

**AP<sup>®</sup> BIOLOGY**  
**2013 SCORING GUIDELINES**

**Question 3**

Fossils of lobe-finned fishes, which are ancestors of amphibians, are found in rocks that are at least 380 million years old. Fossils of the oldest amphibian-like vertebrate animals with true legs and lungs are found in rocks that are approximately 363 million years old.

Three samples of rocks are available that might contain fossils of a transitional species between lobe-finned fishes and amphibians: one rock sample that is 350 million years old, one that is 370 million years old, and one that is 390 million years old.

(a) **Select** the most appropriate sample of rocks in which to search for a transitional species between lobe-finned fishes and amphibians. **Justify** your selection. **(2 points maximum)**

- Selection: Rocks from 370 MYA sample.
- Justification: Transitional fossils are found between 380 MYA (when lobe-finned fishes lived) and 363 MYA (when amphibians appeared) OR between different strata/layers in the correct order.

(b) **Describe** TWO pieces of evidence provided by fossils of a transitional species that would support a hypothesis that amphibians evolved from lobe-finned fishes. **(2 points maximum)**

Descriptions include but are not limited to the following:

- Bones OR specific skeletal structures
  - legs /limbs/digits
  - vertebrae
  - flat skulls
  - (interlocking) ribs
  - flexible neck
- Scales
- Teeth
- Other homologous structures
- Has traits of both the lobe-finned fish and the amphibian
- Finding the transitional fossils in the same area/same environment as either the lobe-finned fish or the amphibian
- Molecular (DNA) evidence

3. Fossils of lobe-finned fishes, which are ancestors of amphibians, are found in rocks that are at least 380 million years old. Fossils of the oldest amphibian-like vertebrate animals with true legs and lungs are found in rocks that are approximately 363 million years old.

Three samples of rocks are available that might contain fossils of a transitional species between lobe-finned fishes and amphibians: one rock sample that is 350 million years old, one that is 370 million years old, and one that is 390 million years old.

- (a) **Select** the most appropriate sample of rocks in which to search for a transitional species between lobe-finned fishes and amphibians. **Justify** your selection.
- (b) **Describe** TWO pieces of evidence provided by fossils of a transitional species that would support a hypothesis that amphibians evolved from lobe-finned fishes.

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370 million  
Fossils from same area  
Likely structure

(A) Sample 2 which is 370 million years old is most appropriate for a transitional species. This is proven by the sample being 370 million yrs old which is right between the lobe-finned fishes which are 380 million yrs old and the amphibians which is 363 millions years old. So sample 2 was just in the middle of transitioning to an amphibian.

(B) Location of the fossils can support the hypothesis because if they are near each other that shows that they evolved from the same thing. And structures of the fossils show that amphibians evolved from lobe-finned fishes because their body structure is similar and they have similar organelles.

3. Fossils of lobe-finned fishes, which are ancestors of amphibians, are found in rocks that are at least 380 million years old. Fossils of the oldest amphibian-like vertebrate animals with true legs and lungs are found in rocks that are approximately 363 million years old.

Three samples of rocks are available that might contain fossils of a transitional species between lobe-finned fishes and amphibians: one rock sample that is 350 million years old, one that is 370 million years old, and one that is 390 million years old.

- (a) **Select** the most appropriate sample of rocks in which to search for a transitional species between lobe-finned fishes and amphibians. **Justify** your selection.
- (b) **Describe** TWO pieces of evidence provided by fossils of a transitional species that would support a hypothesis that amphibians evolved from lobe-finned fishes.

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Because the evolutionary process appears to have happened during the period of 380 - 363 million years ago the best fossil sample to examine would be the 370 million year old fossil this would be the period that would most likely contain a transitional species.

one piece of evidence to support transitional species would be through the loss or gaining of certain traits such as the addition of legs or leg like bone structures lungs adapted for breathing air out of water the loss of gill slits or such things as the location of fossil food source of transitional fossil species through other fossils found in same time period

3. Fossils of lobe-finned fishes, which are ancestors of amphibians, are found in rocks that are at least 380 million years old. Fossils of the oldest amphibian-like vertebrate animals with true legs and lungs are found in rocks that are approximately 363 million years old.

Three samples of rocks are available that might contain fossils of a transitional species between lobe-finned fishes and amphibians: one rock sample that is 350 million years old, one that is 370 million years old, and one that is 390 million years old.

- (a) **Select** the most appropriate sample of rocks in which to search for a transitional species between lobe-finned fishes and amphibians. **Justify** your selection.
- (b) **Describe** TWO pieces of evidence provided by fossils of a transitional species that would support a hypothesis that amphibians evolved from lobe-finned fishes.

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Out of the three samples of rocks that are available, the rock sample that would be most accurate would be the one that is 370 million years old. The reason behind this would be that the ~~lobed~~ lobed-finned fishes are about ~~380~~ 380 million years old and the amphibians about 363 million years old, meaning that somewhere in between you would possibly find one that contains both. Two pieces of evidence that would support my answer are that somewhere in between a transitional species had formed creating some similar and some not. Also it is given in the instructions that amphibians evolved from lobe-finned fish creating an opportunity for a transitional species to be formed.

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**AP<sup>®</sup> BIOLOGY**  
**2013 SCORING COMMENTARY**

**Question 3**

Question 3 was written to the following Learning Objectives in the AP Biology Curriculum Framework: 1.9, 1.10, 1.11, and 1.12.

**Overview**

Question 3 asks students to apply strategies for collecting and analyzing data to a proposed investigation of the evolutionary histories of specific types of organisms. Students were presented with a hypothesis about the evolution of amphibians and with a description of different rock samples that might contain evidence for testing the hypothesis. Students were asked to select the most appropriate rock sample in which to search for evidence of a transitional species between lobe-finned fishes and amphibians. Students were also asked to justify their selection using their knowledge and understanding of paleontology, comparative anatomy, and molecular biology. Finally, students were asked to describe two pieces of evidence provided by fossils of a transitional species that would support the hypothesis that amphibians evolved from lobe-finned fishes.

**Sample: 3A**

**Score: 4**

The response earned 1 point in part (a) for selecting the rock sample that is 370 million years old.

The response earned 1 point in part (a) for justifying the selection by stating that the age of fossils of a transitional species is expected to be between 363 million years old and 380 million years old.

The response earned 1 point in part (b) for describing a fossil that has an imprint of scales.

The response earned 1 point in part (b) for describing a fossil of a species with body structures similar to both lobe-finned fishes and amphibians.

**Sample: 3B**

**Score: 3**

The response earned 1 point in part (a) for selecting the rock sample that is 370 million years old.

The response earned 1 point in part (a) for justifying the selection by stating that the age of fossils of a transitional species is most likely between 363 million years old and 380 million years old.

The response earned 1 point in part (b) for describing a fossil of a species with leg-like bone structures.

**Sample: 3C**

**Score: 2**

The response earned 1 in part (a) point for selecting the rock sample that is 370 million years old.

The response earned 1 point in part (b) for justifying the selection by stating that the age of fossils of a transitional species is expected to be between 363 million years old and 380 million years old.