

Name \_\_\_\_\_

Hour: \_\_\_\_\_

# Why are cells so small?

Today's lab is about the size of cells. To understand this, we first have to understand surface area to volume ratios.

Let's start with **surface area**. Get a box of sugar cubes. The surface area of the cube is calculated by finding the area (length x width) of one side. But we want to know the whole surface. On a cube, there are 6 sides, so we multiply that area x 6. So

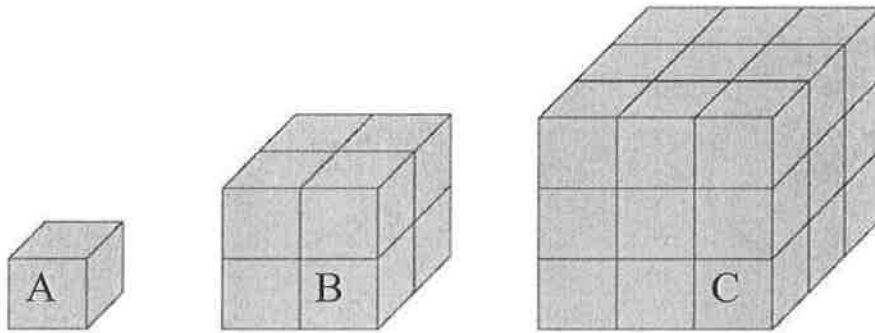
$$\text{Surface area of a cube} = \text{length} \times \text{width} \times 6$$

**Volume** is another simple calculation - we just multiply **length x width x height**.

**Question:** As cells increase in size, what do you predict will be the relative difference between surface area and volume? Surface area and volume will keep a constant difference in size, or surface area will grow faster than volume in size, or volume will grow faster than surface area in size? Write out your hypothesis.

**Hypothesis:**

Build the following four structures above from your sugar cubes, and fill out the table below.



Model	Number of Cubes	Surface Area (SA) of Model (cm <sup>2</sup> )	Volume (V) of Model (cm <sup>3</sup> )	Surface Area to Volume Ratio (SA/V)
A				
B				
C				

### Explanation Questions

*Answer the questions in your own words using full sentences.*

1. What happened to the surface area as the size of the model increased?
2. What happened to the volume as the size of the model increased?
3. What happened to the surface area to volume ratio as the size of the sugar cube model increased?
4. Now imagine you're looking at a very large cell. Next to it is a very small cell. Which one has a larger surface area to volume ratio?
5. How do cells obtain food? Communicate? Release waste? (Everything has to travel through what part of the cell?)
6. If cells rely on diffusion to perform life functions like obtaining food, communicating, and releasing waste, what kind of cell would be able to perform these functions faster - a cell with a small surface area to volume ratio (SA:V), or a cell with a large SA:V? Explain your answer by writing why that cell could diffuse substances faster.