

(Six pages)

Name: _____

Usual Seating Row #: _____

HOUR EXAMINATION #1
Geology 100: History of Life
February 15, 2019
 (All tests are due at 8:50 a.m.)

Parent → Daughter	Half-Life
$^{40}\text{K} \rightarrow ^{40}\text{Ar}$	1.3 billion years
$^{14}\text{C} \rightarrow ^{14}\text{N}$	5730 years

The table above contains the information you need for these questions. Always show your work and make certain your answers are clearly written in the boxes. These are not designed to be difficult!

1. A crystal in an igneous rock contains one-fourth (25%) the ^{40}K it had in it when it crystallized. How old is this rock? [8 points]

Age of the rock:
 ✓ 2.6 billion years

(Show your work – or reasoning -- below)

	Half life	parent	daughter
1.3 bya	0	100	0
1.3 bya	1	50	50
	3	25	75

$$\begin{array}{r} 1.3 \\ + 1.5 \\ \hline 2.6 \text{ billion years} \end{array}$$

2. A horse bone that is 11460 years old has 15 μg of ^{14}C inside. How much ^{14}C did this bone have when the horse was alive? [8 points]

Amount of ^{14}C in living horse bone:
 ✓ 60 μg

$$11460 / 5730$$

(Show your work – or reasoning -- below)

$$\begin{array}{r} 5730 \\ + 5730 \\ \hline 11460 \end{array}$$

$$\begin{array}{r} 0 - 0 \mid 60 \mu\text{g} \\ 5730 - 1 \mid 30 \mu\text{g} \\ 11460 - 2 \mid 15 \mu\text{g} \end{array}$$

3. Identify, define and/or describe any three of the following terms. Be sure to include dates, examples and diagrams where appropriate. For each selected term, state its importance in the History of Life. (If more than three are answered, only the first three will be graded.) [15 points]

biological species

A biological species is a population of organisms that can interbreed and produce fertile offspring. Ex: Horses and Donkeys. Horses can interbreed to produce fertile offspring, but Horses and Donkeys offspring, a mule is not fertile to reproduce. Species are important in the history of life because this is the basic unit of evolution.

vestigial structure

A vestigial structure is a body part that is still present but no longer serves the same purpose that it had in the past. For example, in humans we have extra teeth called wisdom teeth that grow in much later than the rest of adult teeth and cause pain and problems because the present human mouth is too small to fit them, but in the past they aided with mastication of tougher foods.

nucleotides

Nucleotides are the code that makes up RNA and DNA. In DNA there is Adenine and thymine which link together and Guanine and Cytosine which link together into a spiral double helix. In RNA Adenine links with uracil and there is no thymine. It is important to the history of life because the nucleotide code is what the ribosome reads in order to make proteins in all of life.

A	G	C	T	A	A
T	C	G	A	T	T

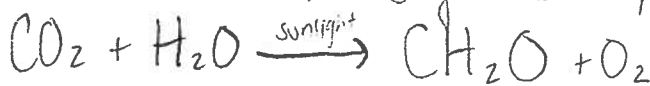
Example of DNA nucleotide code

ribozyme

A ribozyme is a structure made from a tangled up strand of RNA that makes proteins like a ribosome. They are important to the history of life because we believe they created the first proteins, essential building blocks of life.

photosynthesis

Photosynthesis is the process by which some organisms, like plants, make food. They use sunlight, CO₂, and water to create sugars. They expel oxygen as a waste gas during this process. It is important because it feeds most of life, either directly or through the food chain.



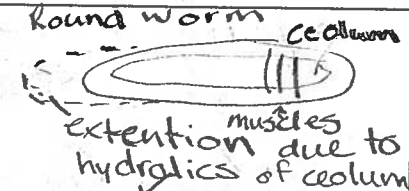
4. List and briefly describe (don't just list) two lines of evidence supporting the Endosymbiotic Hypothesis for the origin of eucaryotes. Use the boxes below. [9 points]

¹ In eucaryotic cells, organelles do not share DNA with the nucleus. They have their own DNA and reproduce independently. ✓

² Organelles have a double lipid membrane. This suggests that they had a membrane of their own and then got a second when they were enveloped by a larger cell. ✓

5. What are the mechanical and respiratory advantages of a coelom in a simple marine worm? Please use the boxes below. [10 points]

Mechanical advantages -- With a coelom, round worms could contract muscles at one end of their body and thus extend the other end by moving the fluid in their coelom to that end. This meant that round worms could dig into mud and deposit-feed.



The diagram shows a cross-section of a round worm. It is an oval shape with a central cavity labeled 'coelom'. Three vertical lines inside the cavity represent 'muscles'. A dashed line on the left side indicates 'extention'.

Respiratory advantages -- Animals without a coelom needed to diffuse oxygen from the water directly into each of their cells. The coelom allows round worms to circulate O_2 , meaning the worms do not need to be flat or small like flatworms. ✓

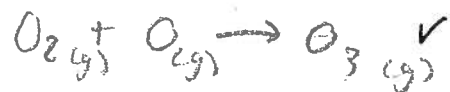
6. Along with natural selection, Darwin described a mechanism for evolution called **sexual selection**. What is this process? Please use an example, real or hypothetical, in your answer. [10 points]

Sexual selection: The process of mates choosing mates based on physical characteristics that typically relate to better or good overall health. These traits selected for & passed on will then be passed on to offspring by inheritance & continue. ✓

eg: In nature selection for a ^{male} peacock with larger, brighter tail-feathers, by females. There are benefits & costs, the male with the largest & brightest feathers will benefit by obtaining of more mates, thus increasing fitness & overall offspring amounts & genes but there are also costs; like being more obvious & standing out more to potential threats & predators. ✓

7. How does atmospheric ozone form and how is it destroyed? Why is ozone critical to the history of life? [10 points]

Ozone forms when UV radiation from the sun (usually UVB) comes in contact with an O_2 molecule and splits it apart. The lone oxygens can then react with other O_2 compounds to create O_3 (ozone):



It is then destroyed through the same process of UV radiation striking the molecule and breaking it up into O_2 and O . ✓

Ozone is important in the HOL because once photosynthetic creatures produced enough O_2 , ✓ ozone could form and could block some of the UV radiation allowing organisms to come on land.

8. What is a **supernova**? How have supernovae influenced the composition of our planet? [10 points]

A Supernova is a massive star 8-10 times the size of our Sun. When a Supernova runs out of Elements to fuse together it collapses and releases a lot of Energy. The Collapse of Supernovas allow for the creation of Elements heavier than Iron. All of the Elements present on Earth that are heavier than Iron come from the collapse of Supernovas. ✓

9. Fill in the blanks! [10 points total]

Principle summarized as "the present is the key to the past": Uniformitarianism

Total number of protons in an atomic nucleus is that element's Atomic Number.

✓ Proteins are chains of Amino Acids.

Single point of space, time and matter: Singularity

Prokaryotes consist of two domains: Bacteria and Archaea.

10. No surprise here. Fill in the appropriate blanks below (all the eras, periods and the Cenozoic epochs). Correct spelling and capitalization is required. [10 points]

ERA	PERIOD	EPOCH
CENOZOIC	Quaternary	Holocene
		Pleistocene
	Neogene	Pliocene
		Miocene
	Paleogene	Oligocene
		Eocene
		Paleocene
	MESOZOIC	Cretaceous
Jurassic		
Triassic		
PALEOZOIC	Permian	
	Carboniferous	
	Devonian	
	Silurian	
	Ordovician	
	Cambrian	
PROTEROZOIC	Ediacaran	
ARCHEAN		
HADEAN		

A half-point will be deducted from the total of 10 for each slot that is filled incorrectly or the name is not properly spelled or capitalized. (A clue: Capitalize them all.)

All tests are due at 8:50 a.m.