The scientific foundations behind "ChanguApp"

form the basis of decisions and the future of the population with which you decide to start the adventure. Life as we know it is extremely fragile and sensitive to various factors and conditions, both environmental (such as pH levels and temperature) and chemical composition necessary to carry out basic biological processes.

Considering that the scenarios presented in the information provided by NASA SpaceApps urge us to imagine a scenario where organisms base their simplest processes on chemosynthesis, it is essential to understand the underlying principles and explanation of these concepts to justify the decisions made by the algorithm on which our game is based.

Firstly, the chemosynthesis process is an alternative to the cellular respiration process that is so essential for life, where the goal is to obtain energy from specific elements and compounds. In broad terms, we understand that for the heterotrophic life known on Earth, we need oxygen and carbohydrates to carry out this process. In contrast, chemosynthetic organisms use more unusual elements from the periodic table to obtain energy through various chemical reactions, where oxygen is not required (anaerobic), and they produce their own food (autotrophic). These organisms are ideal candidates for signs of life on other planets with different compositions.

For this project, we focus on four types of chemosynthetic organisms: sulfur-fixing bacteria, nitrogen-fixing bacteria, hydrogen-fixing bacteria, and ferrous iron-fixing bacteria. These will play the role of producers in our app, where the chemical reactions carried out by each type of bacteria are:

These organisms demonstrate the potential for life in environments vastly different from those on Earth, making them central to the game's mechanics and educational objectives.

Sulfur-fixing bacteria:

$$SO_4{}^{2-} + 8H^+ + 8e^- \rightarrow H_2S + 4H_2O$$

Nitrogen-fixing bacteria:

$$N_2 + 8H^+ + 8e^- \rightarrow 2NH_3 + H_2$$

Hydrogen-fixing bacteria:

$$N_2 + 8H^+ + 8e^- \rightarrow 2NH_3 + H_2$$