

**9<sup>th</sup> Grade Biology:**  
**History of Life and the Theory of Evolution**

April 6 – April 9

*Time Allotment: 40 minutes per day*

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

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

Teacher Name: *Ms. Carstens*

## Packet Overview

Date	Objective(s)	Page Number
Monday, April 6	<ol style="list-style-type: none"><li>1. Compare the principle of biogenesis with the idea of spontaneous generation.</li><li>2. Describe how spontaneous generation was disproved.</li></ol>	2
Tuesday, April 7	<ol style="list-style-type: none"><li>1. Describe significant discoveries regarding organic compounds on Earth.</li></ol>	7
Wednesday, April 8	<ol style="list-style-type: none"><li>1. Identify inferred characteristics that describe the first forms of cellular life on Earth.</li><li>2. Explain the significance of the development of autotrophs on Earth.</li><li>3. Discuss possibilities surrounding the development of Earth's atmosphere.</li></ol>	10
Thursday, April 9	<ol style="list-style-type: none"><li>1. Define the biological process of evolution.</li><li>2. Identify and describe scientific contributions that helped Charles Darwin shape his ideas.</li></ol>	13
Friday, April 10	NO CLASS	

**Additional Notes:** Hello, “Great-Hearted” biology students! First, let me say thank you for all your hard work and that I miss seeing you all every day! As we venture further into our remote learning journey, I want to assure you that even though we don’t see one another face to face, I am still here for each and every one of you—to encourage your questions, facilitate your learning, and fully support you in our endeavors. Please don’t hesitate to reach out!

⇒ A minor assessment is found on p. 16 of this packet. **At the end of your lesson on Thursday, you will complete this minor assessment** reviewing this week’s lessons. You may use your notes from the week. It should take approximately 10-12 minutes.

### Academic Honesty

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

*Student signature:*

\_\_\_\_\_

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

*Parent signature:*

\_\_\_\_\_

**I. Monday, April 6**

Unit – Chapters 14-15

Lesson 1: Biogenesis

**Unit Overview:**

*“The past, the finite greatness of the past! For what is the present, after all, but a growth out of the past.”*

~Walt Whitman

These words from Walt Whitman bring light to the significance of looking into one’s own past to help better understand one’s present nature. In this spirit, our next unit will explore our world’s complex history, from the beginnings of life on Earth to the processes of evolution and adaptations of species.

We will **discover the evidence surrounding Earth’s developmental timeline** as well as **the findings and observations made by key figures**, such as Louis Pasteur, Charles Darwin, and Jean Baptiste Lamarck, **regarding evolution and natural selection**. These scientists along with the contributions of numerous others helped to determine what we know of life’s origins and development into the species we see today and provide insight into what we may see tomorrow!

As we move forward, recall these concepts from our previous units:

- **Prokaryotic cells are typically less complex** than eukaryotic cells.
- **Autotrophs** are organisms that **use light energy to make their own food (photosynthesis)** for energy; **heterotrophs** are organisms that **rely on other organisms** for food.
- **DNA makes up all living things.**
- **DNA sequencing allows for the diversity of species.**
- **Mutations can allow for beneficial changes** to an organism’s DNA.

With these concepts in mind, let’s dig deep into Earth’s history and explore the weaving tapestry of evolution and natural selection!

**Lesson 1 Socratic Guiding Questions:** Keep this in mind as you study!

What is the origin of life?

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

1. Compare the principle of biogenesis with the idea of spontaneous generation.
2. Describe how spontaneous generation was disproved.

**Introduction to Chapters 14-15: Lesson 1**

In Lesson 1, you will be introduced to the principle of **biogenesis** and the idea of **spontaneous generation**. We will explore the scientists and their experiments that eventually disproved spontaneous generation and brought the principle of biogenesis front and center in the study of the history of our beginnings.

**Read pages 279-281 from your text. Then, complete the tasks on the following pages.**

GUIDED OUTLINE: Biogenesis (pp. 279-281)

- ✓ Define the following:
  - Principle of **biogenesis** – \_\_\_\_\_  
\_\_\_\_\_
  - **Spontaneous generation** – \_\_\_\_\_  
\_\_\_\_\_

✓ Redi’s Experiment – *Fill in the following information as you read “Redi’s Experiment” (pgs.279-280).*

1. Who was Francesco Redi?  
\_\_\_\_\_

2. Because of his observations of \_\_\_\_\_, **Redi hypothesized that these flies were generated spontaneously** from rotting meat. Using *Figure 14-1* (p. 279), *sketch and describe the steps of the experiment* he performed in \_\_\_\_\_ (year).

Sketch:

3. What was the difference between the control group and the experimental group? Because of this difference, what did Redi’s experiment show “convincingly?”

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

✓ Spallanzani's Experiment – Fill in the following information as you read "Spallanzani's Experiment" (pg. 280).

1. What new tool was being used during the time of Redi's experiment? \_\_\_\_\_

2. Because of this new tool, scientists discovered what about our world? \_\_\_\_\_

3. Who was Lazzaro Spallanzani?

4. **Spallanzani hypothesized that microorganisms formed not from air**, as was the misconception of the time, **but rather from other microorganisms**. Using *Figure 14-2* (p. 280), sketch and briefly describe the steps of the experiment he performed in the 1700s.

Sketch:

5. Fill in the table below.

What Spallanzani concluded:	What his opponents argued:

- ✓ Pasteur’s Experiment - Fill in the following information as you read “Pasteur’s Experiment” (pg. 281)

1. Who was Louis Pasteur?

\_\_\_\_\_

2. By the mid-1800s, the controversy over spontaneous generation had reached a “boiling point” (pasteurization pun intended ☺). So fierce was the debate, that the \_\_\_\_\_ of \_\_\_\_\_ offered a prize to anyone who could offer clear evidence supporting it or disproving it. **Who won the prize?**

\_\_\_\_\_

3. Using *Figure 14-3* (p. 281), sketch and briefly describe the steps of the experiment

Pasteur performed that won him that prize.

Sketch:

4. How did Pasteur’s experiment differ from Spallanzani’s experiment? What did they have in common? *Identify at least one difference and one similarity.*

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

**Closing:** Check your understanding of the lesson by answering the following questions in 3-5 sentences.

1. When comparing your definition of biogenesis with the explanation in the “Word Roots and Origins” box on pg. 281, why is biogenesis an appropriate name for this principle?

---

---

---

---

---

---

---

---

---

---

## II. Tuesday, April 7

Unit – Chapters 14-15: History of Life and the Theory of Evolution  
Lesson 2: Earth's History

**Lesson 2 Socratic Guiding Question:** Keep this question in mind as you study!  
How did cell-based life arise on Earth?

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

1. Describe significant discoveries regarding organic compounds on Earth.

### Introduction to Lesson 2

Recall that **living organisms are made up of organic compounds**—compounds that are comprised of carbon typically bonded covalently (sharing electrons) with hydrogen, oxygen, or nitrogen. In today's lesson, we will read about:

- ✓ how scientists were able to age the earth.
- ✓ the discovery of organic compounds.
- ✓ the research surrounding how these organic compounds became life forms on Earth.

**Read pages 282-286 in your text. After reading, complete the tasks on the following pages.**

**GUIDED OUTLINE:** Earth's History (pp. 282-286)

#### ❖ The Formation of Earth

➤ Define the following:

- **Radiometric dating** –
- **Isotopes** –
- **Mass number** –
- **Radioactive decay** –
- **Radioactive isotopes** –
- **Half-life** –

How old do scientists estimate the Earth is? \_\_\_\_\_

How did they determine this? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

#### ❖ First Organic Compounds



- Complete the timeline below based on the information found on pgs. 284-285.

1920s	1953	1970s
<p><b>Scientists Involved:</b></p> <p><b>What were their thoughts regarding how organic compounds formed on Earth?</b></p>	<p><b>Scientists Involved:</b></p> <p><b>Summarize their experiment:</b></p> <p><b>What was their conclusion?</b></p>	<p><b>Organic Compounds from Beyond Earth...</b>                      What was discovered?</p>

❖ From Molecules to Cell-Like Structures

- Sidney \_\_\_\_\_ and others did extensive \_\_\_\_\_ on the physical structures that may have given \_\_\_\_\_ to the first \_\_\_\_\_.
- **Microspheres** are \_\_\_\_\_ in shape; composed of many \_\_\_\_\_ molecules that are organized as a \_\_\_\_\_.
- **Coacervates** are \_\_\_\_\_ of droplets that are composed of different molecules, including \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.
- Both microspheres and coacervates can form \_\_\_\_\_ under certain conditions, but do not have all of the properties of \_\_\_\_\_. Specifically, they do not have \_\_\_\_\_ characteristics and cannot \_\_\_\_\_ to natural \_\_\_\_\_.

**Closing:** Check your understanding of the lesson by answering the following question in 4-6 sentences.

1. What are two possible sources of simple organic compounds on early Earth? In your opinion, which do you believe is more likely? Defend your answer.

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

### III. Wednesday, April 8

Unit – Chapters 14-15: History of Life and the Theory of Evolution  
Lesson 3: The First Life-Forms

**Lesson 3 Socratic Guiding Question:** Keep this question in mind as you study!  
Why might prokaryotes have been suitable for the role of Earth's early life-forms?

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

1. Identify inferred characteristics that describe the first forms of cellular life on Earth.
2. Explain the significance of the development of autotrophs on Earth.
3. Discuss possibilities surrounding the development of Earth's atmosphere.

#### Introduction to Lesson 3

Recall the following concepts:

- A **hypothesis is an idea** based on observations that **can be tested**.
- A **theory is an explanation for some phenomenon** that is based on observation, experimentation, and reasoning, supported by large quantities of evidence, and does not conflict with any existing research data or observations.
- **DNA serves as a template for RNA** to transcribe and translate in protein synthesis.
- **RNA molecules differ in purpose and shape.**
- **Prokaryotes are simple organisms.**
- **Anaerobic** – describes a process that does not require oxygen; **aerobic** – describes a process that requires oxygen
- **Autotrophs** are organisms that **use photosynthesis to create sugar for energy**. As a byproduct, **they release oxygen** into the atmosphere.

In today's lesson, we will explore inferences (educated assumptions) made by scientists in order to explain how cells first developed on Earth as well as how these first cells evolved into more complex organisms as the Earth's surface and atmosphere changed.

**Read pages 261-264 in your text. Then, complete the guided outline below.**

GUIDED OUTLINE: The First Life-Forms (pp. 287-290)

#### ❖ The Origin of Heredity

- DNA is a template for \_\_\_\_\_ to transcribe and translate in order to produce \_\_\_\_\_.
- Based on questions and observations regarding RNA's different structures, scientists have speculated that some RNA molecules might behave like \_\_\_\_\_ and \_\_\_\_\_ chemical reactions.

#### ❖ The Roles of RNA

- 1980s – Thomas Cech found that a type of \_\_\_\_\_ found in some \_\_\_\_\_ eukaryotes is able to \_\_\_\_\_ as a \_\_\_\_\_, similar to how an enzyme acts.

➤ What is a **ribozyme**? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

- *RNA world* refers to a hypothesized model of the beginnings of life on Earth based on self-replicating RNA—that is, RNA that acts as a catalyst for its own replication.
- **Identify at least one competing hypothesis** regarding how RNA or other simple replicating systems could have evolved into modern cellular life.

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

❖ The First Cells

- Although lacking direct evidence of the first cells, scientists have made inferences (educated assumptions) about early conditions on Earth and early life forms.

**List three inferences they have made:**

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_
3. \_\_\_\_\_  
\_\_\_\_\_

➤ Chemosynthesis

- **Archaea** – a group of unicellular organisms, many of which thrive under extremely \_\_\_\_\_
  - Likely similar to early prokaryotes on Earth
  - Many species are \_\_\_\_\_ that obtain energy by the process of **chemosynthesis** – using CO<sub>2</sub> and inorganic compounds to produce carbohydrates

➤ Photosynthesis and Aerobic Respiration

- It is estimated that photosynthetic life forms evolved \_\_\_\_\_ years ago.
  - Similar life forms to modern-day \_\_\_\_\_ a group of photosynthetic, \_\_\_\_\_ prokaryotes
  - Produced oxygen as a \_\_\_\_\_ of photosynthesis; thus, destroying some early unicellular organisms, but bonded with other compounds which led to aerobic respiration.

- How do scientists think the ozone was formed in our atmosphere?

---

---

---

---

- How do you think this gradually forming ozone layer helped to develop life on Earth?

---

---

---

❖ The First Eukaryotes

- List two differences between eukaryotes and prokaryotes:

1. \_\_\_\_\_

2. \_\_\_\_\_

- Who was Lynn Margulis? What did she propose?

---

---

---

---

- Identify **at least two** evidences that support her theory:

1. \_\_\_\_\_

2. \_\_\_\_\_

---

**Closing:** Check your understanding of the lesson by completing the following question.

1. What traits make prokaryotic, archaebacteria (archaea) likely relatives of Earth's earliest organisms? **List at least two.**

---

---

---

---

#### IV. Thursday, April 9

Unit – Chapters 14-15: History of Life and the Theory of Evolution  
Lesson 4: History of Evolutionary Thought (Part 1)

**Lesson 4 Socratic Guiding Question:** Keep this question in mind as you study!

What does it mean to “evolve?”

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

1. Define the biological process of evolution.
2. Identify and describe scientific contributions that helped Charles Darwin shape his ideas.

#### **Introduction to Lesson 4**

As we begin this lesson, recall that species have unique traits and characteristics that set them apart from other species. Some of these unique traits are the result of mutations or adaptations that have been passed down to offspring through hereditary material (DNA). Many adaptations or characteristics of organisms directly relate to how they interact with their environments—obtaining food, utilizing shelter, and ensuring survival of their species.

In Lesson 4, get ready to explore the first ideas surrounding evolution— from the study of rock layers in geology and their influence in our thinking of evolution to Jean Baptiste Lamarck’s ideas regarding populations of organisms and their change over time!

**Read pages 297 – 301 in your text. After reading, complete the guided outline below.**

**GUIDED OUTLINE:** History of Evolutionary Thought – pgs. 297–298

❖ The Idea of Evolution

**Write the two definitions** for the term, **evolution**, as found in your text:

Definition #1:

Definition #2:

➤ Ideas of Darwin’s Time

▪ In Europe in the \_\_\_\_\_ century (1700s), most scientists thought that \_\_\_\_\_ species were \_\_\_\_\_ and \_\_\_\_\_.

▪ They also thought that the earth was only \_\_\_\_\_ of years old.

➤ Ideas About Geology

▪ By the 1800s, European scientists had begun to study \_\_\_\_\_, or **strata**, and found that they are formed as new \_\_\_\_\_ of \_\_\_\_\_ are deposited over time.

▪ These strata held \_\_\_\_\_ of different kinds of organisms.

- Describe two scientists' ideas about geology that influenced ideas about evolution.

Scientist #1: _____	Scientist #2: _____
Idea:	Idea:

➤ Lamarck's Ideas on Evolution

What is the *inheritance of acquired characteristics* (an idea proposed by Jean Baptiste Lamarck)?

---

---

---

---

Why is this idea rejected by modern scientists today?

**Closing:** Check your understanding of the lesson by completing the question below (3-5 sent.).

1. In your own words, what is evolution? What does it mean to evolve?

---

---

---

---

---

---



**The following page contains your minor assessment for the week and should be completed on Thursday only AFTER you have completed all previous work in this packet. You may use your notes in this packet to support your answers. It should take you approximately 10-12 minutes.**



Name \_\_\_\_\_ Period \_\_\_\_\_ Date \_\_\_\_\_

**Minor Assessment:** Chapters 14-15, Lessons 1-4

**Directions:** Fill in the blanks.

1. The principle of \_\_\_\_\_ states that all \_\_\_\_\_  
\_\_\_\_\_ come from other living things.
2. The idea of \_\_\_\_\_ was disproved by Louis Pasteur, winning him a prize from the Paris Academy of Science.
3. Spallanzani and Pasteur both \_\_\_\_\_ the broth used in their experiments to kill all the microorganism that might be in it.
4. Earth is estimated to be more than \_\_\_\_\_ years old.
5. Rock layers deposited over time are called \_\_\_\_\_.

**Directions:** Answer the following questions using complete sentences.

1. How did aerobic respiration help in the development of life forms on the surface of the earth? (Think in terms of ozone...)

---

---

---

---

---

---

---

2. What is evolution? In your opinion, why might evolution be a necessary process on Earth? Defend your answer.

---

---

---

---

---

---

---

---

---

---