Phylogenetics (25 points)

Part I: SHORT ANSWER or FILL-IN-THE-BLANK or TRUE/FALSE (8 points total). Provide the appropriate answer or fill in the blank with the appropriate term.

1. Give an example of a character and three character states for it. (2 pts)
   Many possibilities, e.g., petal color (white, yellow, pink); leaf arrangement (alternate, opposite, whorled).

2. Select the one best answer: The phylogenetic tree that explains the observed data in the smallest number of steps is said to be the most ____________________ tree (or explanation). (1 pt)
   a) homoplasious
   b) apomorphic
   c) parsimonious
   d) cladistic
   e) decorated

3. Disregarding branch lengths, which one of the three phylogenetic trees to the right does not show the same topology as the other two? In what way does it differ? (2 pts)
   Tree a. It is different because Alpha and Gamma are sister to each other, whereas in the other two trees, Alpha and Beta are sister.

4. If a symmetrical samara fruit type is shared by all members of the elm family, it would be an example of a(n) ___synapomorphy___ for the family. (1 pt)

5. True or false? The land plants (embryophytes) are an example of a monophyletic group. (1 pt)
6. True or false? Rhizomes, stolons and stems are considered to be homologous structures. (1 pt)

Part II: PHYLOGENY INTERPRETATION (refer to the phylogeny on p. 3 to answer the questions in this section). (17 pts)

1. Taxa A, B, C, D, E, F, G, and H are collectively known as the ____ ingroup _____. (1 pt)

2. What does each numbered hash mark represent? (2 pts)

   A character state transformation

3. Which character state changes in the A-H clade represent synapomorphies? (5 pts)

   1, 2, 3, 4, 5, 6, 7, 8, 11, 12

4. Which character state change(s) in the A-H clade represent autapomorphies? (1 pt)

   9

5. Which character(s) exhibit homoplasy? (2 pts)

   10

6. What is the length of the tree (that is, how many steps are there)? (2 pts)

   13

7. Which clade is sister to the A-C-H-D clade? (2 pts)

   The G-E clade.

8. Give an example of one monophyletic group from this phylogeny. (2 pts)

   Many possibilities—just double-check to be sure they are correct.