

Evolution BIOL403 Spring 2008

1. (6 pts) What were the two central propositions set out by Darwin in the Origin of Species?

2a,b. Identify each pair of traits as either homologous or analogous, and say why.

2a. (4 pts) The arm bones of a bat and a bird

2b. (4 pts) The wing of a bat and a bird

3. (18 pts) List three predictions of evolution as a branching tree. For each prediction provide a (different) real world supporting example.

4. (4 pts) List two problems with the view of evolution as a ladder.

5. (4 pts) What aspect of the theory of natural selection did early Mendelians not accept?

6. (4 pts) What are (different) alleles?

7. (4 pts) Experiments using bacteria and single celled eukaryotes suggest that single mutations have on average what kind of effects on fitness? How would this generalization be modified with respect to the expected effects of mutations in humans?

8. (4 pts) Why is the number of mutations per genome per generation (not per cell division) of key importance to natural selection?

9. (4 pts) In mutation accumulation experiments using *C. elegans*, why is one individual chosen at random to found each new generation?

10. (4 pts) What is the evolutionary explanation for similarly very low mutation rates per DNA base replication in many different organisms? Why is HIV an apparent exception to this rule?

11. (4 pts) List two contributing factors to differences between eukaryotic organisms in the number of mutations/genome/generation.

12. (4 pts) List two processes which can generate new genetic variation for a phenotypic trait (for example, oil content in a population of corn plants).

13. (16 pts) List four requirements for natural selection to operate. For each requirement, provide an evaluation of how/whether the requirement is met for the example of the evolution of AZT resistance in HIV occurring within a single host individual (taking the antiretroviral drug AZT).

14. (4 pts) Give two reasons why offspring may resemble their parents.

15. (4 pts) Some organisms appear to have scarcely changed their phenotype over many millions of years (“living fossils”). What evolutionary explanation accounts for this observation?

16. (4 pts) Each human is born with more than one new deleterious mutation in their genome (on average). This has probably been true for many thousands of generations. Why then do evolutionary biologists think it is a concern now?