

Adult Basic Education  
**Science**

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**Science 3106**  
**Disease Defense and Human Health**

**Study Guide**

**Prerequisites:** None

**Credit Value:** 1

**Text:** *science.connect2; Colbourne, Fehres, et al; McGraw-Hill Ryerson; 2003.*

**Science Courses [General College Profile]**

Science 2100A  
Science 2100B  
Science 2100C  
Science 3101  
Science 3102  
Science 3103  
Science 3104  
Science 3105  
**Science 3106**



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## To the Student

### I. Introduction to Science 3106

Science 3106, *Disease Defense and Human Health*, is the second of two courses at this level that covers Life Science topics.

The course begins with a discussion of the causes of communicable diseases and how they can be transmitted from person to person. You will also study non-communicable diseases and how they result from bad environmental conditions, poor diets, unhealthy lifestyles, and the characteristics that an individual inherits. You will learn that the best way to fight disease is to prevent it by being proactive and adopting healthy practices.

In Unit 2, you will investigate the impact of epidemics and pandemics on society and analyze the impact of public health initiatives and the importance of personal hygiene to maintain community health. You will assess the need for public health guidelines and the role of individuals to maintain personal and public health.

In Unit 3, you will investigate how the body responds to pathogens and prevents infection. The body's physical defenses and immune system will be examined. You will learn about treatments for disease and about the role of immunization in protecting people from disease.

In the last unit, you will investigate genetics by studying the relationships among DNA, genes, and chromosomes, and by examining how characteristics are passed from parents to offspring. You will learn about human diseases that result from changes to genetic make-up and about the importance of genetics and the environment for health. Issues related to genetic research will be explored.

You will be required to complete two **Assignments** in this course. You will also be required to complete two **Core Labs**. Additional assignments and/or laboratory investigations may be added

The textbook that you will need for this course is *science.connect2*; Colbourne, Fehres, et al; McGraw-Hill Ryerson; 2003.

### II. Use of 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*).



## To the Student

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

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..

### Work to Submit

You come across three (4) 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.

#### Computer:

This section indicates that you will use a computer and a printer to complete some of the required work for the course. Ask your instructor for help if you are not sure how to use the computer. You will be required to print out some material each time you do the computer work and the printouts should be included with the written notes.

## To the Student

### III. Recommended Evaluation

Written Notes	10%
Labs/Assignments	20%
Test(s)	20%
Final Exam ( <i>entire course</i> )	<u>50%</u>
	100%

**The overall pass mark for the course is 50%.**







## Unit 1 - Disease

### References and Notes

Load the CD-ROM into your computer, launch the **Bacteria** lesson and follow the instructions to work your way through it. Complete 1.8. ▶▶

**Note:** If you don't have a computer, see your instructor for directions for this section.

Study pages 163 - 165, then answer questions 1.9 - 1.11. ▶▶

Study pages 168 - 170, then answer questions 1.12 - 1.15. ▶▶

*This is the end of Unit 1. See your instructor to see if there is any more work that you need to do for this unit.*

### Work to Submit

#### Computer:

- 1.8 Print out the **Summary** and the **Certificate**. Include these with your notes.

#### Writing:

- 1.9 Explain the difference between **communicable and non-communicable diseases** and give three examples of each.
- 1.10 a) How are communicable diseases spread?  
b) Describe some ways that we can prevent the spread of pathogens.
- 1.11 Name 4 possible causes of non-communicable diseases and give one example of a disease that could be caused by each.
- 1.12 a) What pathogen commonly causes food poisoning?  
b) Describe some ways that food poisoning can be prevented.
- 1.13 Explain how each of the following methods of food preservation protects food from pathogens: *vacuum packing, canning, freezing, drying*
- 1.14 a) What does aseptic mean?  
b) Describe aseptic methods used in hospitals.
- 1.15 Explain why you would put an antiseptic and a disinfectant in a first aid kit.

## Unit 2 - Disease and Society

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

**Reading for this unit:** Chapter 10, pages 174 - 191.

References and Notes	Work to Submit
<p>Study pages 176 - 179, then answer questions 2.1 - 2.2. ▶▶</p>	<p><b>Writing:</b></p> <p>2.1 Explain the difference between an <b>epidemic</b> and a <b>pandemic</b> and give two examples of each.</p>
<p>Study pages 181 - 183, then answer questions 2.3 - 2.4. ▶▶</p>	<p>2.2 For each of the following pandemic diseases; identify the social conditions that contributed to the spread of each, and describe the impact(s) of each on society: <i>bubonic plague, Spanish flu, AIDS</i></p>
<p>Study pages 184 - 185, then answer questions 2.5 - 2.6. ▶▶</p>	<p>2.3 a) Explain what is meant by <b>public health</b>. b) Name three things that provincial public health departments do.</p> <p>2.4 Describe the programs and services provided by public health organizations for each of the following areas:</p> <ul style="list-style-type: none"><li>- <i>water quality</i></li><li>- <i>garbage removal</i></li><li>- <i>treatment of human waste</i></li><li>- <i>vaccination</i></li><li>- <i>air quality</i></li><li>- <i>food safety</i></li></ul> <p>2.5 a) List and explain 5 factors that account for the spread of communicable disease. b) Describe the Public Health Guidelines that have been put in place for each factor that you listed.</p> <p>2.6 Describe four examples of ways that health authorities keep the public informed.</p>

## Unit 2 - Disease and Society

### References and Notes

Study the figures on page 187, then answer question 2.7. ▶▶

Study page 189, then answer question 2.8. ▶▶

*This is the end of Unit 2. See your instructor to see if there is any more work that you need to do for this unit.*

### Work to Submit

#### Writing:

- 2.7 Describe some ways that public health programs can improve the quality of human life throughout the following stages of development:
- prenatal
  - childhood
  - adolescence
  - adulthood
- 2.8 What are three steps you can take to protect your own personal health? Provide a specific example of each.

## Unit 3 - Protection from Disease



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



**Reading for this unit:** Chapter 11, pages 192 - 209.

References and Notes	Work to Submit
<p data-bbox="203 619 625 682"><i>Study pages 194 - 195, then answer questions 3.1 - 3.7. ▶▶</i></p> <p data-bbox="203 724 625 829"><b>Note:</b> You may find the glossary helpful in answering some of the questions.</p> <p data-bbox="203 1354 625 1459"><i>Study pages 197 - 199, then answer questions 3.8 - 3.11. ▶▶</i></p>	<p data-bbox="662 577 787 609"><b>Writing:</b></p> <p data-bbox="662 651 1404 714">3.1 What are the body's three lines of defense against disease?</p> <p data-bbox="662 756 1339 787">3.2 Explain what is meant by <b>physical defenses</b>.</p> <p data-bbox="662 829 1388 903">3.3 Where are your body's physical defenses located and how do they work?</p> <p data-bbox="662 945 1291 1018">3.4 Explain what is meant by <b>inflammatory response</b>.</p> <p data-bbox="662 1060 1421 1123">3.5 Describe the body's inflammatory response in each for the following:</p> <ul data-bbox="755 1165 1266 1270" style="list-style-type: none"><li>- you get a splinter in your finger</li><li>- you get hit by a baseball</li><li>- you get appendicitis</li></ul> <p data-bbox="662 1312 1347 1375">3.6 Explain what <b>macrophages</b> are and how they work.</p> <p data-bbox="662 1417 1144 1449">3.7 What is the <b>immune system</b>?</p> <p data-bbox="662 1491 1015 1522">3.8 What are <b>antigens</b>?</p> <p data-bbox="662 1564 1331 1596">3.9 What are <b>antibodies</b> and how do they work?</p> <p data-bbox="662 1638 1347 1711">3.10 Explain the difference between <b>inherited</b> and <b>acquired immunity</b>.</p>



## Unit 3 - Protection From Disease



### References and Notes

Load the CD-ROM into your computer, launch the **Immunity** lesson and follow the instructions to work your way through it. Complete 3.12.  

Refer to Investigation 11-A, “Blood Transfusions”, page 200 to do the laboratory.  

**Note:** See your instructor to find out what needs to be included in your **Lab Report**.

Study pages 201 - 202, then answer questions 3.14 - 3.15.  

Study pages 204 - 206, then answer questions 3.16 - 3.20.  

### Work to Submit

#### Computer:

3.12 Print out the **Summary** and the **Certificate**. Include these with your notes.

#### Laboratory:

3.13 Complete Investigation 11-A. Pass your **Lab Report** in to your instructor for marking.

#### Writing:

3.14 a) What is a **vaccine**?  
b) How do vaccines prevent disease?

3.15 Explain how an immune response can cause an allergy.

3.16 What is the difference between **over-the-counter drugs** and **prescription drugs**?

## Unit 3 - Protection From Disease

*Note: Load the CD-ROM into your computer, launch the **Immunity** lesson and review it to learn more about the overuse of antibiotics.*


*This is the end of Unit 3. See your instructor to see if there is any more work that you need to do for this unit.*

- 3.17 a) What are **antibiotics** and how do they work?  
b) Name some diseases that antibiotics are prescribed for.
- 3.18 a) Name some common diseases caused by viruses.  
b) Will antibiotics work in the treatment of these diseases?
- 3.19 Give three reasons why antibiotics should not be over-prescribed.
- 3.20 Describe the information you should read on the label of an over-the-counter drug.

## Unit 4 - Genetics and Health

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



**Reading for this unit:** Chapter 11, pages 192 - 209.

References and Notes	Work to Submit
<p data-bbox="203 611 634 684"><i>Study pages 212 - 213, then answer questions 4.1 - 4. 7. </i></p> <p data-bbox="203 1056 630 1234"><i><b>Note:</b> A chromosome map shows the grouping of the chromosome set in a human. Look at Figure 12.2 to see an example of a chromosome map.</i></p>	<p data-bbox="662 569 784 604"><b>Writing:</b></p> <p data-bbox="662 642 992 678">4.1 What is <b>genetics</b>?</p> <p data-bbox="662 716 1398 827">4.2 a) Explain the purpose of <b>chromosomes</b> and <b>genes</b>. b) Which part of the cell contains chromosomes?</p> <p data-bbox="662 865 1349 1014">4.3 a) What is <b>DNA</b>? b) Draw a diagram to show how DNA is organized. c) Describe the diagram that you have drawn.</p> <p data-bbox="662 1052 1414 1125">4.4 a) How many chromosome pairs do humans have? b) Where do these chromosomes come from?</p> <p data-bbox="662 1163 1295 1236">4.5 In a <b>chromosome map</b>, where are the sex chromosomes located?</p> <p data-bbox="662 1274 1333 1348">4.6 a) What sex chromosomes do females have? b) What sex chromosomes do males have?</p> <p data-bbox="662 1386 1403 1459">4.7 Does the chromosome map shown in Figure 12.2 represent a male or a female? How do you know?</p>





## Unit 4 - Genetics and Health

### References and Notes

Study pages 216 - 218, paying close attention to Figure 12.3 and Figure 12.5, then answer questions 4.8 - 4. 15.  

**Note:** Gregor Mendel is sometimes referred to as the “father of Genetics” because his experiments provided so much information about the subject.

**Note:** The worksheets are found in Appendix A. You should have your instructor check them and include them with your notes.

Load the CD-ROM into your computer, launch the **Genetics** lesson and follow the instructions to work your way through it. Complete 4.16.  

### Work to Submit

- 4.8 What is **heredity**?
- 4.9 Explain what is meant by **purebreds** and **hybrids**.
- 4.10 Explain the difference between a **dominant** and a **recessive** trait.
- 4.11 Define **genotype**.
- 4.12 a) What is a **Punnett square** used for?  
b) Describe what the letters in a Punnett square represent.  
b) Describe how a Punnett square is set up.
- 4.13 Complete the worksheet *Predicting the Sex of Offspring*.
- 4.14 Complete the worksheet *Drawing a Punnett Square*.

### Writing:

- 4.15 What is a **pedigree** used for?

### Computer:

- 4.16 Print out the **Summary** and the **Certificate**.

## Unit 4 - Genetics and Health

### References and Notes

Get the worksheet from your instructor and read carefully through the instructions on page 218 to do the assignment. ▶▶

**Note:** You should pass the completed assignment in to your instructor for marking.

Study pages 220 - 222, then answer questions 4.18 - 4.23.



**Note:** Not all mutations are harmful. Many result in changes in organisms that help the organism to survive.

**Note:** Some mutagens are particularly harmful to human embryos. Pregnant women need to be especially careful about what they expose their unborn children to.

### Work to Submit

#### Assignment:

4.17 Complete the Activity, *Interpreting a Pedigree*.

#### Writing:

- 4.18 a) Define **mutation**.  
b) Describe how inherited mutations can occur.
- 4.19 Complete the *Try This* activity on page 220. (Note that the genotype of a carrier is Aa)
- 4.20 a) Define **mutagens** and give several examples.  
b) Are most mutations that are caused by mutagens passed from one generation to another?
- 4.21 Give one example of a helpful mutation.
- 4.22 a) What are **genetic disorders**?  
b) Give two examples of genetic disorders.
- 4.23 Name 2 mutagens that harm human embryos and describe the effects of each.

## Unit 4 - Genetics and Health

### References and Notes

Study pages 223 and 225, then complete the questions for the Assignment. 📄📄

**Note:** Pass the completed assignment in to your instructor for marking. You will **not** need to study the material covered in the assignment for your test.

**Note:** This is the end of Unit 4. See your instructor to see if there is any more work that you need to do for this unit.

### Work to Submit

#### Assignment:

- 4.24 a) What is a **genome**?  
b) What is the Human Genome Project?
- 4.25 Define **genetic engineering**.
- 4.26 Describe some benefits of advances in genetic research and engineering.
- 4.27 Describe some ethical issues that result from advances in genetic research and engineering.
- 4.28 a) What is **amniocentesis**?  
b) Explain how amniocentesis might create an ethical problem for some people.



# Appendix



# Predicting the Sex of Offspring

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Use this worksheet to practise using Punnett squares.

- Answer the question in the space provided.
- File this worksheet in the correct section of your notebook.

## Background

Human body cells contain 23 pairs of chromosomes — a total of 46 chromosomes. Each human egg or sperm cell contains one chromosome that determines sex. The chromosomes that determine sex are labeled as either X or Y. These chromosomes contain the genes that determine the sex of an individual. Females have two X chromosomes. Males have one X chromosome and one Y chromosome. Females produce eggs that have only an X chromosome. Males produce sperm that has either an X or a Y chromosome.

## What to Do

1. Use the blank Punnett square to show the various combinations that female eggs and male sperm can create.
2. What chance is there of having a male or female baby?

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## Drawing Punnett Squares

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Use this worksheet to practise using Punnett squares.

- Eye colour is shown using the symbol B for dominant gene and b for the recessive gene. This means that each individual has one of the following combinations:
  - BB = the person would have brown eyes
  - Bb = the person would have brown eyes
  - bb = the person would have blue eyes
- Draw six Punnett squares showing the mating of couples with different genotypes for eye colour. For example, the first couple both have BB. Fill the possible gametes of each parent into the first Punnett square and determine the genotype and eye colour of each of the offspring.
- There are six ways that the BB, bb, and Bb genotypes can pair. Use the balance of the Punnett squares to show the rest of the genotypes.
- Below each Punnett square, describe the eye colour of the offspring and note the ratio of brown eyes to blue eyes.
- Answer the questions that follow in your notebook.
- File this worksheet in the same section of your notebook.

Genotype of parents: \_\_\_\_\_


# of children with brown eyes \_\_\_\_\_

# of children with blue eyes \_\_\_\_\_

Ratio of brown to blue eyes \_\_\_\_\_

Genotype of parents: \_\_\_\_\_


# of children with brown eyes \_\_\_\_\_

# of children with blue eyes \_\_\_\_\_

Ratio of brown to blue eyes \_\_\_\_\_

Genotype of parents: \_\_\_\_\_


# of children with brown eyes \_\_\_\_\_

# of children with blue eyes \_\_\_\_\_

Ratio of brown to blue eyes \_\_\_\_\_

Genotype of parents: \_\_\_\_\_


# of children with brown eyes \_\_\_\_\_

# of children with blue eyes \_\_\_\_\_

Ratio of brown to blue eyes \_\_\_\_\_

Genotype of parents: \_\_\_\_\_


# of children with brown eyes \_\_\_\_\_

# of children with blue eyes \_\_\_\_\_

Ratio of brown to blue eyes \_\_\_\_\_

Genotype of parents: \_\_\_\_\_


# of children with brown eyes \_\_\_\_\_

# of children with blue eyes \_\_\_\_\_

Ratio of brown to blue eyes \_\_\_\_\_

### Extend your Skills

- What genotypes do parents likely have if all their children have blue eyes?
  - What other genotype combinations produce blue-eyed children?
- Choose two generations of a family that you want to research for hair colour. Draw Punnett squares for the possible combinations of genes that resulted in the children's hair colour.