

1.C-D Formatives

1.

(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

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2.

2. (a) A maximum of 6 points may be given for part (a). A single point may be awarded for each concept that follows. Beware of anything that sounds like a Lamarckian statement.

- **Reproductive potential** — the ability to over produce
- **Variability** — inheritable changes or mutations linked to variability
- **Limited resources** — biotic or abiotic
- **Competition** — intraspecific struggle for existence
- **Differential Reproduction** — reproductive success of variants
- **Generations** — time needed for evolution to occur
- **Elaboration** — expansion of Darwin’s ideas such as the effects of environmental change or artificial selection or good, linked example

2. (b) A maximum of 6 points can be scored in part (b).
A student may not receive a total score of ten without attempting to respond to three sections of part (b).
A single point may be awarded for each of the following:

(i)

- 1 point Different species exhibit adaptations as a result of the same environment
- 1 point Correct descriptive example linked to biome and survival value or linked to natural selection

(iii)

- 1 point A single population divides into two reproductively isolated populations or equivalent (use of gene pools)
- 1 point Role of barriers in speciation or discuss gene pool separation or link to natural selection

3.

Section I

Describe how this classification system presents different conclusions about the relationships among living organisms than those presented by the previous five-kingdom system of classification.

Maximum of 4 points from this section

- (1) Not all prokaryotes are closely related (not monophyletic).
- (1) Prokaryotes split early in the history of living things (not all in one lineage).
- (1) Archaea are more closely related to Eukarya than to Bacteria.
- (1) Eukarya are not directly related to Eubacteria.
- (1) There was a common ancestor for all extant organisms (monophyletic).
- (1) Eukaryotes are more closely related to each other (than Prokaryotes are to each other)
- (1) Correct description of the five-kingdom system.

Section III

Describe four of the characteristics of the universal ancestor.

Maximum of 4 points for this section. Described characteristics can earn one point each OR one point may be earned for a list of the first four correct characteristics.

Characteristic (possible explanations)

- (1) Small (surface to volume ratio, no internal transport system)
- (1) Unicellular (all functions self-contained)
- (1) Prokaryote (no membrane-bound organelles).
- (1) Had cell membrane (containment, protection, semipermeable)
 - (1) cell membrane made of a phospholipid bilayer (barrier).
 - (1) cytoplasm (different from external environment)
- (1) DNA for the genetic material (**or** nucleic acid **or** RNA)
- (1) mRNA for information transfer (common to all organisms)
- (1) tRNA to carry amino acids and/or aminoacylsynthetase (common to all organisms)
- (1) ability to reproduce (asexual)
- (1) ability to mutate, adapt, or evolve through natural selection
- (1) ability to make proteins **or** had ribosomes on which proteins could be constructed
- (1) metabolism: carbon-based **or** organic; Energy transformations, ATP as energy molecule
- (1) enzymes for amino acid, nucleotide, and coenzyme synthesis as well as enzymes for glycolysis and the Krebs cycle (common to all organisms)
- (1) Heterotrophic/Autotrophic* with explanation (* not photosynthetic)
- (1) Anaerobic/aerobic with explanation
- (1) Aquatic with explanation

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4.

One point for each definition, example, impact and explanation.

	Definition	Example	Impact on diversity of life on earth	Explanation
polyploidy	more than 2 complete chromosome sets	plants (common) animals (rare e.g., fish, amphibians)	increase	development of new species (autopoloidy speciation, allopoloidy speciation)
growth of human population	near carrying capacity exponential evidence from age pyramid	rapid increase – developing countries slow growth - U.S. no growth - Italy	decrease	Use of resources leads to extinction of other species