Science 10-Biology
Activity 10
Exercise on Cell Surface Area and Volume
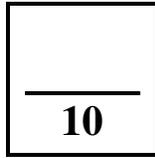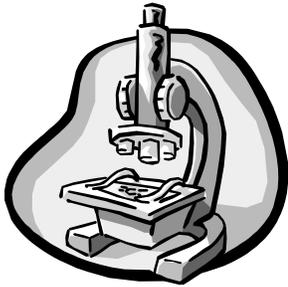
| |
|---|
| Name _____ |
| Due Date _____ |
| Show Me ☐   Hand In ☐ |
| *Correct and Hand In Again By* _____ |

10

Purpose:

To examine how a cell's *surface area* and *volume* affects its ability to exchange nutrients and waste products.

Introduction:

Even though cells are **not** shaped like cubes, the mathematics involved with *surface area* and *volume* are simpler for cubes than for other shapes so for this lab we will *pretend* that cells are cubes.
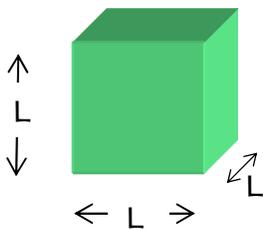
Surface Area
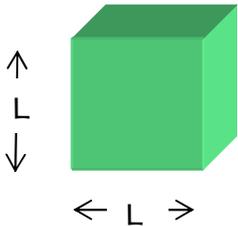
Each side has an area of $L \times L = L^2$

A cube has 6 equal sides, so the   **Surface Area $= 6\,L^2$**

Example: The length of one side of a cube is 0.5 cm. Calculate the Surface Area of the cube.

$$\text{Surface Area} = 6\,L^2 = 6 \times (0.5)^2 = 6 \times 0.25 = \underline{\textbf{\textit{1.5 cm}}^2}$$

Volume

The Volume of a Cube is length x width x height $= L^3$

Volume $= L^3$

Example: The length of one side of a cube is 0.5 cm. Calculate the Volume of the cube.

$$\text{Volume} = L^3 = (0.5)^3 = \underline{\textbf{\textit{0.125 cm}}^3}$$

Procedure: Make the following calculations and write them in the table below:

| Length of one side of Cube (cm)	Surface Area (SA) of Cube (cm^2)	Volume of Cube (cm^3)	Ratio of S.A./Volume
	Surface Area = 6L^2	**Volume = L^3**	**Ratio = SA / Volume**
1			
2.0			
3.0			
4.0			
5.0			
6.0			
7.0			
8.0			

Questions:

1. The ratio of Surface Area/Volume determines the cells ability to _____

   _____

2. What happens to the Surface Area/Volume ratio as the length of a cube (or cell) gets larger? (See

   Table above.) _____

3. If the length of a cube gets really large, the SA/Volume ratio will get very _____

   If this happens, what problem will result in the cell? _____

   _____

4.   The graph below shows what happens to SA and Volume as the length of a cube gets larger

Volume and Surface Area vs Length of Cube Side
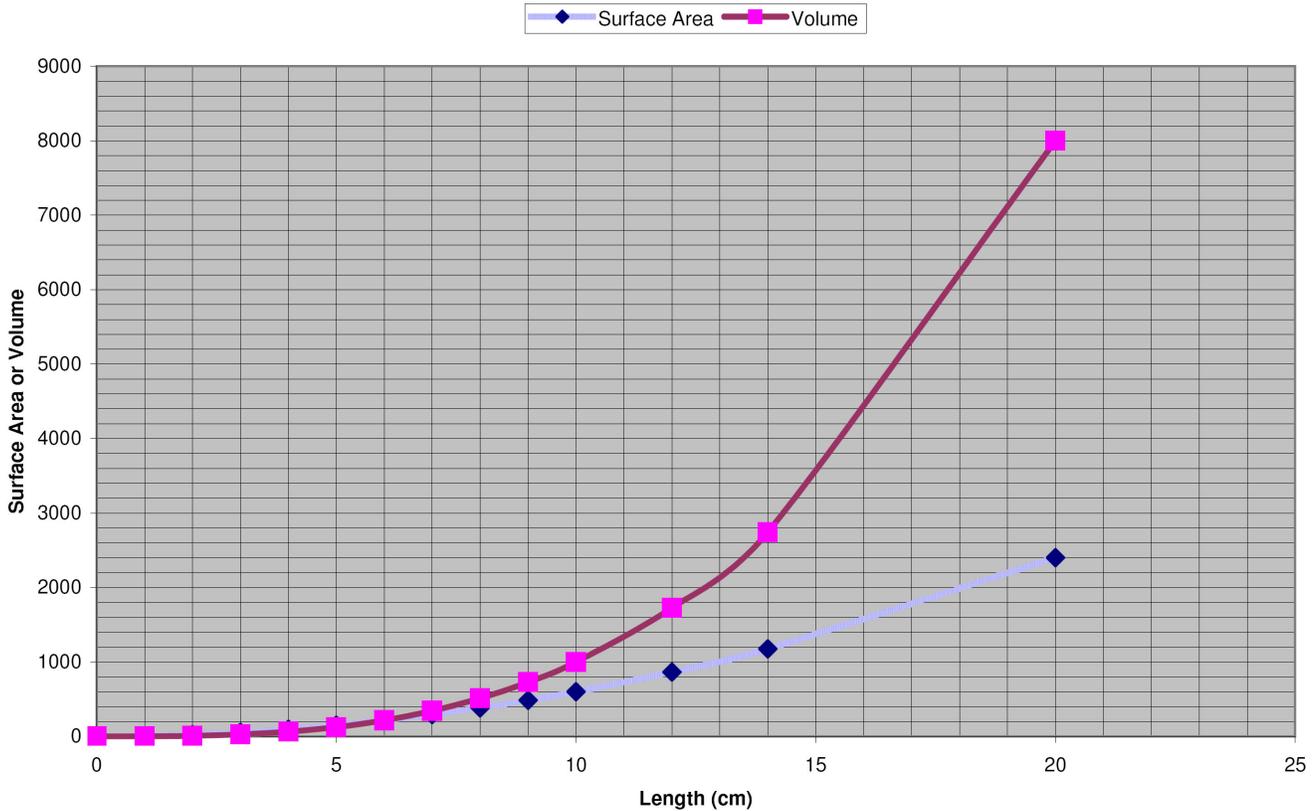
a)   What goes up faster, Surface Area or Volume? _____

b)   What happens to the gap between Surface Area and Volume as a cube (or cell) gets larger?

_____

c)   A cell absorbs nutrients and disposes wastes through its _____.

d)   If the surface area is not large enough to absorb enough nutrients for the whole volume, what would

    happen to the cell? _____

5.   Summarize why unicellular organisms cannot be very large. _____

_____

_____

_____