1 - Why do Biologists need to understand Chemistry?

The Inseparable Bond of Biology and Chemistry

Video 1 - Transcript

Hi everyone. Welcome to our first video in a series that is entitled Essential Chemistry for Biologists - Decoding the Language of Life. In this series, we're going to explore the basic principles of chemistry that any good biology student should know. The first video today is going to explain exactly why biologists need to understand chemistry. Biology is the study of living things. And living things are made up of chemicals. The survival of living things is dependent upon chemical reactions that are occurring inside the organism as well as outside of the organism. In order to understand living things, biologists need a good understanding of chemistry. If we consider about 4 billion years ago, the first signs of life would have appeared on Earth. Now, biologists have classified life on Earth today as existing in three domains. We have the Bacteria, the Archaea, and the Eukarya. Now plants and animals, including humans, belong to the domain of Eukarya. By comparing the genetic material of modern organisms today, such as bacteria, we have found evidence that there is what we call the Last Universal Common Ancestor, abbreviated LUCA. Now LUCA is not thought to be the very first form of life on Earth, but rather is the only type of organism that still has living descendants today. LUCA is most likely a single celled organism that probably used RNA, DNA, protein, and also perhaps had a lipid bilayer... Okay, this is the common ancestral cell from which life, in all three domains that we've identified here, originated. What exactly is life? Life - we say something is alive if it possesses seven key characteristics. We have another useful abbreviation - GRIMNER. So stands for growth, R stands for respiration, I stands for irritability, M for movement, N for nutrition, E for excretion, and R for reproduction. If something possesses these seven characteristics, biologists believe that the entity is alive. If we want to study living things, then we have to understand the chemical composition of living things. All living things on Earth today utilize the same elements as the building blocks of their biomolecules. We have another useful abbreviation, CHNOPS. So CHNOPS stands for carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulphur. These six elements form the building blocks of all biomolecules on Earth. If we think about these elements, these elements were born inside of stars. All of the molecules inside of your body right now, once existed in a star, So living things are literally made of star dust. We have also found evidence of more complex organic molecules. For example, uracil, which is a component of RNA. We have also found niacin, otherwise known as vitamin B3. We have found these complex molecules in heavenly bodies, such as asteroids and meteorites and comets. This afforded us the theory that these bodies that bombarded early Earth would have seeded the young planet with the compounds that helped pave the way for the first microbes. You have embarked upon a study of biology,

probably because you're interested in mitigating climate change, improving agricultural practices, conserving our natural habitats, or even improving human health, Regardless of if you're studying simple bacteria, the complex human body, or you want to study the evolution of birds or the ecology of forests. One thing is, for certain, you have to understand the chemical nature of the biomolecules that make up these systems at the micro level. So that you can describe and explain the same systems at the meso and macro level, so the higher levels. To provide you with a good foundation to do this. This series of videos will take you through basic chemistry concepts that you will meet again and again in your introductory biology courses and that you will also refer to again when you begin even advanced biochemistry courses. That's all for now, and I'll see you guys in the second video where we will be looking at the periodic table.