

CHAPTERS 24-25: Evidence for Evolution and Phylogeny

1. For each of the following, indicate how it is used as evidence of evolution by natural selection or shown as an evolutionary trend:

a. Paleontology - _____

b. Homologous structures - _____

c. Analogous traits - _____

d. Convergent evolution - _____

e. Parallel evolution - _____

f. Co-evolution - _____

g. Vestigial organs - _____

h. Embryology - _____

i. Biochemical similarities - _____

2. What does the comparison of the cytochrome c gene over many species show?

3. What are the mechanisms of molecular evolution?

4. What is meant by the neutral theory of molecular evolution?

5. What is a genome?

6. What does the studies of gene families show?

7. What is a phylogenetic tree?

8. How does the "tree analogy" represent the evolutionary relationships of creatures?

9. Why might it be said that the above "tree" is more like a "bush"?

Name: _____

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10. What is a clade?

11. What is Occam's razor?

12. What is binomial nomenclature?

13. What are the seven classification subgroups below domain in order of most general to most specific?

14. Describe the difference between the following:

a. monophyletic - _____

b. polyphyletic - _____

c. paraphyletic - _____

END OF CHAPTER 24 MULTIPLE CHOICE

1. A higher rate of synonymous than nonsynonymous substitutions in a protein-coding gene is expected under
 - A) stabilizing selection.
 - B) positive selection.
 - C) neutral evolution.
 - D) concerted evolution.
 - E) none of the above

2. Before nucleotide and amino acid sequences can be compared in an evolutionary framework, they must be aligned in order to account for
 - A) deletions and insertions.
 - B) selection and neutrality.
 - C) parallelisms and convergences.
 - D) gene families.
 - E) all of the above

3. Models of nucleotide sequence evolution, developed by biologists to estimate sequence divergence, include parameters that account for
 - A) substitution rates between different nucleotides.
 - B) differences in substitution rates across different positions in a gene.
 - C) differences in nucleotide frequencies.
 - D) all of the above
 - E) none of the above

4. The rate of fixation of neutral mutations is
 - A) independent of population size.
 - B) higher in small populations than in large populations.
 - C) higher in large populations than in small populations.
 - D) slower than the rate of fixation of deleterious mutations.
 - E) none of the above

5. Genome size differs widely among different species. What is the greatest contributing cause for these differences?
 - A) The number of protein-coding genes
 - B) The amount of noncoding DNA
 - C) The number of duplicated genes
 - D) The degree of concerted evolution
 - E) The amount of positive selection for change in protein-coding genes

6. Which of the following is not true of concerted evolution?
- A) Concerted evolution refers to the nonindependent evolution of some repeated genes within a species.
 - B) Unequal crossing over may produce concerted evolution.
 - C) Biased gene conversion may produce concerted evolution.
 - D) Ribosomal RNA genes are an example of a gene family that has undergone concerted evolution.
 - E) Concerted evolution results in divergence of members of a gene family within an organism.
7. When a gene is duplicated, which of the following outcomes may occur?
- A) Production of the gene's product may increase.
 - B) The two copies may become expressed in different tissues.
 - C) One copy of the gene may accumulate deleterious substitutions and become functionless.
 - D) The two copies may diverge and acquire different functions.
 - E) All of the above
8. Paralogous genes are genes that trace back to a common
- A) speciation event.
 - B) substitution event.
 - C) insertion event.
 - D) deletion event.
 - E) duplication event.
9. Which of the following is true of *in vitro* evolution?
- A) *In vitro* evolution refers to bioprospecting for naturally occurring macromolecules.
 - B) *In vitro* evolution can produce new molecular sequences not known from nature.
 - C) *In vitro* evolution can only produce new proteins.
 - D) *In vitro* evolution only selects for changes that were present in the starting pool of molecules, and does not introduce any new mutations.
 - E) All of the above
10. Which of the following is true of the use of molecular evolutionary studies of human disease?
- A) Molecular evolutionary studies are useful for identifying many diseases.
 - B) Molecular evolutionary studies are often used to determine the origin of emerging diseases.
 - C) Molecular evolutionary studies are important for developing vaccines against diseases.
 - D) Molecular evolutionary studies are used to determine whether outbreaks of polio are the result of naturally occurring viruses or viruses that have evolved from attenuated viruses.
 - E) All of the above

END OF CHAPTER 25 MULTIPLE CHOICE (tough ones)

11. A clade is
- A) a type of phylogenetic tree.
 - B) a group of evolutionarily related species that share a common ancestor.
 - C) a tool for constructing phylogenetic trees.
 - D) an extinct species.
 - E) an ancestral species.
12. Phylogenetic trees may be reconstructed for
- A) genes.
 - B) species.
 - C) major evolutionary groups.
 - D) viruses.
 - E) All of the above
13. A shared derived trait, used as the basis for inferring a monophyletic group, is called
- A) a synapomorphy.
 - B) a homoplasy.
 - C) a parallel trait.
 - D) a convergent trait.
 - E) a phylogeny.
14. The parsimony principle can be used to infer phylogenies because
- A) evolution is nearly always parsimonious.
 - B) it is logical to adopt the simplest hypothesis capable of explaining the known facts.
 - C) once a trait changes, it never reverses condition.
 - D) all species have an equal probability of evolving.
 - E) closely related species are always very similar to one another.
15. Convergent evolution and evolutionary reversal are two sources of
- A) homology.
 - B) parsimony.
 - C) synapomorphy.
 - D) monophyly.
 - E) homoplasy.

16. Which of the following are commonly used to infer phylogenetic relationships among plants but not among animals?
- A) Nuclear genes
 - B) Chloroplast genes
 - C) Mitochondrial genes
 - D) Ribosomal RNA genes
 - E) Protein-coding genes
17. Which of the following is not true of maximum likelihood or parsimony methods for inferring phylogeny?
- A) The maximum likelihood method requires an explicit model of evolutionary character change.
 - B) The parsimony method is computationally easier than the maximum likelihood method.
 - C) The maximum likelihood method is easier to treat in a statistical framework.
 - D) The maximum likelihood method is most often used with molecular data.
 - E) Parsimony is usually used to infer time on a phylogenetic tree.
18. Taxonomists strive to include taxa in biological classifications that are
- A) monophyletic.
 - B) paraphyletic.
 - C) polyphyletic.
 - D) homoplastic.
 - E) monomorphic.
19. Which of the following groups have separate sets of rules for nomenclature?
- A) Animals
 - B) Plants and fungi
 - C) Bacteria
 - D) Viruses
 - E) All of the above
20. If two scientific names are proposed for the same species, how do taxonomists decide which name should be used?
- A) The name that provides the most accurate description of the organism is used.
 - B) The name that was proposed most recently is used.
 - C) The name that was used in the most recent taxonomic revision is used.
 - D) The first name to be proposed is used, unless that name was previously used for another species.
 - E) Taxonomists use whichever name they prefer.