

## Section 4.2: Review Answers

### Student Textbook page 133

- (a)** Cuvier—credited with helping to develop the science of paleontology, which is the study of ancient life through the examination of fossils. He determined that different fossils are found in each layer of rock or soil and concluded that some species disappeared and new ones appeared over time, and that some have become extinct. His observations were supported by his idea of natural disaster events, which he called “revolutions”—violent shifts in the environment that caused numerous species to become extinct.

**(b)** Malthus—wrote “Essay on the Principle of Population,” in which he explained that plants and animals of the world produce more offspring than will be able to survive. His essay was integral in helping both Wallace and Darwin support and develop their theories.
- (c)** Wallace—outlined a theory almost identical to Darwin’s in a paper that Darwin reviewed in 1858.

**(d)** Lyell—Darwin credits the reading of Lyell’s work in leading him to develop and support his theory of natural selection. He rejected catastrophism and developed the theory of uniformitarianism, which stated that geological processes operate at the same rate in the past as they do today.
- Both of these scientists realized that the environment has a great influence over animals which survive. Both scientists realized that the best traits will continue to be passed on to the next generation. They both came to the conclusion that, over time, individuals and populations change in response to changes in the environment.
- Birds and bats have wings that are very similar in their function, but their bone structures are very different. This implies that these organisms do not have a common evolutionary origin, but instead they developed similar traits because of available ecological niches within their environment. In other words, these analogous structures were designed for a similar purpose, regardless of their ancestral origin. The bat and the mouse demonstrate homologous structures. They are both mammals, so they are more closely related than bats and birds. The bat’s wing bone is homologous with a digit on the mouse’s forelimb.
- (a)** Animals on the islands evolved from migrants from the mainland. Any observable changes in the organisms were because of the environmental conditions of the new area.

**(b)** All individuals within a species have phenotypic and genotypic differences caused by the variation processes within meiosis and sexual reproduction, as well as the many mutations that occur within DNA.

**(c)** Because resources such as food are limited, species compete both within the species and with other species. Those individuals with the most successful adaptations will out-compete in this environment and will be the ones that reproduce the most. Resources in limited amounts are known as selective pressures.
- Student answers may include similarities between embryos in related groups, evolutionary relationships and common ancestry that can be traced back through DNA and proteins by the study of molecular biology, fossil similarity, anatomy and observing mutations in gene sequences.
- This is not an example of how particular traits are passed from one generation to the next. For an adaptation to be passed on (such as the broken leg and limp) it has to be an inheritable trait. This means that the gametes of the organism must contain the genes that code for this trait so that the offspring will develop the adaptive trait.
- One would find the oldest fossils in the lower layers, and the youngest ones closer to the surface of the fossil bed (in the upper layers), as long as there are no folds in which

the layers have been uplifted in certain areas. This would then cause the fossil layers to change, and the oldest fossils might be more towards the top.

8. Transitional fossils are fossils that show intermediary links between groups of organisms. Transitional fossils have helped scientists better understand the relationships between groups of organisms. They link the past with the present.
9. The following chart can be used to compare homologous structures to analagous structures:

|                      | <b>Structure</b>  | <b>Function</b>  | <b>Origin</b>                            |
|----------------------|---|--|--|
| Homologous Structure | have similar structural elements and origin e.g., forearms of human, frog, bat, porpoise, horse | similar structural elements do not have the same function e.g., limbs of animals used for grasping, jumping, flying, swimming, running | inherited from a common ancestor         |
| Analogous            | similarity in structure based on adaptation for the same function                               | body parts perform a similar function e.g., body shape and flippers in dolphins, penguins, and fish                                    | do not have a common evolutionary origin |

10. In all organisms, all cells that can replicate contain DNA. Since DNA carries genetic information, scientists can determine how closely related two organisms are by comparing their DNA. If two species have similar patterns in portions of their DNA, this similarity indicates that these portions of their DNA were most likely inherited from a recent common ancestor.