Bio 203 Test 2 Practice Questions 1

1   Describe the approaches to systematics used by the following people.

Aristotle

Linnaeus

deQueiroz

2   Contrast the environment when the earth was first formed and life first evolved, vs. the environment now.

3   Describe the Miller-Urey experiment. What did Miller find? Why was this experiment important for 'origin of life' studies?

4   What is the "RNA world" hypothesis? Why is this hypothesis relevant to theories regarding the evolution of early life?

5   Describe hypotheses for how eukaryotic cells evolved to include mitochondria.

6   Describe hypotheses for the origin of multicellularity.

7   Give examples of the following terms: apomorphy, plesiomorphy, synapomorphy, convergence, homoplasy, homology. Be clear about why your example fits with the term. That is, e.g., be able to describe why your example of 'homology' is not interpretable as 'convergence'. [hint 1: these are terms for traits, not taxa/species] [hint 2: if you can't think of your own examples—i.e., examples that were not given in class—you probably do not understand the term]

8   Imagine you want to reconstruct the phylogenetic relationships of the genus *Pristimantis* (454 species). Why is this a difficult problem?

9Discuss desirable properties of data to be used for reconstructing phylogeny.

10   Which happened first: origin of photosynthesis, or origin of multicellularity?

11   Draw a phylogenetic tree of the relationships of Chytridiomycota, *Salmonella*, gerbera daisies, ferns, mosquitoes, roses, Gregg Popovich, *Anolis*, Ctenophora.

12   compare and contrast the views of cladists, pheneticists, and evolutionary taxonomists. Give an example where adherents to each these views would disagree on taxonomy.

13   Why do we consider 'Prokaryotes' to be a paraphyletic group? Give another example of a paraphyletic group.

14   Characterize the circled groups as either monophyletic, paraphyletic, or polyphyletic.
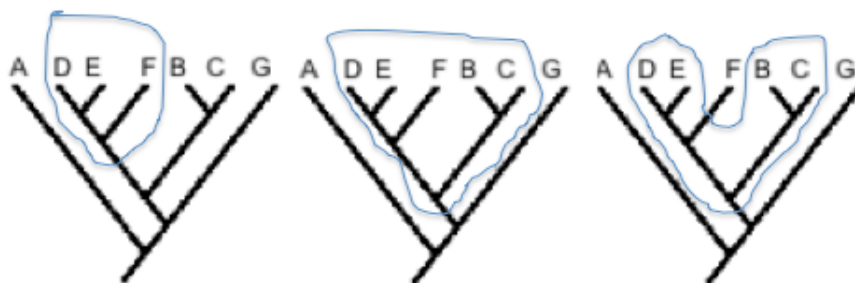
15   Discuss the types of data available for reconstructing phylogeny.

16   For the following dataset, draw the optimal tree according to the parsimony criterion. Use *Salmonella* as your outgroup. Does the resulting tree make sense, according to the trees presented in lecture?

Give the parsimony length (# of changes) of this optimal tree. [answer: length = 7]

Also draw a pairwise distance matrix for these taxa and these 5 DNA characters, assuming that the number of DNA differences is your distance measure.

	1 2 3 4 5
Salmonella	A C T G G
Gary Busey	C G A T C
sunflower	A G T A C
horned lizard	C C A A C

17   Why are DNA sequence characters so popular for phylogenetic analyses?

18   Compare/contrast parsimony, distance, and Bayesian methods for reconstructing phylogeny.

19   What is an 'ecomorph'? How was this concept applied in *Anolis* lizards?

20   Compare and contrast the Linnaean and phylogenetic approaches to taxonomy.

21   A baboon was selected for interspecies transplantation of heart to a human in 1984 (the "Baby Fae" case). Would some other species have been a better choice? Why?

22   Describe how phylogenetics may be used to target sources for drug development.

23   You notice that closely related frogs of the genus *Eleutherodactylus* on four islands of the Lesser Antilles—Nevis, Montserrat, Guadeloupe, Dominica--differ in body size and call (=the sound made when a male tries to attract a female). On each island, there is a large, a medium, and a small species. No frog species is present on more than one island. How would you test whether this *Eleutherodactylus* clade is an adaptive radiation? What evidence would suggest an adaptive radiation? What evidence would suggest otherwise?

24   Describe Dr. Jack Szostak's model for the origin of life (see http://www.youtube.com/watch?v=U6QYDdgP9eg)

25   Compare the morphology of prokaryote and eukaryote cells.

26   Contrast protostome and deuterostome development, and list some taxa that display each kind of development.

27   What are hyphae?

28   Describe a generalized plant life cycle ('alternation of generations'). Note which stages are diploid and which are haploid.

29   What are seeds? Which plant taxa possess seeds?

30   List some taxa of Fungi and describe morphological traits that allow these taxa to be distinguished.

31   Describe the vascular system of plant. Which plant taxa lack a vascular system?

32   What is a coelom?

33   Describe metabolic approaches used in Prokaryotes.

34   Which plant groups have flowers? Why might flowers be considered a 'key innovation'?

35   Give some examples of molluscs (i.e., common names of taxa/species).

36   Several species of lizard of the genus *Liolaemus* are viviparous, and some are oviparous. This genus lives at high and intermediate elevations in the Andes mountains. Herpetologists have hypothesized that viviparity evolves when lizard species invade high elevations. How would you test this hypothesis?

37   Imagine that a population of cichlids lives in lake 1 but the other lakes initially have no fish. First, some members of the population move to lake 2 and form a breeding population. Later, some other members of the population in lake 1 disperse to lake 3 and form a breeding population. Lastly, some individuals of the population in lake 1 disperse to lake 4 and form a breeding population. Draw a phylogenetic tree of populations in lakes 1, 2, 3, 4.
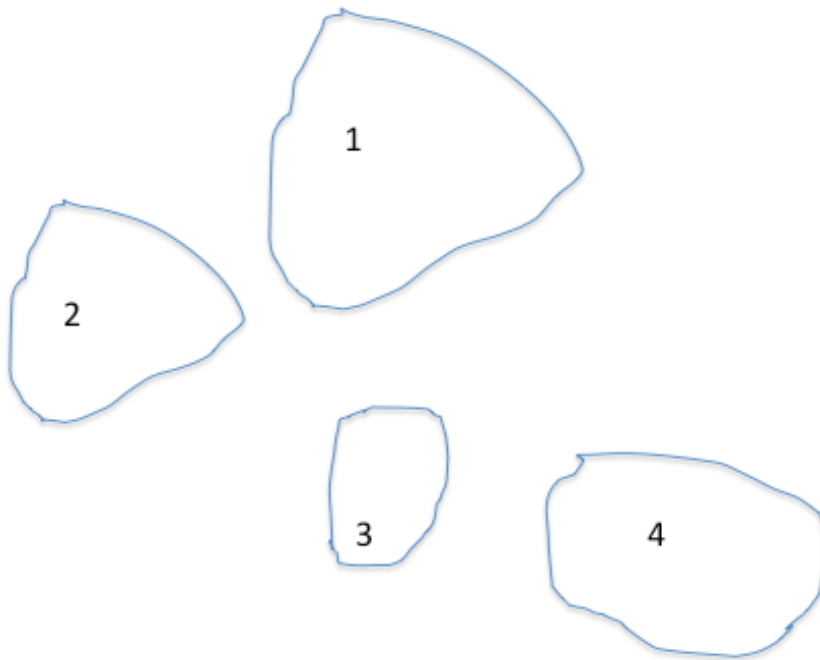
38   Circle those trees that show the same relationships as tree X.

[answer: top left, top right, bottom middle]

A B C D E F G

X

E D F G B C A   A D E F B C G   C B G E D F A

A B C F E D O E G   B C F D E G A   A B C G F E D
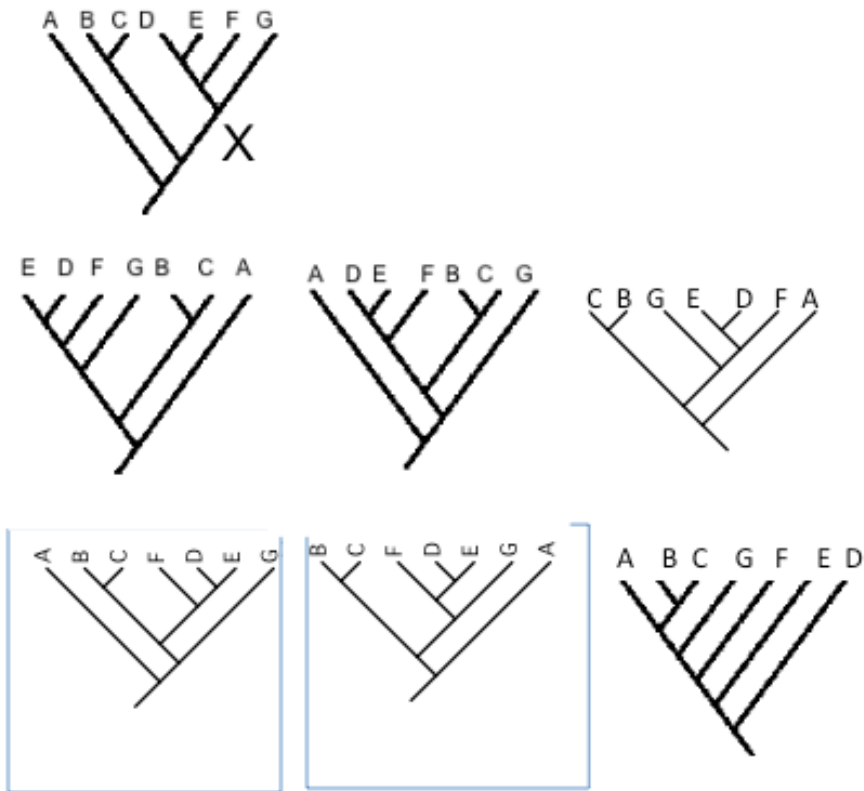
39   Use the following set of phylogenetic relationships to give a (verbal, not graphical) node-based definition of a group that includes *B. debilis* and *B. valliceps* but not *B. speciosus*. Also give a stem-based definition for this group.

Bufo alvarius   *Bufo valliceps*   *Bufo houstonensis*   *Bufo debilis*   *Bufo speciosus*

40   What is the difference between a cladogram and a phylogram?

41   What is the difference between a hard polytomy and a soft polytomy in phylogenetics?