Name _____

Ecology & Evolutionary Biology 2245/2245W
Exam 1
7 February 2017
Version 1

READ THE EXAM OVER CAREFULLY BEFORE YOU BEGIN. IT CONSISTS OF A TOTAL OF 16 QUESTIONS. With the exception of question 3, YOU MUST ANSWER ALL PARTS OF EACH QUESTION.

1. (a) Identify the skull type exhibited by pterosaurs. _____. (2 points)

(b) Circle all of the taxa from the following list that share this skull type with pterosaurs (3 points).

Archaeopteryx	*Dimetrodon*	*Homo sapiens*	*Tyrannosaurus*
Stegosaurus	saurischian dinosaur	*Eubrontes*	ornithischian dinosaur
Latimeria	*Ichthyostega*	eurypterids	*Homo neanderthalensis*

(c) Place an asterisk (*) next to an extant taxon from the above list. (1 point)

2. If you were interested in studying the evolution of vascular tissue in the first gymnosperms, which of the following fossils would be most appropriate for your work? You must justify your answer to receive full points. (4 points)

(a) A petrification from the Silurian Period.
(b) A compression from the Carboniferous Period.
(c) An impression from the Silurian Period.
(d) A petrification from the Carboniferous Period.

3. Complete twelve (12) of the sixteen blank cells in the following table. (Note that if you complete more than 16 cells, only the first 12 (in order from left to right, top to bottom) will be graded. (12 points)

Taxon	**Opposable thumb?**	**Cranial capacity**	**Posture**	**Member of Hominidae?**	**One Epoch in which lived**
Homo habilis	Yes			Yes	
Proconsul		N/A			
Australopithecus afarensis					Pliocene
Gigantopithecus		N/A	quadrupedal		
Homo erectus	Yes			Yes	Pleistocene

4. (a) Circle ALL of the taxa from the following list that you would **NOT** expect to find in a fossil deposit that has been dated to be from the Jurassic Period. (4 points)

rangeomorphs	saurischian dinosaurs	*Cooksonia*	acritarchs
primates	protogymnosperms	pterosaurs with head crests	*Archyopteryx*
flowering plants	trilobites	*Tyrannosaurus*	ostracoderms

(b) Select one of the taxa you have circled above and identify the **PERIOD**, or in the case of pre-Phanerozoic taxa, the **EON**, of geological time in which the taxon you selected **FIRST** appeared. Be certain to indicate which taxon you have selected. (1 point)

5. Identify a mother/daughter isotope combination that would be appropriate for dating rocks surrounding sedimentary rocks bearing fossils typical of the Ediacaran fauna. (2 points)

6. It could be argued that the evolution of the seed and the evolution of the amniotic egg were key innovations that provided the same advantage to two very different major groups of organisms. (5 points)

   (a) Describe that advantage in the two groups of organisms involved. Be sure to identify the two groups of organisms.

   (b) Which came first, the evolution of the seed or the evolution of the amniotic egg?

7. (a) For each of the following pairs of terms and taxa, identify which came FIRST in geological time by placing a 1 in the blank next to the appropriate name. (3 points)

   (i) Pangaea _____

   Rodinia _____

   (ii) Metazoa _____

   Archaea _____

   (iii) *Australopithecus afarensis* _____

   Australopithecus africanus _____

   (b) Identify one of the above 6 terms or taxa that did **NOT** exist in the Cenozoic Era. (1 point)

8. For one of the 5 great Mass Extinction events of geological time, answer the following three questions. (6 points)

   (a) Identify the two intervals of geological time (i.e., Eras and/or Periods) that the extinction event you have chosen marks the boundary between.

   _____ and _____

   (b) Approximately how long ago (± 10 my) is the extinction event you have chosen thought to have occurred?

   (c) Described the factor(s) thought to have caused the mass extinction event you have chosen.

9. Provide the following 4 pieces of information about the Cambrian Explosion (8 points):

   (a) Occurred when? (i.e., ± 10 my) _____

   (b) Included the evolution of such modern PHYLA as _____ (name one)

   (c) Included the evolution of such unusual TAXA as _____ (name one)

   (d) Was there evidence of predation at that time? Explain your answer.

10. Dr. Sonatilla has been sent a fossil vertebrate skull and partial skeleton, which includes evidence of wrap-around ribs, to identify. The person who sent it to him indicated that the fossil had been collected from a formation that had reliably been dated to be approximately 370 million years old. Assuming that date is correct, Dr. Sonatilla should be able to narrow the type of vertebrate from which the skull came down substantially based on the age of the fossil alone. (8 points)

(a) Is it possible that the fossil represents a dinosaur? Explain your answer in detail.

(b) Is it possible that the fossil represents an amniote? Explain your answer in detail.

(c) Is it possible that the fossil represents a therapsid? Explain your answer in detail.

(d) Given the above, what type of vertebrate is it likely the skull represents?

11. Indicate whether each of the following statements regarding the Ediacaran fauna is **TRUE** or **FALSE**. (8 points)

(a) The Ediacaran fauna lived in an environment that was very low in oxygen (i.e., the fauna was essentially anaerobic). _____

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

(c) The Ediacaran fauna included organisms that developed from embryos.

_____

(d) The Ediacaran fauna included some fossils that were thought to represent early plants.

_____

12. As curator of Paleontology at the Honora Museum, you have been assigned the task of developing a new exhibit that depicts life during **the second to last Period of Phanerozoic time**. You have at your disposal the following fossils.

flowering plant	*Latimeria*	*Homo erectus*	early horse
marsupial	a pterosaur	*Australopithecus afarensis*	
mammoth	gymnosperm	*Homo neanderthalensis*	

(a) Assuming your exhibit should be as accurate as possible, circle five of the fossils from the list above that would be appropriate for you to include in your exhibit. (5 points)

(b) Provide the title you would use for your exhibit? (1 point)

(c) Assuming you could borrow fossils from other museums for your exhibit, what fossils would you borrow and how would you use them to explain Cope's Rule in the narrative associated with your exhibit? (2 points)

13. *Archaeopteryx* is intriguing because of the mix of traits it exhibits. (4 points)

(a) Identify **2 features**, OTHER than feathers, that it shares with birds.

_____ _____

(b) Identify **2 features** that distinguish it from birds.

_____ _____

14. For each of the following pairs of taxa, features, or events, circle the one that is generally considered to be the OLDEST. (11 points)

(a) oval or round birth canal in hominids

(b) feathers or flight

(c) mammals or therapsids

(d) pterosaurs with tails or pterosaurs without tails

(e) gymnosperms or algae

(f) snowball earth or Laurasia

(g) leaves or stems

(h) endosymbiosis or metazoans

(i) fossils that can be dated with C14/N14 or fossils that can be dated with K40/Ar40

(j) chloroplasts or stromatolites

(k) hominids or hominoids

(l) life on land or life in the water

15. If you could travel back in time (with scuba gear), from the standpoint of your personal safety, would you prefer to travel to the Ordovician Period or the Cambrian Period? Justify your answer. (3 points)

16. Again, in your capacity of curator of Paleontology at the Honora Museum, you have been assigned the task of purchasing a fossil skeleton of a Triassic saurischian dinosaur at the National Rock and Gem show. Answer the following questions regarding the criteria you will be using to select an appropriate fossil. To receive full points, you must explain your answer in each case. (6 points)

    (a) Will you be looking for a specimen with a skull that has one or two temporal fossa? Explain your answer.

    (c) Will you be looking for a specimen with a pubis that is parallel to the ischium or opposite the ischium? Explain your answer.

    (c) Will you be looking for a specimen that will fit in your car, or one that is likely to require you to rent a large truck to transport back to the museum. Explain your answer.

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BONUS QUESTION: Which of the 3 famous Evolutionary Biologists who have visited class to date this semester did you find to be the most interesting (last name only is fine)? Justify your answer. (1 point total)