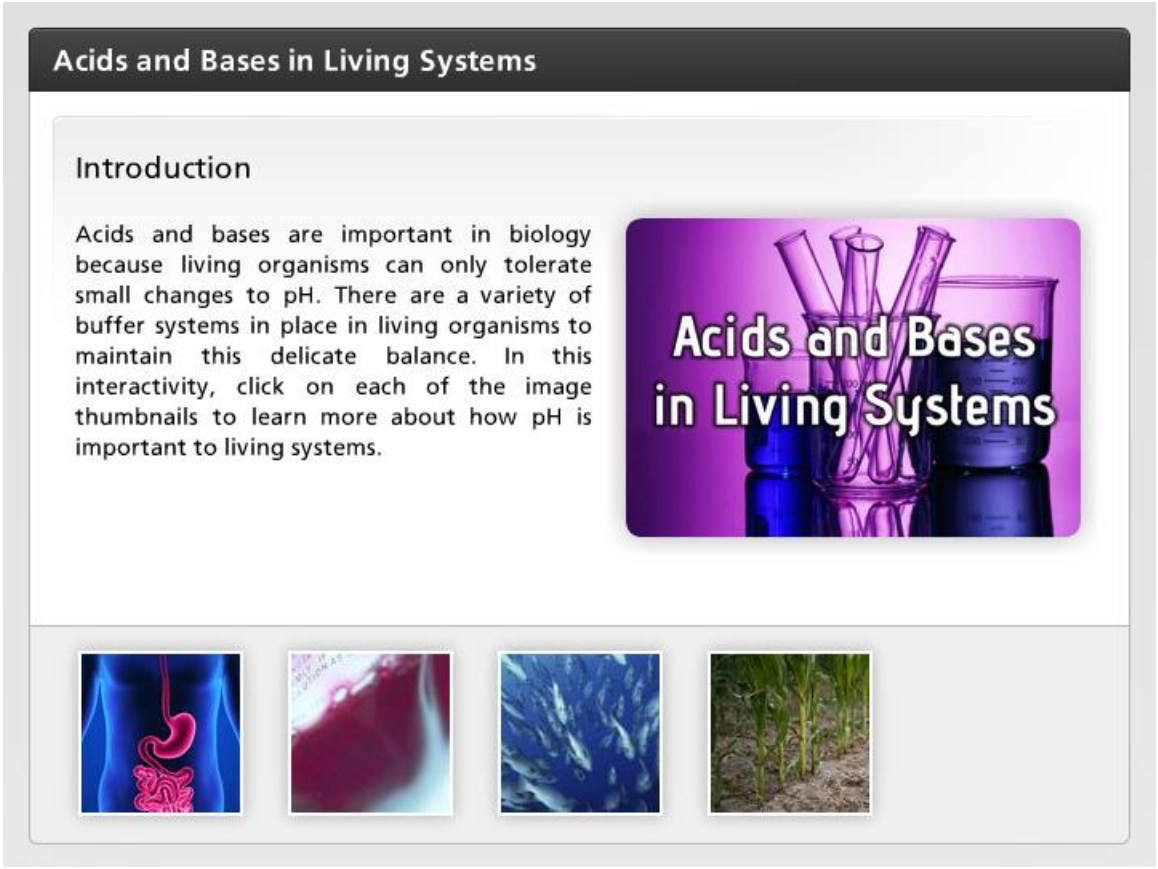
Module 2: Biochemistry
Topic 2 Content: Acids and Bases in Living Systems Notes

Introduction



Acids and bases are important in biology because living organisms can only tolerate small changes to pH. There are a variety of buffer systems in place in living organisms to maintain this delicate balance. In this interactivity, click on each of the image thumbnails to learn more about how pH is important to living systems.

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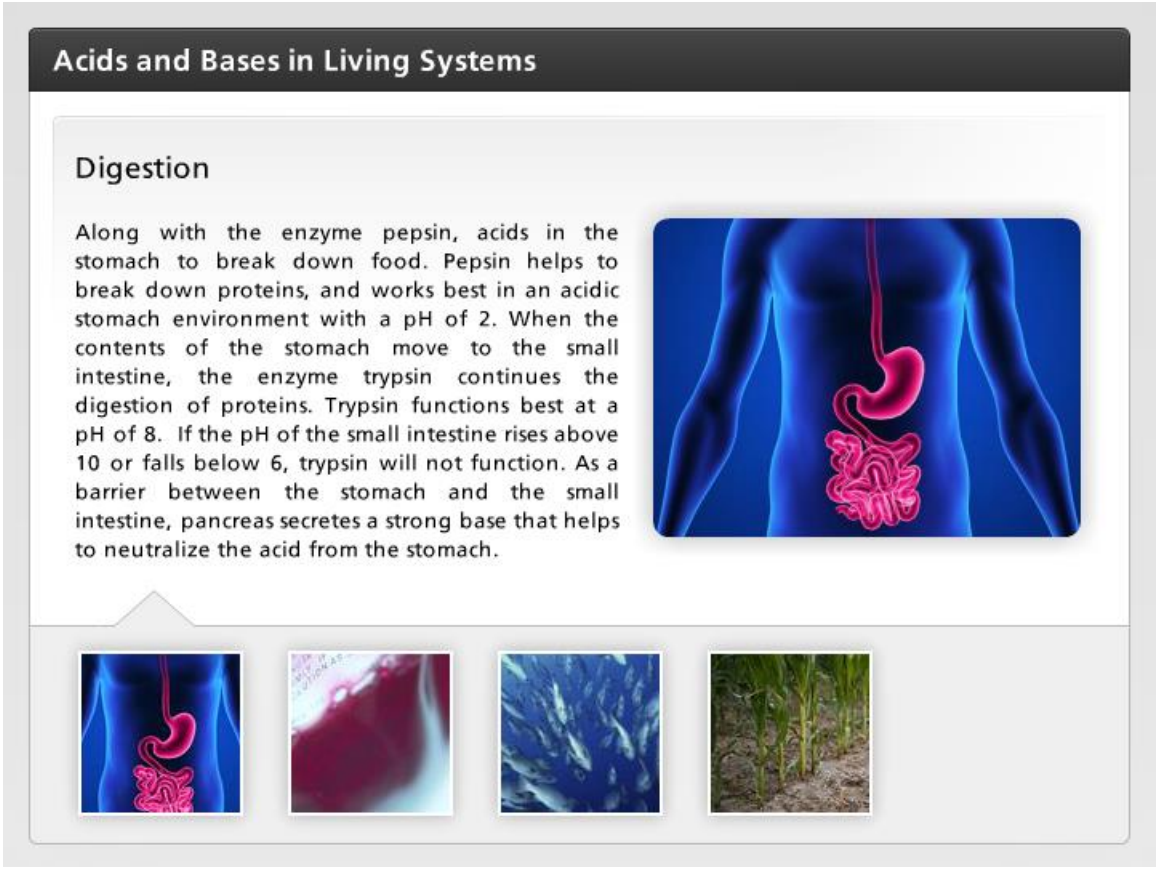
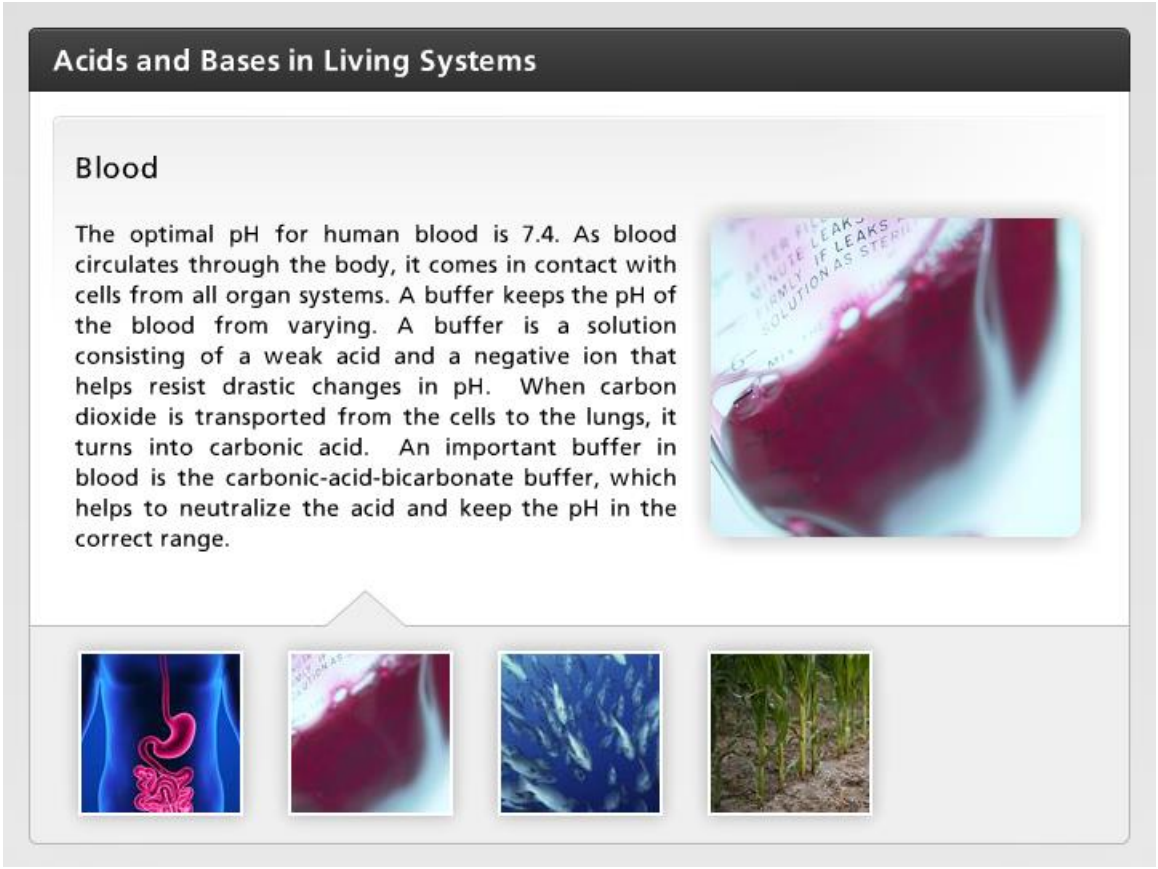
Digestion



Along with the enzyme pepsin, acids in the stomach to break down food. Pepsin helps to break down proteins, and works best in an acidic stomach environment with a pH of 2. When the contents of the stomach move to the small intestine, the enzyme trypsin continues the digestion of proteins. Trypsin functions best at a pH of 8. If the pH of the small intestine rises above 10 or falls below 6, trypsin will not function. As a barrier between the stomach and the small intestine, pancreas secretes a strong base that helps to neutralize the acid from the stomach.

Blood



The optimal pH for human blood is 7.4. As blood circulates through the body, it comes in contact with cells from all organ systems. A buffer keeps the pH of the blood from varying. A buffer is a solution consisting of a weak acid and a negative ion that helps resist drastic changes in pH. When carbon dioxide is transported from the cells to the lungs, it turns into carbonic acid. An important buffer in blood is the carbonic-acid-bicarbonate buffer, which helps to neutralize the acid and keep the pH in the correct range.

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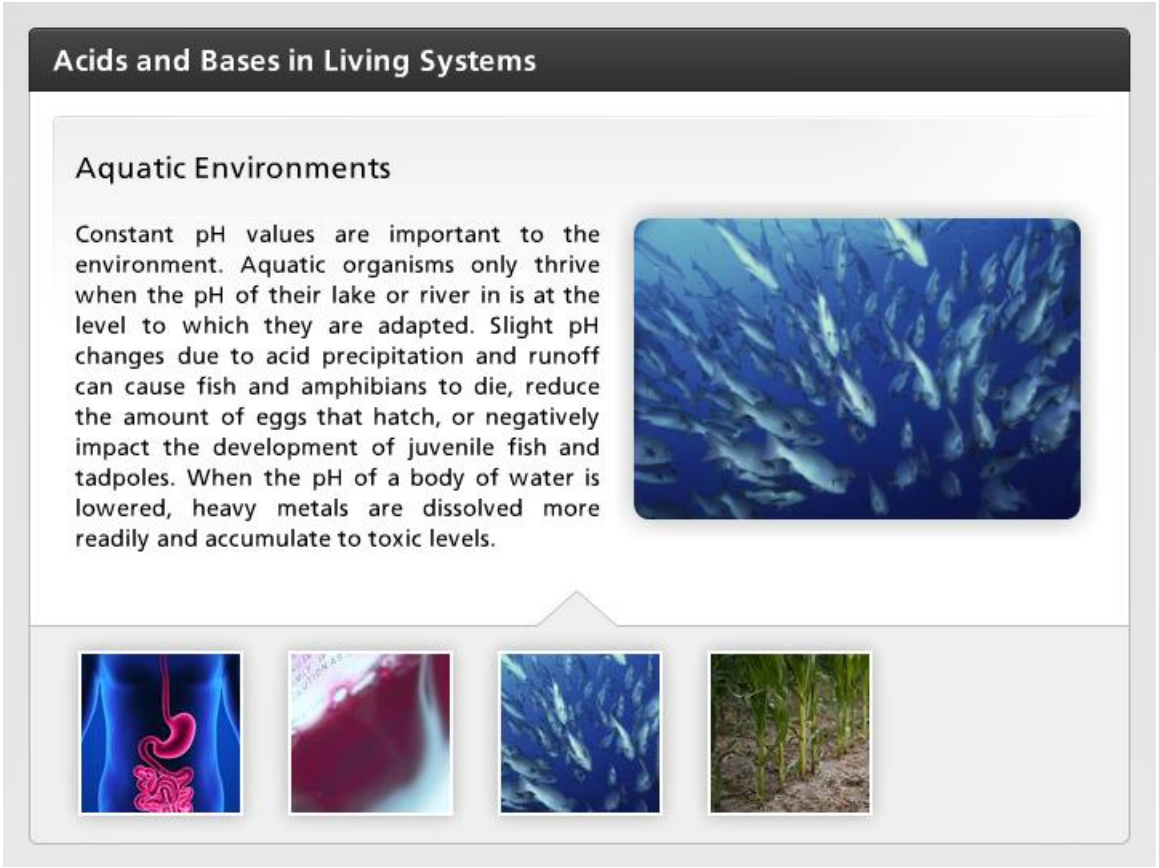
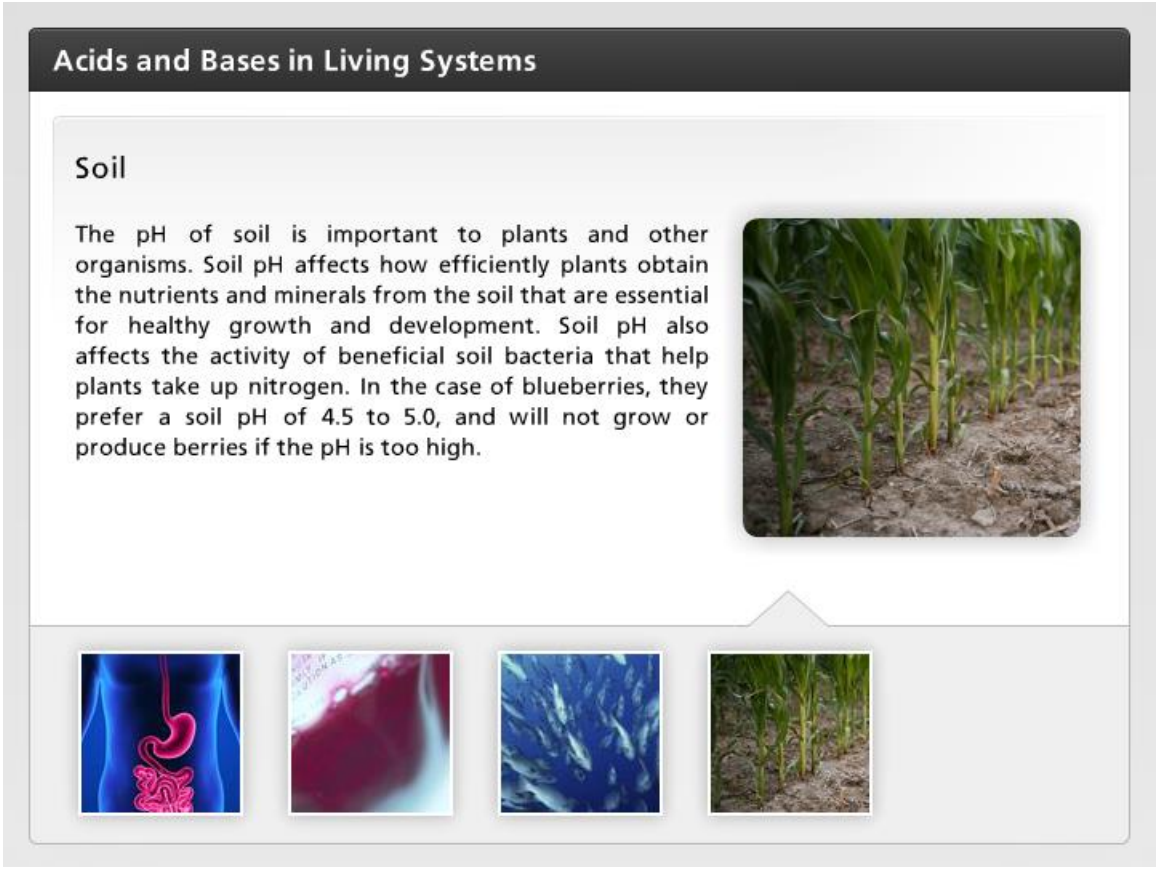
Aquatic Environments



Constant pH values are important to the environment. Aquatic organisms only thrive when the pH of their lake or river in is at the level to which they are adapted. Slight pH changes due to acid precipitation and runoff can cause fish and amphibians to die, reduce the amount of eggs that hatch, or negatively impact the development of juvenile fish and tadpoles. When the pH of a body of water is lowered, heavy metals are dissolved more readily and accumulate to toxic levels.

Soil



The pH of soil is important to plants and other organisms. Soil pH affects how efficiently plants obtain the nutrients and minerals from the soil that are essential for healthy growth and development. Soil pH also affects the activity of beneficial soil bacteria that help plants take up nitrogen. In the case of blueberries, they prefer a soil pH of 4.5 to 5.0, and will not grow or produce berries if the pH is too high.