

Evolution Exam 01

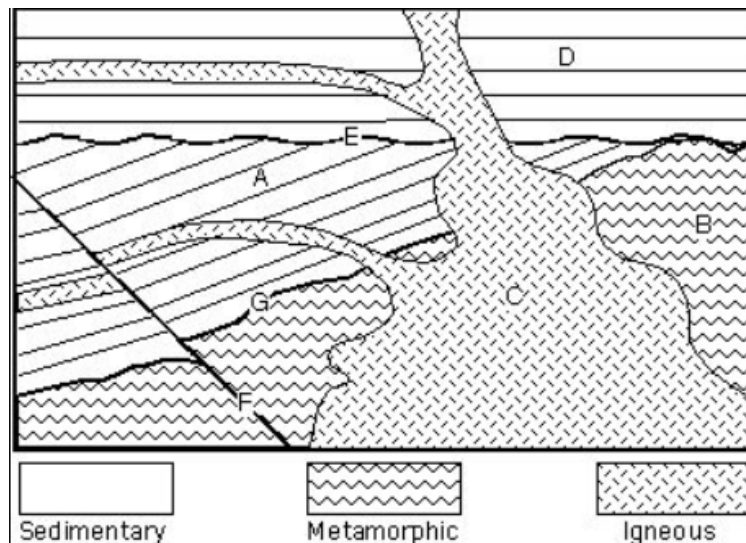
Name:

1. What is one major (global) biogeographic pattern pertaining to how the number of species varies by location? **Richness varies strongly with latitude, while composition varies with longitude.**

2. a) The balance between what rates determines the number of species present on an island? b) What physical attributes of an island impact those rates? c) The world's largest lizard, the Komodo dragon, is capable of a particular type of asexual reproduction called parthenogenesis, so a single female can produce a viable clutch of dozens of eggs without a male present. How does this trait impact the rates you named in a? **a) Extinction and immigration; b) Size of the island impacts extinction and distance from the mainland impacts immigration; c) Less sensitive to extinction due to not needing males. No change in immigration.**

3. Your coolest friend comes and asks you whether or not the pincers seen in lobsters are homologous to those seen in scorpions. a) How do you answer this excellent person? b) Your friend doubts you, so how would you collect some data to convince this person you're correct? **a) "They're segments of an arthropod, and so have some general homology, but they're independent evolution of the pincer form" OR "I'm not sure!"; b) You could 1) compare the detailed anatomy of the pincers to determine if their relationships to their anatomical structures are consistent, OR 2) compare the gene expression profiles to determine if the same genes are responsible for transforming a segment into a pincer OR 3) look at the distribution of the pincer trait across all arthropods to see if you find a pattern inconsistent with homology; OR 4) look at the developmental origins of each of the two structures to determine if similar populations of cells give rise to each. Most likely, you'd need to use at least 3 of these experiments.**

4. If you go outside in West Virginia and flip over rocks, you'll find snails. Likewise, if you go outside in New Orleans and flip over logs, you'll find snails. Which are more likely to be present in the fossil record millions of years from now, and why? **New Orleans, as they live in a depositional environment, rather than an erosional one. nota bene We talked about the Mississippi delta in class as a depositional environment, and WV as an erosional one.**



5. Using the geological rules we discussed, please order the layers and structures shown in this figure from oldest to youngest. **B forms. G cuts B. A on top of G (superposition). E cuts A. D on top of E. C cuts D. F cuts C. nota bene F was the tricky one, but it cuts across C! So by Cross-cutting Relationships, it must be younger than C.**

6. For several hundred years, people found fossils of a very strange type of fish that had a fin structure and skull structure more similar to tetrapods than to “normal” fish. These fossil forms were found all over the world. These fish were found in shallow marine and freshwater rocks from before tetrapods appeared all the way through the Mesozoic era, but they disappeared at the same time as the non-avian dinosaurs. As such, everyone thought they’d gone extinct at the same time. Until a woman named Mary Latimer found one off the coast of Africa in 1938. Although a bit different, the skeleton was recognizable as being the same sort of fish, as its anatomy was very similar to the fossilized forms. A world-wide hunt ensued for more specimens, and across the former British Empire it was known as the “100-quid fish” in honor of the bounty placed on it. Eventually more were found, and it is now known that it is quite abundant in the deep reaches of the Indian Ocean. Please describe the two **most probable** explanations for why this strange fish (the living genus is called *Latimeria*) may not have left any fossils for so long. Moved to an environment that wasn’t readily preserved (deep sea). Moved to a geographic region that wasn’t preserved (area without uplift). *nota bene* We talked in class about how erosion (practically) does not occur under the ocean.

7. a) What is anagenesis, b) is it a bigger problem for data on living organisms, or extinct organisms, and c) why did you give the answer you did for b? Anagenesis is the change in form of a population through time, which is a bigger problem for extinct organisms as 1) we have long time series of occurrences and 2) fossil organisms are only known from their form, so it can be difficult to tell if the form changed or if a new, separate species appeared.

8. Please compare and contrast the quality of information about species through time and across space in the modern world and in the fossil record. Modern world has great data on spatial distribution, bad data on temporal distribution. Fossil record is the reverse.

9. Vertebrates have evolved powered flight three times: in bats, birds and pterosaurs. a) Which appears in the fossil record first? b) Which has the most species in the fossil record? c) Which two clades never overlapped in time? a) Pterosaurs, b) Birds, c) Pterosaurs & bats

10. What are the necessary and sufficient conditions for natural selection? Variation that is heritable and that influences the probability of reproduction.