Adult Basic Education

Level II Science

Science 2012
Physical Science

Study 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

Newfoundland Labrador

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To the Student

Introduction to Science 2012

This course is intended to help you acquire the basic knowledge of Physical 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 2012: Physical 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, ***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.

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: Heat

Required Work	**Suggested Resources/Notes**
Writing:	
1. Define "temperature".	The **Glossary** on pages 481-490 may be helpful in defining terms.
2. Read pages 110-115 in *Discovering Science 7,* and then complete the following items: a) If you were asked what room temperature is, why would it not be possible to give a specific temperature? b) What is the typical temperature in a refrigerator? c) What is your normal body temperature? d) What is hypothermia? e) Examine Map B in **Figure 4.6** on page 115 of the text. Is the section of Newfoundland and Labrador that is warmest in January by the ocean or inland? Is the section of Newfoundland and Labrador that is coldest in January by the ocean or inland?	See Map A and B in **Figure 4.6** on p. 115.
3. Read pages 120-124 in *Discovering Science 7,* and then complete the following items: a) What was the first temperature scale to be widely used? b) How does the Celsius scale differ from the Fahrenheit scale? c) How is the Kelvin temperature scale similar to the Celsius temperature scale? How is it different? d) Why do you think that the Celsius scale is more practical than the Fahrenheit scale?	

Unit 1: Heat

Required Work	**Suggested Resources/Notes**
4. Read pages 136-139 in *Discovering Science 7*, and then complete the following items:	The **Glossary** on pages 481-490 may be helpful in defining terms.
a) What is meant by the term "matter"? Give three examples of matter.	
b) Describe the Particle Theory of Matter.	You may wish to use an illustration to help your explanation.
c) When an object is moving, what kind of energy does it have?	
d) Name two characteristics of an object that determine the amount of kinetic energy the object has.	
e) Two identical balls are hit with a baseball bat. One baseball is travelling at a speed of 35 m/s and the other is travelling at 23 m/s. Which baseball has more kinetic energy? Why?	
f) A billiard ball and a Ping-Pong ball are travelling at the same speed. Which ball has more kinetic energy? Why?	
5. Read pages 140-141 in *Discovering Science 7*, and then complete the following items:	You may wish to use an illustration to help your explanation.
a) What is the connection between the kinetic energy of the particles in an object and the temperature of the object?	
b) Explain why rubbing your hands together makes them feel warmer.	
c) One golf ball has been lying in the sun and another one has been in the shade. The particles of which ball will have a larger average kinetic energy? Explain.	

Unit 1: Heat

Required Work	**Suggested Resources/Notes**
6. Read pages 144-148 in *Discovering Science 7*, and then complete the following items: a) Describe and give an example of the following states of matter: solid, liquid and gas. b) Using the Particle Model of Matter, describe the arrangement of particles in solids, liquids and gases. Use an illustration to help your description.	You may wish to use an illustration to help your explanation.
7. Read pages 149-150 in *Discovering Science 7*, and then complete the following items: a) Define the term "thermal expansion". b) How do the particles of a gas cause the volume of a container to increase when the temperature of the gas increases? c) A metal lid on a jar is stuck on very tight. Use the particle theory to explain whether heating or cooling the lid would make it easier to remove the lid. d) On road surfaces of bridges, you often see structures like the one in the photograph on page 157 of the text. Why do you think these structures are built into the roadways of bridges? Predict whether the photograph was taken in the winter or in the summer. Explain your reasoning.	**Figure 5.9** on page 147 of the text provides a visual that can help in completing item b). The **Glossary** on pages 481-490 may be helpful in defining terms.

Unit 1: Heat

Required Work	**Suggested Resources/Notes**
8. Read pages 158-163 in *Discovering Science 7*, and then complete the following items: a) Define the following terms: • melting • freezing • point • boiling point b) When you are holding a glass of cold water or other cold drink, the outside of the glass often becomes wet. Where does the liquid water comes from?	The **Glossary** on pages 481-490 may be helpful in defining terms.
9. Read pages 174-177 in *Discovering Science 7*, and then complete the following items: a) Explain, using an example, when each of the following occurs: conduction, convection and radiation. b) How is heat transferred from one side of a solid object, such as the bottom of a skillet, to the other side of the object, such as the inside of the skillet?	You may wish to use an illustration to help your explanation.
10. Read pages 177-179 in *Discovering Science 7*, and then complete the following items: a) Give an example of a common form of convection current. b) Why can convection not occur in a solid?	

Unit 1: Heat

Required Work	**Suggested Resources/Notes**
11. Read pages 192-195 in *Discovering Science 7*, and then complete the following items:	
a) Why might you choose to purchase cookware with copper bottoms?	You may wish to use an illustration to help your explanation.
b) Why is stainless steel often used for the lining of cookware?	
c) Give an example of a common form of heat radiation.	
12. Read pages 196-198 in *Discovering Science 7*, and then complete the following items:	
a) What is an insulator? Give two examples of an insulator.	The **Glossary** on pages 481-490 may be helpful in defining terms.
b) What are three common types of insulation used in home construction?	
c) What is meant by the R-value of insulation?	
d) While baking a cake, you want to avoid burning the bottom of the cake. Should you use a glass or metal baking pan? Explain why.	
Laboratory 1 Read 6-1B Displaced Drops on page 179 of *Discovering Science 7*. Make sure you fully understand the safety information. Follow the steps listed under "What to Do". After you have followed the all the steps, complete both items in "What Did You Find Out?"	This lab activity will be submitted to your instructor, and is part of your evaluation for this course. Be sure to ask your instructor for help if you do not fully understand any part of the procedure or safety instructions.

Unit 2: Mixtures and Solutions

Required Work	**Suggested Resources/Notes**
1. Read pages 232-235 in *Discovering Science 7*, and then complete the following items: a) Define the following terms and give an example for each: • mixture • heterogeneous mixture • homogeneous mixture b) When you first open a bottle of pop, the liquid is filled with tiny bubbles. Is the pop homogeneous or heterogeneous? Explain your answer. c) If you let the pop sit for a day, what happens? Is the liquid homogeneous or heterogeneous now? Explain your answer.	The **Glossary** on pages 481-490 may be helpful in defining terms.
2. Read pages 236-237 in *Discovering Science 7*, and then complete the following items: a) What is a "pure substance"? Give two examples of pure substances. b) Identify each of the following as a mixture or pure substance, and give a reason to explain your choice. If you are unsure, write "unsure": • oxygen gas • air • whipped cream • slush • garden soil • iron • sandwich • chocolate chip cookie • pencil • freshly squeezed orange juice	The **Glossary** on pages 481-490 may be helpful in defining terms.

Unit 2: Mixtures and Solutions

Required Work	**Suggested Resources/Notes**
c) Classify each of the mixtures identified in number 1 above as homogeneous or heterogeneous. 3. Read pages 242-245 in *Discovering Science 7*, and then complete the following items: a) Give two examples of a solution from everyday life. b) A mechanical mixture is heterogeneous, while a solution is homogeneous. Explain why. c) Classify each of the following mixtures as a heterogeneous mixture or a solution: • bran cereal with raisins and nuts • soil mixed with water • oil mixed with vinegar • clean air • an aluminum frying pan • a brass doorknob 4. Suppose you are given a liquid mixture. You cannot see any small pieces of different matter in the mixture. When you pass the mixture through a filter, nothing is left on the filter paper. a) Is the mixture a solution or a heterogeneous mixture. Explain your answer. b) How could you be more certain about your inference?	Note: an inference is a conclusion you make based on facts.

Unit 2: Mixtures and Solutions

Required Work	**Suggested Resources/Notes**
5. Read pages 254-258 in *Discovering Science 7*, and then complete the following items: a) Define the terms "solute" and "solvent". b) Why are some substances insoluble in a certain solvent? c) Identify the solvent and solute in these examples: • Lemonade made by mixing lemon-flavored drink crystals with water. • Vinegar is a solution that is made up of 5% acetic acid and 95% water. • Humid air is a solution of water vapor in air. • Home-made window cleaner can be made by dissolving vinegar in water. • One way to make apple juice is by mixing water with frozen concentrated apple juice. • A small outboard motor on a boat is fuelled with a mixture of motor oil and gasoline. • Some people prefer to drink tea with lemon juice. • Therapeutic massage oil is a solution that contains the oil of a medicinal plant such as sage mixed with almond oil.	The **Glossary** on pages 481-490 may be helpful in defining terms.
6. Read pages 262-263 in *Discovering Science 7*, and then complete the following items: a) What is meant by the "concentration" of a solution? b) You put three teaspoons of sugar in a jug with 500 mL of water. You put two teaspoons of sugar into a second jug with 500mL of water. Which jug (solution) is more concentrated. Why?	The **Glossary** on pages 481-490 may be helpful in defining terms. You may wish to use an illustration to help your explanation.