

1. Approximately how many species of animals currently exist on earth? Approximately how many of those are vertebrates?
2. Name the seven “traditional” vertebrate classes and their major subgroups. Include equivalent names as appropriate. For each class, give the approximate number of species. What are gnathostomes, tetrapods, and amniotes?
3. Define the terms “species”, “population” and “gene flow”.
4. Describe the process of natural selection, including Darwin’s postulates. Define all relevant terms (e.g., fitness, adaptation, etc.).
5. Explain the phrase “genetic variation is random with respect to the environment.” Can natural selection create “perfect” organisms? Why or why not? Use examples as appropriate to justify your answer.
6. Compare and contrast anagenesis and cladogenesis.
7. Outline the process of allopatric speciation; include at least brief descriptions of the processes of vicariance and dispersal. What is an adaptive radiation?
8. Define the terms “systematics”, “taxonomy”, and “classification” and explain the importance of each. On what basic points of classification do biologists agree? Describe the two basic conventions of Linnaean classification (binomial nomenclature and the taxonomic hierarchy). Be able to correctly write a scientific name and identify the major levels of the taxonomic hierarchy.
9. Describe the process and reasoning currently used to infer phylogenetic relationships (i.e., to reconstruct phylogeny) from patterns of similarity and difference among organisms. Be sure to define the terms homology, homoplasy, outgroup, clade, synapomorphy (shared, derived character), symplesiomorphy (shared, primitive character), and apomorphy (unique, derived character). What kinds of characters can be/are used for phylogeny reconstruction? Given a cladogram, be able to correctly interpret the branching pattern it depicts. Given a set of taxa and character states, be able to construct the simplest cladogram that can be inferred from the characters.
10. Compare and contrast evolutionary systematics and cladistics in terms of their taxonomic philosophies. On what basic points do members of the two “schools” agree? On what do they disagree? What advantages and disadvantages does each present? Can either be called “correct”? Why or why not? Use the relationships and classification of crocodiles, dinosaurs, and birds to illustrate your answer.