

Name _____

Ecology & Evolutionary Biology
Exam 3
14 November 2001

1. Briefly describe the major events that mark the beginning and the end of the Paleozoic Era. In addition, identify the approximate date (+/-10 million years) of the beginning and end of this Era. (6 points).

Beginning: Date:
 Event:

Ending: Date:
 Event:

2. You are the curator of a major museum who has been given the responsibility of developing an exhibit that illustrates either saurischian OR ornithischian dinosaur evolution. You have, at your disposal in the collection of the museum, fossils of the following groups: *Deinonychus*, *Archaeopteryx*, *Coelophysis*, a rhamphorhynchoid, *Triceratops*, *Brachyosaurus*, *Tyrannosaurus*, a placoderm, and *Allosaurus*. You have been given the task of using as many of these specimens as possible in your exhibit. Answer the following questions regarding the exhibit you would develop.
 - i. What Era of geological time should be the focus of the exhibit? (2 points)
 - ii. Should the exhibit target ornithischian or saurischian dinosaurs? (3 points)
 - iii. Which of the fossils listed above should NOT be included in your exhibit? Provide an explanation for each group you would exclude. (6 points)
 - iv. Would it be appropriate to include flowering plants as background illustrations at some point in the exhibit? Explain your answer. (3 points)

3. Briefly describe an example of a fossil from which DNA has SUCCESSFULLY been extracted. (4 points)

4. For each of the following pairs of organisms, identify which came first in geological time by placing the number 1 in the blank next to the appropriate name; identify the appropriate Period of geological time in which you would expect to find each organism. (12 points)

i. *Australopithecus* _____ Period: _____
Archaeopteryx _____ Period: _____

ii. *Pikaia* _____ Period: _____
Plesiadapis _____ Period: _____

iii. *Ichthyostega* _____ Period: _____
Latimeria _____ Period: _____

5. Describe the evolutionary significance of 2 of the 6 genera listed in parts i-iv of question 4 above. Be certain to indicate which genera you have selected. (3 points each)

Genus 1:

Genus 2:

6. Dr. Andora Millikin has just discovered a fairly complete skeleton of a fossil mammal. This fossil lacks a tail and also lacks grooming claws on its feet; but, it possesses an opposable first digit on its hands, and also possesses arms that are approximately as long as its legs. This skeleton is in fairly good shape; she can see internal structure in many of the bones. Answer the following 4 questions with respect to the organism this fossil represents

i. Would you expect this animal to have used brachiation as its main mode of locomotion? Explain your answer. (3 points)

ii. Could this be a fossil prosimian? Explain your answer. (3 points)

iii. The fossil was dated in the field, using superposition, to be approximately 100 million years old. Is this date likely to be correct? Explain your answer. (3 points)

iv. What type of fossil preservation is likely to have led to the fossilized skeleton with which Dr. Millikin is working? (i.e. what type of fossil has she found?) Explain your answer. (3 points)

7. Which of the following fossils could be dated using the C^{14}/N^{14} method? (circle the appropriate fossil/s). (3 points)

leaf compressions 30,000 years old

leaf compressions 30 million years old

leaf impressions 150,000 years old

leaves preserved in amber 300 million years old

leaves preserved in amber 3 million years old leave casts 30,000 years old

8. i. The first metazoans (i.e. multicelled non-photosynthesizing eukaryotes) are thought to have occurred approximately how many millions of years ago? (+/- 20 million years). (3 points)

ii. Identify 2 phyla to which these early metazoans may have belonged. (4 points)

9. With respect to basic skull type, identify whether or not each of the following 3 sets of terms correctly belong together by placing YES or NO in the blanks provided. (2 points each)

i. marsupial, therapsid, monotreme _____

ii. plesiosaur, ichthyosaur, turtle _____

iii. pterosaur, crocodile, *Stegosaurus* _____

10. What impact did the evolution of photosynthesis have on the evolution of life on the planet? (4 points)

11. i. Provide examples of 2 extinct phyla that were represented among the Burgess shale fauna. (4 points)
- ii. Identify a phylum that may have been present in both the Burgess shale and Ediacaran faunas. (3 points)
12. In general, how would you expect the skull of the dinosaur *Stegosaurus* to differ from that of a euryapsid? (feel free to use diagrams to illustrate your answer) (5 points)
13. At last a machine is developed that allows successful travel back in time. You wish to return in time to witness the evolution of the first ostracoderms.
- i. To what date would you set the machine (i.e. how many years back would you need to go to witness this event?) (+/-10 million years). (2 points)
- ii. Would it be necessary for the time machine to also serve as a submersible in order for you to witness this event? Explain your answer. (3 points)

14. Why is the Devonian Period often referred to as “the Age of Fishes”? (4 points)
15. In your role as paleontologist at a major museum, you are charged with developing an exhibit that highlights one of the Epochs of the Tertiary Period. The museum owns a very diverse collection of fossil elephants (proboscidiens) as well a number of horses with 3 toes, and also some horses with 4 toes. Which Tertiary Epoch would you choose as the focus of your exhibit? Explain your answer. (3 points)
16. The greatest taxonomic disparity on earth existed during what Period of the geological time scale? (2 points)

