

(Six pages)

Name: _____

Usual Seating Row #: _____

HOUR EXAMINATION #1
Geology 100: History of Life
September 21, 2018
(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 chart above contains the information you need for these first two 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 mineral crystal from a granite in Idaho contains 40 μg of ^{40}K and 120 μg of ^{40}Ar . How old is this granite? [9 points]

Age of the granite:

2.6 billion years old ✓

(Show your work – or reasoning -- below)

2.6 by

$1/2$	P	D
0	160	0
1	80	80
2	40	120

2. A fossil mastodon tooth has 4 μg of ^{14}C inside. When the mastodon was alive it had 16 μg of ^{14}C in that same tooth. How old is this fossil tooth? [9 points]

Age of the mastodon tooth:

11,460 years ✓

(Show your work – or reasoning -- below)

$1/2$	P	C
0	16	0
1	8	
2	4	
3		
4		

$$5730 \times 2$$

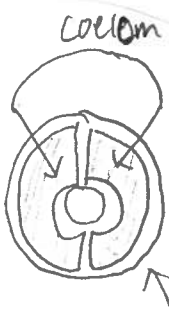
$$\begin{array}{r} 5730 \\ \times 2 \\ \hline 11460 \end{array}$$

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]

isotope

- An isotope is an atom that has a different number of neutrons from that of another atom with the same protons.
- For example: Carbon has 3 isotopes: C_8^6 , C_7^6 , C_8^6
- Isotopes are important to the history of life because we can use them to date absolute time because (some isotopes are radioactive (unstable) so they decay and change their identity)

coelom



roundworm

Oort Cloud

A cloud of ice and rocks approximately 1/2 light year from the sun, this 3D cloud is the remnant of the nebula that originally created our sun but was pushed away by its radiation. This is important to the history of life because the sun gives us most of our energy and is necessary for all life forms today.

ozone

Ozone is a layer of O_3 in the atmosphere that protects the Earth's atmosphere from UV rays. It forms when a UV ray hits an O_2 ^{molecule} ~~atom~~ splitting it into two unbound O atoms. One of these atoms then bonds to O_2 , creating O_3 . This is important because the development of an ozone layer allowed the existence of Eukaryotic life on the Earth's surface (above the oceans)

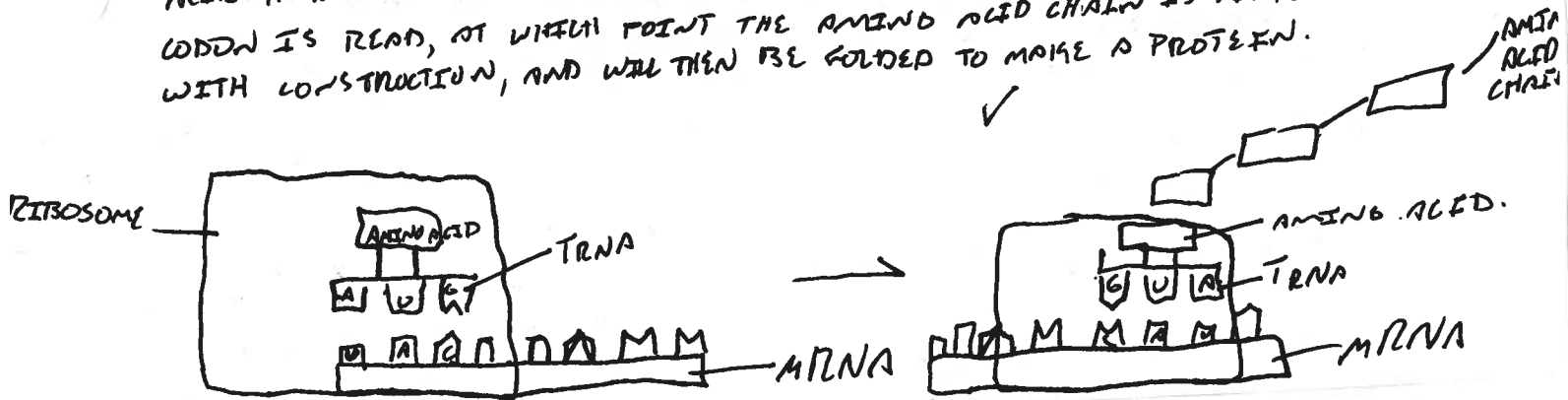
chemosynthesis

Chemosynthesis is a process by which food is created with water, CO_2 , and hydrogen sulfide, provided by underwater hydrothermal vents. This allows life to subsist deep underwater without needing sunlight performing photosynthesis. This means initial life forms may have developed deep underwater through this process, protected from UV rays.



4. How does a ribosome make proteins? Please use the following terms in your answer: triplet nucleotide coding, mRNA, tRNA, DNA, protein, amino acids. A labeled diagram is required. [10 points]

A RIBOSOME RUNS A STRAND OF mRNA THROUGH ITSELF LIKE A STOCK TICKET, READING ITS SEQUENCE. THE mRNA'S SEQUENCE OF BASES IS COMPLEMENTARY TO THAT OF A CERTAIN STRAND OF DNA, AND CARRIES THE INSTRUCTIONS FOR MAKING PROTEINS. THE RIBOSOME READS THE mRNA IN CODONS, TRIPLET NUCLEOTIDES CODING FOR A PARTICULAR AMINO ACID. THEN, THE RIBOSOME FINDS THE COMPLEMENTARY tRNA MOLECULE WITH THAT AMINO ACID AND BRINGS IT IN. THIS PROCESS IS REPEATED UNTIL A STOP CODON IS READ, AT WHICH POINT THE AMINO ACID CHAIN IS FINISHED WITH CONSTRUCTION, AND WILL THEN BE FOLDED TO MAKE A PROTEIN.



5. Darwin and Wallace had four basic observations of nature that led to their concept of Natural Selection. Please list these below and briefly describe each with a sentence. Please use the boxes below. [8 points]

1 Variation in the population ✓
 - there are traits that some organisms in a species has that others don't such as being camouflaged or being bright

2 Variation is heritable ✓
 - the traits can be passed down from generation to generation.

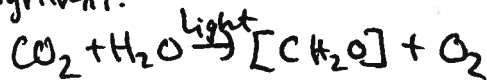
3 Variation in reproductive success ✓
 - These traits can either increase or decrease fitness and that will decide if it stays in the population or not.

4 An excess number of offspring were produced ✓
 - For species that have a small chance of offspring making it to maturity children are produced in excess. You can see this in humans in the U.S. its 2 children in 3rd world countries 23

6. **Cyanobacteria** are the first recognizable organisms (or at least the stromatolites they construct) in the fossil record. Please describe below the characteristics of cyanobacteria, including how they managed to survive the harsh conditions on the early Earth's surface. [10 points]

Cyanobacteria were the first living organisms identified. They were single-celled organisms, and were the first to photosynthesize. They are green in color because they have green chloroplasts. These organisms were able to survive the harsh conditions on early Earth's surface because they could a) produce their own energy, and b) had cell membrane that helped protect their internal parts from the sun and radioactivity. Cyanobacteria create O_2 through photosynthesis and ~~was~~ helped get the atmosphere to reach a minimum O_2 level where other forms of life could also live.

Photosynthesis:



7. What are three advantages of *multicellularity* in life? In other words, what are the benefits of having many cells in an organism instead of just one? Please list these below and describe each with a sentence. [9 points]

1 Size ✓

By having multicellular body you are able to be come bigger and have more control over your motor contr.

2 Specialization ✓

There are more cells in the body which allow for cells to have specific jobs (ex. repairing, protecting, reproduction of other cells.)

3 Repair / damage control ✓

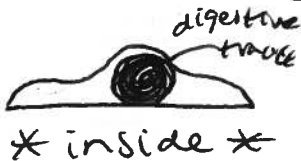
by being multicellular the organism is able to regenerate cells and repair damaged cells to survive.

8. Your choice: Describe either a **sponge**, **cnidarian** or **flatworm**. Choose only one and tell me about its body and life habits. Diagrams are always helpful. [10 points]

The flatworm lives in water. Its body is solid except for a digestive track that runs through its body. It looks like a ribbon when it swims through the ocean.

If you cut it in 1/2, it can regenerate its body.

It breathes through its skin. It is the ancestor of roundworms and many other species, including us! ✓



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

Most common element in the universe today: hydrogen

Cellular structures that contain the DNA in animals and plants: nucleus

Two-word term for chance (or random) factors in evolution: genetic drift

Minimum level of oxygen required for eucaryotes: 2-3% PAL

Term for the set of genes in an organism: genotype

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. (For goodness sakes – don't lose points for not capitalizing!)

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