AP Biology   Name_____Per._____

What Determines Cell Size?

1. Obtain agar cubes in a plastic cup from your teacher.

The agar cubes have been prepared with 1% phenolphthalein, which is a pH indicator. The chart below indicates a color scale of pH for phenolphthalein. The blocks are pink because the agar blocks were soaked in 0.01 % sodium hydroxide.

Phenolphthalein Color Indicator

Color	pH	Acid or Base
Colorless	0 - 8.2	Acidic or slightly neutral
Pink to Red	8.2 – 12.0	Basic

2. Using the metric ruler, measure the dimensions of each agar cube and record the measurements

3. Place the three cubes carefully into a plastic cup. Add white vinegar (acidic solution) until the cubes are submerged. Using a plastic spoon, keep the cubes submerged for **10 minutes** turning them frequently. Be careful not to scratch any surface of the cubes. Be sure to start the timer once the cubes are submerged.

4. As the cubes soak**, calculate the surface area, volume, and surface area to volume ratio for each agar cube. Record this data the table below.**

Block #	Length (cm)	Width (cm)	Height (cm)	Surface area (cm^2)	Volume (cm^3 or mL)
Start 1					
Start 2					
Start 3					
End 1					
End 2					
End 3					

5. After 10 minutes, use the spoon to remove the agar cubes and carefully blot them on dry paper towel. For more accurate measures of diffusion, use a knife to cut the cubes.

6. Using a metric ruler, measure the distance in centimeters (cm) that the white vinegar diffused into each cube. (Distance from surface)

7. Calculate the rate of diffusion for each cube in centimeters per minute (cm/min.).

8. Calculate the volume of the portion of each cube which has not changed color (in other words, the portion of the cube that is still pink).

9. Calculate the extent of diffusion into each cube as a percent of the total volume.

10. Graph the rate of diffusion relative to cell volume and surface area.

11. Graph the extent of diffusion relative to cell volume and surface area.
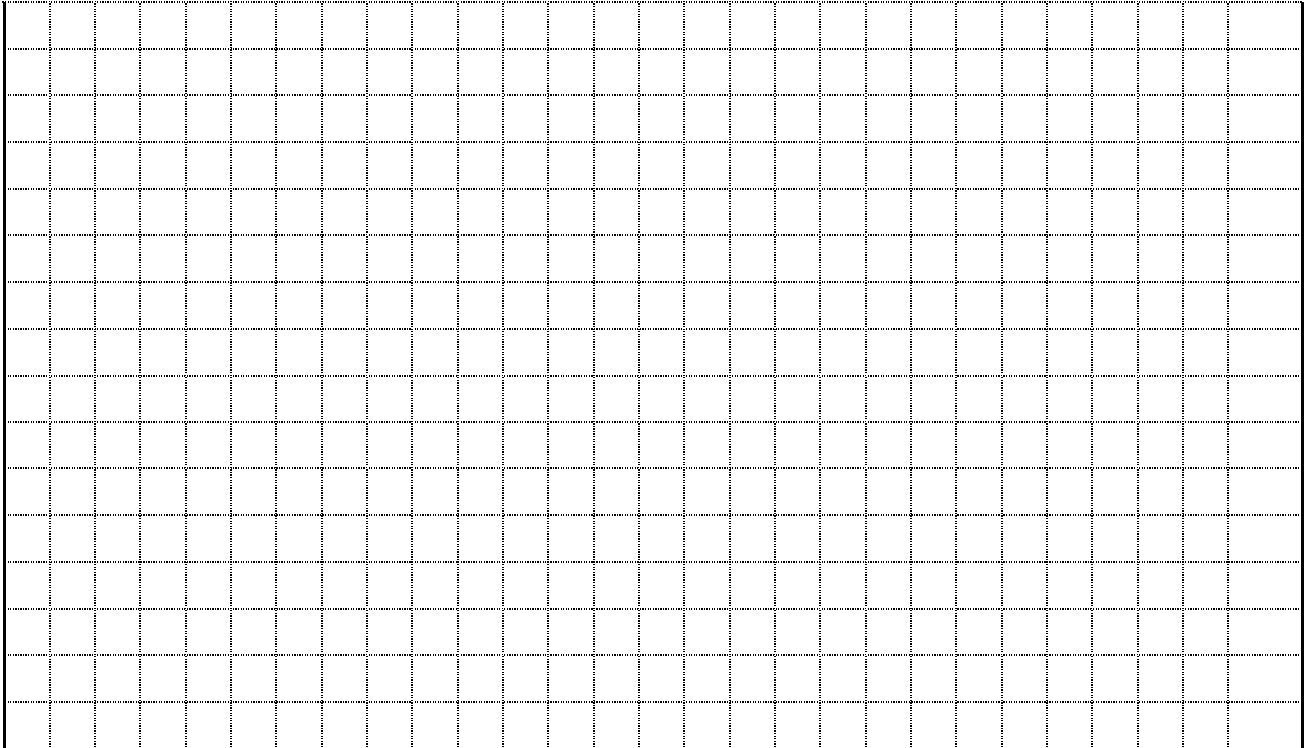
FORMULAS

All formulas for calculations are listed below:

Surface Area =

Length x width x # of sides

Volume =

Length x width x height

Surface Area Volume Ratio =

$$\frac{\text{Surface Area}}{\text{Volume}}$$

Extent of Diffusion =

$$\frac{\text{Total Cube Volume}\ -\ \begin{array}{c}\text{Volume of cube}\\ \text{that has not}\\ \text{changed color}\end{array}}{\text{Total Cube Volume}} \times 100$$