

(c) Christopher R. Hardy

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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.

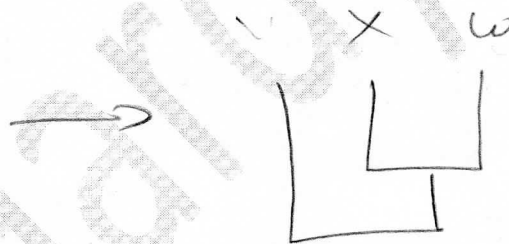
8. Use the following data matrix of 4 taxa (w, x, y, and z) and 5 characters (1-5) in a phenetic analysis.

	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)

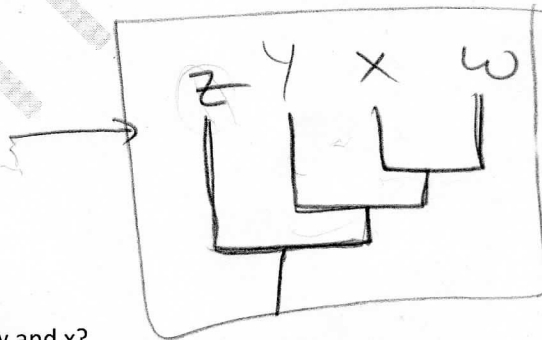
①

	w	x	y	z
w	1.00	0.80	0.40	0.20
x		1.00	0.60	0.00
y			1.00	0.40
z				1.00



②

	w	x	Avg.
y	0.4	0.60	0.50
z	0.20	0.00	0.10



This matches dendrogram 'A' on p. 13

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

26 steps

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 autapomorphy.

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 autapomorphy.

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?

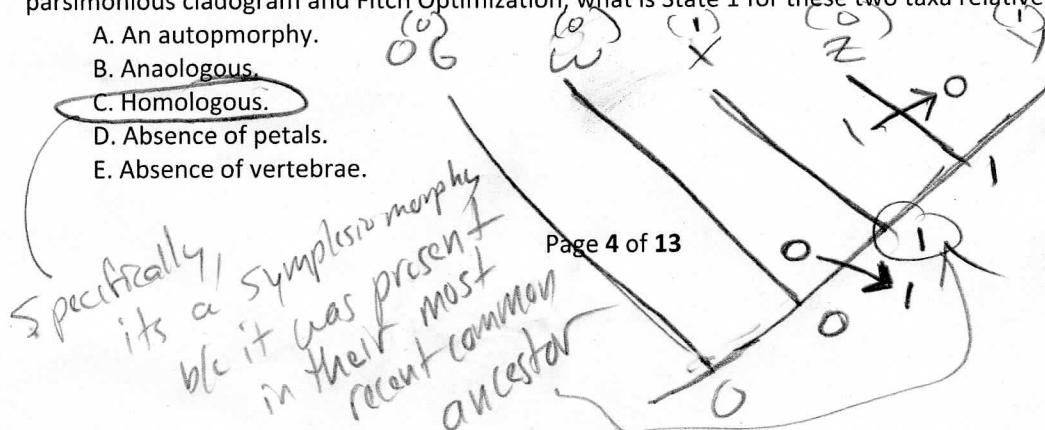
A. An autapomorphy.

B. Analogous.

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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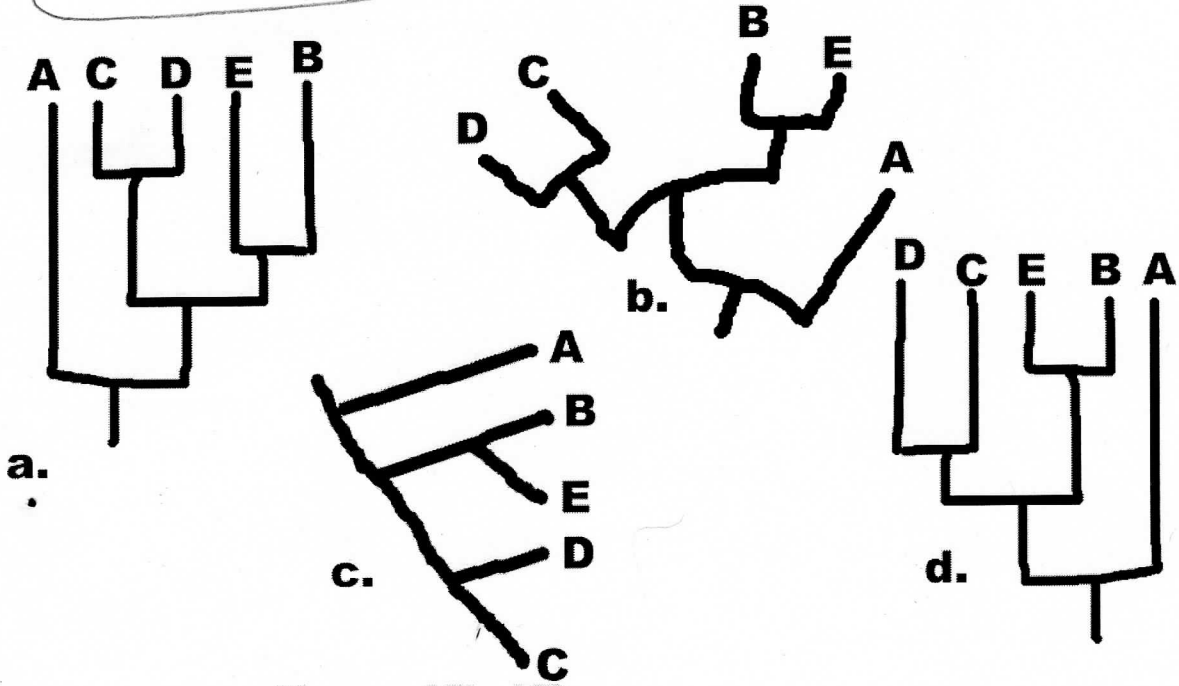
21. Phenetic approaches to classification burst onto the scene in the 1950-70's in part due to
- the influence of two biologists: Sokal & Sneath.
 - the theoretical and now computational foundation for crunching relatively large amounts of data and having quantitative and/or statistical means of assessing species-species similarities.
 - all of the above.
 - The pioneering work of de John Ray.
 - The work of Willi Hennig
22. Linnaeus's system of classification was rejected outright by many prominent French botanists because
- however convenient, it was based too much on evolutionary theory
 - Linnaeus' system relied too heavily on vegetative, rather than reproductive, characters.
 - the Frenchmen could not read Latin.
 - it was not based on a cladistic analysis
 - it was artificial.
23. Arrange the following taxonomic traditions in chronological sequence (order of their appearance):
- folk taxonomy ==> evolutionary taxonomy ==> Linnaeus's sexual system.
 - Linnaeus' sexual system ==> folk taxonomy ==> evolutionary taxonomy.
 - Linnaeus' sexual ==> Bessey's evolutionary system ==> Cronquist's integrated system
 - 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
- "evolutionary" classifications by the likes of the Americans Bessey and Cronquist.
 - "evolutionary" classifications by the likes of Linnaeus.
 - "evolutionary" classifications by the likes of Engler and Prantl.
 - all of the above.
 - A and C.
25. The Father of Botany is
- Aristotle
 - Linnaeus
 - Caesalpino
 - Theophrastus
 - 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....

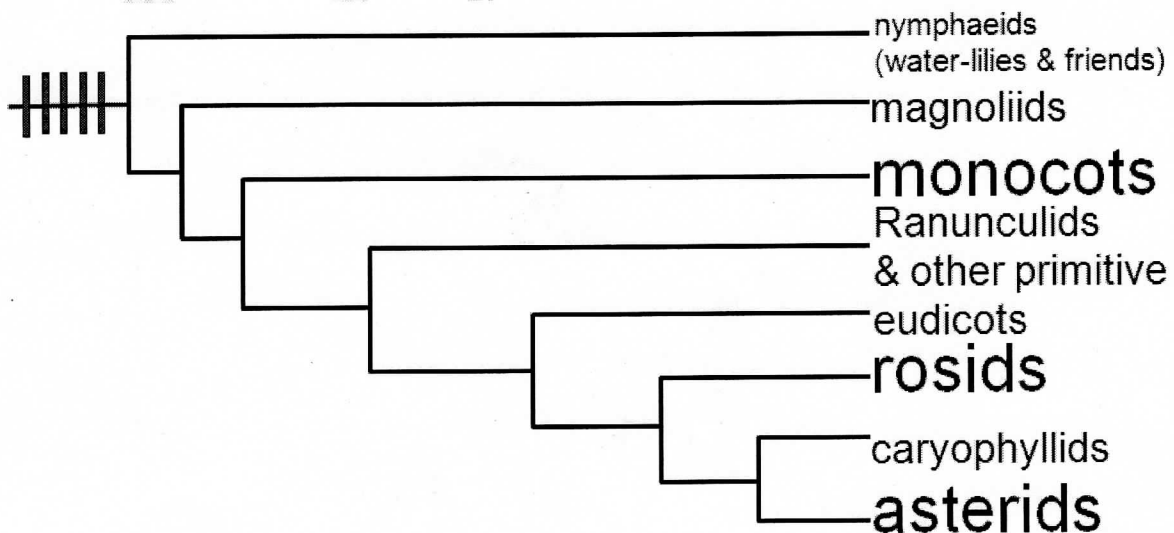
- A. Free-sporing
- B. Vesseled seed
- C. Vascular
- D. Naked seed
- E. Flowering-bearing

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. sympleiosmorphies, hashmarks
- E. synapomorphies, plesiomorphies



Not directly relevant to Fall 2017 Exam 2

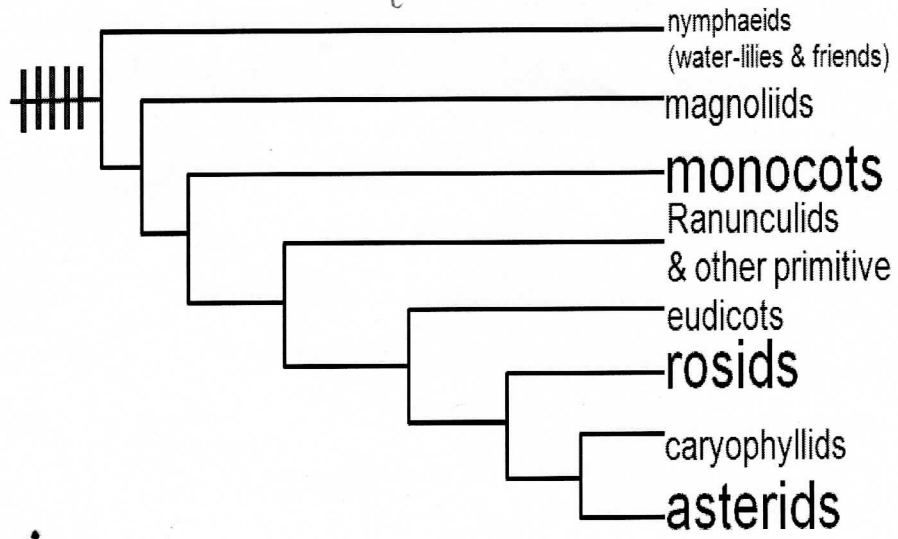
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32. In which lineage (group) would you expect to find many plants with ethereal oil cells?

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

Not Fall 2017 material



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

Not directly relevant to Fall 2017

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

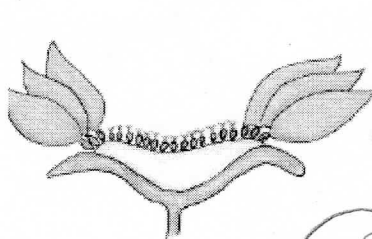
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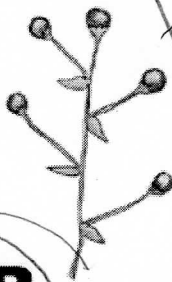
36. In which lineage (group) would you expect to find aquatic plants as comprising most or all of the group?

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

37. Which of the following is a raceme?



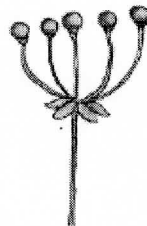
A.



B.



C.



D.



E.

Not directly relevant

38. Which of the diagrams above is an umbel?

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

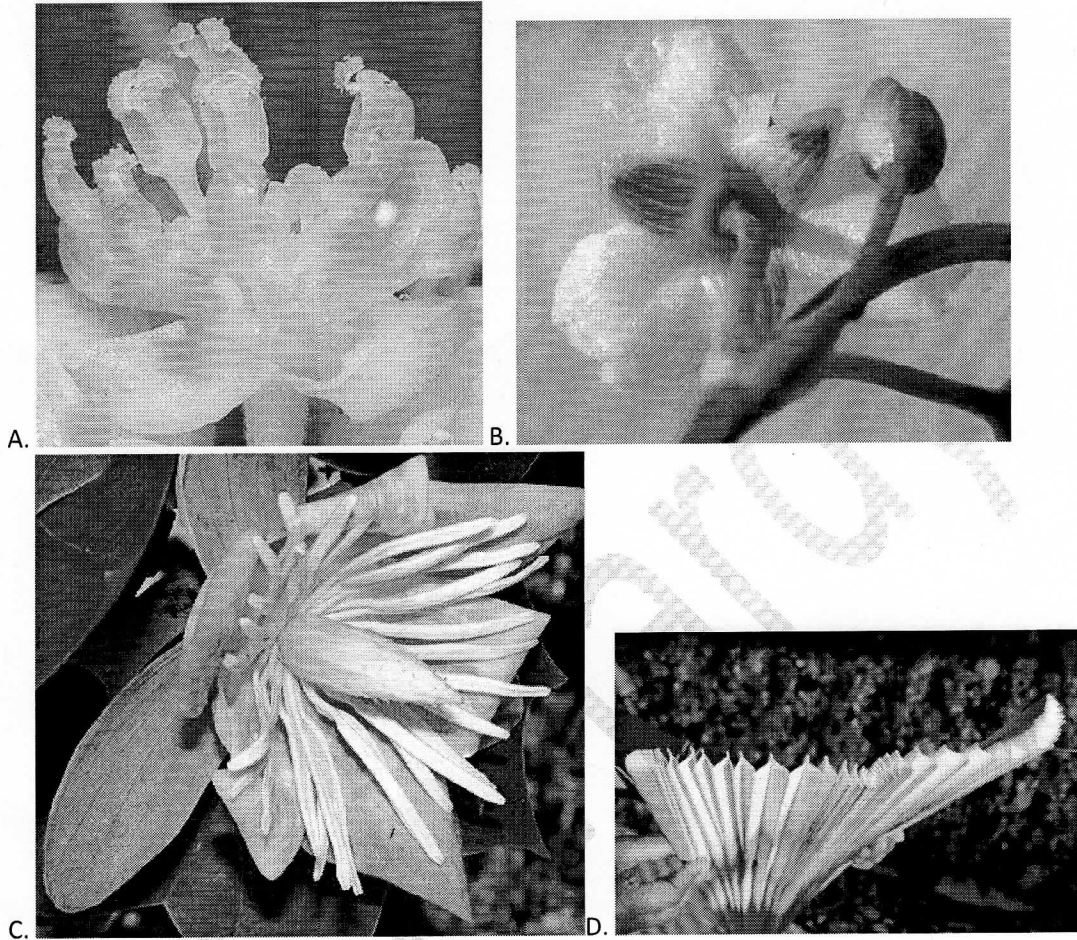
D

A

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



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?

A

Not directly

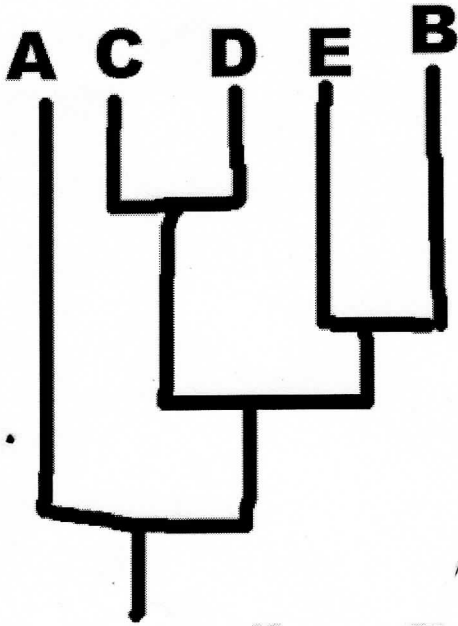
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a. A b. B c. C d. D e. none of the above

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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For questions 8-17, refer to the following three dendrograms (A-C) of 4 taxa (W, X, Y, and Z). This sheet can be torn off of the packet for your convenience.

