
2.04 Define the terms “solute” and “solvent”.	
2.05 Given an example of a solution and its components, Identify the solute and solvent; for example, air, salt water, etc.	
2.06 Define the term “concentration”.	
2.07 Describe the concentrations of solutions.	

Unit 2: Mixtures and Solutions--Suggestions for Teaching, Learning and Assessment
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Outcomes	Notes for Teaching and Learning
	<ul style="list-style-type: none">○ Working With Concentration Units Recording Chart○ Settling Undissolved Solids Activity○ Growing Salt Crystals Activity○ Methods of Separation Activity○ Answer Keys to all BLM worksheets○ Strategies for Separation Chart○ Simple Distillation Activity○ Separating Homogeneous Mixtures Recording Sheet○ Fractional Distillation Worksheet○ Visualizing Key Ideas Recording Sheet○ Answer Keys to BLM's○ Note: Instructors may have to adapt some of this material. Use of this material is at the discretion of the instructor.

Unit 2: Mixtures and Solutions--Suggestions for Teaching, Learning and Assessment
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Suggestions for Assessment	Recommended resources that address outcomes
<ul style="list-style-type: none">• Same general comments as for Unit 1.	<ul style="list-style-type: none">• Same general comments as for Unit 1.• Additional resources for the instructor are available online at www.discoveringscience.ca• The username and password for www.discoveringscience.ca are in the accompanying <i>Teacher's Resource</i>.