

I. The Inorganic Carbon Cycle

The inorganic carbon cycle differs from the organic carbon cycle in that the organic carbon cycle is dominated by biological processes while the inorganic carbon cycle is dominated by abiotic processes. Although the inorganic carbon cycle does have a biological component the main processes are: weathering, diffusion, deposition, and metamorphism. The aim of this portion of the lab is to enable you to recognize the chemical constituents and to understand their movement through the inorganic carbon cycle. Below you will find a list of all the pertinent molecules and processes.

Molecules:

CO_2 – carbon dioxide

H_2O – water (either in liquid or vapor form)

H_2CO_3 – Carbonic acid

HCO_3^- - Bicarbonate

CO_3^{2-} - Carbonate

H^+ - Hydrogen ion

CaCO_3 – Calcium Carbonate

Ca^{2+} Calcium ion

CaSiO_3 – Wollastonite (this is a rock)

SiO_2 – Silica

Processes:

Carbonate rock weathering: $\text{CaCO}_3 + \text{H}_2\text{CO}_3 \rightarrow \text{Ca}^{2+} + 2\text{HCO}_3^-$

Silicate rock weathering: $\text{CaSiO}_3 + 2\text{H}_2\text{CO}_3 \rightarrow \text{Ca}^{2+} + 2\text{HCO}_3^- + \text{SiO}_2 + \text{H}_2\text{O}$

Deposition: movement of SiO_2 and CaCO_3 from a liquid to a solid medium

Diffusion: CO_2 (gas) $\rightarrow$ CO_2 (liquid)

Metamorphism: $\text{CaCO}_3 + \text{SiO}_2 \rightarrow \text{CaSiO}_3 + \text{CO}_2$

Precipitation: movement of H_2CO_3 from a gas to a liquid or solid medium

The inorganic carbon cycle can be separated into two phases: terrestrial and aquatic. In reality, these occur simultaneously and are intricately linked but for our purposes we will address them separately. The picture below is a simplified terrestrial system. Please fill in the correct chemicals “c” and processes “p.”

Terrestrial Inorganic Carbon Cycle

Atmosphere

Arrows indicate the movement of chemicals through the system



1p_____



—

$$\text{CaSiO}_3$$
 CaCO_3

CaSiO_3 and CaCO_3 are types of rock.

2p_____

—

Ocean

river

c _____

c _____

Marine Inorganic Carbon Cycle

Atmosphere



3p_____

c _____

4p_____

river

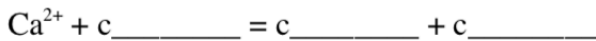
zooplankton

phytoplankton

C _____ C _____ C _____

Ocean

5p_____



6p_____↓

zone of subduction

~~7p~~

C