

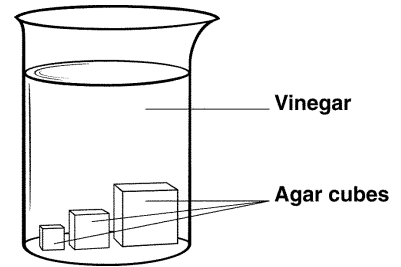
# Cell Cycle and Mitosis – Chapter 10

Name: \_\_\_\_\_ Period: \_\_\_\_\_

A student placed three cubes of agar that contained the indicator phenolphthalein in a beaker of vinegar. The cubes were the following lengths: 3 cm, 2 cm, and 1 cm. In the presence of an acid, such as vinegar, phenolphthalein turns from pink to clear. After 10 minutes, the student cut each cube open and measured the distance that the vinegar had diffused into each cube. She then started to complete the data table.

Comparison of Agar Cubes

Cube Size (length in cm)	Surface Area (cm <sup>2</sup> )	Volume (cm <sup>3</sup> )	Ratio of Surface Area to Volume	Depth of Diffusion (mm)	Time (minutes)	Rate of Diffusion (mm/minute)
3	54	27			10	
2					10	
1	6	1			10	

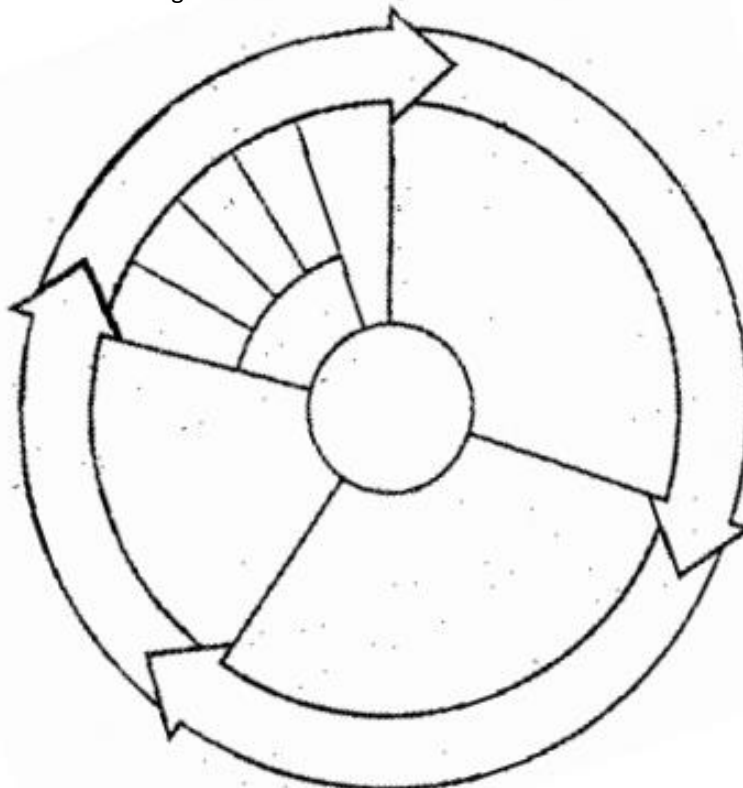


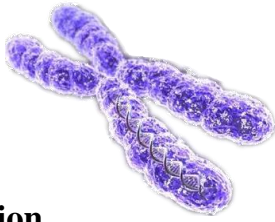
1. What is the student probably trying to test? What do the cubes in the figure probably represent?
2. Look at the data table. What are the surface area, volume, and ratio of surface area to volume for the cube that is 2 cm in length?
3. Compare the cubes in the figure with respect to their sizes and their ratios of surface area to volume.
4. Look at the experimental setup in the figure. How will the student know how far the vinegar has diffused into each cube?
5. Predict how the ratio of surface area to volume will relate to the rate of diffusion and the distance that the vinegar will diffuse into each cube in the figure.

Label the diagram below with the following labels:

- |                           |            |                   |
|---------------------------|------------|-------------------|
| Anaphase                  | Interphase | Mitosis           |
| Cell division (M Phase)   | Interphase | Prophase          |
| Cytokinesis               | Interphase | S-DNA replication |
| G1 - cell grows           | Metaphase  | Telophase         |
| G2 - prepares for mitosis |            |                   |

Then on the diagram, lightly color the G1 phase **BLUE**, the S phase **YELLOW**, the G2 phase **RED**, and the stages of mitosis **ORANGE**. Color the arrows indicating all of the interphases in **GREEN**. Color the part of the arrow indicating mitosis **PURPLE** and the part of the arrow indicating cytokinesis **YELLOW**.





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### I Answer Section

#### OTHER

1. ANS:

The student is varying the size of the cubes and testing how far a solution can diffuse into each cube; thus, she is probably testing the effect of size on the diffusion of materials into each cube. The cubes probably represent cells.

PTS: 1                      DIF: E                      REF: p. 241 | p. 242  
OBJ: 10.1.1                STA: B.1.8

2. ANS:

Surface area = length  $\times$  width  $\times$  the number of sides =  $2 \times 2 \times 6 = 24 \text{ cm}^2$ . Volume = length  $\times$  width  $\times$  height =  $2 \times 2 \times 2 = 8 \text{ cm}^3$ . Ratio of surface area to volume =  $24/8 = 3:1$ .

PTS: 1                      DIF: E                      REF: p. 242 | p. 243  
OBJ: 10.1.1                STA: B.1.8 | B.1.11

3. ANS:

Students should conclude that the largest cube has the smallest ratio of surface area to volume, and the smallest cube has the largest ratio of surface area to volume.

PTS: 1                      DIF: E                      REF: p. 242 | p. 243  
OBJ: 10.1.1                STA: B.1.8 | B.1.11

4. ANS:

The vinegar will turn the pink parts of the cube clear. Thus, the student can cut each cube in half and measure the amount of each cube that has changed from pink to clear.

PTS: 1                      DIF: E                      REF: p. 242                OBJ: 10.1.1  
STA: B.1.8

5. ANS:

The rate of diffusion should be constant across all three cubes. The vinegar will diffuse to a greater extent into the smaller cube than into the larger cubes because the ratio of surface area to volume is larger for the smaller cubes.

PTS: 1                      DIF: E                      REF: p. 241 | p. 242  
OBJ: 10.1.1                STA: B.1.8