

Name:

Bioinformatics Take Home Test #5

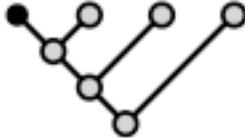
Due Date Monday 10/31/2016 before class

(This is an open book exam based on the honors system -- you can use notes, lecture notes, online manuals, and text books.)

Teamwork is not allowed on the exams, write down your own answers, do not cut and paste from webpages. If your answer uses a citation, give the source of the quoted text.)

All questions worth 1pt unless otherwise stated

1. If the black dot in the cladogram represents a derived character, what does it represent?



- A) synapomorphy
- B) sympleisomorphy
- C) autapomorphy
- D) homoplasy
- E) homology

2. True/False A cladogram may define clades in the absence of a rooted phylogeny.

3. Which of the following refers to a group shown in an unrooted tree?

- A. Clade
- B. Clan
- C. Synapomorphy
- D. Monophyletic group
- E. None of the above

4. True/False dotlet can do DNA-DNA comparisons

5. True/False Both group 2 intron and spliceosomal introns form lariat loops.

6. True/False The distribution of the intron found in mosquito on a phylogenetic tree supports the Intron Early hypothesis.

7. True/False For exon shuffling to work, the introns need to be in the same phase.

8. Which of the following programs uses a guide tree to align sequences?

- A. Muscle
- B. Clustal
- C. GBlocks
- D. BLAST
- E. Needleman Wunsch (as applied in C++)

9. True/False In human and plant genes introns occur frequently; however, there are always slightly more nucleotides in the exon than in the intron sequences.

10. Which of the following is the closest phylogenetic grouping for the mitochondrial endosymbiont?

- A. A protist
- B. An Archaeon
- C. The same as that of the nuclear genome from which the mitochondria came.
- D. *Escherichia coli*
- E. An Alpha-Proteobacterium

11. Brown Algae and Diatoms have which type of plastids?

- A. Primary (i.e. endosymbiosis with a Cyanobacterium)
- B. Secondary (i.e. an endosymbiosis with a Eukaryote with a primary plastid)
- C. Tertiary (i.e. an endosymbiosis with a secondary plastid)
- D. Quaternary (i.e. an endosymbiosis with a tertiary plastid)
- E. None. Photosynthesis occurs across the primary cell membrane

12. Give a few examples (at least 5) of eukaryotic algae becoming endosymbionts in other eukaryotic cells. Give the name of the host, and the name of the symbiont in parenthesis, if known, else a question mark.

0 *Euglena gracilis* (?)

1
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13. Which organisms constitute the archaeplastida?

- A. Red, Green, and Brown Algae
- B. All photosynthetic Eukarya
- C. Glaucophytes, Red Algae, Green Algae (I & II), and Plants
- D. Everything that has a Red Algae endosymbiont
- E. Everything that has a Green Algae endosymbiont

14. Terrestrial tetrapods evolved from within the bony fish. Which of the following is true of a group of all of the bony fish, excluding terrestrial tetrapods?

- A. It is a grade
- B. It is a paraphyletic group
- C. It is NOT a proper taxonomic unit
- E. All of the above

15. Birds and bees both have wings. Which of the following is true?

- A. Wings are a homoplasy and a group comprised of birds and bees is a polyphyletic group
- B. Wings are a synapomorphy and a group comprised of birds and bees is a monophyletic group
- C. Wings are a homoplasy and a group comprised of birds and bees is a paraphyletic group
- D. Wings are a symplesiomorphy and a group comprised of birds and bees is a paraphyletic group

16. Which of the following programs produces a guaranteed optimal alignment (as measured by the alignment score), but with the possibility that there might be many equally optimal pathways/traces through the scoring table?

- A. Muscle
- B. Needleman-Wunch algorithm
- C. Clustal
- D. Seaview
- E. Jalview

17. What are possible benefits to having introns? (list as many as come to mind)

18. In the evolutionary history leading to fish several rounds of whole genome duplication occurred. What is the total number of duplication events that have occurred in bony fish?

- A. 0
- B. 1
- C. 2
- D. 3
- E. 4

19. In the evolutionary history leading to mammals for several rounds of whole genome duplication occurred. What is the total number of duplication events that have occurred in the lineage leading humans?

- A. 0
- B. 1
- C. 2
- D. 3
- E. 4

20. What may cause the difference between the leading and the lagging strands in Bacterial chromosomes?

- A. Coding sequences tend to have a different composition than the complementary strand
- B. There are sequence tags in the genome that tell the DNA polymerase when to stop
- C. Most genes are coded in the same direction as replication, so that the RNA polymerase doesn't interfere with the DNA polymerase by going in the opposite direction
- D. All of the above

21. How are self-splicing introns removed from the mRNA?

- A. A lariat loop is formed in group I and group II introns, and this structure is responsible for cleaving the transcript and joining the ends of the exons together.
- B. There is an open-reading frame within the intron, which codes for the protein, which does the splicing.
- C. A mobile genetic element located elsewhere in the genome codes for the protein complex responsible for the splicing.
- D. None of the above.

22. What are Go plots and Go modules, and why are they named this way?