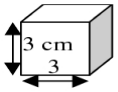
Name:_____ Block:_____ Date:_____

CALCULATING SURFACE AREA TO VOLUME RATIOS



- First of all, the **SURFACE AREA** (abbreviation = **SA**) is the **area of material that it would take to completely cover an object** (for example, the amount of wrapping paper it would take to precisely wrap an expensive gift to your biology teacher☺).
- For a **simple cube shape**, surface area is simply the length of one side times the height of one side times the number of sides (all cubes have, incidentally, 6 sides). The formula can be written like this.

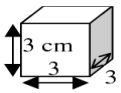
Surface Area = Length x Height x 6

- For example, a cube that was 3 cm on each side would have a surface area of:

SA = 3 cm x 3 cm x 6 = 54 cm^2

Notice that the units are "square" units.

- **VOLUME** (V) is the amount of space inside an object.
- Volume for a simple cube is equal to the **length** times the **height** times the **depth** of an object.



V = L x H x D

For the above example of a 3 cm cube, the volume would be:

V = 3 cm x 3 cm x 3 cm = 27 cm^3

Notice that the units are "CUBIC" units.

The **surface area to volume ratio** (SA:V) is the proportion of area of material covering an object to amount of material within the object. i.e. it is a measure of how much covers the object for each unit of interior volume. For the above example:

SA:V
54:27

(*this ratio can be reduced to smaller numbers similar to the way that fractions can be reduced. It is customary to reduce SA:V ratios so that V is equal to 1. This can be done by dividing the SA by V and V by V as below*)

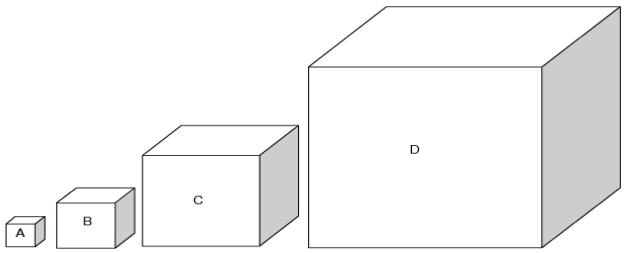
54/27: 27/27
2:1

- The surface area to volume ratio for the above cube is equal to 2:1. That is, *for every 2 units of surface area covering the outside of the cube, there is 1 unit of volume in the inside of the cube.* If this cube were a cell, we could further say that *there are 2 units of cell membrane for every unit volume of cytoplasm in its interior.*

Now you try: Key is on other side -- DO NOT LOOK until you've solved these problems on your own.

- For the four cubes below, **measure** (in cm) each with a ruler, and **calculate** the surface area, the volume, and the surface area to volume ratio. Reduce the SA:V ratio so that it the "V" is = 1.

Cube A	
Surface Area	
Volume	
S:V ratio (reduced)	
Cube B	
Surface Area	
Volume	
S:V ratio (reduced)	
Cube C	
Surface Area	
Volume	
S:V ratio (reduced)	
Cube D	
Surface Area	
Volume	
S:V ratio (reduced)	



1. What trend do you notice as the size of the cells increases?
2. Why is this important to living cells?
3. What can cells do about it?