Biology 115D 2023

**Evolution, Behavior, & Ecology Exam #2**

**Name (printed) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**This work was completed in accordance with the Austin College academic integrity policy. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (signature)**

° Read each question carefully.

° If a question appears ambiguous, ask for clarification.

° Keep an eye on the clock. Do not get bogged down on difficult questions when relatively easy questions remain to be answered. Do not leave an essay entirely blank. One or two sentences may earn a substantial amount of credit.

° Write legibly and try to confine your answers to the space provided. If you must have more space, continue on the back of the last page – but indicate that you have done so.

° Think before you write. Check your essays to make sure they say what you mean and that they are as clear and precise as possible.

1. Describe three major events in the history of life on earth that occurred before the asteroid impact that led to the extinction of dinosaurs. (12 points)

2. Describe three factors that cause average annual precipitation and average annual temperature to vary from place to place around the planet. Be sure to explain the effect of each factor and why it has that effect. (12 points)

3. Some species are at greater risk of extinction than others. Explain three circumstances that would cause a species to be at especially high risk of extinction. (12 points)

Short answer questions: Unless otherwise instructed, choose the best single answer for each multiple-choice question: 2 points each unless otherwise noted.

4. Dr. Schulze questions whether *H. sapiens* and *H. neanderthalis* should be considered separate species, especially because:

\_\_\_\_\_ They both lived in North America at the same time for several thousand years.

\_\_\_\_\_ Their skulls are very similar.

\_\_\_\_\_ Many humans (*H. sapiens*) of Eurasian ancestry carry some *H. neanderthalis* DNA.

\_\_\_\_\_ *H. sapiens* and *H. neanderthalis* both used tools.

\_\_\_\_\_ None of the above

5. Which of the following is not one of Herman Daly’s guidelines for sustainability?

\_\_\_\_\_ Renewable resources should not be depleted faster than they regenerate.

\_\_\_\_\_ Wastes should not be produced faster than they are assimilated (made harmless).

\_\_\_\_\_ New technologies should not be deployed without understanding all their potential side effects.

\_\_\_\_\_ Non-renewable resources should not be depleted faster than substitutes are developed.

\_\_\_\_\_ None of the above. These four are Herman Daly’s four guidelines for sustainability.

6. Which of the following is correct?

\_\_\_\_\_ The genus *Homo* is descended from the genus *Ardipithecus*.

\_\_\_\_\_ The genus *Paranthropus* is an ancestor of the genus *Homo*.

\_\_\_\_\_ The genus *Australopithecus* is descended from the genus *Paranthropus.*

\_\_\_\_\_ Chimpanzees are ancestors of Australopithecines.

\_\_\_\_\_ The genus *Homo* is descended from orangutans*.*

\_\_\_\_\_ All of the above.

\_\_\_\_\_ None of the above.

7. *H. naledi*

\_\_\_\_ was a descendant of *H. habilis* and an ancestor of *H. erectus.*

\_\_\_\_ lived in Europe at the same time as early *H. sapiens.*

\_\_\_\_ gave rise to the lineage that is now composed of Chimpanzees and Bonobos (the genus *Pan*).

\_\_\_\_ was recently described from bones found in a South African cave.

\_\_\_\_ all the above

\_\_\_\_ none of the above

8. What two specific features does this creature have in common with all other primates but no other mammals besides primates?

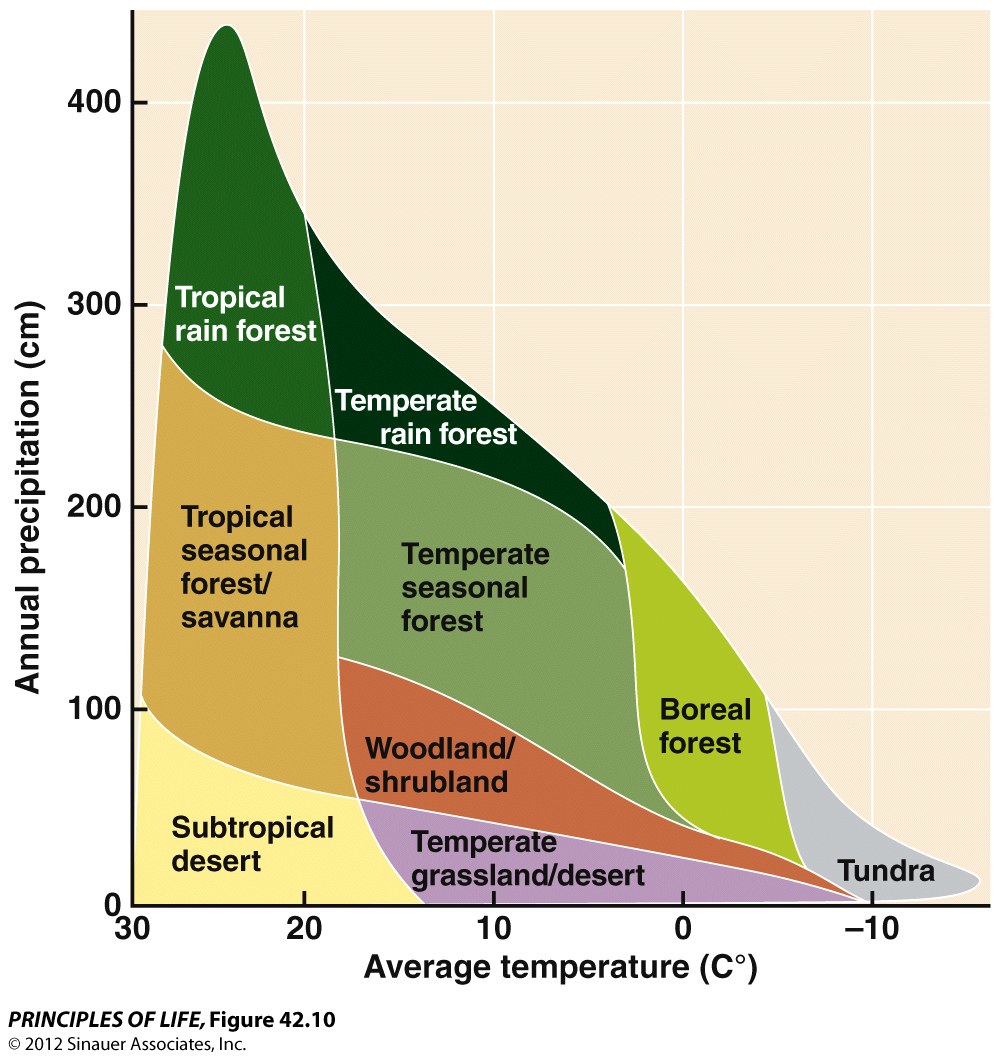
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

9. Provide the correct axis labels for the diagram below to the right.

X-axis \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Y-axis \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



10. The oldest known fossils of members of the genus *Homo* are approximately X years old

\_\_\_\_ 20,000

\_\_\_\_ 200,000

\_\_\_\_ 2,000,000

\_\_\_\_ 20,000,000

\_\_\_\_ 200,000,000

\_\_\_\_ 2,000,000,000

11. Which of the following complicates the definition of, or application of the definition of “species?”

\_\_\_ Sometimes when two populations are diverging it is hard to determine whether they should be considered different species.

\_\_\_ Reproductive isolation cannot be directly tested for fossil species.

\_\_\_ A species of Galapagos finches resulted from the mating of two birds that biologist agree were different species, and yet different species are not supposed to be able to produce fertile offspring.

\_\_\_ All of the above.

\_\_\_ None of the above.

12. Which of the following taxa (species or group of related species) has caused all the others to be threatened with extinction?

\_\_\_\_ gorillas

\_\_\_\_ humans

\_\_\_\_ chimpanzees

\_\_\_\_ gibbons

\_\_\_\_ orangutans

\_\_\_\_ lemurs

13. Besides lacking labels and difficulty distinguishing shading in grey scale, and the distortion of a flat map, what is wrong with this map?

**A map of the world with different colors

Description automatically generated**

14. Which of the following provide evidence consistent with the endosymbiont hypothesis for the origin of eukaryotes?

\_\_\_\_ Mitochondria have DNA

\_\_\_\_ Chloroplasts have DNA

\_\_\_\_ Both bacterial and chloroplast DNA are circular, rather than linear like human chromosomal DNA

\_\_\_\_ All of the above are consistent with the endosymbiont hypothesis.

\_\_\_\_ None of the above is true. The endosymbiont hypothesis has been rejected.

15. The skeleton called “Lucy” is an example of an individual

\_\_\_ *Homo erectus* that lived about 25,000 years ago.

\_\_\_ *Homo naledi* recently discovered in South Africa.

\_\_\_ An Australopithecine that lived about 4.5 million years ago.

\_\_\_ A female *Homo neanderthalis* that lived about 2 million years ago.

\_\_\_ None of the above.

16. The Cambrian explosion

\_\_\_\_\_ refers to a period about 550 million years ago when eukaryotes became much more diverse.

\_\_\_\_\_ refers to a period when a tremendous number of volcanoes spewed oxygen gas into the atmosphere.

\_\_\_\_\_ was the explosion caused by the asteroid that led to the extinction of the dinosaurs.

\_\_\_\_\_ refers to a predicted atmospheric event that could be caused by too much methane outgassing from below tundra permafrost as a result of melting due to global climate change.

\_\_\_\_\_ none of the above.

17. Ocean upwelling occurs where:

\_\_\_\_\_ tectonic plates collide under the ocean to form undersea mountain ranges.

\_\_\_\_\_ onshore winds cause a slight rise in sea level as water driven toward shore “piles” up near the shore. Precise, satellite-based height measurements can detect this upwelling.

\_\_\_\_\_ deep ocean water rises to the surface as winds blowing from the shore to the ocean move surface water away from the shore.

\_\_\_\_\_ unusually low gravitational forces do not “pull” water down as forcefully as in other areas.

\_\_\_\_\_ All of the above.

\_\_\_\_\_ None of the above.

18. Which of the following is not a misconception about evolution?

\_\_\_\_\_ Evolution occurs randomly.

\_\_\_\_\_ Humans are no longer evolving.

\_\_\_\_\_ Genetic drift can cause evolution.

\_\_\_\_\_ Individuals always get better adapted through evolution.

\_\_\_\_\_ Species are distinct natural entities, with a clear definition, that can be easily

recognized by any careful observer.

\_\_\_\_\_ All the above.

\_\_\_\_\_ None of the above.

19. The most recent common ancestor of humans and another ape occurred about

\_\_\_\_\_ 50,000 years ago

\_\_\_\_\_ 500,000 years ago

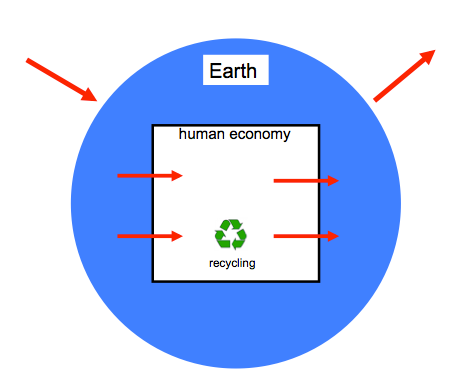
\_\_\_\_\_ 5,000,000 years ago

\_\_\_\_\_ 50,000,000 years ago

\_\_\_\_\_ 500,000,000 years ago

\_\_\_\_\_ 5,000,000,000 years ago

20. Label the arrows on the adjacent diagram. Write clearly. (6 points total)



21. Mammals radiated about

\_\_\_\_ 65,000 years ago

\_\_\_\_ 650,000 years ago

\_\_\_\_ 6,500,000 years ago

\_\_\_\_ 65,000,000 years ago

\_\_\_\_ 650,000,000 years ago

\_\_\_\_ 6,500,000,000 years ago

22. Which of the following ecosystem services is generated by a boreal forest but not by a tar sand mine?

\_\_\_\_ oxygen gas production

\_\_\_\_ rain

\_\_\_\_ fertile soil

\_\_\_\_ cycling of elements

\_\_\_\_ clean water

\_\_\_\_ ultraviolet light shield

\_\_\_\_ all the above

23. Bill McKibben’s statement that bears are like golden retrievers now refers to the circumstance that

\_\_\_\_ bears have become tame due to frequent interactions with humans.

\_\_\_\_ the survival of both species (and others) depend on our decisions.

\_\_\_\_ humans have artificially selected bears just as they have artificially selected golden retrievers.

\_\_\_\_ bears and golden retrievers have similar diet preferences.

\_\_\_\_ all the above

\_\_\_\_ none of the above

24. The earliest primates occurred about

\_\_\_\_ 65,000 years ago

\_\_\_\_ 650,000 years ago

\_\_\_\_ 6,500,000 years ago

\_\_\_\_ 65,000,000 years ago

\_\_\_\_ 650,000,000 years ago

\_\_\_\_ 6,500,000,000 years ago

25. From the perspective of consequences for the biota (living things), the greatest change in the conditions on the planet since the origin of life was

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

26. Which of the following statements about biomes is false?

\_\_\_\_\_ Shrubs dominate chapparal.

\_\_\_\_\_ Grasses dominate savannas and temperate grasslands.

\_\_\_\_\_ Coniferous trees dominate boreal forests.

\_\_\_\_\_ Tundra typically lacks trees.

\_\_\_\_\_ None of the above because all the above are true.

27. Explain in one sentence the relevance of this diagram.

~~A galaxy with a line of stars and a road

Description automatically generated with medium confidence~~

28. True or false? Within-group differences among [human] individuals account for more than 90% of human genetic variation while differences among major groups constitute only a few percent.

\_\_\_\_\_\_\_ true \_\_\_\_\_\_\_\_ false

29. Skull # 3 is a

\_\_\_\_ human

\_\_\_\_ gorilla

\_\_\_\_ orangutan

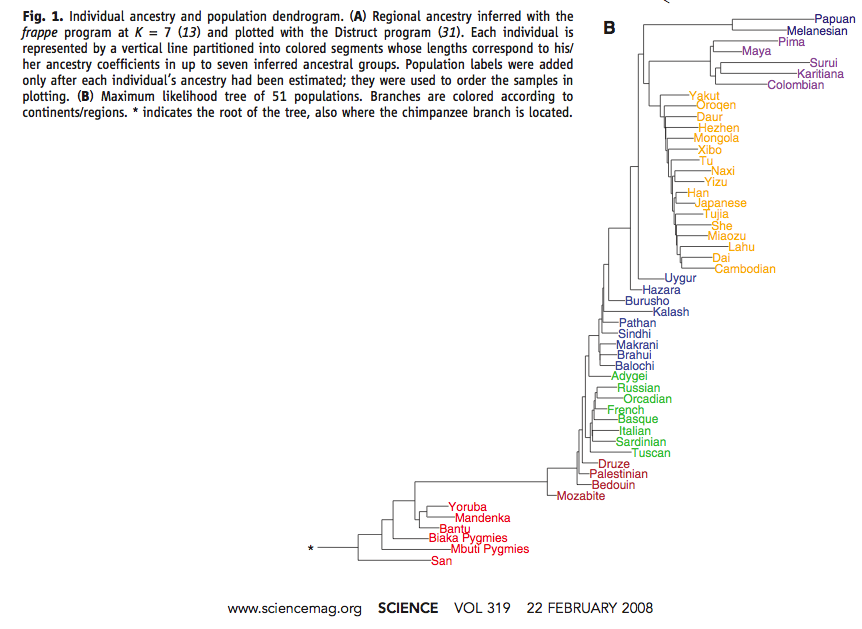
\_\_\_\_ chimpanzee

\_\_\_\_ gibbon

\_\_\_\_ lemur

\_\_\_\_ space alien

30. In one sentence, what was my point in showing the following diagram? Note that the caption refers to figure 1 A and B but only B is reproduced here so you can ignore the explanation of Figure 1A.



31. Describe a sequence of events creating new populations that would result in an evolutionary tree that looks like this. (6 points)

Population A Population B Population C Population D