

Name: \_\_\_\_\_

### "NOVA - Origins: How Life Began" Worksheet

1. Earth is a place that is \_\_\_\_\_ and \_\_\_\_\_ by life.
2. When was Earth "born"?
3. [Earth] was covered in \_\_\_\_\_ and smothered in noxious \_\_\_\_\_.
4. What cataclysm occurred that eventually led to the Moon's formation?
  
5. The young Sun was \_\_\_\_\_ than it is today.
6. When the atmosphere was thicker and dominated by CO<sub>2</sub>, the Earth had a \_\_\_\_\_ tinge to it and the oceans would have had an olive \_\_\_\_\_ color rather than our familiar blue color.
7. For about the first 600 million years, comets and asteroids (300 miles across) pounded our planet- a time known as the "Heavy Bombardment." Their impacts vaporized Earth's \_\_\_\_\_ and melted its \_\_\_\_\_.
8. Hydrogen sulfide can be extremely \_\_\_\_\_ so the scientists wear gas masks inside the cave.
9. Can any other forms of life survive in the deep recesses of a cave so toxic to humans?
10. Snot acidity (pH) is that of \_\_\_\_\_.
11. All living things, from bacteria to mice to you and me, are made from a small set of chemical elements: \_\_\_\_\_, oxygen, \_\_\_\_\_, nitrogen- four of the most common elements in the universe.
12. The brown goo that formed in Stanley Miller's lab experiment was what? \_\_\_\_\_  
(They are compounds that form molecules when carbon and other elements link together and are the building blocks of proteins, cells – which are the vital ingredients of all living things.)
13. A) Where are some of the oldest rocks found on Earth?  
B) How old are these rocks?
14. What do you see in a magnifying piece of space dust?
15. There are more than \_\_\_\_\_ kinds of amino acids that have been found in meteorites, and many are the fundamental ingredients of \_\_\_\_\_ that make up living cells.
16. Amino acids, combinations of carbon and other basic elements, had fused together to form more complex molecules called \_\_\_\_\_.
17. [In underwater volcano vents] despite scalding \_\_\_\_\_, acid eruptions and total lack of \_\_\_\_\_, [scientists] found creatures of all types thriving.
18. Named after the \_\_\_\_\_ - \_\_\_\_\_ color of their cells, these cyanobacteria use photosynthesis to collect energy from the sun. They secrete a sticky coating to shield them from \_\_\_\_\_ radiation.
19. Over time, stromatolites spread out across the \_\_\_\_\_. As a byproduct of photosynthesis, the ancient bacteria formed a waste product: \_\_\_\_\_.
20. Cyanobacteria produced oxygen in varying amounts as water \_\_\_\_\_ changed throughout the seasons.
21. Tiny microbes raised the level of oxygen from less than one percent to today's \_\_\_\_\_ percent.
22. With the protection of the \_\_\_\_\_ layer, life was able to diversify into more complex \_\_\_\_\_.
23. It's only been the last \_\_\_\_\_ percent of Earth's history where there was life on the surface of Earth that you could see with your naked eye.

### Complete a "one pager" for How Life Began

1. Use a visual image (drawing) to create a central focus.
2. 3 statements of fact or personal opinion about the video "How Life Began"
3. Scatter eight words/phrases around the image about the video "How Life Began"
4. Write two questions you have about the video "How Life Began"
5. Put a border around the edges relating to the video "How Life Began"
6. Use colored pencils and/or markers. These must look nice and be in color
7. The grade will be for neatness, creativity and content.

**“NOVA - Origins: How Life Began” Worksheet**

This video explores Earth's early atmosphere, and describes an attempt to determine when life began using geology, biology, and chemistry in addition to present-day geologic and biologic conditions.

**Pre-video question:**

Extremophiles (-*philes* means “to love”) are bacteria that thrive in harsh subterranean and deep ocean environments similar to those believed to have existed on primitive Earth. What do you know already about Earth's primitive atmosphere OR what qualities do you think Earth's atmosphere had before life?

Answers will vary

**Directions:**

Answer the following questions while watching this video. These questions go in chronological order to the video. Some answer to questions will be very close to each other in the video and some will be further away.

1. Earth is a place that is shaped and molded by life.
2. When was Earth “born”? 4.5 billion years ago (bya)
3. [Earth] was covered in lava and smothered in noxious gas.
4. What cataclysm occurred that eventually led to the Moon's formation? A planet the size of Mars hit the Earth.
5. The young Sun was weaker than it is today.
6. When the atmosphere was thicker and dominated by CO<sub>2</sub>, the Earth had a reddish tinge to it and the oceans would have had an olive green color rather than our familiar blue color.
7. For about the first 600 million years, comets and asteroids (300 miles across) pounded our planet- a time known as the “Heavy Bombardment.” Their impacts vaporized Earth's oceans and melted its crust.
8. Hydrogen sulfide can be extremely poisonous so the scientists wear gas masks inside the cave.
9. Can any other forms of life survive in the deep recesses of a cave so toxic to humans? Yes
10. Snottitic acidity (pH) is that of battery acid.
11. All living things, from bacteria to mice to you and me, are made from a small set of chemical elements: hydrogen, oxygen, carbon, nitrogen- four of the most common elements in the universe.
12. The brown goo that formed in Stanley Miller's lab experiment was what? Amino acids

(They are compounds that form molecules when carbon and other elements link together and are the building blocks of proteins, cells – which are the vital ingredients of all living things.)

13. A) Where are some of the oldest rocks found on Earth? [West Greenland](#)  
B) How old are these rocks? [3.7 – 3.9 billion years old](#)
14. What do you see in a magnifying piece of space dust? [Minerals, carbon and 4.5 billion year old materials](#)
15. There are more than [70](#) kinds of amino acids that have been found in meteorites, and many are the fundamental ingredients of [proteins](#) that make up living cells.
16. Amino acids, combinations of carbon and other basic elements, had fused together to form more complex molecules called [peptides](#).
17. [In underwater volcano vents] despite scalding [temperatures](#), acid eruptions and total lack of [sunlight](#), [scientists] found creatures of all types thriving.
18. Named after the [blue-green](#) color of their cells, these cyanobacteria use photosynthesis to collect energy from the sun. They secrete a sticky coating to shield them from [ultraviolet](#) radiation.
19. Over time, stromatolites spread out across the [planet](#). As a byproduct of photosynthesis, the ancient bacteria formed a waste product: [oxygen](#).
20. Cyanobacteria produced oxygen in varying amounts as water [temperatures](#) changed throughout the seasons.
21. Tiny microbes raised the level of oxygen from less than one percent to today's [21](#) percent.
22. With the protection of the [ozone](#) layer, life was able to diversify into more complex [organisms](#).
23. It's only been the last [ten](#) percent of Earth's history where there was life on the surface of Earth that you could see with your naked eye.
24. Multi-cellular life that we are most familiar with- animals, plants, and their environment- was made possible by the slow, toilsome task of [bacteria](#) to oxygenate the [atmosphere](#).