

Regulating Blood Glucose Levels

LT: I can follow a procedure in order to model how the human body maintains a healthy level of blood glucose. 4.1.2c

To be healthy, organisms must maintain **homeostasis**, which keeps their internal environment balanced within normal limits. Failure to maintain homeostasis may result in disease or death. One level that must be maintained is the amount of sugar (glucose) in the blood, called blood glucose. Too much glucose in the blood can be harmful to cells and tissues, too little and organisms cannot generate enough ATP to fuel their life processes. In this lab, we are going to explore the ways in which the human body maintains healthy levels of blood glucose.

Explore Activity: Regulating Sugar Concentration in Cupples

Cupples are imaginary creatures with clear veins so we can see their blood while they are alive. We are going to use Cupples as a **model organism** so that we can better understand how we regulate blood glucose levels. Like all animals, they must maintain blood sugar homeostasis to keep the amount of sugar in their blood in the normal range. Their blood changes color to indicate the amount of sugar in their blood. The chart to the below shows what the color changes mean.

Blood Color	What This Means
<i>Royal Blue</i>	Cupple's blood sugar is too low
<i>Green/Teal</i>	Cupple's blood sugar is at a normal level
<i>Yellow</i>	Cupple's blood sugar is too high.



a. Hypothesize how eating will affect the Cupple's blood sugar.

b. Copy the following data table:

Procedure #	Color Blood Turns	What this Means	What the Cupple Should do to Maintain Homeostasis
2			
3			

Procedure:

- Get a plastic cup with a small amount of Cupple blood. This cup represents a healthy Cupple who has the normal concentration of sugar in its blood.
- The Cupple is hungry. Feed the Cupple by using the "Sugar" dropper to add 5 drops of "Sugar" to the plastic cup. Gently swirl the cup to mix the "Sugar" with the Cupple blood. Complete the data table for Procedure #2.
- Now the Cupple releases insulin into the bloodstream. The function of insulin is to open up cell membranes so that glucose can enter the cells to be used in cellular respiration. Add 10 drops of "Insulin" to the beaker. Gently swirl the cup to mix the "Insulin" with the Cupple blood. Complete the data table for Procedure #3.
- Add drops of "Sugar" until you restore homeostasis. After each drop, gently swirl the cup to mix the "Sugar" with the Cupple blood to see if any color change occurs. Make sure you COUNT EACH DROP!

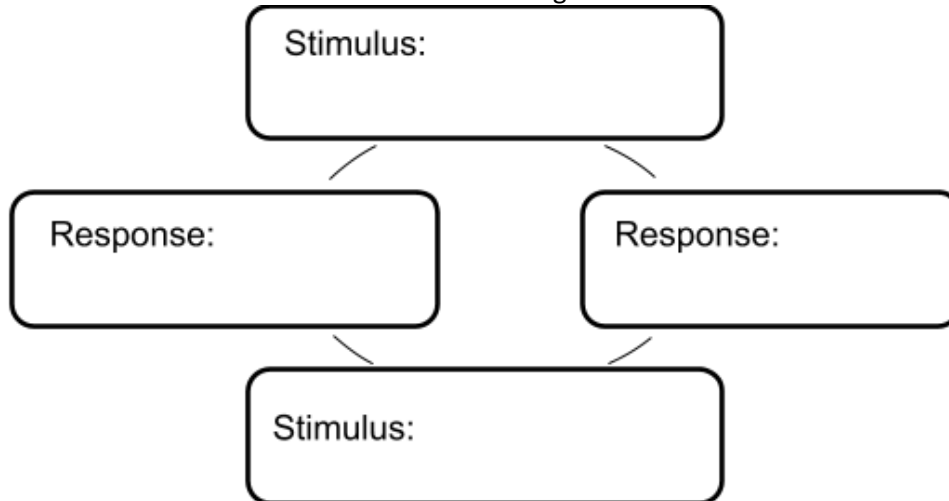
c. How many drops of "Sugar" were needed to restore homeostasis?

Analysis Questions

d. What were the two stimuli and two responses in this lab?

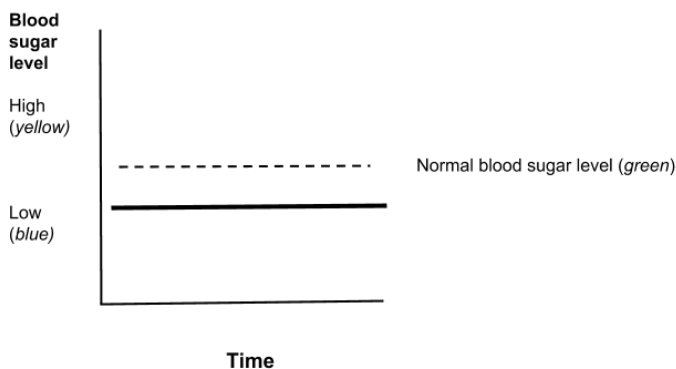
Stimulus (What triggered a color change?)	Response (What was that color change, and what does it mean?)

e. Fill in the flowchart below that outlines how blood glucose levels are maintained based on the data you collected.

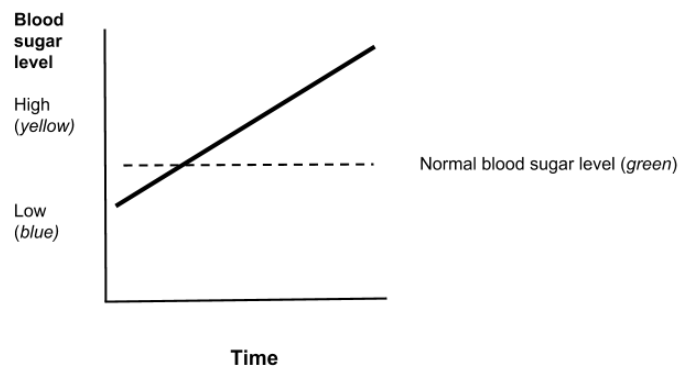


f. Look at each of the following graphs. Choose the one that best represents the data you collected in this lab. On the one that you choose, label where responses would be triggered.

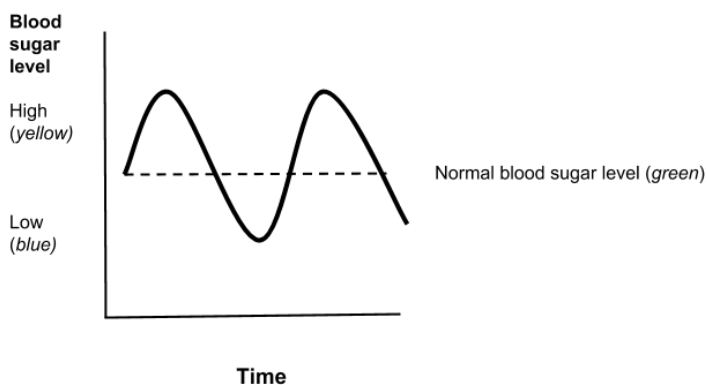
Graph Example 1



Graph Example 2



Graph Example 3



g. Blood glucose levels are regulated through a **feedback loop**, or feedback mechanism. Based on today's activity and your answers to the questions above, provide a definition of a feedback loop, and explain how it works to maintain blood glucose levels.