Name _____

Ecology & Evolutionary Biology 245
Exam 1
12 February 2008

1. Use the following list of fossil taxa to answer parts a through g below. (2 pts each)

Aegyptopithecus	*Australopithecus africanus*	*Diacronis*
Equus	*Gigantopithecus*	*Proconsul*
Australopithecus afarensis	*Homo floresiensis*	*Homo habilis*
Homo erectus	*Paranthropus robustus*	*Glyptodon*

a. Identify the oldest primate included in the list above _____.

b. Name the **Epoch** of Geological Time of the first appearance of the taxon you listed in part a. _____.

c. Identify the oldest hominid (Hominidae) included in the list above _____.

d. From the list above, identify a primate that exhibited a round, rather than an oval, birth canal _____.

e. From the list above, identify a taxon that exhibited a femur that angled in, rather than out, relative to the pelvis, _____.

f. From the list above, identify a taxon that exhibited a gap between the incisors and the canine teeth _____.

g. Which of the hominoids (Hominoidea) listed above is thought to have been FIRST to leave Africa? _____.

2. a. Describe 2 differences between ornithischian and saurischian dinosaurs. (3 pts)

b. Provide an example of **EACH** dinosaur lineage that characterizes the **Cretaceous Period**. (Be certain to indicate which dinosaur exemplifies which lineage) (2 pts)

3. You are faced with identifying a fossil taxon that has been sent to you by a colleague from Germany. The specimen provides the following clues to the identity of the specimen. The skull is that of a diapsid. The specimen also exhibits an opposable hind toe, a long bony tail, a wishbone, and a jaw bearing teeth.

a. What genus is this fossil likely to represent? (2 pts)

b. From what **Period** of Geological Time is this skeleton likely to have come? (2 pts)

c. The organism represented by this fossil was key to the evolution of what modern (extant) group of vertebrate animals? _____. Explain your answer. (3 pts)

4. a. Describe 2 differences between prokaryotes and eukaryotes; be certain to indicate which of the features you describe can be attributed to which group. (4 pts)

b. Provide an example of a eukaryotic taxon considered to be **Precambrian** in origin. (2 pts)

5. a. What was the Great American Interchange? (3 pts)

b. In what **Epoch** of Geological Time did it occur? (2 pts)

6. Dr. Jones discovers time travel and is able to travel back in time for 24 hours at a time. Answer the following questions with respect to three of his forays back in time.

Trip 1: Dr. Jones sets the time dial to 470 million years ago and arrives on land but, except for a few liverworts, there is almost NOTHING there! No vascular plants, no animals. Fortunately, he has brought his snorkeling gear with him, so can investigate the types of organisms found under water.

a. Since he is hoping to observe a diversity of life forms, would his time be more well spent exploring freshwater or marine habitats? (1 pt)

b. While he recognizes that he is unlikely to encounter large predatory dinosaurs or mammals at this time (or place), describe a predator that he may encounter about which he should have some concern. (2 pts)

Trip 2: Dr. Jones sets the dial to a **Period** of the **Paleozoic Era**. He arrives to see individuals of *Ichthyostega* lumbering onto land for the first time.

a. Describe one of the challenges faced by this vertebrate in its efforts to evolve to survive effectively on land. (3 pts)

b. Should Dr. Jones be concerned about predatory dinosaurs on this trip? Explain your answer. (2 pts)

Trip 3: Jones wishes to observe the radiation and diversification of flowering plants.

a. What **Period** of geological time would be most appropriate for him to visit? (2 pts)

b. What other major group of organisms would he expect to find radiating and diversifying throughout this **Period** of time? (2 pts)

c. If he were to attempt to arrive at the **beginning** of this **Period**, to what time should he set the dial on his machine? ($\pm$ 5 mya) (2pts)

7. Dr. Tonoata travels to a museum in China to assist with the sorting of an extensive collection of fossils taken from a local fossil bed. The fossils consist of impressions and casts of an incredibly wide diversity of seafloor dwelling invertebrates. The data associated with the collection, indicate that the fossils were taken from a deposit of sedimentary rock sandwiched between two layers of igneous rock and that the igneous rock below and above the fossil deposit had been dated using absolute dating methods to approx. 530 and 500 million years ago, respectively.

a. Would C14/N14 have been an appropriate dating method to employ in this case? Explain your answer. (3 pts)

b. Describe an example of an **extinct** phylum that is likely to be represented among these fossils. (2 pts)

c. Would you expect the organisms represented by these fossils to have developed from embryos? Explain your answer. (3 pts)

d. Would you expect the organisms represented by these fossils to have possessed mitochondria? Explain your answer. (3 pts)

8. What is a pterosaur? Do representatives of this lineage survive today? (3 pts)

9. Describe life on land during the **Carboniferous Period**; include examples of major plant, invertebrate, and vertebrate life at that time. (3 pts)

10. a. Indicate the **Period** of Geological Time in which **4** of the following taxa first appeared. For **2** of the taxa **you selected**, also indicate the **Era** in which it **first** appeared. (6 pts)

	Period (select 4)	**Era** (select 2 of your 4)
Cooksonia	_____	_____
Pikaia	_____	_____
Homo erectus	_____	_____
flowering plants	_____	_____
Dimetrodon	_____	_____

b. Circle the name of a non-primate synapsid from the list above. (2 pts)

c. Place an * next to the taxon that was **first** to appear among the 6 taxa listed. (2 pts)

d. Place an **X** next to the taxon that was **last** to appear among to the 6 taxa listed. (2 pts)

11. Use the following list of fossils to answer questions a-d below. (Hint: consider both fossil type and age).

Trilobite cast	brachiopod impression
Small crested pterosaur preserved in amber	*Stegosaurus* bone petrification
Mesozoic fern compression	mummified *Homo floresiensis*

a. From the list above identify a fossil from which it might be possible to extract DNA.(2 pts)

b. From the list above identify a fossil that it might be possible to date using C14/N14. (2 pts)

c. From the list above identify a fossil that is likely to yield information on both the external AND internal morphology of the organism it represents. (2 pts)

12. The Geological Time Scale does NOT cover the entire history of the earth, instead it is restricted to a subset of the earth's history.

a. What marks the beginning of the portion of earth's history that **IS** covered by the Geological Time Scale? (3 pts)

b. Approximately when did that event occur? (i.e., the Geological Time Scale covers a period of time beginning how long ago?) ($\pm$ 50 my) (2 pts)

13. Indicate whether each of the following statements regarding the Ediacaran fauna is **TRUE** or **FALSE**. (2 pts each)

a. The Ediacaran fauna includes fossils attributed to the phylum Cnidaria _____.

b. The evolution of the first photosynthetic organisms occurred after the evolution of the Ediacaran fauna _____.

c. The Ediacaran fauna abounds in fossils with hard parts suggesting that predators comprised a significant proportion of this fauna _____.

14. Why is the Endosymbiotic Theory of the origin of organelles referred to as the "Serial" theory? (3 pts)

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BONUS QUESTION (from "Before the Dinosaurs"): The evolution of what invertebrate organ/structure was thought to have led to increased efficiency and diversification of early predators? (1 pt)