Check one:

☐ I am content to have my graded exam placed in a lettered box to which other students will have access.

☐ I will wait in a line, in alphabetical order by last name, to have my graded exam handed to me after other student's exams are placed in lettered boxes.

Fold front page forward so name does not show.

Key

Name as it appears in eLC

GEOL 1122 Mid-Term Exam II
Thursday, October 10, 2019
25 Questions 4 pages 100 points
Read all questions carefully

1. Which of the following did we discuss in class as evidence that biological evolution happens or has happened? Check all that apply. [5]

H

A. Charles Darwin's 1859 book *Origin of Species*
B. Fossils of species that no longer exist.
C. Modern species that are not present far back in the fossil record.
D. James Watson & Francis Crick's theory of the double helix structure of the DNA molecule.
E. A and B
H. B and C
J. A and D

5 B-3 C-3

2. Among these three options, the best statement of the theory of natural selection is that

C

A. Because organisms develop parts of their physiology more to exploit aspects of their environment, they pass on the enhanced development to their offspring, causing their offspring to be better fitted to their environment.

B. Because some members of a population can kill the other members of their population and thus exclude those other members from competition for resources, the most powerful and aggressive members of a population will live to reproduce and pass their genes on to the next generation. [5]

C. Organisms vary in all populations, and some variations are more useful than others in any given environment. All organisms over-reproduce so that not all young survive to reproduce. As a result, those offspring best adapted to their environment are most likely to survive and reproduce to pass on their genes to the next generation, whereas those less adapted will not. This will cause the population to change from one generation to the next.

5

3. Artificial selection demonstrates that [3]

E

A. Evolution can take place in geologically short intervals of time.
B. Selection in successive generations (from one generation to the next, to the next, to the next, etc.) can lead to great evolution of form and behavior.
C. The form of a single organism can be changed greatly during its adulthood.
D. Natural selection cannot explain the diversity of life as we know it.
E. A & B. F. A & C. G. A & D H. B & C J. B &D K. All of the above

3 A-2 B-2

4. Clues to evolutionary lineages that we discussed include (check all that apply) [5]

____ Comparison of DNA
____ Embryonic development
____ Vestigial Structures
____ Homologous structures
____ Gradual transitions in the fossil record

5

5. The present theory of the origin of eukaryotic cells in the Proterozoic is that

B

A. The Menominee cultural hero Manabush made them when he created humans. [4]
B. Prokaryotic cells that were engulfed by larger cells survived as symbionts that became the organelles of those larger, eukaryotic, cells.
C. Prokaryotic cells merged in clusters and, as their individual cell walls atrophied, became eukaryotic cells that were larger.
D. Eukaryotic cells were delivered to Earth by asteroids.
E. Eukaryotic cells arose as the result of extreme mutation during extreme solar flaring of radiation.
F. Eukaryotic cells arose as the result of extreme mutation during the Great Ozone Minimum during the mid-Proterozoic.

4

6. The slide on the screen shows . . . [4]

B

A. a trilobite B. a stomatolite C. a prokaryotic cell D. a eukaryotic cell
D. a conodont, a primitive chordate E. a brachiopod F. a mollusc G.an echinoderm

4

7. Among the phenomena that we looked at as evidence that single-celled life can become multicellular life included [4]

J A. The cycle of forms of slime molds. B. The evolution of fruitflies.
C. The evolution of sharks. D. The reassembly of sponges from separated cells.
_____ E. The aggregation of green algal cells in response to consumption by cilliates.
F. The cycle of forms of toadstool fungi. G. The evolution of wolves.
H. C, D, & E. J. A, D, & E. K. A, C, & D. M. D, E, & F. N. A & B.

8. Evidence that life existed two billion years ago and earlier (as early as 3.8 BYBP) includes [4]
(Check all that apply)

_____ Small shelly fossils
_____ The theory of evolution
_____ Stromatolites in Greenland
_____ Fossils of primitive chordates
_____ Traces of chlorophyll preserved in rocks
_____ Fossil impressions of soft-bodied animals
_____ Microfossils of prokaryotes ("bacteria")
_____ Isotopic ($^{13}C/^{12}C$) evidence of photosynthesis in carbon-rich rocks

9. The period in which shelly fossils, or fossils with hard parts, became common was the

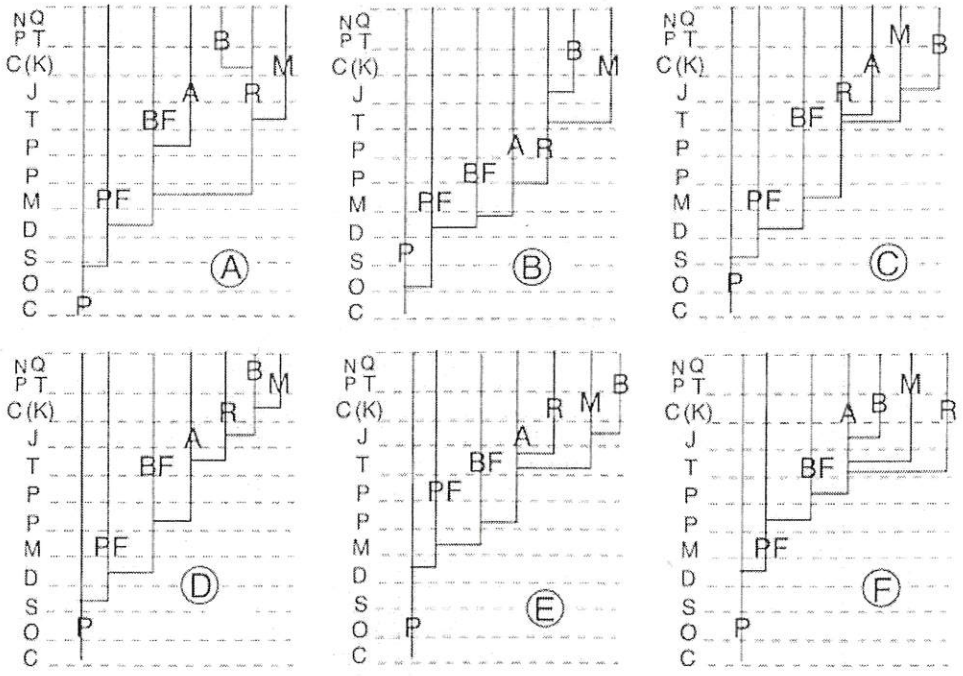
C A. Archean K. Quaternary P. Paleogene
_____ C. Cambrian D. Pennsylvanian J. Jurassic [5]

10. To which of the following invertebrate groups do vertebrates appear to be most closely related?

E. Echinoderms (crinoids, sea urchins, etc.) M. Molluscs (clams, snails, etc.)
E B. Brachiopods Y. Bryozoans ("sea mosses") R. Archaeocyathids
____ A. Arthropods (insects, crustaceans, etc.) C. Corals S. Sponges [5]

11. The fossil record indicates that, among the following, the most likely evolutionary lineage of vertebrate groups is

B



(A=amphibians, B=Birds; BF=bony fishes, M=mammals, P=primitive unskeletonized chordates, PF=primitive fishes, R=reptiles) [5]

12. The fossil record, modern developmental biology, and DNA all indicate that amphibians evolved from [4]

L ____ Y. Ray-finned fishes E. Reptiles C. Cartilaginous fishes P. Placoderms
O. Ostracoderms L. Lobe-finned-fishes A. Acanthodians M. Mammals

13. The most significant development in early reptiles, in comparison to the group from which they evolved, was that [4]

A reptiles suckled* (and still suckle*) their young. **suckle:* to give milk to; to nurse.

B. reptiles had (and have) larger brains and stereoscopic vision.

C ____ C. reptiles had (and have) an egg with an amniotic membrane to keep water inside and thus to keep the egg from drying out.

D. reptiles had (and have) an egg with an amniotic membrane to keep water outside from invading the egg.

14. Dinosaur length and weight ranged from [4]

A. 0.6 meters (2 feet) to more than 25 meters (82 feet), and 2 kilograms (4 lbs) to more than 75 tons.

A ____ B. 4 meters (12 feet) to more than 25 meters (82 feet), and 15 kilograms (35 lbs) to more than 75 tons.

C. 20 meters (66 feet) to more than 40 meters (130 feet), and 120 kilograms (240 lbs) to more than 150 tons.

D. 10 meters (33 feet) to more than 40 meters (130 feet), and 50 kilograms (100 lbs) to more than 150 tons.

15. Considerable evidence suggests that the terminal Cretaceous extinction was caused by a meteorite impact. That evidence includes . . . (check all that apply) [4]

✓ ____ A meteorite crater in the Yucatan that formed at the end of the Cretaceous.

✓ ____ Shocked quartz (quartz with lamellae formed under high pressure) in Cretaceous-Paleogene boundary strata.

____ Copper-rich sandstones found among Cretaceous-Paleogene boundary strata.

____ A meteorite crater in Australia that formed at the end of the Cretaceous.

✓ ____ Unusually high concentrations of iridium in Cretaceous-Paleogene boundary strata.

16. A viable alternative to the idea that the terminal Cretaceous extinction was caused by a meteorite impact is that. . . [3]

A. Volcanic eruptions delivered so much CO_2 to the atmosphere and ocean that climatic warming and ocean acidification doomed much of Earth's life.

A ___ B. Most of Earth's life had been present since the early Triassic and was therefore archaic.

C. Solar flaring combined with resultant production of chemical toxins to cause genetic malfunctions in many species.

17. At the end of our lengthy examination of the evidence regarding whether dinosaurs were ectotherms ("cold-blooded") or endotherms ("warm-blooded'), to what resolution did we come? [4]

A. All dinosaurs were ectotherms ("cold-blooded").

B. All dinosaurs were endotherms ("warm-blooded').

C. Saurischian dinosaurs were endotherms and ornithischian dinosaurs were ectotherms.

D. Ornithischian dinosaurs were endotherms and saurischian dinosaurs were ectotherms.

E ____ E. Some dinosaurs may have been endotherms, some may have been ectotherms, and some may have had some intermediate metabolic condition.

F. Large dinosaurs were ectotherms and small dinosaurs were endotherms.

G. Dinosaurs were endotherms when they (as individuals) were young and became ectotherms are they aged.

18. Projected on the screen are reconstructions of some Mesozoic organisms. For each illustration, put an [6]
"O" if it is an ornithischian dinosaur,
an "S" if it is a saurischian dinosaur,
an "I" if it is an ichthyosaur,
a "T" if it is a pterosaur,
an "M" if it is a mosasaur, or
an "L" if it is a plesiosaur.

O A	O E	S I
L B	O F	M J
S C	O G	S K
T D	I H	

19. With regard to the origin of mammals, we looked at evidence from reptiles, cynodonts, and mammals. Our observations included [4]

A. Reptiles had and have 27 vertebrae, cynodonts had 28 vertebrae, and mammals have 29 vertebrae.
B. Cynodonts had 28 teeth, reptiles have 32 teeth, and mammals have 36 teeth.
C. Reptile teeth were and are undifferentiated, cynodont teeth were somewhat differentiated, and mammal teeth are fully differentiated.
H ____ D. Reptiles' lower jaws consisted of multiple bones, cynodonts' lower jaws consisted of an enlarged dentary bone and other reduced bones, and mammals' lower jaws consist of one bone.
E. Reptile and mammals have different skull-jaw joints, and cynodonts had both kinds of joint.
F. Reptiles had and have no secondary palate, cynodonts had a partial seconday palate, and mammal have a full secondary palate.

H. C, D, E, & F J. A, B, & C K. B, C, & D L. B, E, & F

20. A E ____ ____ Of the organisms illustrated on the screen, which two are considered to be dinosaurs? [3]

21. B ___ Of the organisms illustrated on the screen, which is the one believed to be descended from the Miocene and/or Pliocene genus *Australopithecus* ? [2]

22. The time when placental mammals diverged most (i.e., when the most new orders appeared) was

P ____	T. The Triassic	D. The Devonian	Q. The Quaternary
	J. The Jurassic	C. The Cambrian	M. The Mississippian
	E. The Ediacaran	P. The Paleogene	L. The Late Permian [4]

23. The reason for the abrupt divergence of placental mammals seems to have been

A. Splitting of the continents, causing extensive allopatric speciation. [4]
C ____ B. Intense solar radiation and resultant mutation.
C. Extinction of many reptile groups, resulting in many ecological opportunities.
D. Eruption of uranium-rich volcanic rocks, leading to enhanced mutation.

24. The evidence for divergence of gorillas (genus *Gorilla*), chimpanzees (genus *Pan*), and hominids (genera *Australopithecus* and *Homo*) from a common ancestor sometime in the Neogene comes from (check all that apply) [5]

____ Atomistic theory
____ The fossil record
____ Comparative anatomy of modern primates
____ Comparison of the DNA of modern primates
____ Comparison of the biochemistry of modern primates
____ Comparison of the arrangement of chromosomes in modern primates

25. After covering the material discussed in Question 24, the lecture on evolution of primates concluded with the argument that . . . . [4]

A. Despite the evidence, humans have an origin separate from that of other life.
B. Humans, as descendants of non-human primate ancestors, are only animals and therefore can only be expected to behave like all other animals.
D ____ C. Humans, as descendants of monkeys, can only be expected to behave like monkeys.
D. Humans have exceptionally large and complex brains that allow, and ultimately obligate, intelligent and ethical behavior.