The Birth of the Ocean ... and Life on Earth

In the Kumulipo, the Hawaiian Chant of Creation, we read:

... he wai ka `ai a ka la`au
... a stream of water is the food of plants

&

... he kai ka `ai a ka i`a
... seawater is the food of fish

&

... O ka walewale ho`okumu honua ia
... in the slime was the earth formed

One hundred years before Charles Darwin wrote his Theory of Evolution, the Hawaiian creation chant, which was 1,000s of years old, was created. This chant basically says the same thing as Darwin, & scientists today still agree with the wise kāhuna of old. In fact, there is agreement that life began on Earth with simple forms and became more and more complex over long periods of time. Also, that life began in shallow puddles of water as a chemical “goo,” or the walewale identified as “life-giving slime” in the Kumulipo.

The First “Goo”

What is the ocean made of and how did it get that way? How could the ocean be the origin of all life on earth? Read on to find out the answers!

About 200,000,000 years ago lightning hit the ocean and created oxygen. About another 100,000,000 years later, so much of it had gathered in the water that it rose into the air making the atmosphere a combination of these chemical gases:

\[
\text{carbon dioxide (CO}_2\text{)} + \text{nitrogen (N}_2\text{)} + \text{oxygen (O}_2\text{)}
\]

This is the stuff we breathe! If you looked through a microscope at the tiny molecules these gases are made of, they would look a little like this:

\[
\text{This is the air plants breathe too – and the very same air dinosaurs breathed!}
\]
At first, these gases caused photosynthesis, which is how bacteria get their energy from the sun. Eventually, other chemical elements in the ocean reacted with the oxygen, too, like iron, creating chemical compounds:

\[ \text{Iron (2Fe}^2+) + \text{oxygen (O}_2) \rightarrow \text{iron oxide (2FeO)} \]

Slowly, as all the chemicals in the air and ocean reacted to each other, new and different tiny molecules formed in the organic "goo" – the warm shallow waters. Everything was mostly made of just these simple elements:

- carbon (C)
- hydrogen (H)
- oxygen (O)
- nitrogen (N)
- phosphorus (P)
- sulfur (S)

Even you are made mostly of these basic “building blocks” of life! You get them from the water you drink, the air you breathe, and the plants and animals you eat. And your food sources get these basic elements from the air, soil and water, too.

**Cool Glow-in-the-Dark Life**

Microscopic single-celled algae, called dinoflagellates, were one of the first living things on our planet. Ancient Hawaiians knew this, perhaps because the kāhuna saw their phosphorescence. These algae are present all through the ocean, and give off light when they are disturbed, for example by a boat, a paddle, a swimmer or wave action. This action leads to a chemical reaction inside the organism, and results in glowing light. This photo shows millions of blue-green algae glowing in the ocean waves.

While there is only a little phosphorus in the ocean, it was very important when life began, just as it is very important to all living things now. Phosphorus (P) can be found in parts of the water cycle. It is in the dirt and streams and it flows to the ocean, so the plants and algae can get phosphorus from the water and ground. It is also in bones, shells and muscles of the fish, animals and humans which eat those plants and algae. Today, farmers put extra phosphorus in the soil to grow crops. But too much of it can kill sensitive life forms in nearby ecosystems. This is why people must take great care so nature’s original, perfect balance is maintained.
The Birth of the Ocean: Chemistry Questions  
(10 Points)

1. How do you think life began on Earth? In what ways do you agree with the Kumulipo? Why? ________________________________________________
   _____________________________________________________________(1)

2. What does “in the slime was the earth formed” mean? ________________
   _____________________________________________________________(½)

3. How is “a stream of water … the food of plants?” ________________
   _____________________________________________________________(½)

4. Look at the diagram of molecules on the bottom of page 1. What do you notice about the number & size of the circles? How is this similar to the numbers and letters of the chemical symbols above the circles. ____________
   __________________________________________________________________(1)

5. Describe algae. _______________________________________________(1)
   _____________________________________________________________

6. How did algae start to grow on Earth? _______________________________
   _____________________________________________________________(1)

7. Pick an important chemical from the reading and name 3 places you could find it. ____________________________________________
   _____________________________________________________________(2)

8. WORD BANK: Look up & write the meanings of 6 of the underlined words in this reading below.     (3)
   ___________ - ______________________________________
   ___________ - ______________________________________
   ___________ - ______________________________________
   ___________ - ______________________________________
   ___________ - ______________________________________
   ___________ - ______________________________________
BONUS: There are only about 100 things in the whole universe. We call them elements or chemicals. But when combined they make millions of living & non-living things: rocks, fireworks, cake & you! What 2 things do you think it would be cool to study the chemistry of, & how could we study this so learning it would interest you?
The Birth of the Ocean: Biology Questions (10 Points)

1. How do you think life began on Earth? In what ways do you agree with the Kumulipo? Why? _____________________________________________________________
   _____________________________________________________________(1)

2. What does “in the slime was the earth formed” mean? __________________
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