

**9<sup>th</sup> Grade Biology:**

**Concept Review**

May 18 – 22

*Time Allotment: 40 minutes per day*

Student Name: \_\_\_\_\_

Period: \_\_\_\_\_

Teacher Name: *Ms. Carstens*

## Packet Overview

Date	Objective(s)	Pg. #
Monday, May 18	1. Identify main components and functions of DNA and RNA. 2. Describe how DNA can change.	2
Tuesday, May 19	1. Describe the processes of evolution. 2. Explain the evidence supporting evolution.	4
Wednesday, May 20	1. Explain natural selection. 2. Describe the process of speciation.	6
Thursday, May 21	1. Describe modern classification. 2. Explain the significance of relationships among organisms in the biosphere.	8
Friday, May 22	Review – Minor Assessment	12

**Additional Notes:** Hi all! This week's packet will be a general overview of our biology journey this semester. We'll review DNA and how it changes and varies, evolution and species' adaptations, interactions among species, and how we as humans fit into the puzzle! In each lesson, I'll provide some page numbers in your text as well as some key concepts to remember as you complete the day's work. As always, I encourage you to reach out should you have questions! [kelly.carstens@greatheartsnorthernoaks.org](mailto:kelly.carstens@greatheartsnorthernoaks.org)

**\*\*IMPORTANT NOTE:** Be sure to complete this week's minor assessment! On Friday, complete the minor assessment at the end of this packet, p. 12-14. You may use your packet from the week and your textbook.

### Academic Honesty

I certify that I completed this assignment independently in accordance with the GHNO Academy Honor Code.

*Student signature:*

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I certify that my student completed this assignment independently in accordance with the GHNO Academy Honor Code.

*Parent signature:*

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**I. Monday, May 18**

Unit – Concept Review: Chapters 10 – 13

Review Lesson 1: DNA, RNA and Mutations

**Socratic Guiding Question:** Keep this in mind as you go through this lesson!

What provides a basis for life?

**Objectives:** Be able to do this by the end of this lesson.

1. Identify main components and functions of DNA and RNA.
2. Describe how DNA can change.

**Lesson Introduction:**

Today we will look back at what we've discovered about DNA. We'll review DNA's parts, how it works with RNA to create proteins, what those proteins do for living things, and how DNA can vary and change.

**Complete the tasks below. (Make use of the textbook page numbers for easy reference!)**

**Concept and Vocabulary Review: DNA, RNA, Mutations**

- ✓ How is the genetic material in prokaryotes different than in eukaryotes? (p. 75, 90, 290)

\_\_\_\_\_

\_\_\_\_\_

- ✓ DNA stands for \_\_\_\_\_. (p. 60)

- ✓ **Complete the summary.**

DNA is made up of monomers called \_\_\_\_\_ which include a 5-carbon sugar, called \_\_\_\_\_, a phosphorus group, and four \_\_\_\_\_. These strands of monomers create the \_\_\_\_\_-\_\_\_\_\_ shape of DNA. (p. 197)

- ✓ DNA contains 4 nitrogenous bases: adenine (a purine) that pairs with \_\_\_\_\_ (a pyrimidine) and guanine (a purine) that pairs with \_\_\_\_\_ (a pyrimidine). Purines have a \_\_\_\_\_-ring structure, while pyrimidines have a \_\_\_\_\_-ring structure. (pp. 198-199)

- Write a complementary strand of the DNA strand given below.

A T A C G A T T G C C A G T C G G C A T

\_\_\_\_\_

- ✓ DNA holds the genetic code for all living organisms, however, only about 2% of our DNA provides code for building proteins—chains of amino acids, the building blocks of life. DNA is translated and transcribed by another nucleic acid, RNA, which stands for \_\_\_\_\_ . (p. 204)

✓ RNA differs from DNA in a few different ways. List one. (p. 205) \_\_\_\_\_

\_\_\_\_\_

- ✓ There are three types of RNA, and each is responsible for different tasks. (p. 205)
  - mRNA, or \_\_\_\_\_ RNA is responsible for transcribing DNA.
  - tRNA, or \_\_\_\_\_ RNA is responsible for translating DNA.
  - rRNA, or \_\_\_\_\_ RNA is responsible for building the protein, or chains of amino acids.

✓ When RNA transcribes DNA, it pairs adenine with \_\_\_\_\_ instead of thymine. Transcribe the DNA strand below. (pp. 205-207)

*Original DNA strand:*      T A C G G A T T A C G A

*mRNA complementary strand:*      \_\_\_\_\_

- ✓ Protein \_\_\_\_\_, or the creation of proteins based on RNA sequences called codons, allows the body to maintain protein levels in the body, helps repair and aid in the growth and development of cells, and finally, provides proteins for trait expression.
- ✓ In rare cases, \_\_\_\_\_, or changes in the genetic sequence in DNA, can occur. Sometimes, these result from errors made in the replication, transcription, and/or translation of DNA. Identify one other way that these changes can occur. (p. 202)

\_\_\_\_\_

✓ What is a point mutation? (p. 240) \_\_\_\_\_

\_\_\_\_\_

✓ Mutations can help, \_\_\_\_\_, or have no impact on an organism.

**Short Response.**

The Human Genome Project was an organized research project with the goal of mapping the human genome, or all of the genetic information coded within a human. What made it such a significant project? What value does it have? What concerns might it foster in genetic engineering?

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**II. Tuesday, May 12**

Unit – Concept Review: Chapters 14-15  
Lesson 2: Evolution and the Origins of Life

**Lesson 2 Socratic Guiding Question:** Keep this in mind as you go through the lesson!

How did life evolve on Earth?

**Objectives:** Be able to do this by the end of this lesson.

1. Describe the processes of evolution.
2. Explain the evidence supporting evolution.

**Lesson Introduction:**

Today's concept review focuses on the history of life on Earth—how it originated, how it's changed over time, and what evidence we have to support it.

**Complete the tasks below. (Make use of the textbook page numbers for easy reference!)**

**Concept and Vocabulary Review: Evolution and the Origins of Life**

- ✓ How are biogenesis and spontaneous generation different? (p. 279)

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- ✓ After Louis \_\_\_\_\_ (p. 281) helped to prove the principle of biogenesis with his boiled broth experiments, scientists then moved on to hypothesize how life on Earth originated. Some of the ideas proposed include the following (pp. 284-286):

- Earth's early atmosphere contained gases that, at high temperatures, might have formed simple \_\_\_\_\_ compounds such as amino acids. (Oparin and Haldane, 1920s)
- Organic compounds could have been carried to Earth by \_\_\_\_\_ from space.

- ✓ Earth is estimated to be more than \_\_\_\_\_ years old. How did scientists come to this conclusion? (p. 282)

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- ✓ The First Cells—Even though scientists lack direct evidence of the first cells on Earth, they were able to make specific inferences (p. 288, bottom paragraph)

- First – little or no \_\_\_\_\_ gas existed on early Earth.
- Second – the oldest \_\_\_\_\_ that are thought to be cells are the size and shape of some living \_\_\_\_\_.

- Finally, the first \_\_\_\_\_ might have developed in an environment filled with \_\_\_\_\_ molecules for food. Thus, the first cells were probably \_\_\_\_\_, \_\_\_\_\_ prokaryotes.
- ✓ \_\_\_\_\_ are a group of unicellular, autotrophic organisms that thrive under extremely harsh environments and are most likely the closest living organism to early life on Earth. They are able to obtain energy through \_\_\_\_\_, a process that allows some autotrophs to use CO<sub>2</sub> to assemble organic molecules from inorganic substances such as sulfur. (*p. 289*)
- ✓ Some autotrophs, such as \_\_\_\_\_, a group of photosynthetic, unicellular prokaryotes, are similar to the oldest known fossils of cells. (*p. 289*)
- ✓ As photosynthetic organisms released more O<sub>2</sub> atoms into the atmosphere, it is hypothesized that sunlight split the oxygen atoms, causing them to react with other oxygen atoms to form \_\_\_\_\_, or O<sub>3</sub>. This ozone layer helped block out \_\_\_\_\_ rays from the sun, allowing life on earth to evolve. (*p. 289*)
- ✓ What is evolution? \_\_\_\_\_  
\_\_\_\_\_
- ✓ How did strata, or rock layers, help scientists create a geologic timeline? Why is it considered incomplete? (*p. 298, 302-304*)  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- ✓ Distinguish between homologous structures, analogous structures, and vestigial structures. Give an example of each. (*pp. 305-306*)  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- ✓ How does the presence of homologous structures help support the theory of evolution?  
\_\_\_\_\_  
\_\_\_\_\_

**Short Response.**

Distinguish between convergent evolution, divergent evolution, and coevolution. (pp. 309-320)

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**III. Wednesday, May 13**

Unit – Concept Review: Chapters 15-16  
Lesson 3: Natural Selection and Speciation

**Socratic Guiding Question:** Keep this question in mind as you complete today’s lesson!  
What drives change within a species?

**Objective:** Be able to do this by the end of this lesson.

1. Explain natural selection.
2. Describe the process of speciation.

**Lesson Introduction:**

Today’s concept review revisits the principle of natural selection—what it is, what influences it, and how it leads to evolutionary change. We will also review factors that lead to speciation.

**Complete the tasks below. (Make use of the textbook page numbers for easy reference!)**

**Concept and Vocabulary Review:**

✓ Who was Charles Darwin? (p.297, 299) \_\_\_\_\_

\_\_\_\_\_

Darwin used the phrase, “descent with modification,” to describe evolution. Why is that phrase appropriate? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

✓ Both Darwin and a naturalist named Alfred Russel \_\_\_\_\_ (p. 299) shared similar ideas on the theory of natural selection.

- ✓ Fill in the four main parts of natural selection in the table below. (pp. 300-301)

Main Part	Description
	More offspring can be produced than can survive; the environment limits the populations of all organisms by causing deaths or limiting births
Genetic Variation	
Struggle to Survive	
	Organisms with the best adaptations are most likely to survive and reproduce; through heredity these more desirable traits will be passed on

- ✓ What is an adaptation? How is it different than a mutation? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

- ✓ Wilhelm Weinberg and Godfrey Hardy showed mathematically that genotypes (expressed traits) within a population would generally stay the same and not evolve if a certain set of assumptions were met. The five assumptions are (p. 320):
  - 1) \_\_\_\_\_
  - 2) \_\_\_\_\_
  - 3) \_\_\_\_\_
  - 4) \_\_\_\_\_
  - 5) \_\_\_\_\_

- ✓ Compare and contrast immigration and emigration. What impact do these have on a species' gene pool? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

- ✓ Describe the following types of natural selection. (pp. 323-325)
  - **Sexual selection** – \_\_\_\_\_  
\_\_\_\_\_



- **Stabilizing selection** – \_\_\_\_\_  
\_\_\_\_\_
  - **Disruptive selection** – \_\_\_\_\_  
\_\_\_\_\_
  - **Directional selection** – \_\_\_\_\_  
\_\_\_\_\_
- ✓ How are gradualism and punctuated equilibrium different? (p.330) \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Short Response.**

Explain how geographic isolation and reproductive isolation can lead to speciation.(pp. 327-329)

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\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**IV. Thursday, May 14**

Unit – Concept Review: Chapters 17-20, 22

Lesson 4: Modern Classification and Ecology

**Socratic Guiding Question:** Keep this in mind as you work through today’s lesson!

How are species different from one another? How does this change how they interact with other species?

**Objectives:** Be able to do this by the end of this lesson.

1. Describe modern classification.
2. Explain the significance of relationships among organisms in the biosphere.

**Lesson Introduction**

Today’s review topics are classification of living things—how they’re organized and what tools scientists use to study these—and ecology, specifically how organisms are interdependent and their interactions as a result.

**Complete the tasks below. (Make use of the textbook page numbers for easy reference!)**

**Concept and Vocabulary Review:**

✓ Biodiversity is \_\_\_\_\_  
\_\_\_\_\_. (p. 337)

✓ The science of describing, naming, and classifying organisms is called \_\_\_\_\_. Each of the groups within this classification system is called a \_\_\_\_\_. Carolus Linnaeus was the first scientist to use a modern classification system. How is Linnaeus’s classification system different from Aristotle’s system of classification? Were there any similarities? (p. 338)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

✓ There are 8 taxa in our modern classification system. Complete the list of the categories from broadest to most specific below. (p. 339)

Domain - Kingdom - \_\_\_\_\_ - Class - Order - \_\_\_\_\_ - Genus - \_\_\_\_\_

✓ A species’ name consists of two parts—its genus and \_\_\_\_\_. This two-part naming system is known as \_\_\_\_\_.

Which of the following species name is written correctly? (p. 339)

- a) Homo sapiens
- b) homo sapiens
- c) *homo sapiens*
- d) *Homo sapiens*

✓ How are phylogenetics and cladistics related? (pp. 341-342)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

✓ List one characteristic of each kingdom and provide an example of an organism that would be found in that kingdom. (pp. 348-350)

Eubacteria	
Archaeobacteria	

Protista	
Fungi	
Plantae	
Animalia	

✓ The biosphere includes \_\_\_\_\_  
\_\_\_\_\_ (p. 361)

✓ What is the difference between an ecosystem and a community? (p. 362) \_\_\_\_\_  
\_\_\_\_\_

✓ Identify the following as biotic (B) or abiotic (A) factors in an environment. (p. 363)

- |                        |                     |
|------------------------|---------------------|
| _____ temperature      | _____ producer      |
| _____ a babbling creek | _____ rocky terrain |
| _____ carnivores       | _____ decomposers   |
| _____ humidity         | _____ precipitation |

✓ How are food chains and food webs related? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Create a food chain below. Label the producers and consumers.

✓ In terms of trophic levels, why would large carnivores, such as a tiger, need to consume more food? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



V. Friday, May 15

**Minor Assessment:** Concept Review

**Directions:** Complete the following.

1. A nucleotide in DNA is made up of
  - a. deoxyribose.
  - b. a nitrogenous base.
  - c. a phosphorus group.
  - d. all of the above.
2. Which of the following is NOT a difference between RNA and DNA?
  - a. RNA is shorter
  - b. RNA uses the nitrogenous base, uracil, to pair with adenine instead of thymine
  - c. RNA does not contain sugar in its structure
  - d. DNA is double-stranded
3. \_\_\_\_\_ RNA is responsible for transcribing DNA for protein synthesis.
  - a. Messenger
  - b. Transfer
  - c. Ribosomal
  - d. RNA is not responsible for transcription.
4. Translation takes place in/on the
  - a. nucleus.
  - b. ribosome.
  - c. DNA strand.
  - d. mitochondria.
5. Cancer is an example of \_\_\_\_\_.
  - a. an adaptation
  - b. a mutation
  - c. a hereditary trait
  - d. sex-linked trait
6. What is the process by which individuals better adapted to an environment are more likely to survive and pass on their genes to the next generation?
  - a. Mutation
  - b. Natural selection
  - c. Bottleneck effect
  - d. Founder effect
7. The guppy is a species of small freshwater fish. Scientists observed that the average size of guppies in a pond decreased over a few years after a guppy predator was introduced into the pond. Which of the following best explains the change in guppy size?
  - a. speciation
  - b. convergent evolution
  - c. inbreeding
  - d. natural selection
8. Which of the following is a reason that smaller populations are vulnerable to extinction?
  - a. inbreeding
  - b. less genetic variation
  - c. neither a nor b
  - d. both a and b

9. The movement of individuals into a population is known as \_\_\_\_\_.
- a. immigration
  - b. emigration
  - c. bottleneck effect
  - d. speciation
10. A tapeworm living in the intestines of a host is a form of symbiosis called \_\_\_\_\_.
- a. mutualism
  - b. commensalism
  - c. parasitism
  - d. none of the above
11. Match the following.
- a. Plantae   b. Fungi   c. Bacteria   d. Animalia   e. Archaea   f. Eukarya   g. Protista

\_\_\_\_\_ A domain of prokaryotes that live in extreme environments; similar to life on early Earth

\_\_\_\_\_ A domain including prokaryotes that are considered to be the “true bacteria”.

\_\_\_\_\_ This kingdom includes mostly single-celled or simple multicellular organisms that have the widest diversity

\_\_\_\_\_ This kingdom includes multicellular organisms that are heterotrophic and include a large number of decomposers

\_\_\_\_\_ This kingdom includes multicellular organisms that lack cell walls, usually move, are heterotrophic and usually respond to their environment.

\_\_\_\_\_ This kingdom includes multicellular organisms that are usually green, have cell walls, and perform photosynthesis.

\_\_\_\_\_ This domain includes only organisms whose cell contain a nucleus and cell membranes.

**Short Response:** Answer the following using complete sentences.

1. Why is protein synthesis necessary for living things?

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2. How did Louis Pasteur’s experiment with boiled broth prove the theory of biogenesis?

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3. Explain how human population growth directly affects other species and the environment. Give evidence to support your explanation.

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4. How does the theory of natural selection explain adaptations and the development of diversity among species of organisms?

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5. Describe the concept of **interdependence**. Why is it important for us as humans to value this concept?

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