

Evidence for Evolution Worksheet

Directions: Read each passage. Based on the reading, answer the questions using complete sentences.

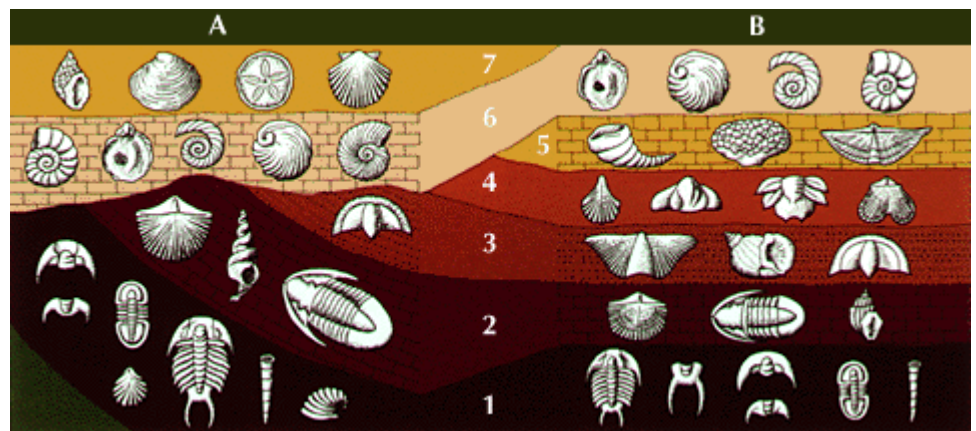
Scientists and crime solvers have something in common. They can both figure out what happened, even if no one was there to see it. They look for clues. The more clues that were left behind, the more likely they are to figure it out. If all of the clues point to the same conclusion, then they know what happened. Scientists have been gathering evidence for evolution for many years by looking at many different areas of science. Below are five areas of science that are discussed.

Paleontology shows us that organisms have changed gradually over time as reflected in the fossil record. Biogeography shows us how new species arise near the location of very similar species. Similar species share a common time and place. Developmental biology shows us that an organism builds on ancestral features as it develops from a single cell or embryo. Morphology shows us how organisms adapt ancestral features to new uses, even when there are more efficient solutions elsewhere in nature. Genetics shows us that we can group related species by the similarity of genes present in their genomes.

1. How are scientists like crime solvers? _____
2. What are the five areas of science mentioned that have evidence for evolution? _____

Paleontology - The Fossil Record

Scientists use the age of fossils as evidence for evolution. There are two ways of dating fossils: Relative dating and absolute dating. Relative dating uses a fossil's location in rock layers to determine that fossil's approximate age. Fossils found deeper in the ground are usually the oldest. Using the chart to the right, a paleontologist can therefore know that a fossil found in layer 1 at the dig site is older than a fossil found at layer 6, for example, by relative dating.



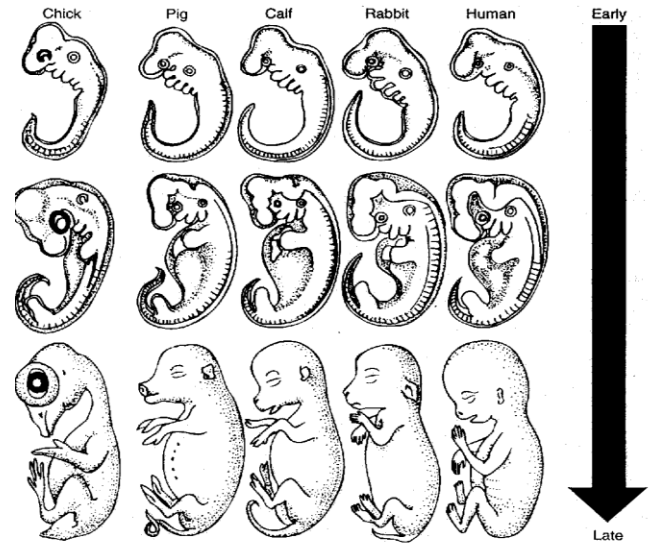
Absolute dating determines the fossil's actual age by measuring amount of an element called carbon-14 in the fossil. There is a mathematical formula that will calculate the rate of decay of this element. By measuring the carbon-14 levels and plugging it into the math formula, the scientist can know an actual number of years old a fossil is.

1. What are the two ways of finding the age of a fossil? _____
2. Describe how relative dating works. _____
3. What does absolute dating do? _____
4. Why is the element carbon-14 important for paleontologists? _____

Developmental Biology - Embryology

Many scientists use what an organism looks like as an embryo, or embryology, as evidence for evolution. The embryos of most vertebrates look very similar and have similar structures. For example, fish, bird, rabbit, and human embryos are similar in appearance in early stages. They all have gill slits and a tail with muscles to move it. Later as the embryos develop, they become less and less similar.

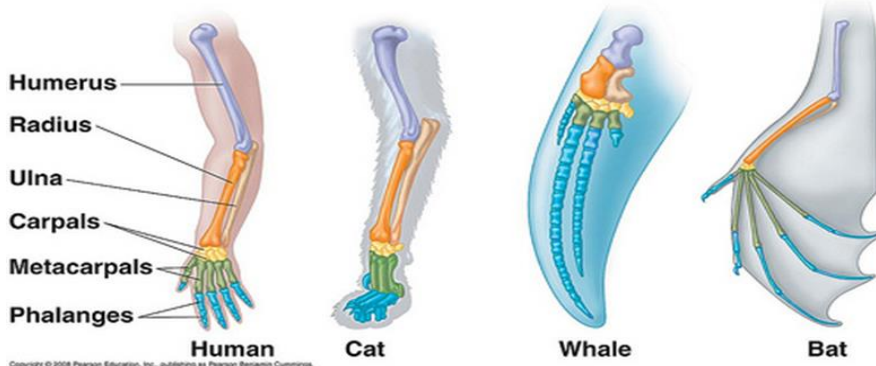
5. What does the study of embryology show when comparing most vertebrates? _____



Morphology - Comparative Anatomy

More evidence for evolution is offered by comparing the anatomy, or body parts, of different organisms. Many animals have body parts that are similar in both structure and function called homologous structures. The forelimbs of animals like humans, whales, birds, and other creatures are strikingly similar even though the forelimbs are used for different purposes such as lifting objects, swimming, or flying. The different changes in the forelimbs are adaptations to the needs of the organisms.

Darwin also observed that animals have structures that they do not use, which are called vestigial organs. These are structures that an organism has that do not have a function, though they may have had one in



the past. In humans they include the appendix, the fused tail vertebrae, and wisdom teeth. Perhaps an environmental change made the organ unnecessary for survival, and the organ gradually becomes nonfunctional. For instance, the appendix in human ancestors may have been an organ for digesting certain foods, but modern humans must no longer need it to digest food.

6. What is a homologous structure? _____

7. Describe a vestigial organ. _____

Genetics - DNA Evidence

Scientists can look at how similar two organisms' DNA is to see how closely they are related. Comparing the chromosomes of organisms lets scientists see the any differences between them such as chromosome number or the genes on the chromosomes. Our closest relatives, chimpanzees, gorillas and orangutans possess 48 chromosomes or 24 pairs, while humans possess 46 chromosomes or 23 pairs. The difference in our chromosome numbers could have two explanations. Either the human lineage lost a chromosome or there was a fusion between two chromosomes, which means a pair of chromosomes must have combined.

8. How does the study of genetics and DNA help the study of evolution? _____