

Lesson 4.5: Life Science – Traits & Genes

Weekly Focus: Reading Comprehension
Weekly Skill: Numeracy & Probability Skills

Lesson Summary: This week students will read for comprehension about traits, genes, and heredity. Then, students will practice numeracy and probability skills using a Punnett square.

Materials Needed:

- Comprehension Reading **Unit 4.5 Handout 1**
- Video **Unit 4.5 – Using a Punnett Square** (4:20 min)
- Comprehension Reading **Unit 4.5 Handout 2** (6-way Paragraphs, Middle Level, #17, pages 34 – 35)
- Extra Work/Homework **Unit 4.5 Handout 3**

Objectives: Students will be able to...

- Read comprehension passages with vocabulary related to traits, genes, and heredity.
- Practice numeracy and probability skills with a Punnett square.

College and Career Readiness Standards: RI, RST, WHST, SL

ACES Skills Addressed: EC, LS, ALS, CT, SM, N

Notes: Please review and be familiar with classroom routine notes for: handling controversial topics (**Routine 5**), reading for fluency strategies (**Routine 2**), 6-way Paragraphs reading techniques (**Routine 3**) summarizing techniques (**Routine 4**), and self-management skills (**Routine 1**). The notes for the different activities will help with making a smooth transition to each activity.

GED 2014 Science Test Overview – For Teachers and Students

The GED Science Test will be 90 minutes long and include approximately 34 questions with a total score value of 40. The questions will have focus on three content areas: life science (~40%), physical science (~40%), and Earth and space science (~20%). Students may be asked to read, analyze, understand, and extract information from a scientific reading, a news brief, a diagram, graph, table, or other material with scientific data and concepts or ideas.

The online test may consist of multiple choice, drop down menu, and fill-in-the-blank questions. There will also be two short answer questions (suggested 10 minutes each) where students may have to summarize, find evidence (supporting details), and reason or make a conclusion from the information (data) presented.

The work students are doing in class will help them with the GED Science Test. They are also learning skills that will help in many other areas of their lives.

Lesson 4.5: Life Science – Traits & Genes

Activities:

Warm-Up: Journal Writing

Time: 15 -20 minutes

Write on the board "All living things inherit traits from their parents through the process of heredity. List three traits you have that your genes control. For each trait, write down from whom you think you inherited it. Example: trait: curly hair – from my father.

While students come into the classroom, have them write this in their notebooks. If students seem to be stuck on traits, help them think of traits that are inherited: hair/eye color; facial dimples; bent little finger; chin cleft; early onset myopia (childhood nearsightedness); free earlobe (dominant trait is for lobes to hang free; hand clasping (dominant trait is to place left thumb on top of their right); mid-digital hair (hair on the second or middle joint of one or more of their fingers); "achoo syndrome" (if you suddenly sneeze when exposed to light).

If students are comfortable sharing their traits, it is a great time to create a community atmosphere and have students share their answers.

Note: There may be some students from whom this activity brings up painful memories of family. Please be aware of your students and their personal stories and act accordingly with some.

Extra Activity: If you have time, you can go over a PDF of inherited human traits reference guide produced from the University of Utah. It is interesting to go through some of the traits we have that are inherited!

http://learn.genetics.utah.edu/content/inheritance/activities/pdfs/Inherited%20Human%20Traits%20Quick%20Reference_Public.pdf

Activity 1: Comprehension Reading (Unit 4.5 Handout 1)

Time: 40 - 45 minutes

- 1) Hand out **Unit 4.5 Handout 1** to students.
- 2) Explain to students that they will read about traits and heredity. This information is important foundational knowledge for questions that may be on the 2014 GED Science module.
- 3) Discuss with students that when reading for comprehension, there are many strategies to use: read the title to predict what the reading is about; look at the words in bold and their definitions on the left side of page; if there are images, look at them to get a better understanding; while reading remember to ask "What is this all about?"
- 4) Have students read the first two pages of the passage independently.
- 5) Circulate class while they are reading to make sure they understand the information presented and see if there are any questions.
- 6) For pages 3 & 4 – show the video for Unit 4.5 on using a Punnett square. Students should watch the video and fill in the blanks of page 3 while watching. You may have to show the video two times or stop it while students are watching in order that they get all of the information.
- 7) Review the answers as a whole class.
- 8) Next have students work on page 4 of the handout on their own or in groups. They should be working on finding the answers to the Punnett squares. This is a good time to remind them that this Punnett square can be used not only for people, but for plants and animals, too.
- 9) Review answers as a whole class.

Break: 10 minutes

Lesson 4.5: Life Science – Traits & Genes

Activity 2: Main Idea Reading (Unit 4.5 Handout 2)	Time: 40 - 45 minutes
<p>1) Distribute Unit 4.5 Handout 2 to students.</p> <p>2) Explain to students that the purpose of the 6-way Paragraphs reading passages is to master the essential skills needed to organize, understand, and apply information found in nonfiction texts.</p> <p>3) Ask students to review the title and count the number of paragraphs in the reading passage. Ask students how they know where a paragraph begins. Explain that it is important to know how to find a paragraph quickly as some test questions may ask students to refer to a certain paragraph. If you have an overhead, point to it and/or label the indents.</p> <p>4) Explain to students they should read all of the paragraphs silently in order to answer the questions that follow. To help students find the main idea of the reading passage, remind them to think “What are <u>all</u> the paragraphs about?” and “What is the point that the author is trying to make?” while reading.</p> <p>5) Explain to students that they will decide which of the statements that follow the reading passage is the main idea, broad idea, or narrow idea. Use the explanations in Using 6-way Paragraphs Readings (Routine 3 handout).</p> <p>6) While students are reading, circulate and discuss with students that when reading for comprehension, there are many strategies to use: <u>read the title</u> to predict what the reading is about; while reading remember to ask “What is this all about?”</p> <p>7) Review answers as a whole class. Ask students to point out the evidence (proof) from the reading that led them to the answer. If there is extra time or to challenge and differentiate instruction for students, some can write a 3 – 5 sentence summary of all of the material presented. (Use <u>Routine 4 Summarizing Techniques Handout</u>)</p> <p>8) Remind students that they need to have a good foundational knowledge of cells in order to answer some questions that may be on the GED 2014 test.</p> <p>9) If there is extra time, have students read passage in pairs to promote reading fluency. Students who finish early should try to paraphrase the main idea of the passage for extra practice.</p>	

Wrap-Up: Summarize	Time: 5 minutes
<p>Have students turn to a partner (or write in their journals) about what they have learned today about heredity and traits. Ask them to tell a partner one thing they learned today in one or two sentences. <i>Note: Use Routine 4 Handout</i></p>	

Extra Work/Homework: Unit 4.5 handout 3	Time: 30 minutes outside of class
<p>Students can continue work with another reading passage on heredity and genes. (5 pages total) This is an excellent opportunity for students to review today's material in an independent manner. It can also help some students who may have missed class or arrived late to gain information on today's lesson.</p>	

Differentiated Instruction/ELL Accommodation Suggestions	Activity
If some students finish early, they can turn their paper over and summarize the reading passage.	Activity 1
Teachers should be aware that ELLs could have some difficult time with some of the vocabulary encountered in the handouts for Activity 1 & 2 and in the video for Activity 1.	Activity 1 & 2

Lesson 4.5: Life Science – Traits & Genes

Encourage them to look for context clues in the reading that will help them with interpreting the main idea of each reading passage.	
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Lesson 4.5: Life Science – Traits & Genes

Online Resources:

If students have Internet connection, they should practice more with Punnett squares and probability. This is a website with questions on heredity and Punnett squares. Students can also practice digital literacy skills needed for 2014 GED.

http://glencoe.mcgraw-hill.com/sites/0078778066/student_view0/chapter5/math_practice.html

Suggested Teacher Readings:

- GED Testing Service – GED Science Item Sample (to get an idea of what the test may be like)

<http://www.gedtestingservice.com/itemsamplerscience/>

- Assessment Guide for Educators: A guide to the 2014 assessment content from GED Testing Service:

<http://www.riaepdc.org/Documents/ALALBAASSESSMENT%20GUIDE%20CHAPTER%203.pdf>

- Minnesota is getting ready for the 2014 GED test! – website with updated information on the professional development in Minnesota regarding the 2014 GED.

http://abe.mpls.k12.mn.us/ged_2014_2

- Essential Education's 2014 GED Test Curriculum Blueprint (PDF)

<http://www.passged.com/media/pdf/educators/curriculum-blueprint.pdf>

Lesson 4.5: Life Science – Traits & Genes

Unit 4.5 Handout 1 (4 pages total)

The Reproduction of Living Things

Brief #3: Traits and Genes (cont.)



Traits

You know that during sexual reproduction, an organism receives half of its chromosomes from a female parent and the other half from a male parent. This is why you don't look exactly like your mother or your father but are more of a combination of the two of them.

Each generation of offspring inherits traits from their parents. But what determines which traits are seen and which are not? For example, let's say that a male parent has blue eyes and a female parent has brown eyes. What factors determine what color eyes the offspring will have?



Traits can either be dominant or recessive. If a trait is dominant, it means that it is seen in the offspring. If a trait is recessive, it means that it is not seen. Many traits are made by a pair of genes. If a trait is dominant, it is shown like this: RR . If a trait is recessive, it is shown like this: rr . The chart below shows some common dominant and recessive traits.

So the blue eyes of a male parent is a recessive trait (rr), and the brown eyes of a female parent is a dominant trait (RR). Any offspring from these two parents will get one copy of the dominant gene (R) from their female parent and one copy of the recessive gene (r) from their male parent. The offspring will be Rr . In this case, the "R" stands for brown eyes, so the offspring will have brown eyes.

Traits

Dominant (RR)	Recessive (rr)
brown eyes	blue eyes
widow's peak	no widow's peak
six fingers	five fingers
freckles	no freckles

But what might happen if two people, each having one dominant gene for brown eyes and one recessive gene for blue eyes, reproduced? Their offspring would be either RR , Rr , or rr . Only the rr combination would have blue eyes.

If an organism has two copies of the same dominant or recessive gene, it is called purebred. If an organism has one dominant gene and one recessive gene for a trait, then it is called a hybrid.

Lesson 4.5: Life Science – Traits & Genes

The Reproduction of Living Things

Brief #3: Traits and Genes (cont.)



Punnett Square

A Punnett square is a diagram that illustrates all of the possible genetic combinations that can occur during sexual reproduction. Let's say that "T" stands for a dominant gene for tallness and that "t" stands for a recessive trait for shortness. The Punnett square below shows the possible outcomes. This pattern is called the dominant-recessive pattern.

		Height from Parent 1	
		T	t
Height from Parent 2	T	TT	Tt
	t	Tt	tt

The dominant-recessive pattern is not the only way that genes and their traits can work in an organism. Say, for instance, that both parents of an organism have two recessive traits for a gene. In that case, the genes would have dominance.

Let's say that two black and white cats mated. A black and white cat would have a recessive gene for whiteness and a recessive gene for blackness (wb). What color would the kittens be?

By looking at this Punnett square on the right, you can see the possible outcomes for the color of the kittens.

		black and white cat 1	
		b	w
black and white cat 2	w	bw	ww
	b	bw	bw

Sometimes when the parents of organisms have two recessive copies of a gene, the traits that are produced are a kind of blend of both. For example, pink flowers are often produced by the sexual reproduction of a white flower and a red flower.

Lesson 4.5: Life Science – Traits & Genes

Punnett Square Video:

Watch the video on Punnett squares for better understanding. While watching the video fill in the blanks below with information presented.

- [illegible]

Lesson 4.5: Life Science – Traits & Genes

Name _____

**Unit
Review**

Visual Literacy

Punnett Squares

Scientists use diagrams called Punnett squares to predict the probability, or likelihood, that an offspring will have certain traits based on the genes of its parents.

Look at the Punnett squares below. Fill in the squares to determine the possible combinations of the baby's genes. (Always write the capital letters first. For example, write Bb, not bB.) The first one has been done for you. Then answer the questions.

- A.** Mom has a dominant gene for dimples and a recessive gene for no dimples (Dd), and Dad has two dominant genes for dimples (DD).

	D	d
D	DD	
d		

- Probability is written as ____ : **4**, or a certain number out of four. What is the probability that the baby will have dimples? ____ :
- What are the possible gene combinations that the baby can have? _____

- B.** Both Mom and Dad have a dominant gene for brown hair and a recessive gene for blond hair (Bb).

	B	b
B	BB	
b		

- What is the probability that the baby will have blond hair? ____ :
- What color hair do Mom and Dad have? _____



Lesson 4.5: Life Science – Traits & Genes

Unit 4.5 Handout 1

TEACHER ANSWER KEY

Page 3: Punnett Square Video:

- **Alleles:** one member of a pair or series of genes that occupy a specific position on a specific chromosome.
- **Dominant** alleles have more of a say in what the outcome of that cross is going to be.
- **Recessive** alleles have little to no say unless there are two recessives that are available.
- In each of the crosses there is one allele from the **mother** and one allele from the **father**.
- Draw a Punnett square below:

- Each of the squares is a probability and each of those squares are **one fourth** or 25 percent.
- Generally people put the **father** or male allele on top.
- In any relationship for a Punnett square a **capital** letter is going to be for the dominant.
- The little or **lower case** letter is for the recessive.
- Heterozygous means that you have **two different** alleles for that trait (dominant and recessive).
- Homozygous means that you have two alleles that are the **same** (both dominant or both recessive).

Page 4:

		D	d		
A.	D	DD	Dd	1.	4:4
	D	DD	Dd	2.	DD or Dd
	B	BB	Bb	1.	1:4
B.	b	Bb	bb	2.	brown

Lesson 4.5: Life Science – Traits & Genes

Unit 4.5 handout 2

TEACHER ANSWER KEY

1. a. **N** (narrow idea)
 b. **M** (main idea)
 c. **B** (broad idea)
2. **b**
3. **d**
4. **a**
5. **b**
6. **c**

Lesson 4.5: Life Science – Traits & Genes

Unit 4.5 Handout 3 (5 pages total)

Name _____

**Day
1**

Weekly Question

Why are some people left-handed?

Do you look more like your mom or your dad? Do you have your mother's eyes, or your father's nose? Looking in the mirror, you probably can see in yourself at least a couple of traits from each parent. All living organisms inherit traits from their parents through the process of **heredity**. In some cases, traits don't show up in one generation but are evident in the next. This is why some people have traits that their grandparents have but that their parents do not.

The smallest, most basic unit of heredity is the **gene**. Each person has approximately 25,000 genes. Genes control all of your inherited traits, from how you look and grow to the way your body functions. They even help determine which hand you write with.

- A.** List four traits you have that your genes control. For each trait, write whom you think you inherited it from.

1. _____
2. _____
3. _____
4. _____

- B.** Traits aren't the only thing that can be inherited. Some diseases can also be inherited. How do you think our understanding of genes might affect doctors' ability to treat or prevent disease in the future?

- C.** Use the vocabulary words to complete the sentence.

Your inherited traits are determined by thousands of _____
passed down through the process of _____.

Daily Science

**Big
Idea 1**

WEEK 2

Vocabulary

gene

jeen

a part of the code that controls the development of traits

heredity

huh-RED-ih-tee

the transmission of traits from parent to offspring

Lesson 4.5: Life Science – Traits & Genes

Name _____

**Day
2**

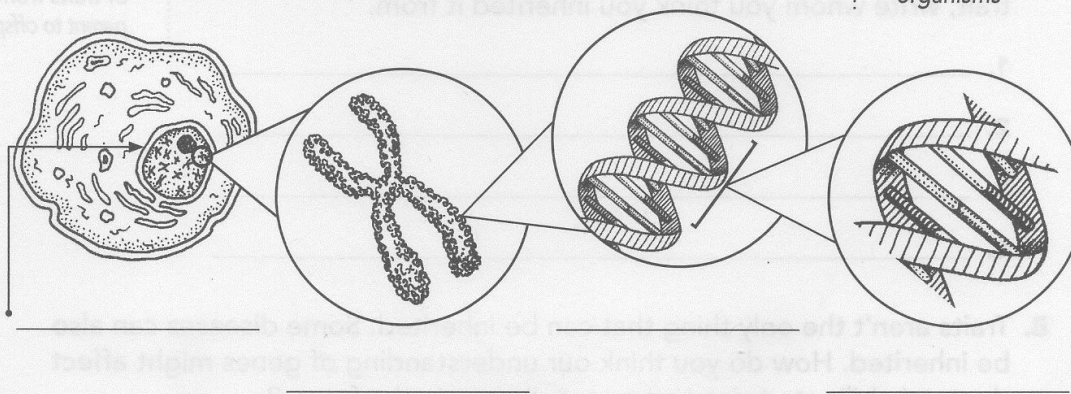
Weekly Question

Why are some people left-handed?

A gene is a segment of **DNA**. There may be hundreds of genes on each strand of DNA. A single strand of DNA coils up to form a **chromosome**. The chromosomes are located inside the nucleus of a cell. Humans have 23 pairs of chromosomes, and each parent contributes one chromosome per pair. This means that half of your DNA comes from your mother and half comes from your father. The DNA that your parents give you is copied over and over again as your cells reproduce and you continue to grow.

DNA is often compared to a recipe because it contains all the instructions needed to create an organism. Almost every living thing has DNA, from plants to animals to microscopic bacteria.

A. Label the pictures in the diagram using the terms *gene*, *cell*, *nucleus*, *DNA*, and *chromosome*.



B. Write *true* or *false*.

1. Genes are found in the nucleus of a cell. _____
2. Each parent contributes 23 pairs of chromosomes. _____
3. There are hundreds of DNA strands in each chromosome. _____
4. Genes are located on the chromosomes. _____

Daily Science

**Big
Idea 1**

WEEK 2

Vocabulary

chromosome

KROH-muh-SOHM
a package of DNA
and protein found
within the nucleus
of a cell

DNA

the genetic material
of most living
organisms

Lesson 4.5: Life Science – Traits & Genes

Name _____

**Day
3**

Weekly Question

Why are some people left-handed?

Remember that your chromosomes come in pairs. Therefore, the genes on those chromosomes are in pairs, too. Each of your parents contributes one gene to each pair. The **dominant** gene in a gene pair is the one that controls the appearance of a trait. If one or both genes in a pair are dominant, the dominant form of the trait is visible. For example, the gene for brown eyes is dominant over the gene for blue eyes. This means that if you receive a gene for brown eyes from at least one of your parents, you are guaranteed to have brown eyes.

By comparison, **recessive** genes have little or no observable effect on a trait. Only when both genes in a pair are recessive will the recessive form of the trait be visible. So if you have blue eyes, you know that both of your parents passed on the recessive gene for eye color to you.

Answer the questions.

1. If a girl has blue eyes, does she have two dominant genes, one dominant and one recessive gene, or two recessive genes for eye color?

2. If a boy has brown eyes, what two combinations of genes for eye color could he have?

3. If two parents each have a dominant and a recessive gene for eye color and have a baby, how many possible combinations of genes could there be? List them.

4. Will a person with two dominant genes for brown eyes ever be able to have a baby with blue eyes? Why or why not?

Daily Science

**Big
Idea 1**

WEEK 2

Vocabulary

dominant

DAH-mih-nent
controlling;
tending to be
expressed

recessive

ree-SESS-iv
tending to recede,
or disappear
from view

Lesson 4.5: Life Science – Traits & Genes

Name _____

**Day
4**

Weekly Question

Why are some people left-handed?

Left-handedness is a recessive trait that is inherited, like blue eyes or red hair. But left- and right-handedness are not always determined by genes alone. Your environment can play a factor in which hand you use. For example, because there are more tools, such as scissors or can openers, made for right-handed people, left-handed people must learn how to use these tools with their right hand.

Also, the way people think and behave can affect a trait. In some countries, it is considered customary to use your right hand to greet someone or to eat. So people in these cultures learn how to perform daily tasks with their right hand. Similarly, some people may learn how to write with their left hand in order to stand out and be able to do what only 10% of the world can do!

- A. Think about a sport you know. Name one disadvantage and one advantage that a left-handed athlete might have over a right-handed athlete in playing that sport.**

Disadvantage: _____

Advantage: _____

- B. Complete the analogies.**

1. Right-handed is to **brown eyes** as **left-handed** is to _____.

2. Brown hair is to **dominant** as **red hair** is to _____.

- C. Are you right-handed or left-handed? Complete the sentence and then rewrite it with your other hand!**

I am _____-handed. _____

Daily Science

**Big
Idea 1**

WEEK 2

Lesson 4.5: Life Science – Traits & Genes

Name _____

**Day
5**

Weekly Question

Why are some people left-handed?

A. Next to each vocabulary word, write the letter of its definition.

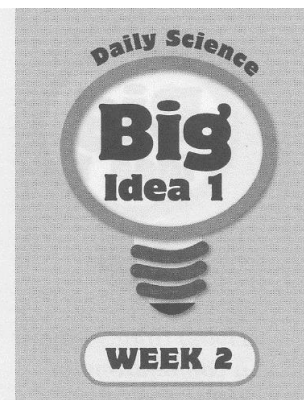
- | | |
|--------------------|---|
| ____ 1. gene | a. made of DNA and proteins |
| ____ 2. chromosome | b. disappears from view |
| ____ 3. dominant | c. provides cells with detailed instructions |
| ____ 4. heredity | d. controlling |
| ____ 5. DNA | e. transmission of traits from parents to offspring |
| ____ 6. recessive | f. smallest unit of heredity |

B. A right-handed woman and a right-handed man have a baby. Could the baby be left-handed? Explain your reasoning.

C. The squares on the right show different combinations of genes that may be inherited from a mother who has freckles and a father who doesn't. The gene for freckles (F) is dominant, and the gene for no freckles (f) is recessive. Study the combinations and then answer the questions.

		mother	
		F	f
father	f	Ff	ff
	f	Ff	ff

- What are the chances that the mother and father above will have a baby with freckles? _____ out of 4, or _____%
- What are the chances that the mother and father will have a baby with no freckles? _____ out of 4, or _____%



Lesson 4.5: Life Science – Traits & Genes

Unit 4.5 Handout 3

TEACHER ANSWER KEY

Page 1

- A. answers will vary
- B. If doctors can figure out which genes carry which diseases, they may be able to find a way to prevent those diseases
- C. genes, heredity

Page 2

- A. cell nucleus chromosome DNA gene
- B. 1. True 2. False 3. False 4. True

Page 3

- 1. two recessive genes
- 2. two dominant genes or one dominant and one recessive
- 3. three: two dominant, two recessive, or a dominant and a recessive
- 4. No, because he or she will always contribute a dominant gene for brown eyes to his or her offspring

Page 4

- A. Answers will vary: Suggested answer: *Advantage*: There are fewer left-handed people, so your competitors might not know you to beat you.
I it's harder to find sports gear for left-handed people.
- B. 1. Blue eyes 2. recessive
- C. Answers will vary

Page 5

- A. 1. F 2. A 3. D 4. E 5. C 6. B
- B. Yes, the baby could be left-handed if both the mom and the dad pass down a recessive gene.
- C. 1. 2, 50% 2. 2, 50%