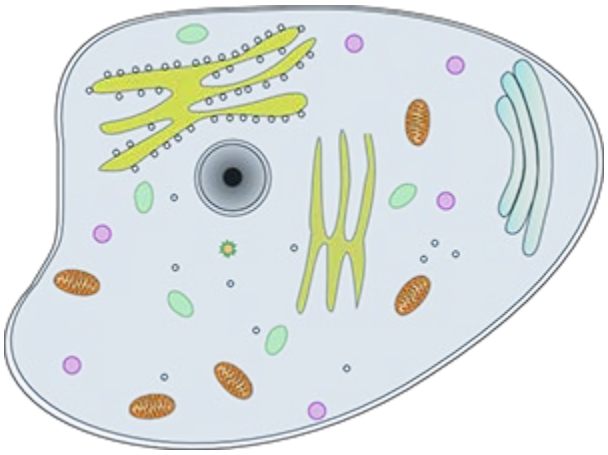
Name:_____

Investigation: Why Are Cells So Small?

Introduction:



The smallest objects that can be seen by the human eye are about 0.1 mm long. Some single-celled organisms are just big enough that you could see them. A human egg is about 0.12 mm in diameter. The vast majority of cells in your body and cells that form bacteria are too small to see without a microscope. Usually, when a cell gets too large, it divides or stops growing. Cells remain small because all materials that are exchanged between the cell and its environment, like oxygen and glucose, must pass through the cell membrane. If materials cannot be exchanged efficiently, then the cell could die.

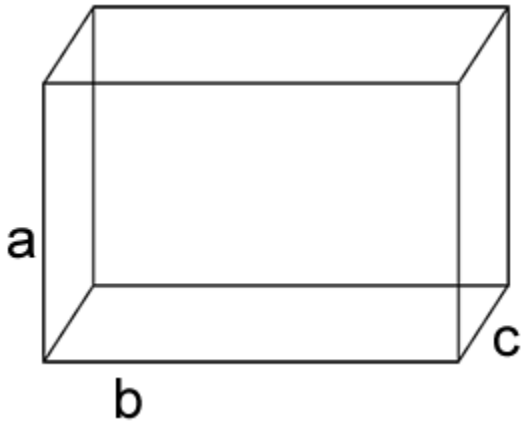
In this activity, you will explore how surface area and volume limit the size of cells.

Procedure

Your group will receive a box (tissue box, jewelry box, food box) and your task is to measure the surface of the box, and also measure the volume of the box.

1. Measure the surface area by measuring the area of each side of the box and adding those numbers. Show your work below!

Surface area = 2 × a × b + 2 × b × c + 2 × a × c



2. Measure the volume of the box.

Volume= a × b × c

3. Calculate the Surface Area to Volume ratio.

SA / Volume

3. Compile Data - All the boxes in the room are different sized.

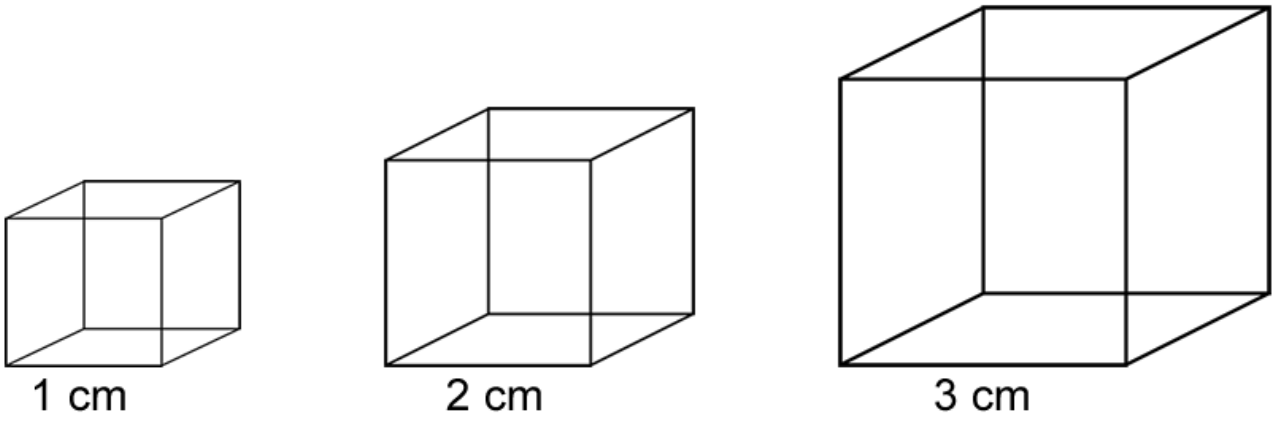
Fill out the chart below by collaborating with your classmates.

Surface Area	Volume	SA / Volume

4. Summarize: What happens the SA/Volume ratio as the boxes get larger?

Analysis

Measure the surface area and the volume of each of the cubes below. Show your work!



	Box 1	Box 2	Box 3
Surface Area			
Volume			
SA/Ratio			

1. Consider the investigation question: "Why Are Cells So Small?" Use your data and observations from this lab to answer the question. Be thoughtful and thorough and provide evidence for your statement.

2. The amoeba is a single-celled protist that is found in pond water or lakes. The genus *Chaos* contains some of the largest individuals. Shown below is a representative of the species, *Chaos carolinensis*. Note that the shape of an amoeba is irregular. In fact, the word amoeba means "change." Amoebas move by stretching their cytoplasm into extensions called **pseudopodia**.

How could you measure the surface area of the amoeba shown?

How does the shape of the amoeba allow it to become much larger than other cells?