Name:

Bioinformatics Take Home Test #5

Due Date Wednesday 11/02/2015 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.)

Make sure each answer is only on one page, by using page breaks. Splitting an answer onto two pages leads to grading errors.

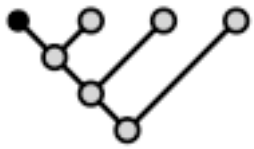
Do not write or type in font smaller than 12 point or write in cursive. Doing so will lose you 2 pts.

If you have an emergency and cannot submit a quiz in person, email it in by the start of class on the due date. If you do so, first remove the instructions and extras (blank lines, alternative answers for multiple choice questions) from your document, so that only your answers, a minimal amount white space, and optionally the questions, are left.

Note on Late Quizzes: Late quizzes are an inconvenience and cannot be accepted at all after the answers have been released. If your quiz is submitted within the first 12 hours after the deadline, you will receive 5% off. Each additional 12 hours is an additional 5% off, up until the graded quizzes are returned or the answers released.

All questions worth 1pt unless otherwise stated.

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



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

2. True/false Jalview can be used to prove that two sequences are homologous beyond a reasonable doubt by generating the evolutionary tree of these sequences.

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

4. Which of the following refers to a group shown in an unrooted tree?
A. Clade
B. Clan
C. Synapomorphy
D. Monophylic group
E. None of the above

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

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

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

8. True/False Scaled branches on a phylogenetic tree take into account all changes over time.

9. 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++)

10. Which of the following can be used to align sequences?
a. Needleman Wunsch is an algorithm
b. clustalw & clustalx
c. SAM
d. eye
e. all of the above

11. Which of the following in 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-Proteo Bacteria

12. 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

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

15. What is a grade?
A. Another name for a clade
B. A type of proper taxonomic unit
C. A paraphyletic group of organisms defined by a symplesiomorphy
D. A monophyletic group of organisms defined by a synaposomorphy
E. A polyphyletic group of organisms defined by a homoplasy

16. 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 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

18. Which term means shared derived characters?
A. Symplesiomorphy
B. Synapomorphy
C. Autapomorphy
D. Homoplasy

19. Why has the new term amniote has replaced the old term reptile as the proper taxonomic term?
A. Reptile is unspecific; no one really knew what a reptile was.
B. Trick question. Reptile is still an accepted taxonomic category
C. The birds and mammals have the nerve to have not gone extinct, making reptiles a paraphyletic group. Amniote includes the birds and mammals.

D. Reptiles turned out to be a paraphyletic group. Most of them were retained as a group, the amniotes, while a few were removed to a different clade.
E. None of the above.

20. Which of the following programs produced 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

21. Which term means shared derived characters?
A. Symplesiomorphy
B. Synapomorphy
C. Autapomorphy
D. Homoplasy

22. What is sympleisiomorphy?
a) a distinctive anatomical feature, unique to a terminal group
b) ancestral trait shared by 2 or more taxa
c) characteristic present in ancestral species and shared by ALL descendants
d) all of the above
e) none of the above

23. What are the benefits to having introns?
A. Exon shuffling
B. Alternative splicing
C. One Gene can turn into many different products
D. All of the above

24. In the evolutionary history leading to fish for 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

25. What advantage does Hennig's form of taxonomy has over Ashford's revised form, resulting in Hennig's form being the primary form used today?
A. Trick Question: Ashford's revised form is a great improvement
B. It is more precise, while Ashford's imprecise definitions are basically useless
C. Hennig recognized groups composed of shared primitive characters
D. It allows us to separate humans out of groups that we were previously lumped into, i.e. apes, mammals, and animals.

E. None of the above.

26. 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

27. Recombination events occur during replication and some rearrangements could mess up the directional sequence tags that tell the DNA polymerase when to stop. What phenomenon does this cause?
A. Genome rearrangement tends to occur equidistant from the origin of replication.
B. Gene synteny
C. The upward sloping diagonal seen on genome versus genome plots of BLAST searches
D. GC compositional bias
E. Monophyly

28. How are self-splicing introns removed from the mRNA?
A. A lariat loop is formed 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.

29. In a gene tree, which of the following types of homologs best specifies homology, when the basal bifurcation is caused by gene duplication?
A. homolog
B. paralog
C. hololog
D. ortholog
E. homeolog

30. Which of the following types of homologs best specifies homology through a bifurcation caused by speciation?
A. homolog
B. paralog
C. hololog

D. ortholog

31. _____ is a sequence alignment program that aligns an amino acids where homology is questionable to gaps in other sequences, resulting is visual displeasing, gappy sequences?
A. MUSCLE
B. PRANK
C. CLUSTALX
D. DOT PLOT
E. MAFT

32. Submit your own question by 4pm on Wednesday

Extra credit: 2pt
A. What happened to cause the downfall of the Five Kingdoms of Life?

B. What does this have to do with Hennig's cladistics?