

## Lesson 4.4: Life Science – Mitosis & DNA

**Weekly Focus:** Reading Comprehension  
**Weekly Skill:** Simple Experiment

**Lesson Summary:** This week students will read for comprehension about *Mitosis* and *DNA*. Then, students will conduct a simple experiment to extract their own DNA.

### Materials Needed:

- Comprehension Reading [Unit 4.4 Handout 1](#) (Spectrum Science, Grade 8, pages 46-47)
- Comprehension Reading & Experiment Steps [Unit 4.4 Handout 2](#)
- Video [Unit 4.4 – DNA Extraction Experiment](#) (2:46 min)
- Ingredients for experiment: (the list is for one person – use quantities for your class size)
  - 500ml bottled water
  - 3 x clear plastic cups or glasses
  - Clear liquid dish soap
  - 1 tbsp table salt
  - 100 ml isopropyl (rubbing) alcohol
  - Blue food coloring
- Extra Work/Homework [Unit 4.4 Handout 3](#) (Spectrum Science, Grade 6, pages 50-51)

**Objectives:** Students will be able to...

- Read comprehension reading passages with vocabulary related to mitosis and DNA
- Conduct a simple experiment on DNA extraction

**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](#)), 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.

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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.

### Activities:

#### Warm-Up: Journal Writing

Time: 10 - 15 minutes

- As students enter the class, have the following written on the board or overhead **“Mitosis is the process of cell division. What do you know about cell division?”** Have students create a “KWL” chart on a piece of notebook paper (below). This helps to activate students' prior knowledge by asking them what they already **Know** (column 1); students (collaborating as a classroom unit or within small groups) set goals specifying what they **Want** to learn (column 2); and after reading students discuss what they have **Learned** (column 3).
- Students apply higher-order thinking strategies which help them construct meaning from what they read and help them monitor their progress toward their goals.

#### KWL Chart:

K - What (else) do I KNOW?	W - What do I WANT to know?	L - What did I LEARN?

#### Activity 1: Comprehension Reading (Unit 4.4 Handout 1)

Time: 35 - 40 minutes

- Hand out **Unit 4.4 Handout 1** to students.
- Explain to students they will read about mitosis. This information is important foundational knowledge for questions that may be on the 2014 GED Science module.
- 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?”
- Have students read the passage and answer the questions independently.
- Circulate class while they are reading to make sure they understand the information presented and see if there are any questions.
- Review answers as a whole class – note: some answers may vary – ask students with different answers to discuss theirs with the class.
- Have students fill in the “**L**” portion of the KWL chart from the warm up activity.

**Break: 10 minutes**

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Activity 3: Reading and Experiment (Unit 4.4 Handout 2)	Time: 45 - 50 minutes
<ol style="list-style-type: none"> <li>1) Distribute <b>Unit 4.4 Handout 2</b> to students.</li> <li>2) Explain to students that the purpose of the reading is to gain more background knowledge about DNA.</li> <li>3) 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.</li> <li>4) Students should then answer the questions on page 3 of the handout.</li> <li>5) While students are reading, circulate to make sure they have an understanding of the material presented on DNA.</li> <li>6) 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>.</li> <li>7) When finished with the questions, watch the DNA Extraction video. The video shows the steps of the simple experiment. Students can read along from page 4 of <b>Unit 4.4 Handout 2</b>.</li> <li>8) Have students conduct the experiment in groups of 2 depending on the size of your class.</li> <li>9) Remind students that conducting an experiment is a time to stay focused on the goal: DNA Extraction.</li> </ol>	

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 mitosis or DNA. 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 4.4 handout 3	Time: 30 minutes outside of class
<p>Students can continue work with another reading passage on DNA. 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.	<b>Activity 1</b>
Teachers should be aware that ELLs could have some difficult time with some of the vocabulary encountered in the handouts for Activity 1 & 2. Encourage them to look for context clues in the reading that will help them with interpreting the main idea of each reading passage.	<b>Activity 1 &amp; 2</b>

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### **Online Resources:**

If students have Internet connection, they should practice reading more about mitosis and meiosis. There are some animations that show the two processes.

<http://www.amazingscienceonline.com/mitosis-and-meiosis>

These online videos compare meiosis and mitosis. If possible, show to the entire class.

[http://highered.mcgraw-hill.com/sites/0072495855/student\\_view0/chapter3/animation\\_comparison\\_of\\_meiosis\\_and\\_mitosis\\_quiz\\_2\\_.html](http://highered.mcgraw-hill.com/sites/0072495855/student_view0/chapter3/animation_comparison_of_meiosis_and_mitosis_quiz_2_.html)

[http://highered.mcgraw-hill.com/sites/0072495855/student\\_view0/chapter3/animation\\_comparison\\_of\\_meiosis\\_and\\_mitosis\\_quiz\\_1\\_.html](http://highered.mcgraw-hill.com/sites/0072495855/student_view0/chapter3/animation_comparison_of_meiosis_and_mitosis_quiz_1_.html)

This link is to Jefferson Labs online activity to fill in the blank statements about mitosis with dropdown menus. This is a good way to allow students to practice some of the digital literacy skills needed for the 2014 GED tests.

[http://education.jlab.org/reading/mitosis\\_01.html](http://education.jlab.org/reading/mitosis_01.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](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>

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Unit 4.4 Handout 1 (2 pages total)

### TEACHER ANSWER KEY

1. centromere
2. interphase
3. nuclear
4. cytokinesis
5. centrosomes
6. mitosis
7. chromatin
8. DNA
9. chromosomes
10. cell
11. They transport the identical sets of chromosomes to each side of the cell, and they push the cell apart.

## Lesson 4.4: Life Science – Mitosis & DNA

Unit 4.4 Handout 2 (4 pages total)

### The Reproduction of Living Things

#### Brief #3: Traits and Genes

##### Focus

Genes and traits are passed from one generation to the next through reproduction.

You have probably noticed that living things look like their parents. Young maple trees look like older maple trees, and you probably look like a combination of your mom and your dad.

But you do not look exactly like them. And if you have brothers and sisters, you know that while you all may resemble one another, each one of you is unique.

##### Vocabulary

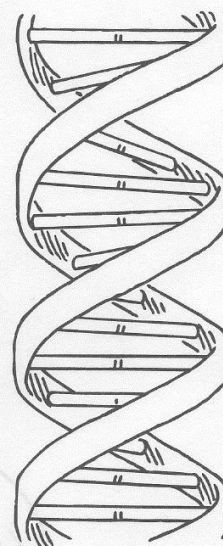
1. double helix
2. gene
3. base pairs
4. mitosis



#### DNA

DNA is a chemical molecule that is located in the cells of all living things. Chromosomes are made from DNA. Chromosomes determine what an organism will be. All living things have different numbers of chromosomes. Different numbers of chromosomes produce different type of living things.

**The DNA molecule has a definite shape. It is called a double helix.** It looks like a kind of twisted ladder. Each rung on this chemical ladder is made up of a gene. **It is the genes that provide the instruction to the cell and determine whether a flower will be red or purple, whether a person will be short or tall, or whether a dog will be black with white patches or white with black patches.**



#### Base Pairs

DNA is made up of four different chemical bases. These bases are called base A (adenine), base T (thymine), base G (guanine), and base C (cytosine). **The genes in DNA are made up of base pairs.** For example, the base pair TA is a combination of base T and base A.

But these bases that join to form pairs can only join together in certain ways. Bases C and G can only form pairs with each other, and bases A and T can only form pairs together. This is what makes it possible for DNA to copy itself during mitosis. Each rung of the DNA ladder is made up of two base pairs. The ways they are combined determine the traits of a living organism. For example, GC, TA, AT, CG will form a different trait than TA, AT, GC, CG.

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### The Reproduction of Living Things

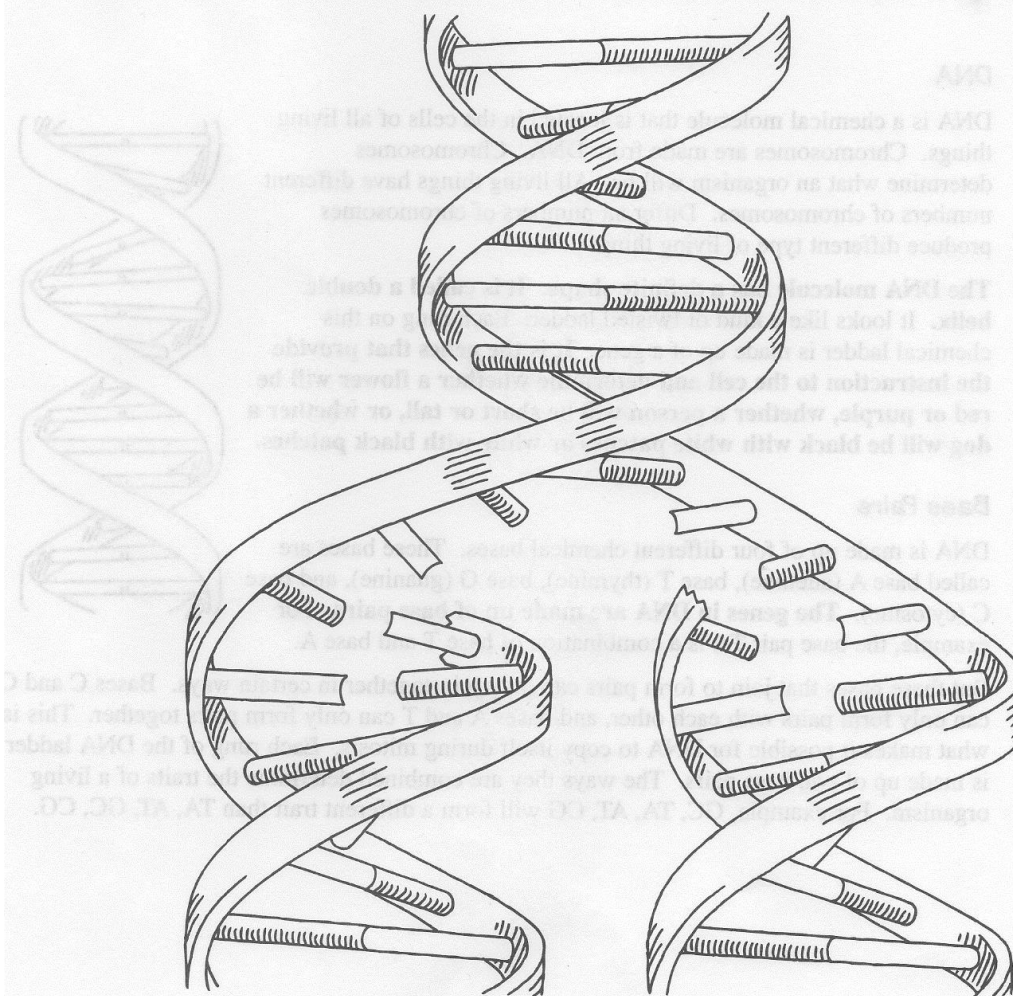
#### Brief #3: Traits and Genes (cont.)



#### DNA and Mitosis

**During mitosis, the base pairs in a DNA molecule come apart.** The two strands of DNA are no longer connected by the rungs on the ladder. Each base is now floating around in the cell nucleus. These floating bases find a disconnected strand on the DNA and reconnect. In asexual reproduction, the new strands that are formed are exactly the same as the original DNA. The new organism that is produced will be an exact duplicate of its parent. Sometimes this is called a clone.

Sometimes during sexual reproduction, DNA doesn't copy itself exactly. A change can occur in the way the DNA has been copied. This is called a mutation. Mutations change the instructions in the genes. Mutations can be passed along from one generation to the next.



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**Answer the questions below with information from the reading passage.**

1. What is DNA?  
A. a crystal atom                      B. a chemical molecule                      C. proton                      D. a cell
2. What is a mutation?  
A. a error in the DNA                      B. an alien form of the DNA  
C. a change in the DNA                      D. a type of fish DNA
3. How are the genes arranged in the DNA?  
A. in groups of 3                      B. in base pairs  
C. in groups of 4                      D. in a single line
4. What happens during mitosis?  
A. the base pairs come apart and are then reconnected  
B. the base pairs die  
C. the base pairs undergo a chemical change  
D. all of the above
5. Which of the following shows an incorrect arrangement of bases?  
A. AG, GC                      B. TA, GC                      C. AT, CG                      D. GC, TA
6. What are the “rungs on the ladder” of DNA made of?  
A. atoms                      B. protons                      C. bacteria                      D. genes
7. What do genes determine?  
A. number of cells                      B. size of cells                      C. amount of blood                      D. traits
8. Describe the DNA molecule. What is it made of? What does it look like?

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## Lesson 4.4: Life Science – Mitosis & DNA

### Extract Your Own DNA!

**Have you ever wanted to see what makes you, you?** NOVA, an American TV series on PBS, has a great experiment. You can extract your DNA using ingredients in your kitchen!

#### What you need:

- 500ml bottled water
- 3 x clear plastic cups or glasses
- Clear liquid dish soap
- 1 tbsp table salt
- 100 ml isopropyl (rubbing) alcohol
- Blue food coloring
- You!

**How to:** Watch the video to see how it is done, then do the experiment in class.

1. Mix the bottled water with the salt in a cup. Stir until salt is dissolved.
2. Transfer 3 tbsp of the salt water into a separate cup.
3. Gargle the salt water for 1 minute. Don't swallow it!
4. Spit the water back into the cup. (Be careful to spit carefully.)
5. Add one drop of washing up liquid to the salt water. Stir gently. Try not to create any bubbles.
6. In a separate cup, mix the isopropyl alcohol and 3 drops food coloring.
7. Gently pour the alcohol and food coloring mixture into the salt water cup. Tilt the salt water cup as you pour, so the alcohol mixture forms a layer on top of the salt water.
8. Wait for 2.5 minutes. You should see white clumps and strings forming.
9. The white clumps and strings are your DNA!

#### What's happening?

When you gargle the salt water and spit it back out, some of your cheek cells become suspended in the salt water. The more vigorously you gargle, the more cheek cells will collect in the salt water.

The washing up liquid breaks down your cheek cell membranes. This causes the DNA to be released into the salt water.

DNA is not soluble in alcohol, so it forms a solid where the alcohol and salt water layers meet. Most other substances from your cheek cells stay dissolved in the salt water layer. The white strings and clumps you see are thousands of DNA molecules clumped together. Single DNA molecules are far too small to see with the naked eye.

When you gargle the salt water, you are also collecting some bacterial cells from the inside of your mouth, so the DNA you see is a mixture of your DNA and bacterial DNA!

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Unit 4.4 handout 2

### TEACHER ANSWER KEY

1. B
2. C
3. B
4. A
5. A
6. D
7. D
8. *Answers may vary. Suggested answer:* DNA is a chemical molecule that is located in the cells of all living things. DNA is made up of four different chemical bases: A, T, G, and C. The genes in DNA are made up of base pairs, such as the base pair GC. Each rung of the DNA is made up of two base pairs. Bases C and G can only form pairs with each other, and bases A and T can only form pairs. DNA is the shape of a double helix, which looks like a twisted ladder.

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### Unit 4.4 Handout 3

### TEACHER ANSWER KEY

1. a
2. b
3. c
4. chromosomes
5. Answer may vary. Suggested answer: DNA contains the instructions that are used to create all the cells in an organism.
6. Answer may vary. Suggested answer: Each cell contains all the information needed to recreate an entire organism.