

SI Geology - Full Discipline Demo

Evolution

Final Report - Answer Guide

Institution	Science Interactive University
Session	SI Geology - Full Discipline Demo
Course	SI Geology - Full Discipline Demo
Instructor	Sales SI Demo

Test Your Knowledge

Match the following terms with their corresponding definitions:

Evolution	The process through which certain traits become more common in a population due to their advantage in surviving and reproducing.	1
Natural selection	The phenomenon where a single species diversifies into multiple species, each adapted to different ecological niches.	2
Morphology	The formation of a new and distinct species through the evolutionary process.	3
Speciation	The process by which new species arise due to the accumulation of small genetic changes over time.	4
Adaptive radiation	The study of the form and structure of organisms.	5

Correct answers:

- 1 Natural selection 2 Speciation 3 Adaptive radiation 4 Evolution
5 Morphology

Sort the following statements into their corresponding categories:

Gradualism	Punctuated Equilibrium
1	2

⌘ Slow and steady accumulation of small changes over extended periods.

⌘ Rapid bursts of evolutionary change followed by periods of stability.

⌘ Emphasizes a constant rate of change in species over time.

⌘ Suggests that evolution occurs through short episodes of rapid change.

Correct answers:

- 1 Slow and steady accumulation of small changes over extended periods.
Emphasizes a constant rate of change in species over time.
- 2 Rapid bursts of evolutionary change followed by periods of stability.
Suggests that evolution occurs through short episodes of rapid change.

Exploration

Which historical biologist proposed the idea that organisms share a common ancestor and laid the foundation for the theory of evolution?

- ☐ Charles Darwin
- ☐ Aristotle
- ☒ Jean-Baptiste Lamarck
- ☐ Gregor Mendel



True or False?

Populations residing in diverse environments are prone to developing a wide range of morphologies.

- ☒ True ✓
- ☐ False
-

Species ____ is a natural outcome of evolution, resulting in the disappearance of a species from Earth.

- ☒ extinction ✓
- ☐ evolution
- ☐ adaptation
- ☐ endangerment
-

True or False?

Evolution is a rapid process driven by new genes created through sexual reproduction, resulting in immediate changes in population morphology.

- ☐ True
- ☒ False ✓
-

____ is the evolutionary pattern characterized by gradual changes in features over time, with species displaying a progression of morphologies.

- ☐ Punctuated equilibrium
- ☐ Catastrophic evolution
- ☒ Gradualism ✓
- ☐ Sudden adaptation
-

Exercise 1

For the yellow habitat, did you observe a selective advantage for the yellow beads or the blue beads? Why?

For the blue habitat, did you observe a selective advantage for the yellow beads or the blue beads? Why?

Summarize how the distribution of phenotypes changed over time for the two different environments.

This exercise was a highly idealized scenario with minimal variables. In nature, the natural selection process is much more complicated. Describe two additional variables that were not considered in this exercise and how they might have impacted the outcomes.

Data Table 1: Yellow Habitat Data for Three Generations
(SAMPLE ANSWER BELOW)

Bead Color	Generation 1 Ending Distribution	Generation 1 Re-Populated Distribution	Generation 2
Yellow	25	50	28
Blue	19	28	15

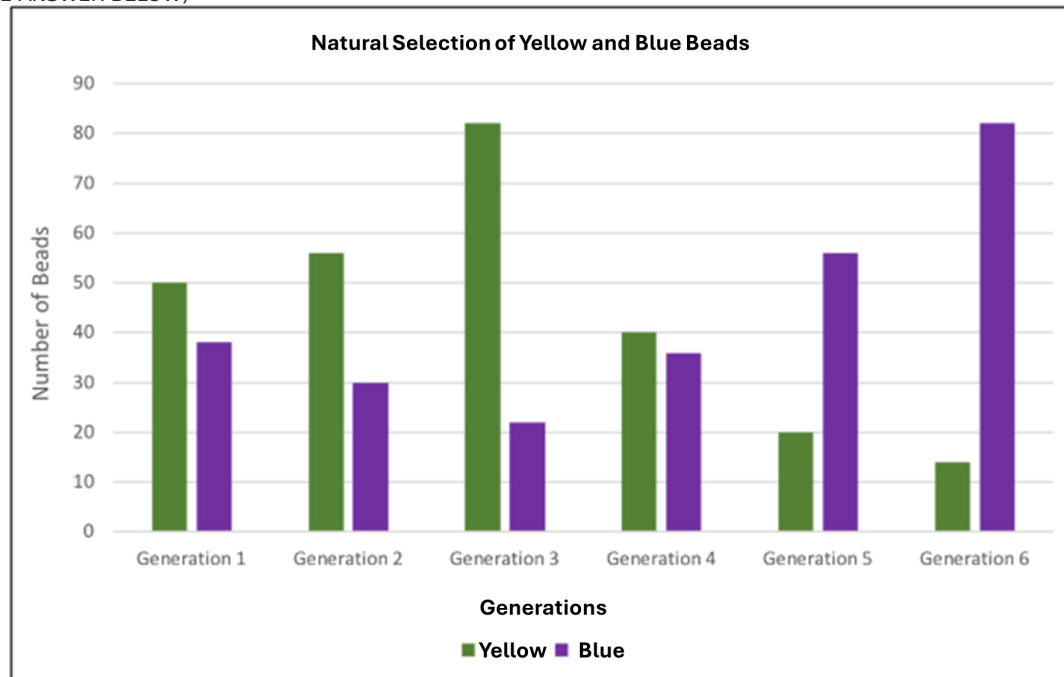
Data Table 2: Blue Habitat Data for Three Generations

(SAMPLE ANSWER BELOW)

Bead Color	Generation 4 Ending Distribution	Generation 4 Re-Populated Distribution	Generation 5
Yellow	20	40	10
Blue	18	36	28

Graph 1: Natural Selection of Yellow and Blue Beads

(SAMPLE ANSWER BELOW)



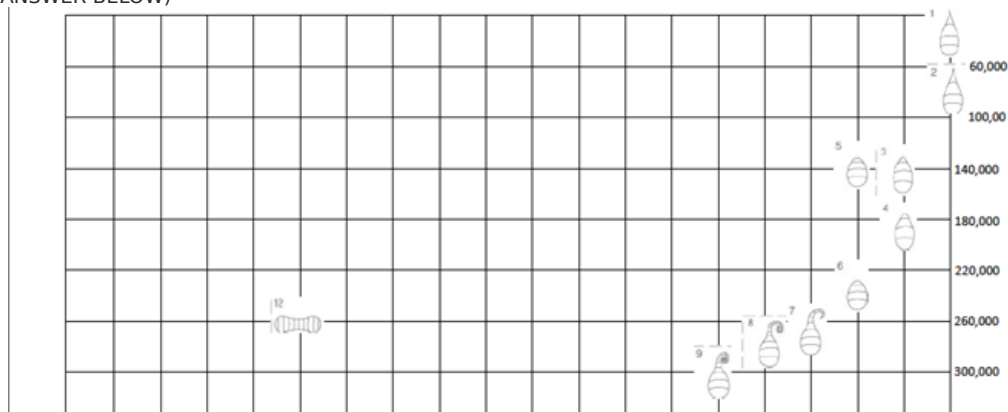
Exercise 2

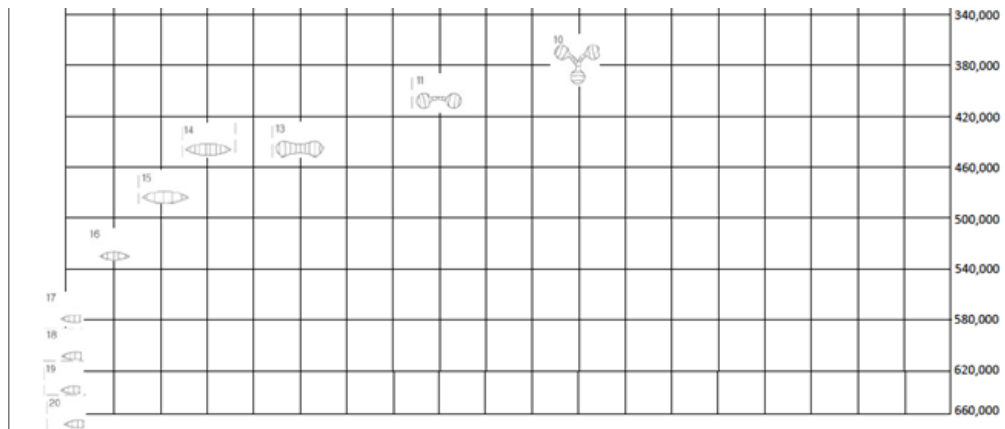
Describe the general changes in your fossil record as you move forward in time.

Is there any evidence of punctuated equilibrium in your fossil record? If so, indicate the length of time between fossils and identify the numbers assigned to them. Then, explain your reasoning.

Is there any evidence of gradualism in your fossil record? If so, indicate the length of time between fossils and identify the numbers assigned to them. Then, explain your reasoning.

Photo 1: Fossil Worksheet
(SAMPLE ANSWER BELOW)





Competency Review

What is the fundamental process described in the theory of evolution that leads to the modification of characteristics within populations over successive generations?

- ☒ Inheritance of traits and natural selection
- ☐ Acquired traits during an individual's lifetime
- ☐ Random genetic mutations
- ☐ Common ancestry of species



In the process of natural selection, organisms that are well adapted to their environment tend to reproduce at a ____ rate, passing on their advantageous genes to the next generation.

- ☐ slower
- ☒ higher ✓
- ☐ variable
- ☐ consistent

Natural Selection describes the process through which organisms with advantageous traits have higher reproductive success, leading to changes in population characteristics over successive generations.

- ☒ True ✓
- ☐ False

Gradualism is characterized by steady and continuous morphological changes over time, while Punctuated Equilibrium involves abrupt changes separated by long periods of stability.

- ☒ True ✓
- ☐ False

Natural selection operates on the principle that individuals with advantageous traits have a higher likelihood of ____ and ____ their genes to the next generation.

- ☐ adapting; mutating
- ☐ migrating; evolving
- ☐ thriving; inheriting
- ☒ reproducing; transmitting ✓

Through the comparison of sizes and shapes of fossils spanning various time periods, scientists can deduce alterations in population morphology and patterns in evolution.

- ☒ True
- ☐ False



How can scientists best utilize a fossil record to examine changes in morphology and evolutionary trends?

- ☒ By studying variations in sizes and shapes of fossils from different time periods.
- ☐ By identifying the absolute age of each fossil to determine its chronological position.
- ☐ By conducting DNA analysis of fossil remains to uncover genetic changes.
- ☐ By comparing the geographic distribution of fossils to infer changes in habitat.



Gradual changes involve steady and continuous morphological modifications over extended periods, while punctuated changes entail _____ shifts in morphology separated by prolonged periods of stability.

- ☐ irregular
- ☒ abrupt
- ☐ random
- ☐ incremental



Extension Questions

Explain the process of evolution and its fundamental mechanisms, highlighting the role of natural selection in driving changes in population characteristics over time. Provide an example to illustrate your explanation. (SAMPLE ANSWER BELOW)

Answers will vary.

Evolution is a biological process by which populations of organisms gradually change over time through the inheritance of traits. It's driven by genetic variations and is responsible for the diversity of life on Earth. One of the key mechanisms behind evolution is natural selection, proposed by Charles Darwin in the mid-19th century.

Natural selection is a process where organisms that are better adapted to their environment are more likely to survive and reproduce, passing on their advantageous traits to their offspring. This differential reproductive success leads to a gradual accumulation of beneficial traits within a population, ultimately resulting in changes in the overall characteristics of that population.

For instance, consider a population of insects that live in a forest with varying levels of camouflage. In this scenario, insects with better camouflage are less likely to be spotted by predators and have a higher chance of

surviving and reproducing. Over generations, the population's overall camouflage improves as those insects with more effective camouflage traits pass on their genes more frequently