# SI A&P - Full Discipline Demo - Fetal Pig

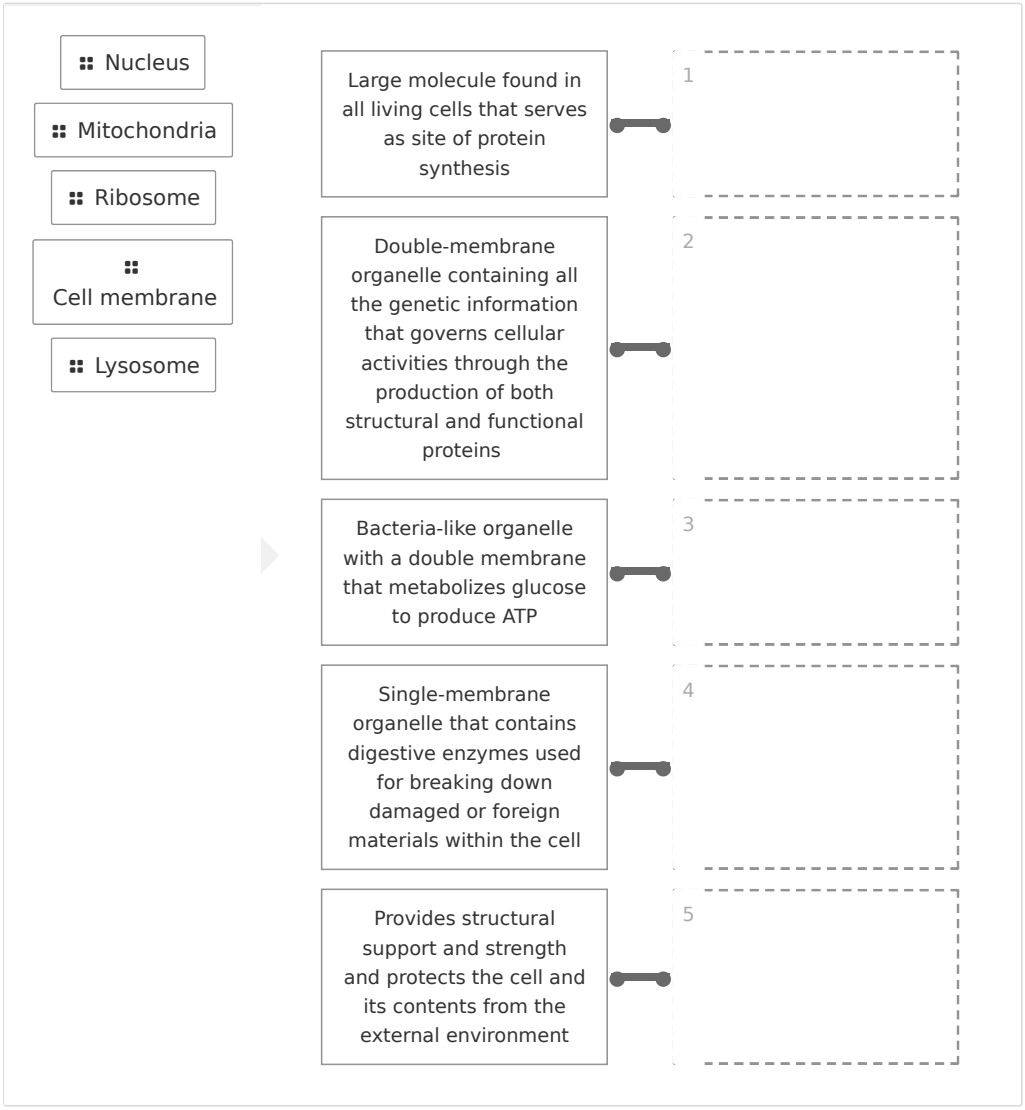
## Cell Structure and Function

## Final Report - Answer Guide

| | |
|---|---|
| **Institution** | Science Interactive University |
| **Session** | SI A&P - Full Discipline Demo - Fetal Pig |
| **Course** | SI A&P - Full Discipline Demo - Fetal Pig |
| **Instructor** | Sales SI Demo |

## Test Your Knowledge

**Match each term to the best description.**

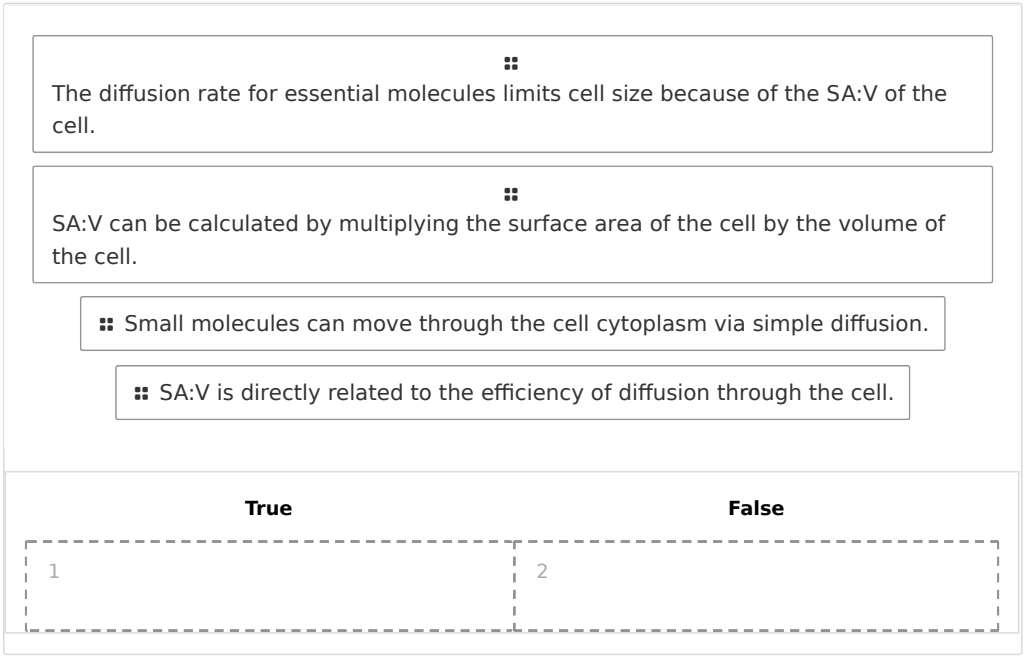



Correct answers:

1 Ribosome 2 Nucleus 3 Mitochondria 4 Lysosome

5 Cell membrane

**Categorize each statement as true or false.**




Correct answers:

1

The diffusion rate for essential molecules limits cell size because of the SA:V of the cell.

Small molecules can move through the cell cytoplasm via simple diffusion.

2

SA:V can be calculated by multiplying the surface area of the cell by the volume of the cell.

SA:V is directly related to the efficiency of diffusion through the cell.

## Exploration

**Eukaryotic cells can be differentiated from prokaryotic cells through the presence of membrane bound organelles and a nucleus.**

- True ✔
- False

**The ribosome functions for _____.**

- digestion
- DNA replication
- mobility
- protein synthesis ✔

**The SA:V for a cell can be calculated by dividing the surface area by the volume.**

- True ✔
- False

## Exercise 1

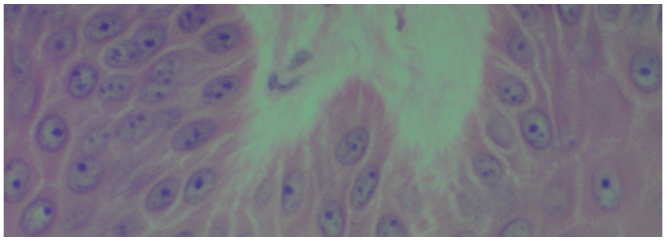
**What are the functions of each of the cellular structures labeled in Photo 1?**

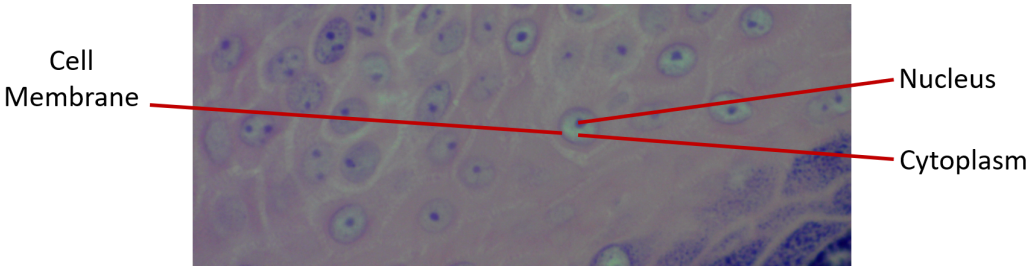
0 Word(s)

**Was the labeled cell in Photo 1 eukaryotic or prokaryotic? Explain your answer by referencing the distinguishing structure(s) labeled in Photo 1.**

0 Word(s)

Photo 1: Skin Cell
(SAMPLE ANSWER BELOW)






(SAMPLE ANSWER BELOW)

| Slide | Total magnification |
|---|---|
| Human Skin | 600 |

## Exercise 2

**How did increasing the cell diameter affect the surface area to volume ratio?**

As the diameter increased, the surface area to volume ratio decreased.

**What impact did the change in surface area to volume ratio have on diffusion?**

0 Word(s)

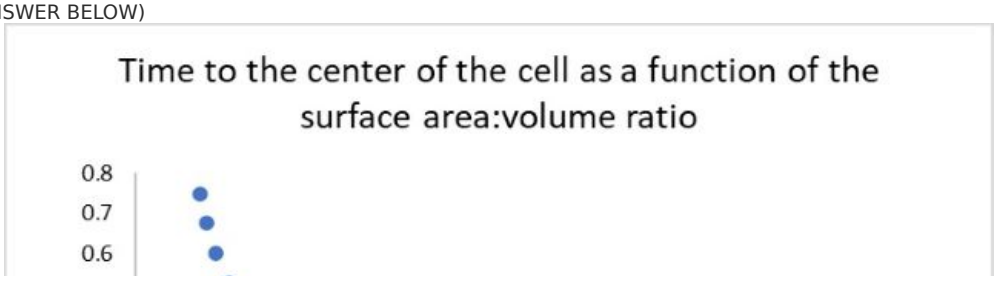
**How does this experiment demonstrate the need for cells to maintain a smaller size?**

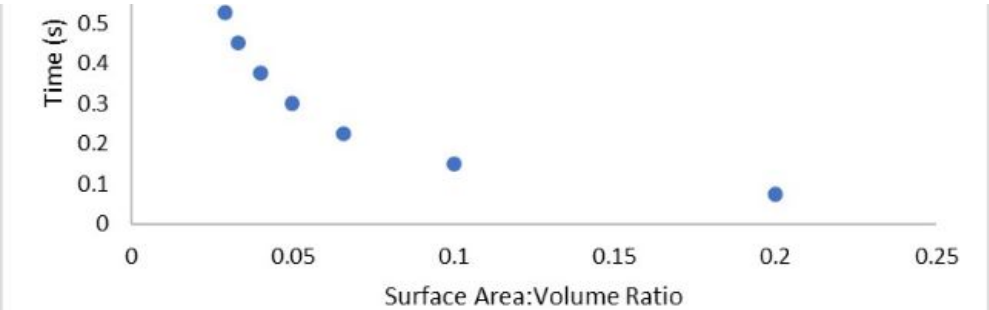
0 Word(s)

Data Table 2: Surface Area and Volume in Relation to Cell Size
(SAMPLE ANSWER BELOW)

| Radius (μm) | Surface Area ($\mu m^2$) | Volume ($\mu m^3$) | SA:V ($\mu m^{-1}$) | Diffusion Time (s) |
|---|---|---|---|---|
| 15 | 2827 | 14137 | 0.2 | 0.075 |
| 45 | 25447 | 382000 | 0.066 | 0.225 |
| 75 | 70686 | 1770000 | 0.04 | 0.375 |
| 105 | 139000 | 4850000 | 0.029 | 0.525 |
| 135 | 229000 | 10300000 | 0.022 | 0.675 |

Graph 1: Time to the Center of the Cell
(SAMPLE ANSWER BELOW)






## Competency Review

**All human cells are eukaryotic.**

- True ✔
- False

**The cytoplasm is made up of _____, a water-based solution containing small molecules such as proteins and sugars.**

- cytoskeleton
- cytosol ✔
- centrioles
- ribosomes

**_____ are single-membraned organelles that store water and other small molecules.**

- Centrioles
- Ribosomes
- Mitochondria
- Vacuoles ✔

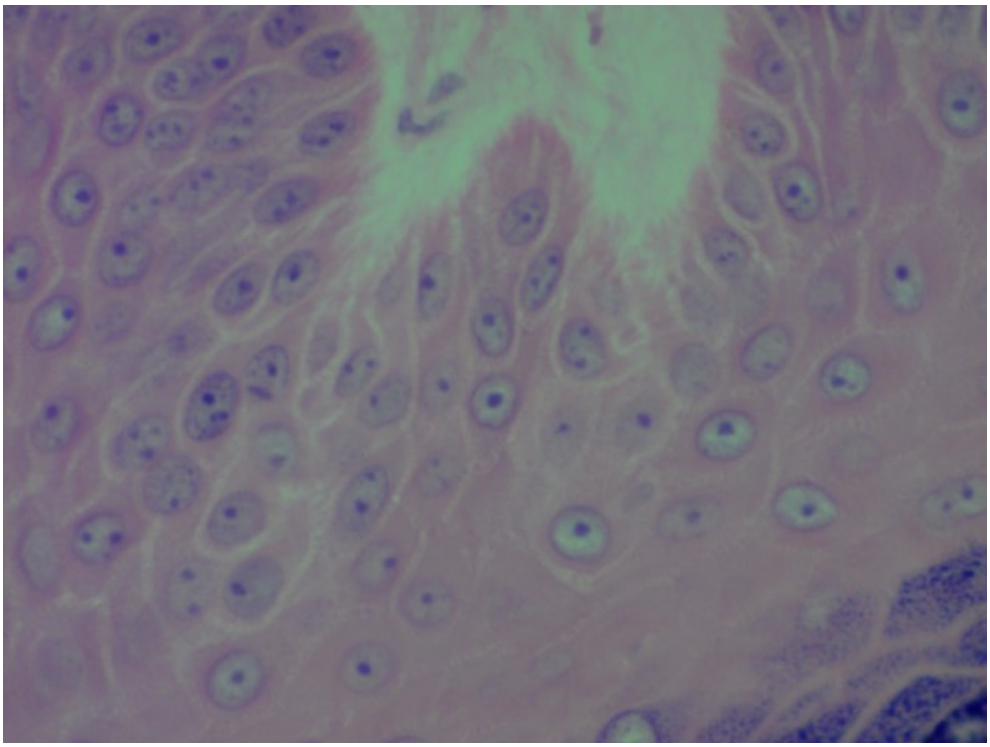
**Through simple diffusion, molecules move from areas of high concentration to areas of low concentration.**

- True ✔
- False

**$4\pi r^2$ is used to calculate cell _____.**

- density
- mass
- surface area ✔
- volume

**_____ is/are visible in the image of human skin cells below.**

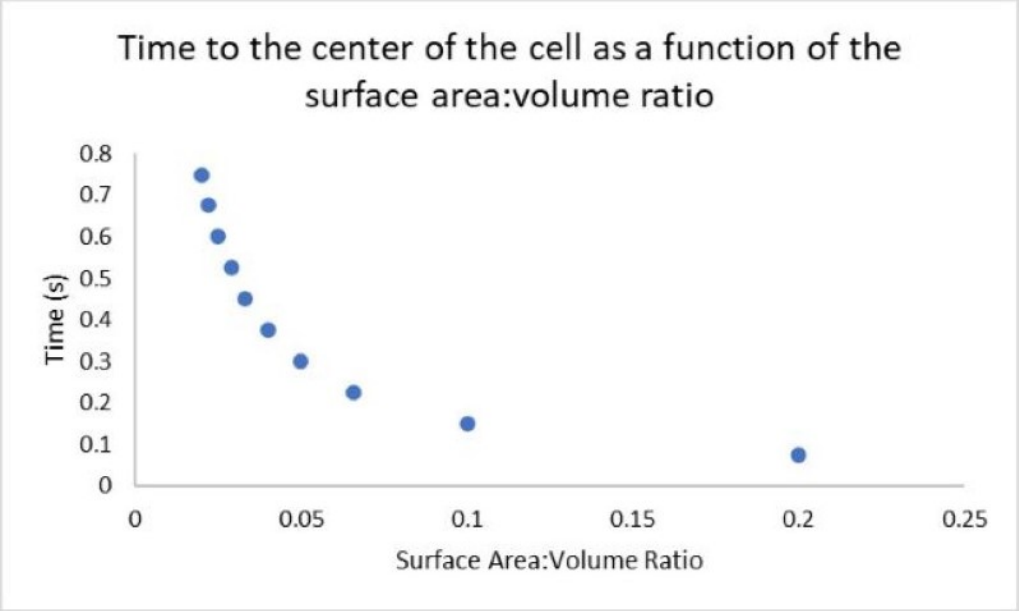


- Cell membranes
- Cytoplasm
- Nuclei
- All of the above ✔

**A cell has a surface area of 2827 $\mu m^2$ and a volume of 14137 $\mu m^3$. The SA:V of the cell is _____ $\mu m^{-1}$.**

- 0.2 ✔
- 5
- 11
- 17

**The graph below indicates that diffusion time is inversely related to the surface:volume ratio of the cell.**




- True ✔
- False

## Extension Questions

**Human cells vary in size from 30-4,000,000 $\mu m^3$ in volume. Apply your knowledge of cell structure and simple diffusion to predict which cell type in the table below would have the fastest diffusion rate for water molecules to the center of the cell. Explain your prediction by referencing the relationship between cell size and diffusion rate.**

| Cell Type | Average Volume ($\mu m^3$) |
|---|---|
| Sperm cell | 30 |
| Red blood cell | 100 |
| Neutrophil | 300 |
| Beta cell | 1,000 |
| Fibroblast | 2,000 |
| Osteoblast | 4,000 |
| Megakaryocyte | 30,000 |
| Fat cell | 600,000 |
| Oocyte | 4,000,000 |

(SAMPLE ANSWER BELOW)

The sperm cell would have the fastest diffusion rate for water molecules to the center of the cell because the sperm cell has the smallest volume and simple diffusion rates are inversely related to cell size.