UNIT 7

BIOLOGY

GENETIC TESTING

Unit Description

Content: This course is designed to familiarize the student with concepts in genetic testing.

Skills: Purpose

- Recognizing a writer’s or speaker’s primary purpose
- Recognizing a writer’s secondary purpose
- Recognizing a speaker’s purpose
- Recognizing a speaker’s secondary purpose
- Recognizing how thought groups, stress, and intonation help express a speaker’s attitude
- Understanding the intended audience

Unit Requirements

- Lecture: “Genetic Testing”
- Integrated Writing Task: Writing a pamphlet about genetic testing, keeping in mind the purpose and audience
- Assignments: www.MyAcademicConnectionsLab.com
Contents

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GRAMMAR CHART: Embedded Questions

UNIT 7 ANSWER KEY
Biology, the study of living organisms in the environment, is a broad area of science, so students studying for a biology degree have a variety of options. Graduates with an undergraduate degree in biology typically find careers in fields, such as health care, environmental management and conservation, and education. The study of genetics attempts to understand how characteristics are biologically inherited. In this unit, students will examine:

- some basic principles of genetics
- the ethics and implications of genetic testing, especially before birth

Activating Background Knowledge

Before students read and study about biology and genetic testing you may want to spend some time exploring the attitudes and beliefs that are common in the students' home countries.

- Has any of them had or known someone who has had genetic testing? What was the circumstance? What was the result?
- In their home countries, is genetic testing common? What are the laws related to genetic testing?

Examine the Key Words on page 138. This vocabulary will be helpful for comprehension of the exercises in this section and useful for the Integrated Writing Task. Point out the distinction in form between deterioration and deteriorate; susceptible and susceptibility.

Previewing the Academic Skills Focus, page 142

Highlight the purpose of this section, stated on the left. This unit focuses on strategies for:

- recognizing a writer or speaker’s primary and secondary purposes
- recognizing how thought groups, stress, and intonation help a speaker express intended meaning
- understanding an intended audience
Remind students that they were introduced to primary purpose in Unit 2 when they learned about various patterns of organization and the relationship of each to a writer’s purpose.

Review the academic skills focus: Recognizing a Writer’s or Speaker’s Primary Purpose

After you have examined the skills section on pages 139–140, point out that, in many cases, an author or speaker has more than one purpose. This section of the unit addresses primary purpose. Secondary purpose will be addressed later in the unit.

Summary of the Text

“The Story of Dan and Steve,” pages 140–141

Dan and Steve are brothers. Dan likes to take risks and lives his life doing things, such as solo backpacking and skydiving, but he hasn’t always been this way. When his father was diagnosed with Huntington’s disease, Dan decided to have genetic testing to find out if he had the Huntington’s gene. He did. Huntington’s disease usually occurs in middle age and causes first clumsiness and forgetfulness, then mental deterioration and uncontrollable movements, and eventually, death. The knowledge that he was going to develop this terrible disease caused Dan to completely change his lifestyle. He felt he had nothing to lose.

Dan’s brother Steve was happily married and had a great life, so he decided not to have the genetic testing. However, when Steve’s wife became pregnant, she had the baby tested for Huntington’s. She wanted a child, but not if it would have the gene for Huntington’s. Luckily, the test was negative.

Most of us don’t have to worry about getting this disease, but our families do have traits that appear through generations. Physical traits are the most obvious ones, but are only a minor part of our genetic makeup. The genes we got from our parents determine all of the reactions in our cells, our tendency to get certain diseases or have certain behaviors, and even how long we live. Our environment also has influences, but it is our genes that determine our rudimentary possibilities.

Go to www.MyAcademicConnectionsLab.com for Comprehension.

Go to www.MyAcademicConnectionsLab.com for Discussion Board.
2 BUILDING ACADEMIC READING SKILLS

Go to www.MyAcademicConnectionsLab.com for Vocabulary Check.

Highlight the purpose of this section, stated on the left. Tell students that in this section, they will learn some content-specific vocabulary, how dominant and recessive genes influence physical traits, and the primary and secondary purposes of a written text.

Before You Read, page 142
Students study the vocabulary and concepts related to genetics.

- Examine the Key Words on pages 142 and 143. This vocabulary will be helpful for comprehension of the text and useful for the Integrated Writing Task.
- You may want to model the pronunciation of these scientific terms.
- Explain the captions of the photographs. Two capital letters mean that a person gets the dominant gene from both parents. Two lower case letters mean that a person gets the recessive gene from both parents. One capital and one lower case letter mean that a person has the dominant gene, but only from one parent. If the dominant gene is present, a person will have that particular trait.
- Students might have fun looking at the presence of some of these traits in themselves. Who has freckles? a widow’s peak? attached earlobes? unattached earlobes? Which students can roll their tongues?

Go to www.MyAcademicConnectionsLab.com for Key Words and Key Words: Practice.

Global Reading, page 143
Students read a text about basic principles of inheritance and answer questions about the information in the text.

After students have completed Exercise 2, page 145, discuss their answers as a class to ensure that they understand the content of this scientific text.
Summary of the Text

“Principles of Inheritance,” by J. Goodenough, B. McGuire, and R. Wallace, pages 143–144

1. Chromosomes
   a. A human cell has 23 chromosome pairs. One in each pair comes from the female and the other from the male.
   b. A homologous pair of chromosomes has genes for the same trait.
   c. DNA and protein make up chromosomes, and specific parts of the chromosome work as genes.
   d. A gene determines whether particular proteins affect the structure or function of a cell. These proteins affect whether or not a trait appears.

2. Alleles
   a. Different forms of genes are called alleles. They create different versions of the trait they control.
   b. There are usually two alleles for each of the body’s characteristics—one on each homologous chromosome. Example: One gene that influences eye color affects whether melanin, a brown coloring, will appear in the iris. If this allele is present, the eye can range from green to dark brown. The other allele for eye color does not produce melanin, so if neither chromosome has the melanin allele, a person will have blue eyes.

3. Dominant and recessive alleles
   a. A gene is homozygous when the gene has two copies of the same allele for that characteristic (homo = same; zygo = joined together). When the alleles of a gene are different, they are heterozygous (hetero = different).
   b. The allele is dominant when the effects of an allele are apparent. Dominant alleles determine dimples, freckles, and attached earlobes.
   c. A recessive allele’s effects are hidden, so only traits connected to homozygous recessive alleles are apparent. Cystic fibrosis and albinism are two disorders that result from homozygous recessives alleles.

4. Convention for designating dominant and recessive alleles
   a. A capital letter designates a dominant allele, while a lowercase letter indicates a recessive allele.
   b. When a person has a homozygous dominant gene (AA) or a heterozygous gene (Aa), the dominant trait appears.
   c. The recessive trait appears only when there are two recessive genes (aa) for the same trait.

5. Genotypes and phenotypes
   a. Genotype refers to the exact alleles that occur—whether they are homozygous or heterozygous.
   b. Phenotype refers to the physical traits we can see in a person.

Go to www.MyAcademicConnectionsLab.com for Reading Activities 1–4.
Focused Reading, page 146

Students reread excerpts of the two texts they have read in this unit and identify the writer’s secondary purpose in each excerpt.

Review the academic skills focus: Recognizing a Writer’s Secondary Purpose.

Point out that rhetorical, as it is used here, refers to the skill of using language both effectively and persuasively; it can also refer to language that sounds good but is not sincere.

Go to www.MyAcademicConnectionsLab.com for Reading Activity 5.

Go to www.MyAcademicConnectionsLab.com for Checkpoint 1.

3 BUILDING ACADEMIC LISTENING SKILLS

Go to www.MyAcademicConnectionsLab.com for Vocabulary Check.

Highlight the purpose of this section, stated on the left. In this section, students learn how to determine the primary and secondary purposes of a lecture. They also learn how thought groups, stress, and intonation are used to express meaning.

Before You Listen, page 149

Summary of the Student Conversation (used in Exercise 1)

(For the complete audioscript, see Academic Connection 3, page 187.)

The male student asks if genetic testing and genetic screening are synonymous, and the female student says they are. The instructor said that at the beginning of the lecture. The male says he must have missed that, but is glad that he knew the two synonyms for disease. The female says one synonym for disease is disorder, but she can’t think of the other one. The male says it’s a condition—such as Huntington’s disease. The female says she laughed about the image the instructor used for genetic testing—that momentum was increasing like a snowball rolling down a hill. She supposes he meant that genetic testing is unstoppable, just like the rolling snowball. The male comments that you have to come from a place where it snows to understand the expression. He asks if the
instructor’s primary purpose was informative or persuasive. The female says she isn’t sure. At first she thought it was informative, but at the end it seemed persuasive. She asks the male what he thinks. The male says he’s not sure.

Global Listening, page 149

Students listen to a lecture about genetic testing and identify its primary and secondary purposes.

Examine the Key Words on page 149. This vocabulary will be helpful for comprehension of the lecture and useful for the Integrated Writing Task. Point out the distinction in form for prevalent and prevalence; relieved and relieve.

Review the academic skills focus: Recognizing a Speaker’s Purpose.

- Elicit meanings for the three modals mentioned in the first skills section: must, have to (it’s necessary); should (it’s a good idea).
- Ask students which of these modals would be equivalent to need to (have to; must)

Review the academic skills focus: Recognizing a Speaker’s Secondary Purpose.

Summary of the Lecture

“Genetic Testing,” page 149 (For the complete audioscript, see Academic Connections 3, pages 187–188.)

A. Introduction
1. Genetic testing, also called genetic screening, is the testing of people without symptoms to determine if genes they carry will make their chances of getting particular genetic conditions more likely.
2. The practice is increasing, but genetic testing raises many ethical issues that we need to consider in order to make intelligent decisions.

B. Advantages of genetic testing
1. You can take precautions to reduce your risk of getting a disorder.
2. You find out if it’s likely that you’ll pass on a disorder.
   a. If the disorder is caused by a hidden recessive allele or a dominant allele that doesn’t show up until later in life, you can choose to prevent suffering of future generations.
   b. Example: Tays-Sachs disease, which causes death by the age of five, is common in Eastern European Jewish people. A healthy infant stops smiling, crawling, or turning over by the age of six months, and later
becomes blind, paralyzed, and unaware of its environment. The number of children born with this disorder has decreased by ten times because many Jewish people have decided to be genetically tested.

C. Disadvantages of genetic testing

1. Learning that you will get a genetic disease that isn’t preventable or treatable can be devastating.
   a. After a genetic test, people at risk can experience anxiety and depression, and their siblings who aren’t at risk often feel guilty.
   b. Example: Huntington’s disease, caused by a dominant allele, doesn’t show up until later in life, usually between the ages of 35 and 50. It causes brain degeneration, muscle spasms, personality disorders, and death within 10 to 15 years. A person whose parent dies from this disease might not want to know if he or she will get it or might feel understandably depressed and anxious upon learning that the allele for Huntington’s is present.

2. Results of the testing may not stay confidential.
   a. An employer might not want to hire and train someone who was at risk for a serious disease.
   b. An insurance company might not want to insure someone who was at risk for a serious disease.

D. Unanswered questions about genetic screening

1. Who should decide if it should be done, on whom, for what gene, and in which communities?
2. Can we make laws to provide answers to these questions? Should we let judges and legislators decide ethical issues? Should moral issues be decided by society or clergy, or should they be personal decisions?
3. Who should get the results of a genetic test? Should parents be told if a child has a poorly understood condition? Would that benefit or harm a child?
4. Testing for and treatment of genetic illnesses is expensive. Who should pay for testing? Should we test only if treatment or prevention is possible? Who should pay for treatment if the news is bad?
5. The answers aren’t easy, and we all need to think about these and similar issues.

After you have examined the skills section about secondary purpose, point out to students that primary purpose relates to the entire text—the macro level. Secondary purpose relate to specific points in a text—the micro level.
Summary of the Excerpts (used in Exercise 2, page 150)

(For the complete audioscript, see Academic Connections 3, page 188.)

- Excerpt One: Genetic testing is gaining momentum, like a snowball rolling downhill.
- Excerpt Two: One advantage of genetic testing is that you can take precautions to prevent getting the disease if it’s treatable or preventable. Another is that you learn how likely it is that you’ll pass the disorder on.
- Excerpt Three: Tay-Sachs disease causes death in children, usually by age five.
- Excerpt Four: A lot of people in these communities decided to undergo genetic testing. As a result, the number of children born with Tay-Sachs has been reduced by ten times.
- Excerpt Five: Genetic testing also has disadvantages. Psychologically, it can be devastating to get the results.
- Excerpt Six: Many genetic disorders are not preventable or treatable. People might not want to know how they’ll die. For example, Huntington’s disease results from a dominant allele that doesn’t appear until later in life.
- Excerpt Seven: Genetic tests may not remain confidential. What would happen if information about your genetic test were available to your employer or an insurer?
- Excerpt Eight: Who should decide if testing should be done, on whom, for what, and where? Could laws be made to make the answers clear? Should judges and legislators decide ethical issues? Should society or the clergy decide moral matters, or should these decisions be personal? If testing is done, who should get the results? Should parents always be informed even if their child has a poorly understood condition? Would that help or harm a child?

Go to www.MyAcademicConnectionsLab.com for Key Words and Key Words: Practice.


Focused Listening, page 151

Students learn how speakers use thought groups, stress, and intonation to express their attitudes, and they practice listening for these elements.

Review the academic skills focus: Recognizing How Thought Groups, Stress, and Intonation Express a Speaker’s Attitude.
For Exercise 3, page 152, you may want to have the listener mark the slashes for the speaker’s pauses in a different color. Partners can then compare their marks.

- Go to www.MyAcademicConnectionsLab.com for Listening Activity 5.
- Go to www.MyAcademicConnectionsLab.com for Checkpoint 2.

### 4 BUILDING ACADEMIC WRITING SKILLS

Make sure that students are familiar with the grammar point covered in MyAcademicConnectionsLab for this unit (embedded questions) before they begin this section. Go to page 14 in these Teacher’s Notes for the grammar chart.

- Go to www.MyAcademicConnectionsLab.com for Grammar Check.

Highlight the purpose of this section, stated on the left. Tell students that in this section, they will learn how to adjust their writing based on purpose and intended audience. They will also write a pamphlet about how genes produce traits and when prenatal and personal genetic testing are justified.

**Before You Write, page 155**

Examine the Key words. This vocabulary will be helpful for comprehension of the text and useful for the Integrated Writing Task.

For Exercise 1, page 155, before students read the text, you may want to have them preview the questions on page 156.

**Summary of the Text**

“Prenatal Genetic Testing,” by N. Campbell, J. Reece, and E. Simon, page 155

1. Why should parents consider genetic testing of their unborn child?
   a. Women over 35 have an increased risk of bearing a child with Down syndrome. Genetic testing will let them know if their child has this syndrome.
   b. Some genetic disorders occur in families, so parents may want to know if their future children are at risk.
2. How is genetic testing of the unborn child done?
   a. Fetal cells are collected using amniocentesis, a procedure performed between the 14th and 20th weeks of pregnancy. A doctor collects a sample of the fluid surrounding the fetus and tests it for genetic disorders. Specific chemicals in this amniotic fluid can indicate a genetic disorder or abnormal chromosomes.

3. What are the risks and benefits of amniocentesis?
   a. There is about a 1 percent risk of complications from amniocentesis: maternal bleeding, miscarriage, or premature birth. Therefore, doctors perform amniocentesis only when there is a high risk of genetic disease.
   b. If the tests show a serious genetic disorder, parents can decide whether to terminate the pregnancy or prepare for a child with serious problems.
   c. Early identification can help families prepare emotionally, medically, and financially.

Go to www.MyAcademicConnectionsLab.com for Comprehension.

Focused Writing, page 156

Students analyze the purpose, intended audience, and techniques of several pamphlets. They prepare to write a pamphlet about genetic testing by analyzing their audience and choosing the best techniques for that audience.

If you prefer, have students generate a list of possible audiences. Make sure that each group they list is clearly defined.

Review the academic skills focus: Understanding the Intended Audience.

Go to www.MyAcademicConnectionsLab.com for Writing Strategy.

Integrated Writing Task, page 157

The Integrated Writing Task requires students to apply the knowledge they have acquired in this unit in order to compose a pamphlet.

- Go over the Integrated Writing Task assignment on page 157.
- Review Steps 1–6 on pages 157–159.
- If you have had students add to the list of possible audiences, make sure that they are specific and clear about the purpose of the pamphlet. They can use the chart on page 158 as a guide.
- For Step 5, you may want students to get feedback from more than one person.
Go to www.MyAcademicConnectionsLab.com for Internet Activity and Academic Words Puzzle.
### GRAMMAR CHART: Embedded Questions

<table>
<thead>
<tr>
<th>Embedded Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong> An embedded question is a question that is inside another sentence. An embedded question can be:</td>
</tr>
<tr>
<td>• inside a statement</td>
</tr>
<tr>
<td>• inside another question</td>
</tr>
<tr>
<td>If the embedded question is inside a statement, use a period at the end of the sentence.</td>
</tr>
<tr>
<td>If the embedded question is inside a question, use a question mark at the end of the sentence.</td>
</tr>
<tr>
<td><strong>Direct question:</strong> What is genetic screening?</td>
</tr>
<tr>
<td><strong>Embedded questions:</strong></td>
</tr>
<tr>
<td>I don’t know <strong>what genetic screening is.</strong> <em>(inside a statement)</em></td>
</tr>
<tr>
<td>Can you tell me <strong>what genetic screening is?</strong> <em>(inside a question)</em></td>
</tr>
<tr>
<td><strong>2.</strong> Introduce an embedded yes / no question with <em>if</em> or <em>whether (or not).</em> <em>Whether</em> is more formal than <em>if.</em></td>
</tr>
<tr>
<td><strong>Yes / no question:</strong> Is genetic screening safe?</td>
</tr>
<tr>
<td>Embedded question: I’m not sure <em>if genetic screening is safe.</em> OR I’m not sure <em>whether genetic screening is safe.</em> OR I’m not sure <em>whether or not genetic screening is safe.</em></td>
</tr>
<tr>
<td>Incorrect: I’m not sure <em>if or not genetic screening is safe.</em></td>
</tr>
<tr>
<td><strong>3.</strong> Introduce an embedded wh-question with a question word.</td>
</tr>
<tr>
<td><strong>Wh-question:</strong> What is Tay-Sachs disease?</td>
</tr>
<tr>
<td>Embedded question: I wonder <strong>what Tay-Sachs disease is.</strong></td>
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</tbody>
</table>
4. Use **statement word order** (subject + verb) in embedded *yes / no* questions and *wh*-questions about the predicate.

Do not use the auxiliary verb *do* in embedded questions.

**Direct question:** Is she getting tested for Huntington’s disease?

**Correct:** She won’t say *if she is getting tested* for Huntington’s disease.

**Incorrect:** She won’t say if is she getting tested for Huntington’s disease.

**Direct question:** Why do some people have freckles?

**Correct:** Do you know *why some people have freckles*?

**Incorrect:** Do you know why do some people have freckles?

5. For embedded *wh*-questions about the subject, the word order is the same in the embedded question.

If a direct question about the subject has the form **question word + be + noun**, then the embedded question has the form **question word + noun + be**.

**Direct question:** Who is at risk of getting Huntington’s disease?

**Embedded question:** The teacher told us *who is at risk of getting Huntington’s disease*.

**Direct question:** Who is our doctor?

**Correct:** Do you know who our doctor is?

**Incorrect:** Do you know who is our doctor?
UNIT 7 ANSWER KEY

1 PREVIEW

Previewing the Academic Content

Exercise 2, page 139
2. lack of color in skin, hair, and eyes
3. Tay-Sachs disease; 1 in 3,500
4. 1 in 1,800
5. Alzheimer's disease
6. Huntington’s disease; 25,000
7. hypercholesterolemia
8. short

Previewing the Academic Skills Focus, pages 140–141

1. c  2. b  3. c (the information becomes more general)  4. a  5. a  6. b

2 BUILDING ACADEMIC READING SKILLS

Before You Read

Exercise 1, page 142
1. T  2. T  3. F; An allele is a kind of gene.

Exercise 2, pages 142–143
1. T  2. F; People with FF or Ff alleles will have freckles.  3. T

Global Reading

Exercise 1, page 143
• author’s primary purpose: to inform
• lots of facts; shift from second person to third person
• paragraph 2
Exercise 2, page 145
1. They are chromosomes that carry genes for the same traits.
2. Genes contain proteins that influence whether a physical characteristic will develop.
3. They are a form of gene that produces various versions of the trait they control.
4. Your eye color will range from green to dark brown.
5. Homozygous means two similar alleles for a physical trait are present.
   Heterozygous means that two different alleles for a physical trait are present.
6. Cystic fibrosis and albinism are human disorders that result from homozygous recessive genes.
7. We see the physical trait when the genes are homozygous dominant (AA) or heterozygous (Aa).
8. We see the physical trait when the genes are homozygous recessive (aa) only.
9. You are describing their phenotype.
10. (from left to right) FF or Ff; ff; WW or Ww; ww; EE or Ee; ee

Focused Reading, pages 146–148
1. a 4. b 7. a
2. c 5. c 8. b
3. b 6. a 9. c

3 BUILDING ACADEMIC LISTENING SKILLS

Before You Listen, page 149
1. genetic screening
2. disorder, condition
3. genetic testing can’t be easily stopped
4. not sure
Global Listening

Exercise 1, page 149
Students can argue either way about the primary purpose here. Generally, the lecture is informative—filled with facts. However, the lecture is “framed” by statements that contain modal verbs in the introduction (“. . . we have to think about these now so we can decide make informed decisions about genetic testing”) and in the conclusion (“We must all think about the issues raised by these and similar questions.”). Certainly students could argue that the instructor’s purpose is to persuade them to spend some time thinking about these issues.

Exercise 2, pages 150–151
Excerpt One: b Excerpt Three: c Excerpt Five: a Excerpt Seven: b
Excerpt Two: a Excerpt Four: c Excerpt Six: b Excerpt Eight: c

Focused Listening

Exercise 2, page 152
1. Two years ago, / Dane hiked through the Andes, / which was a dangerous thing to do.
2. Two years ago, / Dane hiked through the Andes, / with only a backpack / and a knife.

Exercise 3, page 152
Dan hasn’t always been like this. / Six years ago, / he was finishing law school / and looking forward to a career in politics. / Then his father was diagnosed with Huntington’s disease, / which is caused by the degeneration of brain cells. / This devastating disease usually appears in middle age / with symptoms of clumsiness / and forgetfulness. Now Dan’s dad is still able to work, / but his handwriting has become uncontrollable, / and it is difficult for him to sit for long periods / without twitching.
Exercises 5 and 6, page 153
Because HUNTINGTON’S disease is caused by a DOMINANT gene, / if Dan and Steve DO carry the gene, / they will SURELY DEVELOP the disease in middle age. / After diagnosis, / DAN decided to have HIS genes analyzed / to see if HE carried the gene that affected their FATHER. / UNFORTUNATELY, / HE DID. / When Dan finished school, / he started to live the life of a RISK TAKER. / “What do I have to LOSE?” / he thought. / STEVE, / on the other hand, / was HAPPILY MARRIED to Jessica. / He elected NOT to have his genes tested / but to continue to live the NEARLY PERFECT LIFE he and Jessica had always enjoyed.

4 BUILDING ACADEMIC WRITING SKILLS

Before You Write

Exercise 1, pages 155–156
1. informative
2. to get our attention
3. to provide information about how prenatal genetic testing is done
4. They can end the pregnancy or prepare for the birth of a child who will have a disorder.