

2:2 & 2:3

Lesson 2.2 & 2.3 Assessment (Answer Key)

[Note: These same assessment questions apply to both Lesson 2.2 and Lesson 2.3. This assessment may be given to the students after Lesson 2.2 or delayed until after the completion of Lesson 2.3.]

Section 1: Multiple Choice

Choose the correct answer for each of the following questions.

1. What are the three key principles of evolution discussed in the lesson?
 - a. Evolution, Darwinism, and Neo-Darwinism
 - b. Deep time, common ancestry, and mechanisms
 - c. Natural selection, random mutations, and genetic variations
 - d. Origin of life, homology, and fossil records
2. Why is the concept of “deep time” important in the theory of evolution?
 - a. It refers to the time needed for sudden changes in species.
 - b. It emphasizes the recent origin of the Earth.
 - c. It allows for gradual changes in species over an extended period of time.
 - d. It supports the idea that the Earth is only a few thousand years old.
3. Which scientific technique is commonly used to determine the age of the Earth?
 - a. Carbon dating
 - b. Radiometric dating
 - c. Tree ring analysis
 - d. Archaeological studies
4. What is the main reason for considering the principle of common ancestry in the theory of evolution?
 - a. To emphasize the differences among species.
 - b. To prove that all species are completely independent.
 - c. To show that all biological life is interconnected through a historical lineage.
 - d. To promote the idea of spontaneous generation.

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5. Human Exceptionalism in Cognitive Abilities: Which of the following best describes the cognitive aspect of human exceptionalism?
 - a. The ability of humans to adapt physically to their environment.
 - b. The advanced cognitive and intellectual abilities of humans, such as complex thinking and problem-solving.
 - c. The physical strength of humans compared to other animals.
 - d. The ability of humans to fly.
6. Moral and Ethical Reasoning: Human exceptionalism includes the development of:
 - a. Only legal systems
 - b. Complex ethical systems and the ability to ponder questions of right and wrong
 - c. Basic instincts for survival
 - d. The ability to hibernate
7. Divine Creation in Theological Human Exceptionalism: According to Islamic theology, Adam (pbuh) and Ḥawwā' (pbuh) were created:
 - a. Through evolutionary processes
 - b. By a random chance
 - c. Directly by God, as a special creation distinct from random evolutionary processes
 - d. As descendants of apes
8. Speech and Knowledge in Islam: Which sūrah mentions that Allah (swt) has taught humans eloquence and expression?
 - a. Sūrah al-Baqarah
 - b. Sūrah al-Nisā'
 - c. Sūrah al-Raḥmān
 - d. Sūrah al-Fatiḥa
9. Role of Prophets in Human Exceptionalism: In Islamic theology, the role of prophets and messengers is primarily to:
 - a. Teach humans about technology
 - b. Guide humans in moral and ethical reasoning
 - c. Lead humans in battles
 - d. Advise on economic matters

Section 2: Short Answers

Write a well-formulated response for each of the following.

10. Explain why the age of the Earth is a critical factor in the theory of evolution. Provide an example of how a long period of time is essential for evolutionary changes.

A: The reason time is a major factor in evolutionary concepts is that, in order for evolution to take place, immensely long periods of geological time are necessary to account for the possibility of small changes/adaptations to occur, resulting slowly into major changes. Without a long period of time, the changes would not be noticeable enough unless there was a major event that caused changes immediately. Even changes within species occur over a few generations, which is again an extended period of time. A classic example is Darwin's study of finches in the Galápagos Islands. A single ancestral bird species arrived on the islands and over thousands to millions of years, different groups adapted to different environments. Their beaks slowly changed shape depending on food sources, and, eventually, they became distinct species according to the theory.

11. Describe the principle of common ancestry and its role in understanding the unity and diversity of life. How is it represented through a Phylogenetic Tree of Life?

A: The Phylogenetic Tree of Life shows that all life came from the very same cell and continued to develop/adapt and branch off into different forms of life. Common ancestry is explained by the branching and diversification of lineages as populations adapted (primarily through natural selection). This not only is a way to explain the diversity of life (of all living things), but it also is a way of understanding the unity of life (core requirements that all living things have in common; cell structures and mechanisms, all have DNA which is constructed the same, basic elements that they are constructed from are the same/organic molecules.)

Section 3: Critical Thinking Question

Write a well-structured essay response to one of the following questions.

12. Neo-Darwinism is defined as a theory of evolution that combines Charles Darwin's natural selection theory with modern population genetics. Considering the information presented in the lesson, do you think Neo-Darwinism is a *qat'i* (certain) or *ẓannī* (probabilistic) explanation for the processes of evolution? Provide a well-reasoned argument for your answer, considering the evidence and challenges discussed.

The knowledge presented suggests that Neo-Darwinism and its principles are *ẓannī* (probabilistic) rather than *qaṭī* (certain). Explain whether Neo-Darwinism provides a certain or probabilistic explanation for the processes of evolution. Support your argument with evidence and its implications.

A: Answers will vary, but should include key points such as Neo-Darwinism is *ẓannī* due to the probabilistic nature of evolutionary arguments and its processes. Scientists cannot go back in time and investigate or analyze extinct species, and then measure accurately, or do experiments in a lab. Scientists have to use inferences based on current traces and project them onto the past. As a result, what we get from this is that inferences and projections are constantly changing due to new information being deciphered. This would mean that the principle of common ancestry is *ẓannī* in terms of its truth seen through the constant adjustments and disagreements. And since there is no *qaṭī* information or source of knowledge on the processes of evolution, by default, it will be *ẓannī*. Evolutionary biologists have methodological disagreements about these phylogenetic trees. The branching patterns of phylogenetic trees disagree even when they have been constructed using different portions of the same data. This phylogenetic discord (incongruence) can be explained by real differences in evolutionary process or history but also may be due simply to random chance or sampling error. Some evolutionary biologists even question whether there is a single tree or multiple trees to accommodate all the disagreements and interpretations of the data. Therefore, scientists are constantly revising the placement of species in the light of new knowledge.

*This assessment evaluates students' knowledge of evolution's key principles, their ability to apply critical thinking skills to scientific concepts, and their capacity to express their thoughts coherently.