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BIOL 325 – Plant Systematics
Sample Exam 2 from years past Name:_____

Instructions:

- Do not open this exam packet until you are asked to do so by your Professor.
- All answers are to be bubbled in onto a Scantron answer sheet using a number 2 pencil.
- For each question, you should choose the best, single answer of those provided.
- You must hand in both the Scantron sheet and this question packet at the end of the exam period.

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1. Who did I credit as inventing the dichotomous key?
   A. Theophrastus
   B. Dioscorides
   C. Linnaeus
   D. Lamarck
   E. Cronquist

2. Who wrote an herbal that was used for nearly 1500 years?
   A. Theophrastus
   B. Dioscorides
   C. Linnaeus
   D. Lamarck
   E. Cronquist

3. Who is credited with inventing the binomial system of nomenclature used today?
   A. Theophrastus
   B. Dioscorides
   C. Linnaeus
   D. Lamarck
   E. Cronquist

4. Binomials are used for which taxonomic rank?
   A. Subspecies
   B. Genus
   C. Family
   D. Order
   E. Species

5. Which of the two could be credited with developing a foundation for phenetic thinking and methodology in classification?
   A. Hennig and Sokal
   B. Sokal and Linnaeus
   C. Adanson and Sneath
   D. Theophrastus and Dioscorides
   E. Lamarck and Darwin

6. Who considered *Magnolia* and its flowers more evolutionarily derived amongst the angiosperms?
   A. Theophrastus
   B. Engler
   C. Linnaeus
   D. Lamarck
   E. Cronquist

7. Who considered *Magnolia* and its flowers more evolutionarily primitive amongst the angiosperms?
   A. Theophrastus
   B. Engler
   C. Linnaeus
   D. Lamarck
   E. Cronquist

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For questions 8-17, refer to the three dendrograms (A-C) of 4 taxa (W, X, Y, and Z) that appear on the last page of this packet.

8. Use the following data matrix of 4 taxa (w, x, y, and z) and 5 characters (1-5) in a phenetic analysis.

	Char. 1	**Char. 2**	**Char. 3**	**Char. 4**	**Char. 5**
w	0	0	0	0	0
X	0	0	0	0	1
Y	0	0	1	1	1
Z	1	1	1	1	0

Treat the three dendrograms on the last page of this test as possible phenograms. Which is the best phenogram? (2 pts)

A. A B. B C. C

9. In the above analysis, what is the similarity between w and x?
   A. 0.0
   B. 0.2
   C. 0.4
   D. 0.6
   E. 0.8

10. In the above analysis, what is the similarity between y and z?
   A. 0.0
   B. 0.2
   C. 0.4
   D. 0.6
   E. 0.8

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11. Use the following data matrix of 4 taxa (w, x, y, and z) and 5 characters (1-5) in a cladistic analysis. The matrix is exactly the same as in 8, with the exception that an outgroup taxon is included.

	Char. 1	**Char. 2**	**Char. 3**	**Char. 4**	**Char. 5**
Outgroup	0	0	0	0	0
w	0	0	0	0	0
X	0	0	0	0	1
Y	0	0	1	1	1
Z	1	1	1	1	0

Now treat the three dendrograms on the last page of this test as possible cladograms. Which is the most parsimonious cladogram: A, B, or C? (3 pts)

A. A B. B C. C

12. In the above data matrix, State 0 for Characters 1 and 2 are shared between taxa w, x and y. Based on the most parsimonious cladogram and Fitch Optimization, what is State 0 for these three taxa?

A. An autopmorphy.
B. A synapomorphy.
C. A symplesiomorphy.
D. Analogous
E. Homoplasy

13. In the above data matrix, State 1 for Character 4 is shared between taxa y and z. Based on the most parsimonious cladogram and Fitch Optimization, what is State 1 for these two taxa?

A. An autopmorphy.
B. A synapomorphy.
C. A symplesiomorphy.
D. Analogous.
E. Homoplasy.

14. In the above data matrix, State 1 for Character 5 is shared between taxa y and x. Based on the most parsimonious cladogram and Fitch Optimization, what is State 1 for these two taxa relative ?

A. An autopmorphy.
B. Anaologous.
C. Homologous.
D. Absence of petals.
E. Absence of vertebrae.

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15. Of those three possible cladograms, how many steps is the most parsimonious cladogram when including the outgroup in the cladogram?

A. 4
B. 5
C. 6
D. 7
E. 8

16. Of those three possible cladograms, how many steps is the second most parsimonious cladogram when including the outgroup in the cladogram?

A. 4
B. 5
C. 6
D. 7
E. 8

17. Are the groupings among the taxa the same when comparing the two approaches to classification, phenetics and cladistics, regarding the data matrix used above in Questions 8 and 11?

A. Yes B. No

18. What is another term for primitive?

A. Derived
B. Apomorphic
C. Homoplasious
D. Autapomorphic
E. Plesiomorphic

19. Criticisms like "[such] loathsome harlotry as several males with one female would not be permitted in the vegetable kingdom by the Creator!" are likely to have been directed at

a. Theophrastus, as his classification based primarily on habit.
b. Johann Siegesbeck
c. Arthur Cronquist.
d. Bessey
e. Carl Linnaeus.

20. Bessey's system of classification of flowering plants

a. categorized plants based on the types of pollinators they had.
b. considered simple flowers as primitive and complex flowers as advanced.
c. categorized plants based on the numbers of stamens and pistils.
d. considered showy flowers with numerous free parts (e.g., *Magnolia*) as primitive and smaller flowers with fewer fused parts (e.g., *Aster*) as derived (i.e., evolutionarily advanced).

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21. Phenetic approaches to classification burst onto the scene in the 1950-70's in part due to
    a. the influence of two biologists: Sokal & Sneath.
    b. the theoretical and now computational foundation for crunching relatively large amounts of data and having quantitative and/or statistical means of assessing species-species similarities.
    c. all of the above.
    d. The pioneering work of de John Ray.
    e. The work of Willi Hennig

22. Linnaeus's system of classification was rejected outright by many prominent French botanists because
    a. however convenient, it was based too much on evolutionary theory
    b. Linnaeus' system relied too heavily on vegetative, rather than reproductive, characters.
    c. the Frenchmen could not read Latin.
    d. it was not based on a cladistic analysis
    e. it was artificial.

23. Arrange the following taxonomic traditions in chronological sequence (order of their appearance):

    a. folk taxonomy ==> evolutionary taxonomy ==> Linnaeus's sexual system.

    b. Linnaeus' sexual system ==> folk taxonomy ==> evolutionary taxonomy.

    c. Linnaeus' sexual ==> Bessey's evolutionary system ==> Cronquist's integrated system

    d. Linnaeus' sexual ==> Cronquist's integrated system ==> Bessey's evolutionary system

24. Darwin's ideas expressed in his *On the Origin of Species by Means of Natural Selection* (1859) were influential in establishing the arena for
    a. "evolutionary" classifications by the likes of the Americans Bessey and Cronquist.
    b. "evolutionary" classifications by the likes of Linnaeus.
    c. "evolutionary" classifications by the likes of Engler and Prantl.
    d. all of the above.
    e. A and C.

25. The Father of Botany is
    a. Aristotle
    b. Linnaeus
    c. Caesalpino
    d. Theophrastus
    e. Cronquist

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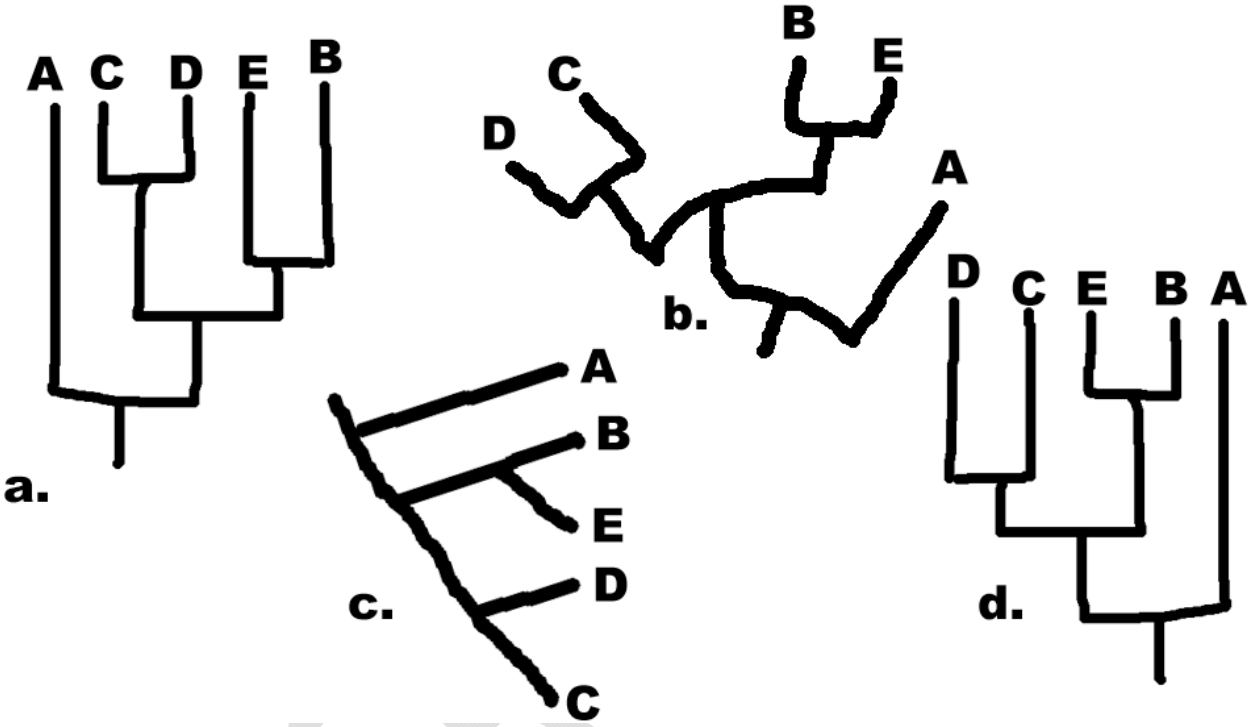
26. Which of the following depicts a set of cladistic (sister group) relationships different from the others?

A. a
B. b
C. c
D. d
E. None of the above



27. How many clades are represented in cladogram c above?

A. 2
B. 3
C. 4
D. 5
E. 6

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28. According to Hennig, relationships within species are _____ and those between species are _____.

A. superfluous, important
B. cladistic, phenetic
C. phylogenetic, tokogenetic
D. important, superfluous
E. tokogenetic, phylogenetic

29. "Angiosperm" means....

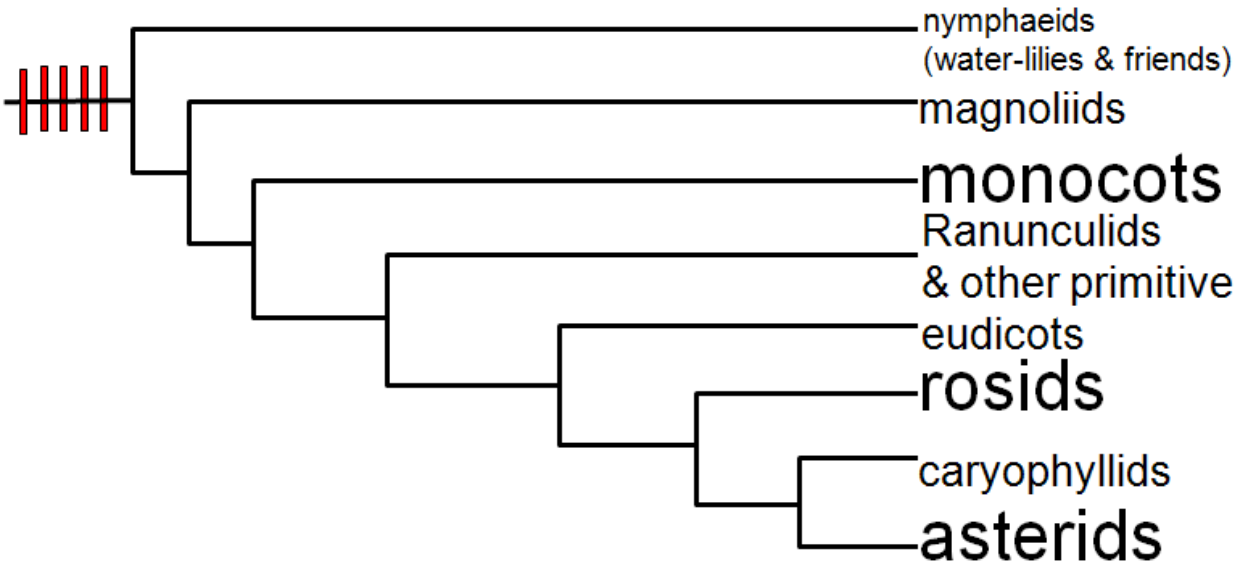
A. Free-sporing
B. Vesseled seed
C. Vascular
D. Naked seed
E. Flowering-bearing

30. The literal meaning of the word "Angiosperm" is a reference to which of the following?

A. The Flower
B. The Fruit
C. The Stamen
D. The Carpel
E. The Inflorescence

31. The short vertical lines on the left-most branch of this cladogram are _____ used to represent _____ uniting the angiosperms.

A. hashmarks, synapomorphies
B. synapomorphies, hashmarks
C. hashmarks, sympleiosmorphies
D. symplesiomorphies, hashmarks
E. synapomorphies, plesiomorphies



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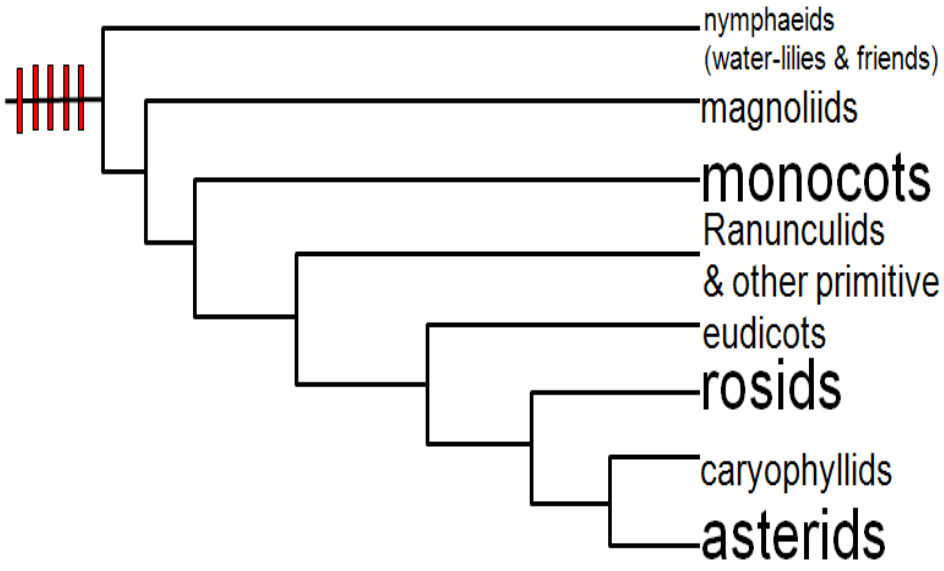
32. In which lineage (group) would you expect to find many plants with ethereal oil cells?

A. nymphaeids
B. magnoliids
C. monocots
D. rosids
E. asterids



33. In which lineage (group) would you expect to find many plants with triaperturate pollen?

A. nymphaeids
B. caryophyllids
C. monocots
D. eudicots
E. core eudicots

34. In which lineage (group) would you expect to find many plants with monoaperturate pollen and flower parts in threes?

A. nymphaeids
B. caryophyllids
C. monocots
D. eudicots
E. core eudicots

35. In which lineage (group) would you expect to find many plants with monoaperturate pollen and flower whorls poorly differentiated from one another?

A. nymphaeids
B. caryophyllids
C. monocots
D. eudicots
E. core eudicots

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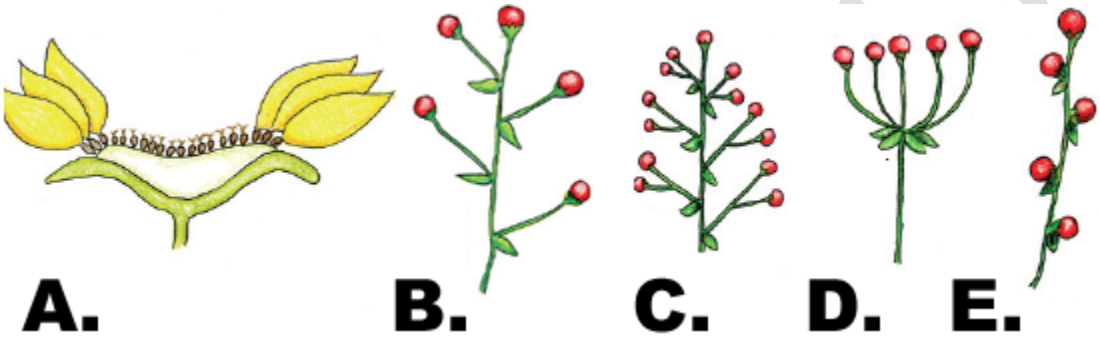
36. In which lineage (group) would you expect to find aquatic plants as comprising most or all of the group?

A. nymphaeids
B. caryophyllids
C. monocots
D. eudicots
E. core eudicots

37. Which of the following is a raceme?



38. Which of the diagrams above is an umbel?

39. Which diagrams above in 37 is a synapomorphy uniting the Compositae?

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Questions 40-45, refer to the 4 lettered pictures below

A.

B.

C.

D.

40. Which picture depicts a member of the Alismataceae?
a. A b. B c. C d. D e. none of the above

41. Which picture depicts a member of the Rosaceae?
a. A b. B c. C d. D e. none of the above

42. Which picture depicts a member of the Magnoliaceae?
a. A b. B c. C d. D e. none of the above

43. Which picture depicts a member of the Arecaceae?
a. A b. B c. C d. D e. none of the above

44. Which picture depicts a member of the asterids?
a. A b. B c. C d. D e. none of the above

45. Which picture depicts a member of the Lauraceae?

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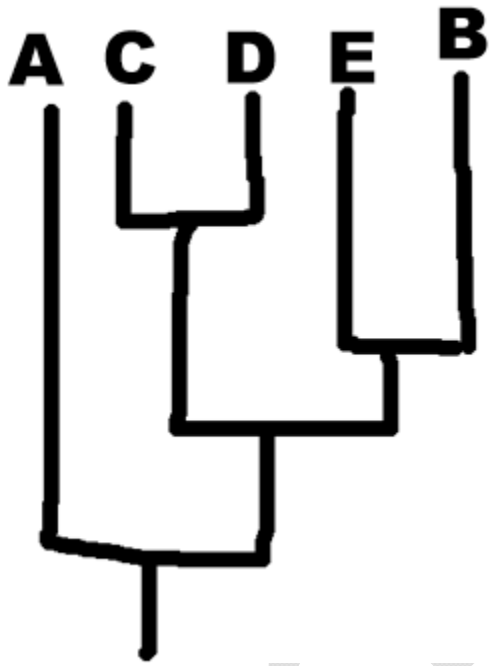
a. A b. B c. C d. D e. none of the above

46. Which classification below is consistent with this cladogram according to Hennigian (cladistic) principles?

A. Family 1: A, C; Family 2: D; Family 3: E, B
B. Family 1: C; Family 2: A, D; Family 3: E, B
C. Family 1: A; Family 2: C, D; Family 3: D, E, B
D. Family 1: A; Family 2: C, D, E and B
E. Family 1: A; Family 2: C, D and E; Family 3: B



47. Which of the following is a paraphyletic or polyphyletic (nonmonophyletic) taxon, based on the cladogram above?

A. One that consists of only A and C;
B. One that consists of only D;
C. One that consists of only E, B
D. One that consists of only C;
E. One that consists of only C, D, E and B

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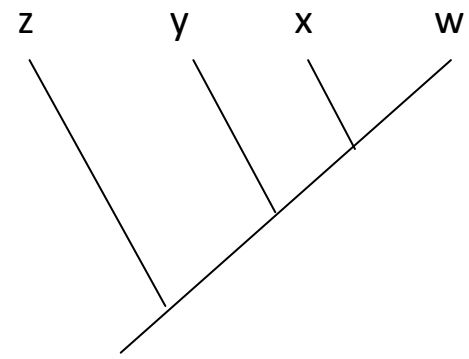
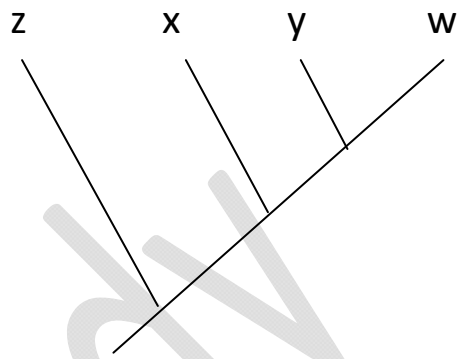
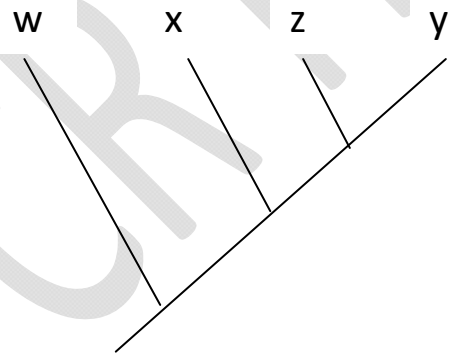


A



B



C

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