Insta-Review: Unit 2

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Organelle
Membrane Transport
Cell Communication
FRQ Discussion

Surface Area : Volume Ratio

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Surface Area and Volume

Surface Area of a Sphere

$SA = 4\pi r^2$

Volume of a Sphere

$V = \frac{4}{3}\pi r^3$

Surface Area of a Rectangular Solid

$SA = 2lh + 2lw + 2wh$

Volume of a Rectangular Solid

$V = lwh$

Surface Area of a Cylinder

$SA = 2\pi rh + 2\pi r^2$

Volume of a Cylinder

$V = \pi r^2 h$

Surface Area of a Cube

$SA = 6s^2$

Volume of a Cube

$V = s^3$

r = radius

l = length

h = height

w = width

s = length of one side of a cube

SA = surface area

V = volume

Surface Area : Volume

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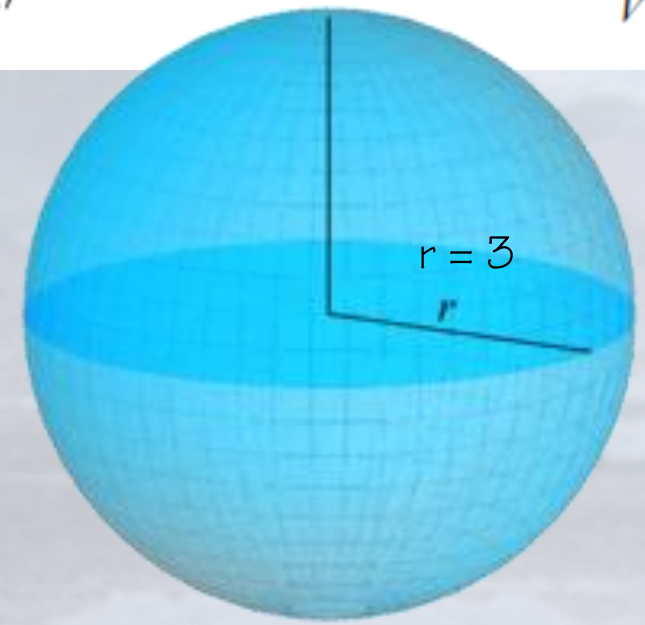
Surface Area of a Sphere

$SA = 4\pi r^2$

Volume of a Sphere

$V = \frac{4}{3}\pi r^3$



$SA = 4\pi r^2$

$SA = 4\pi(3)^2$

$SA = 4\pi(9)$

$SA = 36\pi$

$V = \frac{4}{3}\pi\ r^3$

$V = \frac{4}{3}\pi\ 27$

$V = 36\pi$

$$\frac{SA}{V} = \frac{36\pi}{36\pi} = 1$$

Organelles

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Organelle	Function
Nucleus	Contains hereditary information (DNA/chromosomes) Site of RNA synthesis
Ribosomes	Site of protein synthesis
Rough ER	Protein synthesis for membrane and secretion
Smooth ER	Lipid synthesis Detoxification
Mitochondria	ATP synthesis Site of cellular respiration
Chloroplasts	Site of photosynthesis
Vacuole	Storage
Cilia/Flagella	Motility
Centrioles	Assist chromosome movement in mitosis
Golgi bodies	Protein modification/packaging
Lysosomes	Enzymatic hydrolysis of wastes, metabolites, and pathogens

Membrane Transport

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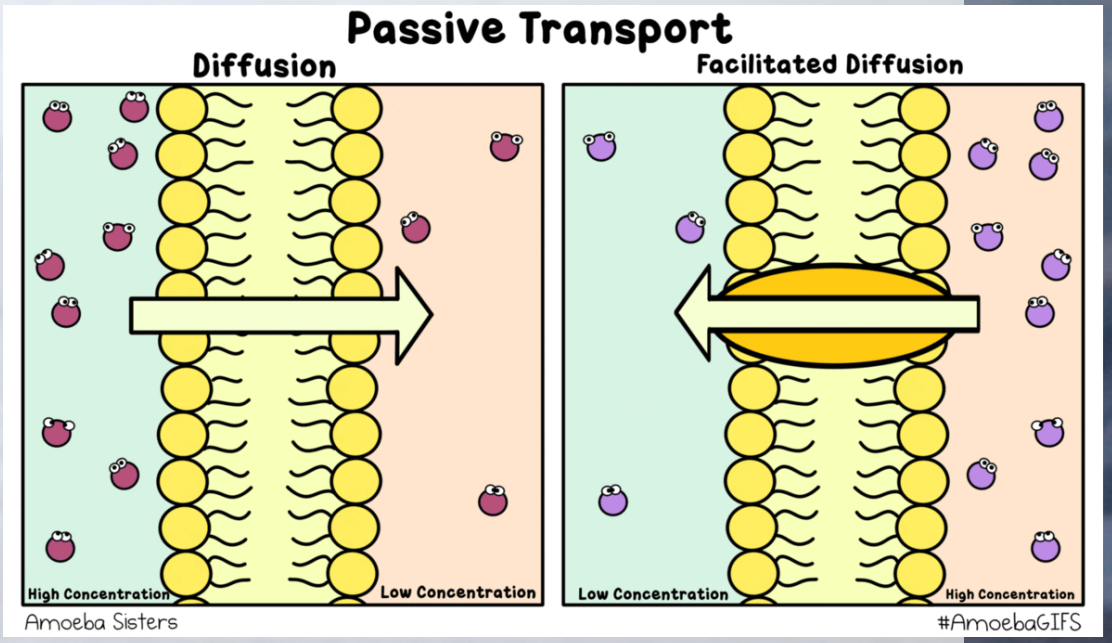
- Passive
  - Types:
    - Simple Diffusion: plasma membrane
    - Facilitated Diffusion: transport protein
  - No energy required
  - Solutes move high concentration to low concentration



Membrane Transport

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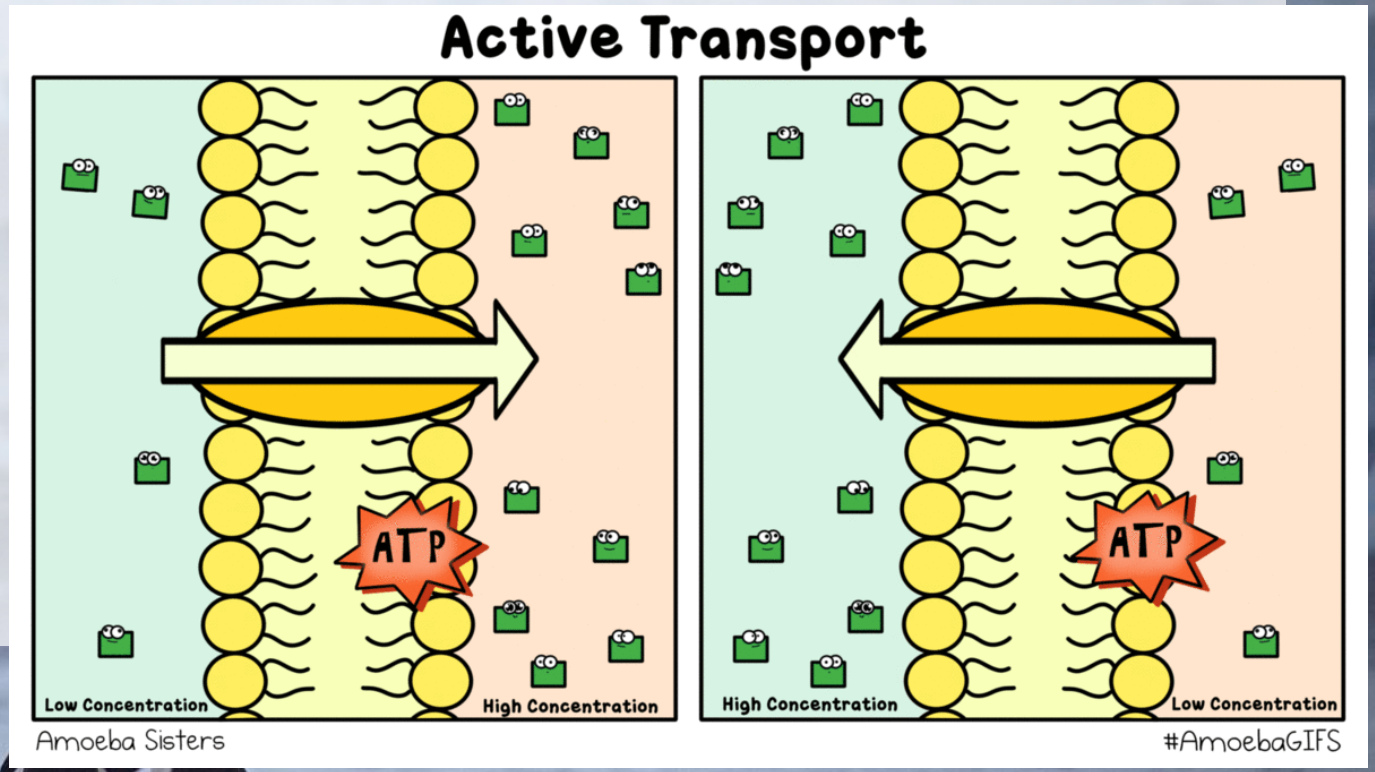
- Active
  - Requires energy
  - Moves solutes from low concentration to high concentration



Membrane Transport

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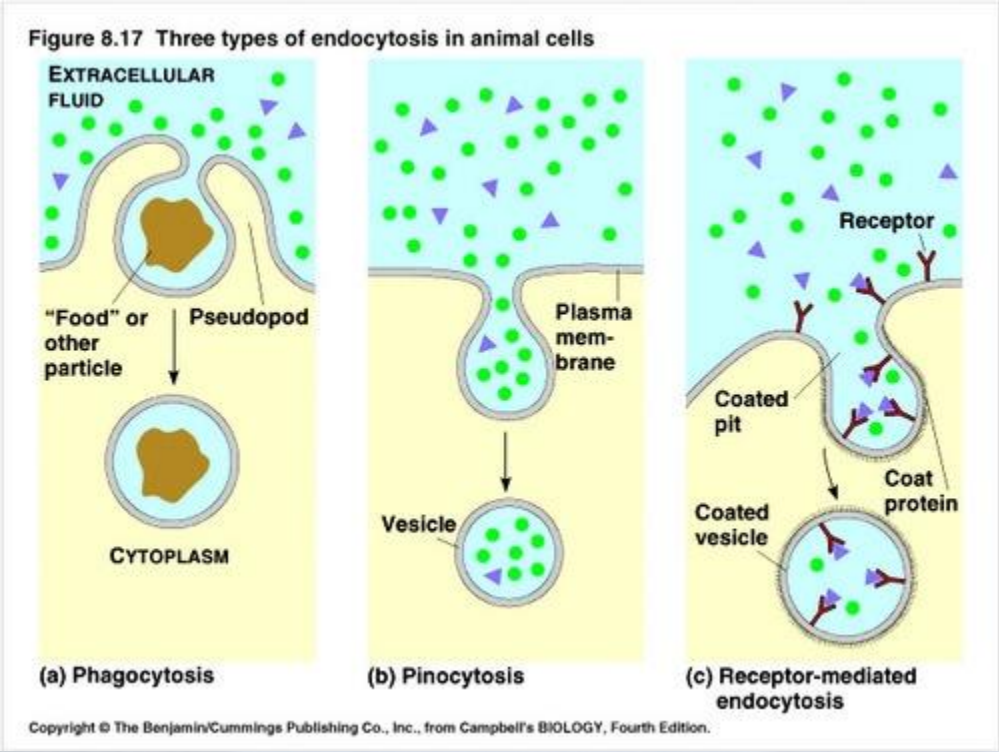

- Bulk Transport
  - Exocytosis
    - Materials leaving the cell
  - Endocytosis
    - Phagocytosis: cellular eating
    - Pinocytosis: cellular drinking
    - Receptor Mediated Endocytosis: ligands binds to stimulate endocytosis

Cell Communication

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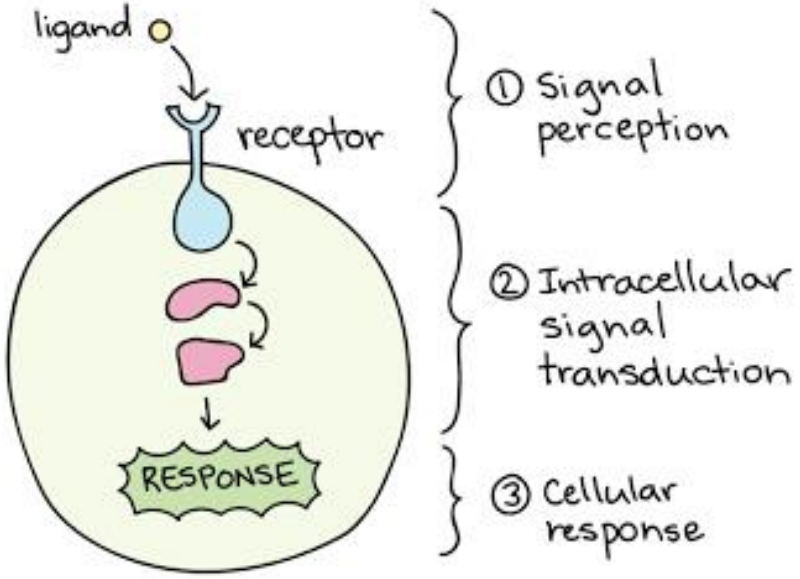

Practice FRQ: 2019 #8

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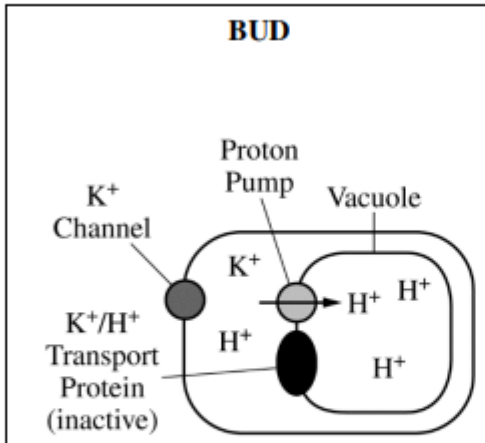
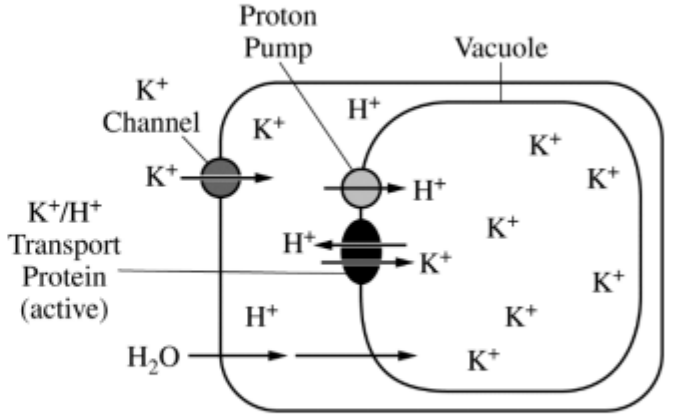
TABLE 1. CHANGES IN MORNING GLORY PETAL CELLS DURING FLOWER OPENING

	BUD	OPEN FLOWER
		
Vacuole pH	6.6	7.7
Flower Color	Red	Blue
Cell Volume	Small	Large

The petal color of the Mexican morning glory (*Ipomoea tricolor*) changes from red to blue, and the petal cells swell during flower opening. The pigment heavenly blue anthocyanin is found in the vacuole of petal cells. Petal color is determined by the pH of the vacuole. A model of a morning glory petal cell before and after flower opening is shown in Table 1.

Practice FRQ: 2019 #8

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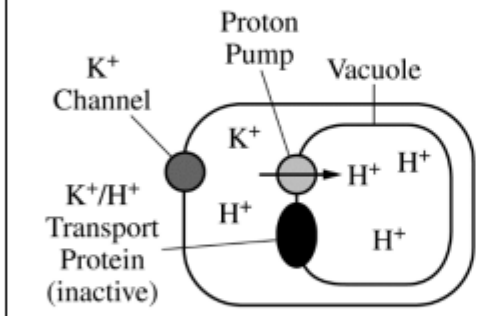
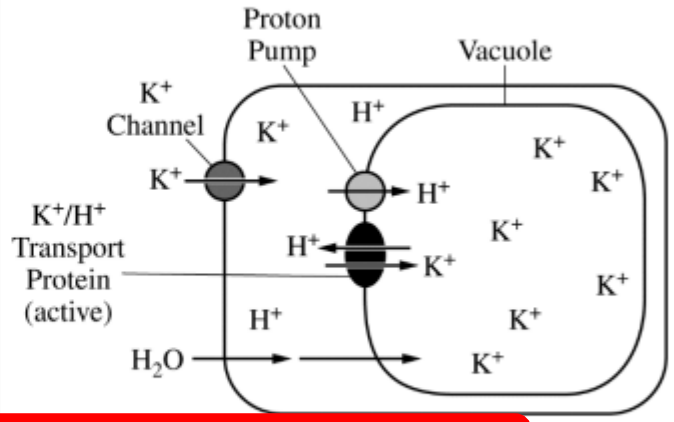
(a) **Identify** the cellular component in the model that is responsible for the increase in the pH of the vacuole during flower opening AND **describe** the component's role in changing the pH of the vacuole.

TABLE 1. CHANGES IN MORNING GLORY PETAL CELLS DURING FLOWER OPENING

	BUD	OPEN FLOWER
		
Vacuole pH	6.6	7.7
Flower Color	Red	Blue
Cell Volume	Small	Large

Identification (1 point)

- (K^+ / H^+) transport protein

Description (1 point)

- It moves H^+ out of the vacuole.

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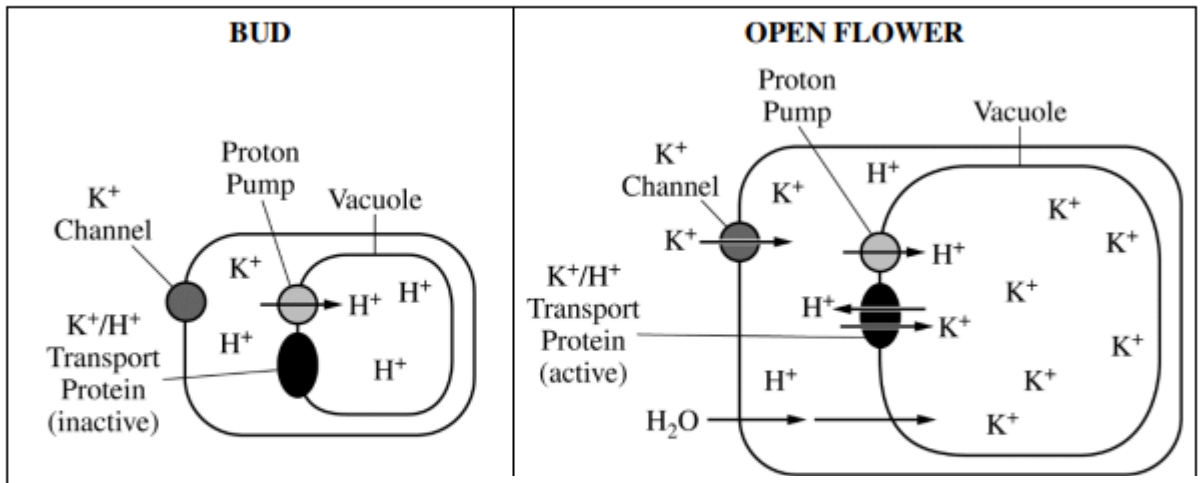
(b) A researcher claims that the activation of the K^+/H^+ transport protein causes the vacuole to swell with water. **Provide reasoning** to support the researcher's claim.

TABLE 1. CHANGES IN MORNING GLORY PETAL CELLS DURING FLOWER OPENING

	BUD	OPEN FLOWER
Vacuole pH		
Flower Color		
Cell Volume		



Reasoning (1 point)

- The concentration of solute (K^+) is increasing inside the vacuole.
- The solute (K^+) is moving into the vacuole, making it hypertonic/hyperosmotic/lowering water potential.

Practice FRQ: 2013 #6

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The following data were collected by observing subcellular structures of three different types of eukaryotic cells.

RELATIVE AMOUNTS OF ORGANELLES IN THREE CELL TYPES

Cell Type	Smooth ER	Rough ER	Mitochondria	Cilia	Golgi Bodies
X	Small amount	Small amount	Large number	Present	Small amount
Y	Large amount	Large amount	Moderate number	Absent	Large amount
Z	Absent	Absent	Absent	Absent	Absent

Based on an analysis of the data, **identify** a likely primary function of each cell type and **explain** how the data support the identification.

Practice FRQ: 2013 #6

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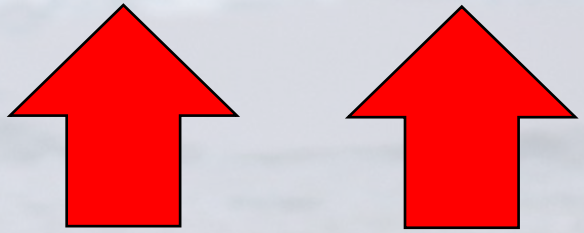
Cell Type	Smooth ER	Rough ER	Mitochondria	Cilia	Golgi Bodies
X	Small amount	Small amount	Large number	Present	Small amount



Cell Type	**Identify function**		**Explain how data support identification (1 point each correct pair). NOTE: No points for identification without explanation.**
X	• Locomotion • Movement / surface transport	**AND**	Has cilia for movement and large amounts of mitochondria to provide energy for locomotion of cell itself (ciliated protist) or movement of particles (mucus /oocyte) along cell surface

Practice FRQ: 2013 #6

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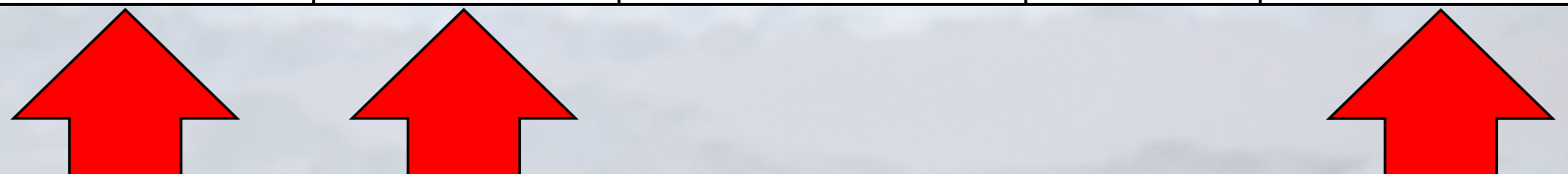
Cell Type	Smooth ER	Rough ER	Mitochondria	Cilia	Golgi Bodies
Y	Large amount	Large amount	Moderate number	Absent	Large amount



Cell Type	**Identify function**		**Explain how data support identification (1 point each correct pair). NOTE: No points for identification without explanation.**
Y	• Secretion / exocytosis • Protein synthesis	**AND**	Has large amounts of rough ER and Golgi to produce and package proteins
	• Lipid/hormone synthesis • Detoxification	**AND**	Has large amounts of smooth ER to produce lipids / hormones

Practice FRQ: 2013 #6

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Cell Type	Smooth ER	Rough ER	Mitochondria	Cilia	Golgi Bodies
Z	Absent	Absent	Absent	Absent	Absent

Cell Type	**Identify function**		**Explain how data support identification (1 point each correct pair). NOTE: No points for identification without explanation.**		
Z	• Transport	**OR**	• Oxygen transport in animal cells • Water transport in plant cells	**AND**	Does not require these organelles
	• Protection	**OR**	• Epidermal cells (stratum corneum, cork, nails)	**AND**	
	• Support	**OR**	• Ground tissue (schlerenchyma) • Vascular tissue (xylem)	**AND**	
	• Storage	**OR**	• Maximizes volume / space available (hemoglobin, oxygen)	**AND**	
	• No function	**OR**	• Is a dead cell/is undergoing apoptosis	**AND**	

Quizizz Games

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Unit 2

Diffusion & Osmosis: **0590 1206**

Organelles: **4155 2790**