AP BIO INSTA-REVIEW

TOPIC
2.1

Cell Structure: Subcellular Components

SYI-1.D.1

Ribosomes comprise ribosomal RNA (rRNA) and protein. Ribosomes synthesize protein according to mRNA sequence.

SYI-1.D.2

Ribosomes are found in all forms of life, reflecting the common ancestry of all known life.

AP BIO INSTA-REVIEW

TOPIC
2.1

Cell Structure: Subcellular Components

SYI-1.D.3

Endoplasmic reticulum (ER) occurs in two forms—smooth and rough. Rough ER is associated with membrane-bound ribosomes—

a. Rough ER compartmentalizes the cell.

b. Smooth ER functions include detoxification and lipid synthesis.

AP BIO INSTA-REVIEW

TOPIC 2.1

Cell Structure: Subcellular Components

SYI-1.D.4

The Golgi complex is a membrane-bound structure that consists of a series of flattened membrane sacs—

a. Functions of the Golgi include the correct folding and chemical modification of newly synthesized proteins and packaging for protein trafficking.

AP BIO INSTA-REVIEW

TOPIC

2.1

Cell Structure: Subcellular Components

SYI-1.D.5

Mitochondria have a double membrane. The outer membrane is smooth, but the inner membrane is highly convoluted, forming folds.

SYI-1.D.6

Lysosomes are membrane-enclosed sacs that contain hydrolytic enzymes.

AP BIO INSTA-REVIEW

TOPIC 2.1

Cell Structure: Subcellular Components

SYI-1.D.7

A vacuole is a membrane-bound sac that plays many and differing roles. In plants, a specialized large vacuole serves multiple functions.

SYI-1.D.8

Chloroplasts are specialized organelles that are found in photosynthetic algae and plants. Chloroplasts have a double outer membrane.

AP BIO INSTA-REVIEW

TOPIC 2.1

Which organelle is responsible for detoxification and storage of Ca^{2+}?

A. Golgi Bodies
B. Lysosome
C. Rough ER
D. Smooth ER

AP BIO INSTA-REVIEW

TOPIC 2.1

Which organelle is responsible for detoxification and storage of Ca^{2+}?

D. Smooth ER

The smooth ER has multiple functions in the cell

- Storage of Calcium
- Detoxification
- Lipid Synthesis

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AP BIO INSTA-REVIEW

TOPIC

2.1

Which organelle is responsible for modification of proteins?

A. Golgi Bodies
B. Lysosome
C. Rough ER
D. Smooth ER

AP BIO INSTA-REVIEW

TOPIC 2.1

Which organelle is responsible for modification of proteins?

A. Golgi Bodies

The Golgi Bodies will recieve the proteins from the Rough ER. It will then package and modify the products from the rough ER before sorting and sending to another part of the cell.

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AP BIO INSTA-REVIEW

TOPIC
2.1

Which organelle is responsible for digestion of macromolecules?

A. Golgi Bodies
B. Lysosome
C. Rough ER
D. Smooth ER

Which organelle is responsible for digestion of macromolecules?

B. Lysosome

The lysosome is a sac with hydrolytic enzymes. These hydrolytic enzymes will undergo hydrolysis to digest macromolecules.

Describe two locations of ribosomes plus their function.

AP BIO INSTA-REVIEW

TOPIC

2.1

Describe two locations of ribosomes plus their function.

Ribosomes can be found bound or free. They all start out as free ribosomes. Then once they receive a single peptide, the free ribosomes can move through the rough ER membrane to continue their process. Ribosomes function in protein synthesis. If free, they produce cytosolic proteins. If bound, they produce membrane proteins or proteins for secretion.

AP BIO INSTA-REVIEW

TOPIC

2.1

Which organelle with highly folded cristae for ATP synthesis?

A. Chloroplast

B. Mitochondria

AP BIO INSTA-REVIEW

TOPIC 2.1

Which organelle with highly folded cristae for ATP synthesis?

B. Mitochondria

Recall: the cristae is the inner membrane of the mitochondria. The electron transport chain takes place here generating the proton gradient that is used by ATP synthase in chemiosmosis to synthesize ATP.

AP BIO INSTA-REVIEW

TOPIC

2.1

Which organelle with highly folded thylakoid for ATP synthesis?

A. Chloroplast

B. Mitochondria

AP BIO INSTA-REVIEW

TOPIC

2.1

Which organelle with highly folded thylakoid for ATP synthesis?

A. Chloroplast

Recall: the thylakoid are membraneous sacs in the chloroplasts. During the light reactions, the proton gradient is generated then used to synthesize ATP for the Calvin Cycle.

AP BIO INSTA-REVIEW

TOPIC
2.1

Which organelle that aids in turgid pressure in plant cells?

A. Central vacuole
B. Contractile vacuole
C. Food vacuole
D. Transport vesicle

AP BIO INSTA-REVIEW

TOPIC

2.1

Which organelle that aids in turgid pressure in plant cells?

A. Central vacuole

Central vacuole is found in plant cells and is mostly responsible for maintaining the turgor pressure due to the storage of water. This turgor pressure allows the plant cells to be turgid (in a hypotonic environment). Additionally, nutrients, enzymes, and wastes can also be stored.

AP BIO INSTA-REVIEW

TOPIC

2.1

Which organelle fuses with lysosome?

A. Central vacuole
B. Contractile vacuole
C. Food vacuole
D. Transport vesicle

AP BIO INSTA-REVIEW

TOPIC

2.1

Which organelle fuses with lysosome?

C. Food vacuole

During phagocytosis (cellular eating), the pseudopodia surrounds the food creating the food vacuole. This membranous sac will fuse with the lysosome to assist with digestion of the food materials.

AP BIO INSTA-REVIEW

TOPIC 2.1

Which organelle is produced by Rough ER and Golgi after their function?

A. Central vacuole
B. Contractile vacuole
C. Food vacuole
D. Transport vesicle

AP BIO INSTA-REVIEW

TOPIC
2.1

Which organelle is produced by Rough ER and Golgi after their function?

D. Transport vesicle

Transport vesicles are created from the membrane of the rough ER and Golgi bodies as materials are transported throughout the cell carrying materials from one organelle to another organelle.

AP BIO INSTA-REVIEW

TOPIC

2.1

How does a contractile vacuole function in osmoregulation?

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AP BIO INSTA-REVIEW

TOPIC

2.1

How does a contractile vacuole function in osmoregulation?

Found in protists that live in a hypotonic environment. This organelle will contract to push water out of the organism as water rushes in to inhibit cell from lysing

AP BIO INSTA-REVIEW

TOPIC 2.1

What makes up ribosomes?

A. mRNA & proteins
B. mRNA & tRNA
C. rRNA & proteins
D. rRNA & tRNA

AP BIO INSTA-REVIEW

TOPIC

2.1

What makes up ribosomes?

C. rRNA & proteins

rRNA is the ribosomal RNA. This RNA folds with proteins to create the large and small subunits of the ribosomes.

AP BIO INSTA-REVIEW

TOPIC 2.1

What binds to the small subunit of a ribosome?

A. DNA
B. mRNA
C. rRNA
D. tRNA

AP BIO INSTA-REVIEW

TOPIC 2.1

What binds to the small subunit of a ribosome?

B. mRNA

The ribosome is arranged with the large subunit on "top" and the small subunit on "bottom". The large subunit has the A, P, and E sites for the tRNA and the small subunit binds to the mRNA for translation.

AP BIO INSTA-REVIEW

TOPIC

2.1

What binds to the large subunit of a ribosome?

A. DNA
B. mRNA
C. rRNA
D. tRNA

AP BIO INSTA-REVIEW

TOPIC

2.1

What binds to the large subunit of a ribosome?

D. tRNA

The ribosome is arranged with the large subunit on "top" and the small subunit on "bottom". The large subunit has the A, P, and E sites for the tRNA and the small subunit binds to the mRNA for translation.

AP BIO INSTA-REVIEW

TOPIC

2.1

Name the three types of RNA and their functions

AP BIO INSTA-REVIEW

TOPIC

2.1

Name the three types of RNA and their functions

mRNA (messenger RNA) is the RNA transcript synthesized from the DNA template. This binds to the ribosome to provide the codon sequence that is read to synthesize a polypeptide.

rRNA (ribosomal RNA) is the RNA that comprises the ribosome. It binds with protein to make the ribosome.

tRNA (transfer RNA) will transfer amino acids to the ribosome to allow for translation.

AP BIO INSTA-REVIEW

TOPIC 2.1

Which organelle synthesizes cytosolic proteins?

A. Free Ribosomes

B. Golgi Bodies

C. Rough ER

D. Smooth ER

AP BIO INSTA-REVIEW

TOPIC 2.1

Which organelle synthesizes cytosolic proteins?

A. Free Ribosomes

Cytosolic proteins are proteins found in the cytosol. This means that the ribosome will not attached to a membrane since the protein is not in or surrounded by membrane. These ribosomes are called free ribosomes.

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AP BIO INSTA-REVIEW

TOPIC

2.1

Which organelle synthesizes proteins for secretion or membrane bound?

A. Free Ribosomes

B. Golgi Bodies

C. Rough ER

D. Smooth ER

AP BIO INSTA-REVIEW

TOPIC 2.1

Which organelle synthesizes proteins for secretion or membrane bound?

C. Rough ER

Membrane bound proteins are in a membrane. Proteins for secretion are surrounded by a membrane. This means that the ribosome that synthesized these proteins must be attached to a membrane to allow for protein placements. The Rough ER is studded with ribosomes for this function.

AP BIO INSTA-REVIEW

TOPIC

2.1

Which organelle stores calcium?

A. Free Ribosomes

B. Golgi Bodies

C. Rough ER

D. Smooth ER

AP BIO INSTA-REVIEW

TOPIC

2.1

Which organelle stores calcium?

D. Smooth ER

The smooth ER has multiple functions in the cell

- Storage of Calcium
- Detoxification
- Lipid Synthesis

AP BIO INSTA-REVIEW

TOPIC 2.1

Which organelle sorts, modifies, and packages protein products?

A. Free Ribosomes
B. Golgi Bodies
C. Rough ER
D. Smooth ER

AP BIO INSTA-REVIEW

TOPIC
2.1

Which organelle sorts, modifies, and packages protein products?

B. Golgi Bodies

The Golgi Bodies are responsible for sorting, modifying, and packaging the protein products from the Rough ER. This occurs as the materials pass through each cisternae of the Golgi.

AP BIO INSTA-REVIEW

TOPIC

2.1

Which organelle has the role of detoxification?

A. Free Ribosomes
B. Golgi Bodies
C. Rough ER
D. Smooth ER

AP BIO INSTA-REVIEW

TOPIC 2.1

Which organelle has the role of detoxification?

D. Smooth ER

The smooth ER has multiple functions in the cell

- Storage of Calcium
- Detoxification
- Lipid Synthesis

AP BIO INSTA-REVIEW

TOPIC
2.1

Describe the relationship between ribosome, rough ER, and Golgi?

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TOPIC 2.1

Describe the relationship between ribosome, rough ER, and Golgi?

mRNA binds to the ribosome to begin translation. The ribosome moves to the membrane of the rough ER to continue protein synthesis. After synthesis the rough ER packages protein in a vesicle that leads to the Golgi to be modified before leaving the cell.

AP BIO INSTA-REVIEW

TOPIC 2.1

Which organelle has the role of Intracellular digestion?

A. Chloroplast
B. Lysosome
C. Mitochondria
D. Vacuole

AP BIO INSTA-REVIEW

TOPIC 2.1

Which organelle has the role of Intracellular digestion?

B. Lysosome

The lysosome is a sac of hydrolytic enzymes. The enzymes assist the organelle in digesting macromolecules and defective organelles (autophagy).

AP BIO INSTA-REVIEW

TOPIC 2.2

Cell Structure & Function

SYI-1.E.1

Organelles and subcellular structures, and the interactions among them, support cellular function—

a. Endoplasmic reticulum provides mechanical support, carries out protein synthesis on membrane-bound ribosomes, and plays a role in intracellular transport.

b. Mitochondrial double membrane provides compartments for different metabolic reactions.

AP BIO INSTA-REVIEW

TOPIC

2.2

Cell Structure & Function

SYI-1.E.1

Organelles and subcellular structures, and the interactions among them, support cellular function—

c. Lysosomes contain hydrolytic enzymes, which are important in intracellular digestion, the recycling of a cell's organic materials, and programmed cell death (apoptosis).

d. Vacuoles have many roles, including storage and release of macromolecules and cellular waste products. In plants, it aids in retention of water for turgor pressure.

AP BIO INSTA-REVIEW

TOPIC

2.2

Cell Structure & Function

SYI-1.F.1

The folding of the inner membrane increases the surface area, which allows for more ATP to be synthesized.

SYI-1.F.2

Within the chloroplast are thylakoids and the stroma.

AP BIO INSTA-REVIEW

TOPIC
2.2

Cell Structure & Function

SYI-1.F.3

The thylakoids are organized in stacks, called grana.

SYI-1.F.4

Membranes contain chlorophyll pigments and electron transport proteins that comprise the photosystems.

AP BIO INSTA-REVIEW

TOPIC

2.2

Cell Structure & Function

SYI-1.F.5

The light-dependent reactions of photosynthesis occur in the grana.

SYI-1.F.6

The stroma is the fluid within the inner chloroplast membrane and outside of the thylakoid.

SYI-1.F.7

The carbon fixation (Calvin-Benson cycle) reactions of photosynthesis occur in the stroma.

Cell Structure & Function

SYI-1.F.8

The Krebs cycle (citric acid cycle) reactions occur in the matrix of the mitochondria.

SYI-1.F.9

Electron transport and ATP synthesis occur on the inner mitochondrial membrane.

AP BIO INSTA-REVIEW

TOPIC
2.2

Where does carbon fixation occur?

A. Cristae
B. Matrix
C. Stroma
D. Thylakoid

AP BIO INSTA-REVIEW

TOPIC

2.2

Where does carbon fixation occur?

C. Stroma

Carbon fixation takes place in the chloroplast, specifically in the stroma of the chloroplast. This is the cytosol of the chloroplast. The carbon fixation step is involved in the Calvin Cycle.

AP BIO INSTA-REVIEW

TOPIC 2.2

Where does the cellular ATP synthesis occur?

A. Cristae
B. Matrix
C. Stroma
D. Thylakoid

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AP BIO INSTA-REVIEW

TOPIC 2.2

Where does the cellular ATP synthesis occur?

A. Cristae

Don't get tricked by this question. This question mentions the "cellular ATP" which means the ATP for the cellular processes. These ATP molecules are synthesized during cellular respiration (hence the mitochondrial cristae).

AP BIO INSTA-REVIEW

TOPIC

2.2

Where does the ATP for G3P synthesis occur?

A. Cristae
B. Matrix
C. Stroma
D. Thylakoid

AP BIO INSTA-REVIEW

TOPIC 2.2

Where does the ATP for G3P synthesis occur?

D. Thylakoid

The light reactions are responsible for the synthesize of ATP and NADPH to be used as reactants in the Calvin cycle, where G3P is synthesized. The light reactions take place in the thylakoid membrane of the chloroplast.

AP BIO INSTA-REVIEW

TOPIC

2.2

Where does the Krebs Cycle take place?

A. Cristae
B. Matrix
C. Stroma
D. Thylakoid

AP BIO INSTA-REVIEW

TOPIC 2.2

Where does the Krebs Cycle take place?

B. Matrix

The Krebs Cycle is the second step of cellular respiration. Recall: cellular respiration involves the mitochondria and the Krebs cycle specifically involves the Mitochondrial Matrix.

AP BIO INSTA-REVIEW

TOPIC 2.2

What is the function of the electron transport chain and where is it?

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TOPIC 2.2

What is the function of the electron transport chain and where is it?

Electron transport chain (ETC) takes place in the mitochondrial cristae AND thylakoid membrane (and technically prokaryotes plasma membrane). It functions to generate a protein gradient for ATP synthesis.

Note: ETC alone does not generate any ATP, it produces a gradient that will provide the potential energy needed for ATP synthesis

AP BIO INSTA-REVIEW

TOPIC 2.2

What is the function of hydrolytic enzymes?

AP BIO INSTA-REVIEW

TOPIC 2.2

What is the function of hydrolytic enzymes?

Hydrolytic enzymes are important for hydrolysis. The breaking of a water molecule to break a bond. We see this when we discuss breaking polymers into monomers.

Hydrolytic enzymes are found in the lysosome. They function to break down macromolecules so:
- intracellular digestion (white blood cells engulf prokaryotes and they need to be broken down. Phagocytosis involves engulfing "food"
- recycling cell material: misinformed proteins, nonfunctional organelles, etc.
- apoptosis: programmed cell death

AP BIO INSTA-REVIEW

TOPIC

2.2

The cristae is highly folded, what is the significance?

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TOPIC 2.2

The cristae is highly folded, what is the significance?

Increased surface area

More surface area means more sites for ETC and chemiosmosis to synthesize ATP.

AP BIO INSTA-REVIEW

TOPIC
2.2

Where is chlorophyll found?

A. Cristae
B. Matrix
C. Stroma
D. Thylakoid

AP BIO INSTA-REVIEW

TOPIC 2.2

Where is chlorophyll found?

D. Thylakoid

Chlorophyll is a green pigment found in plant cells, specifically found in the chloroplast. This pigment is responsible for absorbing the solar energy in the light reactions which take place in the thylakoid membrane.

AP BIO INSTA-REVIEW

TOPIC

2.2

What is the stroma comparable with?

A. Cytosol

B. Endoplasmic Reticulum

C. Golgi Bodies

D. Lysosome

AP BIO INSTA-REVIEW

TOPIC 2.2

What is the stroma comparable with?

A. Cytosol

The chloroplast is believed to be a prokaryote based on the endosymbiotic theory. So, the gel substance on the inside of the organelle would be similar to the cytosol of the prokaryote

AP BIO INSTA-REVIEW

TOPIC 2.2

Which organelle is responsible for apoptosis?

A. Endoplasmic Reticulum
B. Golgi Bodies
C. Lysosomes
D. Mitochondria

AP BIO INSTA-REVIEW

TOPIC

2.2

Which organelle is responsible for apoptosis?

C. Lysosomes

Apoptosis is programmed cell death. This process involves the cell digesting from the interior to the exterior. The organelle responsible for digestion is the lysosome.

AP BIO INSTA-REVIEW

TOPIC 2.2

How does an increased surface area increase efficiency of rough ER?

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TOPIC 2.2

How does an increased surface area increase efficiency of rough ER?

Rough ER is responsible for synthesis of membrane proteins or proteins for secretion. An increased surface area allows for more locations for the ribosomes to bind (and more locations for protein synthesis).

AP BIO INSTA-REVIEW

TOPIC 2.2

Which of the following aids in the turgor pressure in plants?

A. Chloroplast
B. Mitochondria
C. Nucleus
D. Vacuole

AP BIO INSTA-REVIEW

TOPIC

2.2

Which of the following aids in the turgor pressure in plants?

D. Vacuole

Turgor pressure results from the water storage in the central vacuole when the plant is in a hypotonic environment. This allows the plant cell to be firm.

What is turgor pressure?

What is turgor pressure?

Turgor pressure is the pressure from the cell wall from being "overfilled". We will discuss more later, but when the plant cell is placed in an hypotonic solution, the cell wall will take up water. This water that moves into the cell will be stored in the central vacuole. As it continues to fill, the overfilled central vacuole pushed cytosol against the cell wall which pushes back. This is why the plant cell doesn't lyse in a hypotonic environment.

AP BIO INSTA-REVIEW

TOPIC

2.2

Where are photosystems located?

A. Cristae
B. Matrix
C. Stroma
D. Thylakoid

AP BIO INSTA-REVIEW

TOPIC 2.2

Where are photosystems located?

D. Thylakoid

Photosystems are a component of the light reactions. They are found in the reaction center complexes. The light reactions take place in the thylakoid membrane of the chloroplast.

What is a photosystem?

AP BIO INSTA-REVIEW

TOPIC 2.2

What is a photosystem?

A photosystem is the light capturing component of the chloroplast. The thylakoid is composed of little sacs. The membrane of it has the photosystem. The photosystem is responsible for the energy absorbing part of the photosynthesis. The light energy is captured and stored in the form of high energy electrons and ATP.

AP BIO INSTA-REVIEW

TOPIC

2.2

What process takes place on the inner mitochondrial membrane?

A. Glycolysis

B. Krebs Cycle

C. Oxidative Phosphorylation

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AP BIO INSTA-REVIEW

TOPIC

2.2

What process takes place on the inner mitochondrial membrane?

C. Oxidative Phosphorylation

The mitochondria is responsible for the link reaction plus second and third steps of cellular respiration. The inner membrane (called the cristae) is the site of oxidative phosphorylation. The ETC generates a proton gradient which is used to synthesize ATP by ATP synthase.

AP BIO INSTA-REVIEW

TOPIC 2.2

Where do the light dependent reactions take place?

A. Cristae
B. Matrix
C. Stroma
D. Thylakoid

AP BIO INSTA-REVIEW

TOPIC 2.2

Where do the light dependent reactions take place?

D. Thylakoid

The light dependent reactions are the light reactions in photosynthesis. Photosynthesis takes place in chloroplast. Specifically, the light reactions take place in the thylakoid membrane.

AP BIO INSTA-REVIEW

TOPIC

2.2

Where does the light independent process take place?

A. Cristae

B. Matrix

C. Stroma

D. Thylakoid

AP BIO INSTA-REVIEW

TOPIC 2.2

Where does the light independent process take place?

C. Stroma

The light independent reactions are the Calvin cycle. These reactions will take place in photosynthesis, specifically in the chloroplast. The Calvin cycle takes place in the stroma of the chloroplast.

AP BIO INSTA-REVIEW

TOPIC 2.2

What are the roles of the Rough ER?

A. Intracellular transport

B. Mechanical support

C. Protein synthesis

D. All of the above

AP BIO INSTA-REVIEW

TOPIC 2.2

What are the roles of the Rough ER?

D. All of the above
intracellular transport
mechanical support
protein synthesis

The Rough ER has multiple functions including:

- Compartmentalization
- Intracellular Transport
- Mechanical Support
- Protein Synthesis

AP BIO INSTA-REVIEW

TOPIC 2.2

What is the function of double membrane in mitochondria?

A. Provides more surface area

B. Provides compartments for metabolic processes

C. Provides more ATP to the cell

D. Provides more volume to decrease SA:V ratios

AP BIO INSTA-REVIEW

TOPIC

2.2

What is the function of double membrane in mitochondria?

B. Provides compartments for metabolic processes

The mitochondria has a double membrane due to the endosymbiotic theory (inner membrane is the membrane of the prokaryote and outer membrane is the host membrane when it went through the phagocytosis. The space between the two membranes is used by the last step of cellular respiration (oxidative phosphorylation) to generate a protein gradient that is used to synthesize ATP.

AP BIO INSTA-REVIEW

TOPIC

2.2

Describe apoptosis

AP BIO INSTA-REVIEW

TOPIC

2.2

Describe apoptosis

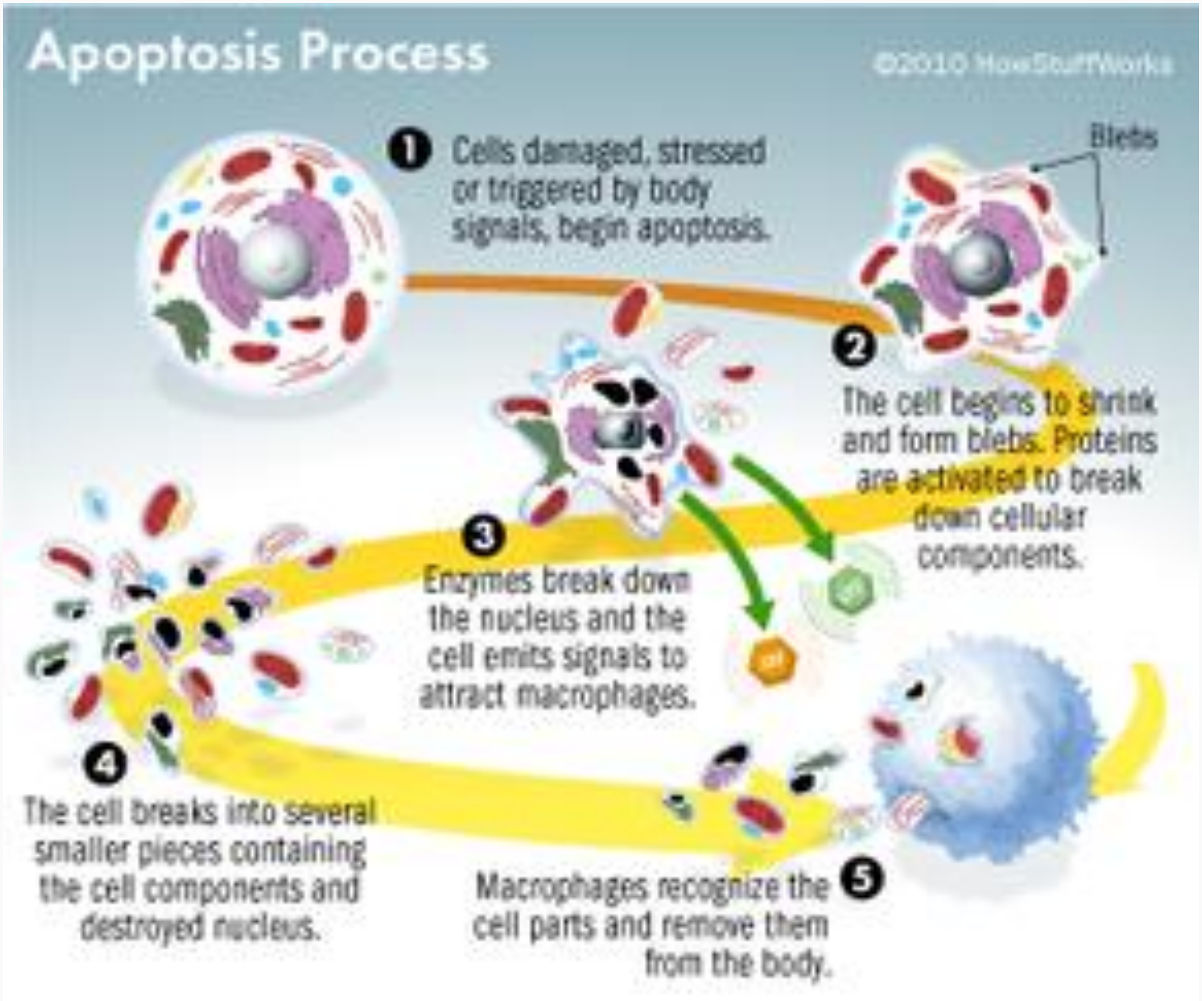
Programmed cell death

Cell receives an autocrine signal which leads to nucleases and proteases to be active breaking down the nucleic acids and proteins in the cell. The cell is engulfed by a macrophage then digested in their lysosome.

AP BIO INSTA-REVIEW

TOPIC 2.2

Describe apoptosis



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AP BIO INSTA-REVIEW

TOPIC 2.2

How are thylakoids organized?

A. Small sacs of hydrolytic enzymes

B. Small sacs free floating in the cytosol

C. Small sacs organized in stacks called grana

D. Small sacs with ribosomes attached to nucleus

AP BIO INSTA-REVIEW

TOPIC 2.2

How are thylakoids organized?

C. Small sacs organized in stacks called grana

The thylakoid is the membranous sacs within the chloroplast which allows for the light reactions to take place. In order to increase surface area, they are organized as small sacs in stacks called grana.

AP BIO INSTA-REVIEW

TOPIC 2.2

Where is ATP synthesized in plant cells?

A. Plasma membrane
B. Chloroplast
C. Mitochondria
D. Chloroplast & Mitochondria

AP BIO INSTA-REVIEW

TOPIC 2.2

Where is ATP synthesized in plant cells?

D. Chloroplast & Mitochondria

ATP is synthesized in the mitochondria (cellular ATP) and the chloroplast (ATP used in the Calvin cycle). Both processes use a proton gradient and ATP synthase to synthesize ATP.

AP BIO INSTA-REVIEW

TOPIC 2.3

Cell Size

ENE-1.B.1

Surface area-to-volume ratios affect the ability of a biological system to obtain necessary resources, eliminate waste products, acquire or dissipate thermal energy, and otherwise exchange chemicals and energy with the environment.

AP BIO INSTA-REVIEW

TOPIC 2.3

Cell Size

Volume of a Sphere: $V = \frac{4}{3}\pi r^3$

Volume of a Cube: $V = s^3$

Volume of a Rectangular Solid: $V = lwh$

Volume of a Cylinder: $V = \pi r^2 h$

Surface Area of a Sphere: $SA = 4\pi r^2$

Surface Area of a Cube: $SA = 6s^2$

Surface Area of a Rectangular Solid:
$SA = 2lh + 2lw + 2wh$

Surface Area of a Cylinder: $SA = 2\pi rh + 2\pi r^2$

r = radius
l = length
h = height
w = width
s = length of one side of a cube

AP BIO INSTA-REVIEW

TOPIC
2.3

Cell Size

ENE-1.B.2

The surface area of the plasma membrane must be large enough to adequately exchange materials—

a. These limitations can restrict cell size and shape. Smaller cells typically have a higher surface area-to-volume ratio and more efficient exchange of materials with the environment.

b. As cells increase in volume, the relative surface area decreases and the demand for internal resources increases.

AP BIO INSTA-REVIEW

TOPIC

2.3

Cell Size

ENE-1.B.2

The surface area of the plasma membrane must be large enough to adequately exchange materials—

c. More complex cellular structures (e.g., membrane folds) are necessary to adequately exchange materials with the environment.

d. As organisms increase in size, their surface area-to-volume ratio decreases, affecting properties like rate of heat exchange with the environment.

AP BIO INSTA-REVIEW

TOPIC 2.3

Cell Size

ENE-1.C.1

Organisms have evolved highly efficient strategies to obtain nutrients and eliminate wastes. Cells and organisms use specialized exchange surfaces to obtain and release molecules from or into the surrounding environment.

AP BIO INSTA-REVIEW

TOPIC

2.3

Which of the following cells is most efficient?

Note: SA = surface area V = volume

A. SA: 4 V: 1

B. SA: 3 V: 2

C. SA: 2 V: 3

D. SA: 1 V: 4

AP BIO INSTA-REVIEW

TOPIC

2.3

Which of the following cells is most efficient?

Note: SA = surface area V = volume

A. SA: 4 V: 1

The most efficient cell is the cell with the highest surface area to volume ratio.

A. 4/1 = 4

B. 3/2 = 1.5

C. 2/3 = 0.67

D. 1/4 = 0.25

AP BIO INSTA-REVIEW

TOPIC

2.3

As surface area is squared, volume is...

A. Halved
B. Doubled
C. Squared
D. Cubed

AP BIO INSTA-REVIEW

TOPIC 2.3

As surface area is squared, volume is...

D. Cubed

Let's take a cube for example.

The side length x side height equals the side squared x 6 sides gives the surface area of the cube.

The side length x side height x side width equals the side cubed gives you the volume of the cube.

AP BIO INSTA-REVIEW

TOPIC

2.3

As the organism grows, how does it overcome the SA:V requirement?

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TOPIC 2.3

As the organism grows, how does it overcome the SA:V requirement?

Increases the number of cells. As the organism is bigger, it has more cells to ensure that each cell still has a large surface area to volume ratio. In addition, the organism builds "compartments" (aka tissues/organs with specific jobs)

AP BIO INSTA-REVIEW

TOPIC
2.3

The small intestines is responsible for nutrient absorption in the digestive system. There are folds called microvilli in this organ. What is the function of the microvilli in the small intestines?

AP BIO INSTA-REVIEW

TOPIC 2.3

The small intestines is responsible for nutrient absorption in the digestive system. There are folds called microvilli in this organ. What is the function of the microvilli in the small intestines?

Increases the surface area which provides more space for an increased efficiency absorbing nutrients.

AP BIO INSTA-REVIEW

TOPIC

2.3

What is the surface area of a sphere with a radius of 3?

A. 4 pi
B. 16 pi
C. 36 pi
D. 64 pi

AP BIO INSTA-REVIEW

TOPIC 2.3

What is the surface area of a sphere with a radius of 3?

C. 36 pi

The equation for surface area is $4\pi(r)^2$.

So, $4\pi(3)^2$

$= 4\pi(9)$

$= 36\pi$

AP BIO INSTA-REVIEW

TOPIC 2.3

What is the volume of a sphere with a radius of 3?

A. (4/3) pi
B. (32/3) pi
C. (108/3) pi or 36 pi
D. (256/3) pi

AP BIO INSTA-REVIEW

TOPIC

2.3

What is the volume of a sphere with a radius of 3?

c. (108/3) pi

The equation for volume is (4/3)pi$(r)^3$.

So, (4/3)pi$(3)^3$

= (4/3)pi(27)

= (108/3)pi

AP BIO INSTA-REVIEW

TOPIC

2.3

What is the surface area of a cube with a side length of 2?

A. 6
B. 24
C. 54
D. 96

AP BIO INSTA-REVIEW

TOPIC 2.3

What is the surface area of a cube with a side length of 2?

B. 24

The equation for surface area is $6s^2$.

So, $6(2)^2$

$= 6(4)$

$= 24$

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AP BIO INSTA-REVIEW

TOPIC 2.3

What is the volume of a cube with a side length of 2?

A. 1
B. 8
C. 27
D. 64

AP BIO INSTA-REVIEW

TOPIC 2.3

What is the volume of a cube with a side length of 2?

B. 8

The equation for surface area is s^3.

So, $2^3 = 8$

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AP BIO INSTA-REVIEW

TOPIC 2.3

Why is the inner membrane of the mitochondria highly folded?

A. Increase volume of mitochondria
B. Increase in surface area for oxidative phosphorylation
C. Decrease volume of mitochondria
D. Decrease in surface area for oxidative phosphorylation

AP BIO INSTA-REVIEW

TOPIC 2.3

Why is the inner membrane of the mitochondria highly folded?

B. Increase in surface area for oxidative phosphorylation

The more surface area available in the mitochondria, the more sites of oxidative phosphorylation, and the more ATP can be synthesized for the cell.

AP BIO INSTA-REVIEW

TOPIC

2.3

How does the increase in surface area affect the volume?

AP BIO INSTA-REVIEW

TOPIC 2.3

How does the increase in surface area affect the volume?

As surface area increases, the volume increases. The surface area increases by factor squared. The volume increased by factor cubed.

AP BIO INSTA-REVIEW

TOPIC 2.3

How do microvilli increase diffusion?

AP BIO INSTA-REVIEW

TOPIC 2.3

How do microvilli increase diffusion?

Microvilli are extensions of the plasma membrane. These are traditionally found on cells like those in the small intestines which are responsible for absorption of nutrients. They are able to increase diffusion by increasing the surface area to volume ratios of these cells.

AP BIO INSTA-REVIEW

TOPIC

2.3

Which cell is more efficient?

A. Sphere

B. Cube

Note:

Sphere	Cube
SA: 36 pi	SA: 24
V: (108/3)pi	V: 8

AP BIO INSTA-REVIEW

TOPIC
2.3

Which cell is more efficient?

B. Cube

The sphere has a SA/V ratio of 1 and the cube has a SA/V ratio of 3.

The larger SA:V ratio is more efficient

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AP BIO INSTA-REVIEW

TOPIC 2.4

Plasma Membrane

<u>ENE-2.A.1</u>

Phospholipids have both hydrophilic and hydrophobic regions. The hydrophilic phosphate regions of the phospholipids are oriented toward the aqueous external orinternal environments, while the hydrophobic fatty acid regions face each other within the interior of the membrane.

AP BIO INSTA-REVIEW

TOPIC 2.4

Plasma Membrane

ENE-2.A.2

Embedded proteins can be hydrophilic, with charged and polar side groups, or hydrophobic, with nonpolar side groups.

AP BIO INSTA-REVIEW

TOPIC

2.4

Plasma Membrane

ENE-2.B.1

Cell membranes consist of a structural framework of phospholipid molecules that is embedded with proteins, steroids (such as cholesterol in eukaryotes), glycoproteins, and glycolipids that can flow around the surface of the cell within the membrane.

AP BIO INSTA-REVIEW

TOPIC 2.4

What is the main component of the cell membrane?

A. Carbohydrates
B. Nucleic Acids
C. Phospholipids
D. Proteins

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AP BIO INSTA-REVIEW

TOPIC 2.4

What is the main component of the cell membrane?

C. Phospholipids

The plasma membrane is made up of phospholipids with proteins. The main component is the phospholipids.

AP BIO INSTA-REVIEW

TOPIC 2.4

Describe the orientation of the phospholipids to make the membrane

AP BIO INSTA-REVIEW

TOPIC 2.4

Describe the orientation of the phospholipids to make the membrane

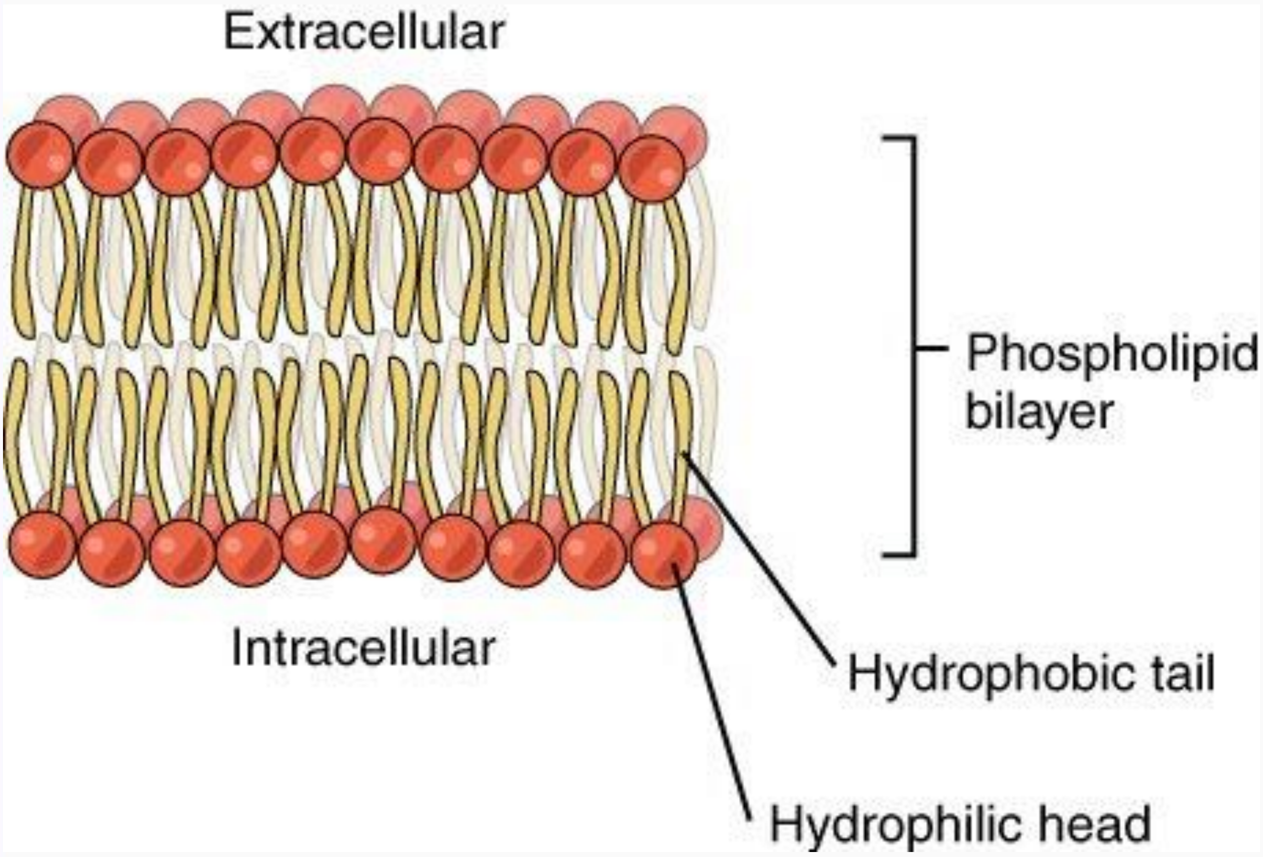
Phospholipids have a nonpolar region (fatty acid tails) and a polar region (phosphate head).

The fatty acid tails were associate with one another to "hide" from the aqueous environment. So, the membrane will double layer the sandwich the nonpolar region to the interior with the polar region to the exterior facing the extracellular and cytoplasmic sides of the membrane.

AP BIO INSTA-REVIEW

TOPIC 2.4

Describe the orientation of the phospholipids to make the membrane



AP BIO INSTA-REVIEW

TOPIC

2.4

Describe the folding of a transmembrane protein.

AP BIO INSTA-REVIEW

TOPIC 2.4

Describe the folding of a transmembrane protein.

If the protein is transmembrane, it means that it goes through the membrane (aka through the nonpolar region). This means that the membrane protein must have the hydrophobic region facing outwards and hydrophilic region facing inwards.

This provides a region for hydrophilic substances to pass through the membrane (channel protein)

AP BIO INSTA-REVIEW

TOPIC

2.4

What other lipid is found in the membrane?

A. Cholesterol
B. Cortisol
C. Estrogen
D. Testosterone

AP BIO INSTA-REVIEW

TOPIC 2.4

What other lipid is found in the membrane?

A. Cholesterol

Cholesterol is a steroid. It will sit in the fatty acid tail region to act as a buffer for the membrane. If it gets too warm, cholesterol will inhibit the phospholipids from getting too apart. If it gets too cold, cholesterol will inhibit the phospholipids from getting too close together.

AP BIO INSTA-REVIEW

TOPIC 2.4

What is the function of cholesterol in the plasma membrane?

AP BIO INSTA-REVIEW

TOPIC

2.4

What is the function of cholesterol in the plasma membrane?

Cholesterol associates with the nonpolar region (fatty acid tails). This acts as a temperature buffer to maintain the fluidity of the membrane.

If it gets too hot, molecules move faster which causes the plasma membrane to have big gaps (reason why you heat shocked your bacteria in the transformation experiment). The cholesterol helps to keep the membrane together when its hot.

If it gets too cold, molecules slow down and compress. The cholesterol inhibits the membrane from compressing so much that it becomes a solid.

AP BIO INSTA-REVIEW

TOPIC 2.4

What two macromolecules make up most of the membrane?

A. Carbohydrates & Nucleic Acids
B. Nucleic Acids & Phospholipids
C. Phospholipids & Proteins
D. Proteins & Carbohydrates

AP BIO INSTA-REVIEW

TOPIC 2.4

C. Phospholipids & Proteins

The plasma membrane is made up of phospholipids with proteins embedded in the membrane.

AP BIO INSTA-REVIEW

TOPIC 2.4

What steroid helps to maintain membrane fluidity?

AP BIO INSTA-REVIEW

TOPIC 2.4

What steroid helps to maintain membrane fluidity?

Cholesterol

It binds to the fatty acid tails to inhibit compaction in cold conditions or spacing in warm conditions. This helps to maintain fluidity of the membrane.

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AP BIO INSTA-REVIEW

TOPIC

2.4

How are phospholipids oriented in the membrane?

A. Single layer, fatty acids to interior of cell, phosphate heads to exterior of the cell.

B. Single layer, phosphate heads to interior of cell and fatty acids to exterior of the cell

C. Double layer, fatty acid tails to interior of membrane and phosphate groups of exterior of membrane

D. Double layer, phosphate heads to interior of membrane and fatty acid tails to exterior of membrane

AP BIO INSTA-REVIEW

TOPIC

2.4

How are phospholipids oriented in the membrane?

C. Double layer, fatty acid tails to interior of membrane and phosphate groups of exterior of membrane

The phosphate group is charged leading to hydrophilic properties. The fatty acid chains are composed of hydrocarbons leading to hydrophobic properties. Due to this differing polarity, the plasma membrane is a double layer of phospholipids with the phosphate heads facing the exterior of the membrane while the fatty acid tails will face each other.

AP BIO INSTA-REVIEW

TOPIC
2.4

What types of materials can easily pass through the membrane?

A. Large, Nonpolar
B. Large, Polar
C. Small, Nonpolar
D. Small, Polar

AP BIO INSTA-REVIEW

TOPIC 2.4

What types of materials can easily pass through the membrane?

C. Small, Nonpolar

Due to the plasma membrane being nonpolar, the nonpolar materials can dissolved and pass through the membrane by simple diffusion. The small component allows it to fit between the phospholipids to pass through the membrane.

AP BIO INSTA-REVIEW

TOPIC 2.4

If a membrane protein has a polar R group, where is it found?

A. Peripheral protein in the phosphate head region
B. Peripheral protein in the fatty acid region
C. Transmembrane protein through both phosphate head and fatty acid

AP BIO INSTA-REVIEW

TOPIC 2.4

If a membrane protein has a polar R group, where is it found?

A. Peripheral protein in the phosphate head region

Polar R groups means that the R group is hydrophilic. This means "water loving". The protein will fold and remain in the hydrophilic region (phosphate head region)

AP BIO INSTA-REVIEW

TOPIC 2.4

What are glycolipids and glycoproteins and what is the function?

AP BIO INSTA-REVIEW

TOPIC 2.4

What are glycolipids and glycoproteins and what is the function?

Glycolipids are short carbohydrate polymers attached to lipids.

Glycoproteins are short carbohydrate polymers attached to proteins.

Both function in cell-to-cell recognition.

AP BIO INSTA-REVIEW

TOPIC 2.4

What are glycolipids and glycoproteins and what is the function?

Example:

A blood type has the A glycoproteins on their membrane, B blood type has B glycoproteins on their membrane, AB blood type has both the A and B glycoproteins on their membrane, and O blood type has neither A nor B glycoproteins on their membrane.

AP BIO INSTA-REVIEW

TOPIC

2.5

Membrane Permeability

ENE-2.C.1

The structure of cell membranes results in selective permeability.

ENE-2.C.2

Cell membranes separate the internal environment of the cell from the external environment.

AP BIO INSTA-REVIEW

TOPIC 2.5

Membrane Permeability

ENE-2.C.3

Selective permeability is a direct consequence of membrane structure, as described by the fluid mosaic model.

ENE-2.C.4

Small nonpolar molecules, including N_2, O_2, and CO_2, freely pass across the membrane. Hydrophilic substances, such as large polar molecules and ions, move across the membrane through embedded channel and transport proteins.

AP BIO INSTA-REVIEW

TOPIC 2.5

Membrane Permeability

ENE-2.C.5

Polar uncharged molecules, including H_2O, pass through the membrane in small amounts.

ENE-2.D.1

Cell walls provide a structural boundary, as well as a permeability barrier for some substances to the internal environments.

ENE-2.D.2

Cell walls of plants, prokaryotes, and fungi are composed of complex carbohydrates.

AP BIO INSTA-REVIEW

TOPIC 2.5

Which is the easiest to cross the membrane unassisted?

A. Small, nonpolar
B. Small, polar
C. Large, nonpolar
D. Large, polar

AP BIO INSTA-REVIEW

TOPIC 2.5

Which is the easiest to cross the membrane unassisted?

A. Small, nonpolar

The membrane is composed of phospholipids which makes the membrane nonpolar. In order for a material to pass through the membrane unassisted, it needs to be small to fit between the phospholipids and nonpolar to "dissolve" in the membrane to pass through.

AP BIO INSTA-REVIEW

TOPIC 2.5

Why is it easiest for small & nonpolar to cross?

AP BIO INSTA-REVIEW

TOPIC 2.5

Why is it easiest for small & nonpolar to cross?

The interior of the membrane is nonpolar so the substance dissolves in the membrane to cross.

The small molecules are smaller and more able to pass between two phospholipids.

AP BIO INSTA-REVIEW

TOPIC

2.5

Which is the easiest to pass?

A. Carbon dioxide

B. Glucose

C. Sodium ions

D. Water

AP BIO INSTA-REVIEW

TOPIC

2.5

Which is the easiest to pass?

A. Carbon dioxide

In order for a material to pass through the membrane easily, the material needs to be small and nonpolar. Carbon Dioxide is made up of 1 carbon and 2 oxygens so its small. The shape is linear due to the double bonds to the oxygen on opposites sides of carbon so its nonpolar. Glucose is polar, sodium is charged thus polar, and water is polar.

AP BIO INSTA-REVIEW

TOPIC

2.5

Why do sodium ions have difficulty crossing the membrane?

AP BIO INSTA-REVIEW

TOPIC 2.5

Why do sodium ions have difficulty crossing the membrane?

Sodium ions are cations (positively charged) so they are small & polar

AP BIO INSTA-REVIEW

TOPIC

2.5

A small amount of water can cross the membrane unassisted.

A. True

B. False

AP BIO INSTA-REVIEW

TOPIC 2.5

A small amount of water can cross the membrane unassisted.

A. True

In small amounts, the water molecule is able to slowly pass through the membrane. This is DIRECTLY from the CED, so its important to know this.

ENE-2.C.5

Polar uncharged molecules, including H_2O, pass through the membrane in small amounts.

AP BIO INSTA-REVIEW

TOPIC 2.5

How do small & polar substances cross the membrane?

AP BIO INSTA-REVIEW

TOPIC 2.5

How do small & polar substances cross the membrane?

Transport proteins

These are transmembrane proteins with a hydrophilic region interior to allow a channel or active site to bind to the solute to carry across.

AP BIO INSTA-REVIEW

TOPIC 2.5

Which does NOT have a cell wall?

A. Fungi
B. Plants
C. Prokaryote
D. Protist

AP BIO INSTA-REVIEW

TOPIC 2.5

Which does NOT have a cell wall?

D. Protist

Fungi, Plants, and Prokaryotes have cell walls around their cells. Fungi has the carbohydrate chitin, plants have the carbohydrate cellulose, and some prokaryotes have the carbohydrate peptidoglycan.

AP BIO INSTA-REVIEW

TOPIC

2.5

Describe the orientation of phospholipids & how that contributes to permeability.

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AP BIO INSTA-REVIEW

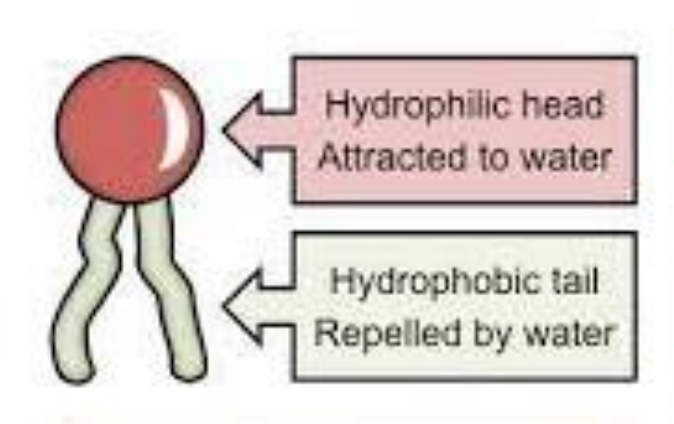
TOPIC

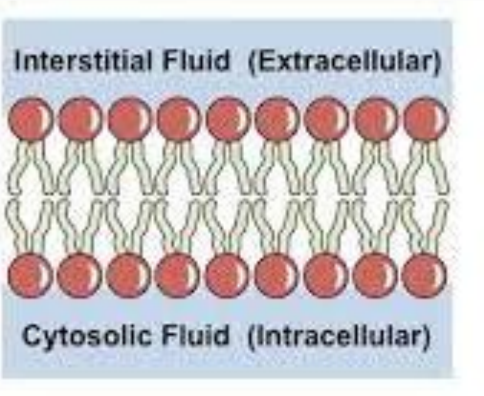
2.5

Describe the orientation of phospholipids & how that contributes to permeability.

The membrane is made up of a double layer of phospholipids. The phosphate heads associate to the extracellular and intracellular regions while the fatty acid tails associate to the interior of the membrane.

This creates a barrier that only allows certain materials to pass through allowing the membrane to be selectively permeable.





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TOPIC 2.5

Which passes through the membrane easily?

A. Ca^{2+}

B. CO_2

C. Glucose

D. H_2O

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TOPIC 2.5

Which passes through the membrane easily?

B. CO_2

In order for a material to pass through the membrane easily, the material needs to be small and nonpolar. Carbon Dioxide is made up of 1 carbon and 2 oxygens so its small. The shape is linear due to the double bonds to the oxygen on opposites sides of carbon so its nonpolar. Calcium is charged thus polar, glucose is polar and water is polar.

AP BIO INSTA-REVIEW

TOPIC

2.5

What type of membrane protein allows water passage?

A. Carrier protein
B. Channel protein

AP BIO INSTA-REVIEW

TOPIC
2.5

What type of membrane protein allows water passage?

B. Channel protein

Water passes through a channel protein called an aquaporin. Channel proteins act as a tunnel to allow materials to pass from one side of the membrane to the other side of the membrane.

AP BIO INSTA-REVIEW

TOPIC 2.5

What is the difference between endocytosis and exocytosis?

AP BIO INSTA-REVIEW

TOPIC

2.5

What is the difference between endocytosis and exocytosis?

Endocytosis involves bringing materials from the extracellular environment into the cell.

Exocytosis involves secreting materials from the cell into the extracellular environment.

AP BIO INSTA-REVIEW

TOPIC 2.5

Cellular eating, use pseudopod to engulf food

A. Exocytosis
B. Phagocytosis
C. Pinocytosis
D. Receptor Mediated Endocytosis

AP BIO INSTA-REVIEW

TOPIC 2.5

Cellular eating, use pseudopod to engulf food

B. Phagocytosis

Phagocytosis is the act of cellular eating. The pseudopods surround the food particle forming the food vacuole which fuses with the lysosome.

AP BIO INSTA-REVIEW

TOPIC

2.5

Cellular drinking, cell "gulps" extracellular fluid

A. Exocytosis
B. Phagocytosis
C. Pinocytosis
D. Receptor Mediated Endocytosis

Cellular drinking, cell "gulps" extracellular fluid

C. Pinocytosis

Pinocytosis is the act of cellular drinking. The membrane undergoes invagination to bring in extraceullar fluid and solutes.

AP BIO INSTA-REVIEW

TOPIC 2.5

Organelle that fuses with product from phagocytosis

A. Golgi
B. Lysosome
C. Nucleus
D. Smooth ER

AP BIO INSTA-REVIEW

TOPIC

2.5

Organelle that fuses with product from phagocytosis

B. Lysosome

Phagocytosis is cellular eating. The food vacuole that is formed needs to be digested, thus it will fuse with lysosomes to be digested.

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TOPIC

2.5

Proteins made in rough ER are secreted by

A. Exocytosis
B. Phagocytosis
C. Pinocytosis
D. Receptor Mediated Endocytosis

AP BIO INSTA-REVIEW

TOPIC 2.5

Proteins made in rough ER are secreted by

A. Exocytosis

Exocytosis is the process where materials are EXiting the cell. The proteins are synthesized in the rough ER, then packaged and modified in the Golgi apparatus before being released from the cell.

AP BIO INSTA-REVIEW

TOPIC 2.5

What makes up cell wall of fungi?

A. Cellulose
B. Chitin
C. Peptidoglycan

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AP BIO INSTA-REVIEW

TOPIC 2.5

What makes up cell wall of fungi?

B. Chitin

The cell wall of fungi is made up of chitin, a structural polysaccharide that is also found in the exoskeleton of arthropods.

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TOPIC 2.5

What makes up cell wall of some prokaryotes?

A. Cellulose
B. Chitin
C. Peptidoglycan

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AP BIO INSTA-REVIEW

TOPIC 2.5

What makes up cell wall of some prokaryotes?

C. Peptidoglycan

The cell wall of some prokaryotes is made up of peptidoglycan, a structural polysaccharide which leads to staining from crystal violet.

AP BIO INSTA-REVIEW

TOPIC 2.5

What makes up cell wall of plants?

A. Cellulose
B. Chitin
C. Peptidoglycan

AP BIO INSTA-REVIEW

TOPIC 2.5

What makes up cell wall of plants?

A. Cellulose

The cell wall of plants is made up of cellulose, a structural polysaccharide.

AP BIO INSTA-REVIEW

TOPIC 2.6

Membrane Transport

ENE-2.E.1

Passive transport is the net movement of molecules from high concentration to low concentration without the direct input of metabolic energy.

ENE-2.E.2

Passive transport plays a primary role in the import of materials and the export of wastes.

AP BIO INSTA-REVIEW

TOPIC

2.6

Membrane Transport

ENE-2.E.3

Active transport requires the direct input of energy to move molecules from regions of low concentration to regions of high concentration.

ENE-2.F.1

The selective permeability of membranes allows for the formation of concentration gradients of solutes across the membrane.

AP BIO INSTA-REVIEW

TOPIC 2.6

Membrane Transport

ENE-2.F.2

The processes of endocytosis and exocytosis require energy to move large molecules into and out of cells—

a. In exocytosis, internal vesicles fuse with the plasma membrane and secrete large macromolecules out of the cell.

b. In endocytosis, the cell takes in macromolecules and particulate matter by forming new vesicles derived from the plasma membrane.

AP BIO INSTA-REVIEW

TOPIC
2.6

Passive transport moves substances...

A. From high to high concentration
B. From high to low concentration
C. From low to low concentration
D. From low to high concentration

AP BIO INSTA-REVIEW

TOPIC 2.6

Passive transport moves substances...

B. From high to low concentration

Passive transport does not require ATP so it moves down its concentration gradient. This means that substances will move from high to low concentration.

AP BIO INSTA-REVIEW

TOPIC 2.6

Passive transport requires...

A. Energy input
B. No energy input

AP BIO INSTA-REVIEW

TOPIC

2.6

Passive transport requires...

B. No energy input

Passive transport does not require any ATP input as the substance moves down its concentration gradient from high to low concentration.

AP BIO INSTA-REVIEW

TOPIC 2.6

Provide an example of passive transport

AP BIO INSTA-REVIEW

TOPIC 2.6

Provide an example of passive transport

Movement of water from hypotonic environment to hypertonic environment

Movement of glucose from blood to extracellular fluid after a meal.

Note: additional examples apply

AP BIO INSTA-REVIEW

TOPIC 2.6

What are the two types of passive transport?

AP BIO INSTA-REVIEW

TOPIC 2.6

What are the two types of passive transport?

Simple diffusion – does not require a membrane protein for transport

Facilitated diffusion – requires a transport protein

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AP BIO INSTA-REVIEW

TOPIC 2.6

Active transport requires...

A. Energy
B. Transport protein
C. Both energy & transport protein
D. Neither energy nor transport protein

AP BIO INSTA-REVIEW

TOPIC 2.6

Active transport requires...

C. Both energy & transport protein

Active transport involves substances from moving from a low concentration to a high concentration. Due to the substance moving against its concentration gradient, the movement requires an input of energy.

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TOPIC 2.6

Why does the active transport required energy & transport protein?

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TOPIC 2.6

Why does the active transport required energy & transport protein?

Active transport is AGAINST the concentration gradient. This means that substances go from low concentration to high concentration. Imagine being at the bottom of a hill on a bike and you gotta get to the top of the hill... you gotta put some energy since you are from

AP BIO INSTA-REVIEW

TOPIC

2.6

Process of exporting materials with vesicles?

A. Endocytosis

B. Exocytosis

C. Facilitated Transport

D. Simple Diffusion

AP BIO INSTA-REVIEW

TOPIC 2.6

Process of exporting materials with vesicles?

B. Exocytosis

Since there is a substance being exported, this process is called exocytosis. An easy way to remember this is that EXocytosis involves materials EXiting the cell.

AP BIO INSTA-REVIEW

TOPIC 2.6

Where are the proteins made for export by exocytosis?

A. Golgi
B. Nucleus
C. Ribosome
D. Rough ER

AP BIO INSTA-REVIEW

TOPIC 2.6

Where are the proteins made for export by exocytosis?

D. Rough ER

Proteins for secretion are made in the rough ER. The rough ER has membrane studded with ribosomes. Ribosomes synthesize proteins and since they are on a membrane, they made proteins for secretion (or membrane proteins)

AP BIO INSTA-REVIEW

TOPIC
2.6

Describe the pathway for a protein to be exported.

AP BIO INSTA-REVIEW

TOPIC 2.6

Describe the pathway for a protein to be exported.

Rough ER
Vesicle
Golgi bodies/apparatus
Vesicle
Plasma Membrane

AP BIO INSTA-REVIEW

TOPIC

2.6

Describe the process of receptor-mediated endocytosis

AP BIO INSTA-REVIEW

TOPIC

2.6

Describe the process of receptor-mediated endocytosis

A ligand (signaling molecule) binds to a receptor protein. After signal transduction, the membrane undergoes invagination to create a "pit" that forms the vesicle.

AP BIO INSTA-REVIEW

TOPIC
2.6

What does the product of phagocytosis bind to?

A. Endoplasmic Reticulum
B. Lysosome
C. Nucleus
D. Mitochondria

AP BIO INSTA-REVIEW

TOPIC 2.6

What does the product of phagocytosis bind to?

B. Lysosome

Phagocytosis is cellular eating. The pseudopods surround the food particle creating the food vacuole which fuses with the lysosome for digestion.

AP BIO INSTA-REVIEW

TOPIC 2.6

Amount of ATP used to move 30 moles of glucose down concentration gradient

A. 0 moles ATP
B. 15 moles ATP
C. 30 moles ATP
D. 60 moles ATP

AP BIO INSTA-REVIEW

TOPIC 2.6

Amount of ATP used to move 30 moles of glucose down concentration gradient

A. 0 moles ATP

This was a "trick" question. The glucose is moving down its concentration gradient which is PASSIVE transport. Passive transport does NOT require ATP.

What type of movement requires no energy, down concentration gradient

A. Active transport

B. Passive transport

AP BIO INSTA-REVIEW

TOPIC 2.6

What type of movement requires no energy, down concentration gradient

B. Passive transport

Passive transport does not require any ATP as the material is moving down its concentration gradient. The substances are moving from high concentration to low concentration.

AP BIO INSTA-REVIEW

TOPIC

2.6

What is the difference between facilitated transport and simple diffusion?

AP BIO INSTA-REVIEW

TOPIC 2.6

What is the difference between facilitated transport and simple diffusion?

Facilitated transport requires a transport protein.

Simple diffusion does not require a protein and passes directly through the plasma membrane.

Both are passive transport and do NOT require an input of ATP.

AP BIO INSTA-REVIEW

TOPIC 2.6

Identify two components of active transport

AP BIO INSTA-REVIEW

TOPIC 2.6

Identify two components of active transport

Active transport moves materials against the concentration gradient.

Active transport requires use of ATP

Active transport requires a transport protein (traditionally a carrier protein)

AP BIO INSTA-REVIEW

TOPIC

2.6

Move glucose from GI tract into blood supply.

Identify type of transport used.

A. Active

B. Facilitated

C. Simple

AP BIO INSTA-REVIEW

TOPIC

2.6

Move glucose from GI tract into blood supply. Identify type of transport used.

B. Facilitated

Glucose is a polar substance. Due to its polar nature, it requires assistance to cross the membrane. If a protein is helping material to cross the membrane, this is considered facilitated diffusion.

AP BIO INSTA-REVIEW

TOPIC

2.6

Movement of oxygen from alveoli (lungs) into blood supply Identify type of transport used.

A. Active

B. Facilitated

C. Simple

AP BIO INSTA-REVIEW

TOPIC 2.6

Movement of oxygen from alveoli (lungs) into blood supply. Identify type of transport used.

C. Simple

Oxygen is small and nonpolar. This means that it is able to cross the plasma membrane without assistance. In addition, in the lungs the oxygen will be entering the blood supply so it will be moving down its concentration gradient.

AP BIO INSTA-REVIEW

TOPIC
2.6

Sodium/potassium pump moving 3 Na^+ out and 2 K^+ into neuron (nervous cell)
Identify type of transport used.

A. Active
B. Facilitated
C. Simple

AP BIO INSTA-REVIEW

TOPIC 2.6

Sodium/potassium pump moving 3 Na+ out and 2 K+ into neuron (nervous cell). Identify type of transport used.

A. Active

Sodium and potassium are charged which means they are polar. They are being "pumped" which means it is going against its concentration gradient which describes active transport.

AP BIO INSTA-REVIEW

TOPIC 2.6

Secretion of proteins from rough ER is done by

A. Exocytosis
B. Facilitated Transport
C. Simple Diffusion

AP BIO INSTA-REVIEW

TOPIC

2.6

Secretion of proteins from rough ER is done by

A. Exocytosis

EXocytosis is the process of materials EXiting the cell. After the materials are made in the rough ER, they are sorted and modified in the Golgi, then released by fusing with the plasma membrane.

Identify and describe the three types of endocytosis.

AP BIO INSTA-REVIEW

TOPIC
2.6

Identify and describe the three types of endocytosis.

Endocytosis is bulk transport across the plasma membrane.

Phagocytosis – cellular eating, pseudopodia surround "food" to be engulfed by the cell

Pinocytosis – cellular drinking, cell "gulps" extracellular fluid and solutes it contains

Receptor-Mediated Endocytosis – ligand binds to receptor causing invagination to move material across membrane

AP BIO INSTA-REVIEW

TOPIC 2.6

Pathway to exocytosis

A. Rough ER ⇨ Golgi ⇨ Membrane
B. Rough ER ⇨ Lysosome ⇨ Membrane
C. Smooth ER ⇨ Golgi ⇨ Membrane
D. Smooth ER ⇨ Lysosome ⇨ Membrane

AP BIO INSTA-REVIEW

TOPIC 2.6

Pathway to exocytosis

A. Rough ER ⇨ Golgi ⇨ Membrane

The materials are synthesized by the ribosomes on the rough ER membrane. The materials are sorted and modified by the Golgi bodies. The materials are secreted by the transport vesicles fuses with the membrane.

Pathway of phagocytosis

A. Membrane ⇨ Golgi ⇨ Rough ER
B. Membrane ⇨ Golgi ⇨ Smooth ER
C. Membrane ⇨ Lysosome
D. Membrane ⇨ Rough ER

AP BIO INSTA-REVIEW

TOPIC 2.6

Pathway of phagocytosis

C. Membrane ⇨ Lysosome

Phagocyosis is cellular eating. After the food vacuole is formed from the phagocytosis, it will fuse with the lysosome for digestion.

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AP BIO INSTA-REVIEW

TOPIC 2.7

Facilitated Diffusion

ENE-2.G.1

Membrane proteins are required for facilitated diffusion of charged and large polar molecules through a membrane—

a. Large quantities of water pass through aquaporins.

b. Charged ions, including Na^+ and K^+, require channel proteins to move through the membrane.

c. Membranes may become polarized by movement of ions across the membrane

AP BIO INSTA-REVIEW

TOPIC

2.7

Facilitated Diffusion

ENE-2.G.2

Membrane proteins are necessary for active transport

ENE-2.G.3

Metabolic energy (such as from ATP) is required for active transport of molecules and/ or ions across the membrane and to establish and maintain concentration gradients.

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TOPIC 2.7

Facilitated Diffusion

ENE-2.G.4

The Na^+/K^+ ATPase contributes to the maintenance of the membrane potential.

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AP BIO INSTA-REVIEW

TOPIC
2.7

Which of the following is required for facilitated diffusion?

A. ATP
B. Concentration gradient
C. Glycolipid
D. Membrane Protein

AP BIO INSTA-REVIEW

TOPIC

2.7

Which of the following is required for facilitated diffusion?

D. Membrane Protein

Facilitated diffusion is passive transport through a transport protein. Since it is crossing the membrane, we need a membrane protein. The two different membrane proteins are channel and carrier proteins.

AP BIO INSTA-REVIEW

TOPIC

2.7

What types of molecules require a transport protein?

AP BIO INSTA-REVIEW

TOPIC 2.7

What types of molecules require a transport protein?

Polar substances

CED: charged and large polar substances

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AP BIO INSTA-REVIEW

TOPIC 2.7

The transport membrane protein is specific.

A. True
B. False

AP BIO INSTA-REVIEW

TOPIC 2.7

The transport membrane protein is specific.

A. True

The transport protein has an active site to bind to the appropriate material to cross the membrane. In addition, the size and charge will match the substance to allow passage through the transport protein.

AP BIO INSTA-REVIEW

TOPIC 2.7

Name of the membrane protein that allows water to diffuse.

AP BIO INSTA-REVIEW

TOPIC 2.7

Name of the membrane protein that allows water to diffuse.

Aquaporin

Water is polar and large quantities require a channel protein called an aquaporin to pass

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AP BIO INSTA-REVIEW

TOPIC 2.7

How does the membrane maintain Na+/K+ levels?

AP BIO INSTA-REVIEW

TOPIC 2.7

How does the membrane maintain Na^+/K^+ levels?

In specific membrane (ex. neurons), the cell must maintain a potential using sodium and potassium ions. In this case, active transport in the form of Na/K pump allows the membrane potential to be maintained. Using ATP, 3 sodium ions are pumped OUT of the cell and 2 potassium ions are pumped INTO the cell. This creates a difference of charge (aka membrane potential as the cytoplasmic side is negatively charged)

AP BIO INSTA-REVIEW

TOPIC

2.7

How does the membrane maintain Na+/K+ levels?

(Mrs. Jones' crazy way to remember the direction for ion movement in Na^+/K^+)

So... some people call their grandma NaNa (so Na is sodium) and kids are the potassium (K).

So, when grandma comes over (Na enters the cell)... she always squeezes your cheeks, asks you personal questions, whatever you want to say. This causes the kids to go out (K leaves the cell).

After a certain amount of time, grandma's gotta go home but grandma likes to stay (Na is pushed out) and then the kids have to be dragged home (K is pulled back into the cell)

AP BIO INSTA-REVIEW

TOPIC 2.7

How does the membrane maintain Na+/K+ levels?

(Student submitted way to remember the number and direction)

Hold 3 fingers up & move away and say "Na"

Hold 2 fingers up say K like posing and move hand towards you

AP BIO INSTA-REVIEW

TOPIC 2.7

Charged molecules (ions) are

A. Hydrophilic
B. Hydrophobic

AP BIO INSTA-REVIEW

TOPIC 2.7

Charged molecules (ions) are

A. Hydrophilic

Hydrophilic means that they are water loving. The charge on the molecule will attract the opposite partial charge of the water.

AP BIO INSTA-REVIEW

TOPIC

2.7

How does large quantity of water move across a membrane?

A. Carrier protein
B. Channel protein
C. Exocytosis
D. Simple diffusion

AP BIO INSTA-REVIEW

TOPIC

2.7

How does large quantity of water move across a membrane?

B. Channel protein

Water moves through aquaporins. These are channel proteins found in the membrane which allows water to pass through from a high free water concentration to a low free water concentration.

AP BIO INSTA-REVIEW

TOPIC 2.7

What is the channel protein that transport water across the membrane?

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AP BIO INSTA-REVIEW

TOPIC

2.7

What is the channel protein that transport water across the membrane?

Aquaporin

AP BIO INSTA-REVIEW

TOPIC 2.7

Transport proteins are specific for the material transported

A. True
B. False

AP BIO INSTA-REVIEW

TOPIC 2.7

Transport proteins are specific for the material transported

A. True

Transport proteins have an active site that binds to the material. The active site is specific to the material plus the size and charge of the transport protein will allow for the passage of the material across the membrane.

AP BIO INSTA-REVIEW

TOPIC
2.7

Describe how the transport protein are specific for the material

AP BIO INSTA-REVIEW

TOPIC 2.7

Describe how the transport protein are specific for the material

The material binds to the active site (bonding, size, and polarity)

In the case of carrier protein, when the material binds – it causes a conformational shape change to shuttle the material across.

AP BIO INSTA-REVIEW

TOPIC 2.7

How many Na^+ and K^+ are pumped in the Na^+/K^+ pump?

A. 1 Na^+ and 2 K^+
B. 2 Na^+ and 3 K^+
C. 3 Na^+ and 2 K^+
D. 4 Na^+ and 3 K^+

AP BIO INSTA-REVIEW

TOPIC 2.7

How many Na+ and K+ are pumped in the Na+/K+ pump?

C. 3 Na+ and 2 K+

Three Na^+ molecules are pumped OUT of the cell into the extracellular fluid and two K^+ molecules are pumped INTO the cell into the intracellular fluid. This is an unequal movement of ions which leads to an electrochemical gradient.

AP BIO INSTA-REVIEW

TOPIC 2.7

Describe the membrane potential based on 3 Na^+ out and 2 K^+ in.

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AP BIO INSTA-REVIEW

TOPIC 2.7

Describe the membrane potential based on 3 Na^+ out and 2 K^+ in.

There are more positive charge removed (with negative charge stuck in the cell) from the ions that entered.

This causes an electrochemical gradient as the inside of the cell membrane is negatively charged and the outside of the cell membrane is positively charged.

AP BIO INSTA-REVIEW

TOPIC 2.8

Tonicity and Osmoregulation

ENE-2.H.1

External environments can be hypotonic, hypertonic or isotonic to internal environments of cells—

a. Water moves by osmosis from areas of high-water potential/low osmolarity/low solute concentration to areas of low water potential/high-osmolarity/high solute concentration.

AP BIO INSTA-REVIEW

TOPIC

2.8

Tonicity and Osmoregulation

ENE-2.H.1

Water Potential:

$$\Psi = \Psi_p + \Psi_s$$

$\Psi_p =$ pressure potential

$\Psi_s =$ solute potential

AP BIO INSTA-REVIEW

TOPIC 2.8

Tonicity and Osmoregulation

ENE-2.I.1

Growth and homeostasis are maintained by the constant movement of molecules across membranes.

ENE-2.I.2

Osmoregulation maintains water balance and allows organisms to control their internal solute composition/water potential.

AP BIO INSTA-REVIEW

TOPIC

2.8

Tonicity and Osmoregulation

ENE-2.1.2

SOLUTE POTENTIAL OF A SOLUTION

$\Psi_s = -iCRT$

where:

i = ionization constant

C = molar concentration

R = pressure constant

$\left(R = 0.0831 \dfrac{L \bullet bars}{mol \bullet K}\right)$

T = temperature in Kelvin (°C + 273)

AP BIO INSTA-REVIEW

TOPIC
2.8

Tonicity and Osmoregulation

Note:

Tonicity is one of the harder topics for students. There's something about the vocabulary that gets students confused.

Remember the terms are in respect of each other.

AP BIO INSTA-REVIEW

TOPIC

2.8

Solution with a higher solute concentration...

A. Hypertonic

B. Hypotonic

C. Isotonic

AP BIO INSTA-REVIEW

TOPIC 2.8

Solution with a higher solute concentration...

A. Hypertonic

The hypertonic solution has a HIGH solute concentration and a LOW free water concentration. The solute needs to be dissolved, so there is a higher number of water molecules surrounding the solute.

AP BIO INSTA-REVIEW

TOPIC 2.8

Solution with a lower solute concentration...

A. Hypertonic
B. Hypotonic
C. Isotonic

AP BIO INSTA-REVIEW

TOPIC 2.8

Solution with a lower solute concentration...

B. Hypotonic

The hypotonic solution has a LOW solute concentration and a HIGH free water concentration. The solute needs to be dissolved, so there is a lower number of water molecules surrounding the solute.

AP BIO INSTA-REVIEW

TOPIC
2.8

Solution with a higher free water concentration...

A. Hypertonic
B. Hypotonic
C. Isotonic

AP BIO INSTA-REVIEW

TOPIC

2.8

Solution with a higher free water concentration...

B. Hypotonic

In order for solutes to dissolve, they need to be surrounded by water molecules. If there is a higher free water concentration, then there is a lower solute concentration hence the **HYPOTONIC** solution.

AP BIO INSTA-REVIEW

TOPIC

2.8

Solution with a lower free water concentration...

A. Hypertonic
B. Hypotonic
C. Isotonic

AP BIO INSTA-REVIEW

TOPIC 2.8

Solution with a lower free water concentration...

A. Hypertonic

In order for solutes to dissolve, they need to be surrounded by water molecules. If there is a lower free water concentration, then there is a higher solute concentration hence the **HYPERTONIC** solution.

AP BIO INSTA-REVIEW

TOPIC 2.8

Describe the direction of water flow.

AP BIO INSTA-REVIEW

TOPIC 2.8

Describe the direction of water flow.

Water flows down its concentration gradient. There is a higher free water concentration in hypotonic solutions and a lower free water concentration in hypertonic solution.

So... water flows from hypotonic to hypertonic

HYPO to HYPER

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AP BIO INSTA-REVIEW

TOPIC 2.8

If the intracellular concentration is 1.0 M and extracellular concentration is 0.4 M. Which direction does water flow?

A. Both in and out (equilibrium)

B. Into the cell

C. Out of the cell

AP BIO INSTA-REVIEW

TOPIC 2.8

If the intracellular concentration is 1.0 M and extracellular concentration is 0.4 M. Which direction does water flow?

B. Into the cell

Let's first determine the hypertonic and hypotonic solutions.

The 1.0 M solution has a HIGH solute concentration compared to the 0.4 M solution. This means than the 0.4 M is HYPOTONIC and the 1.0 M is HYPERTONIC. The water will move from the HYPOTONIC extracellular solution to the HYPERTONIC intracellular solution.

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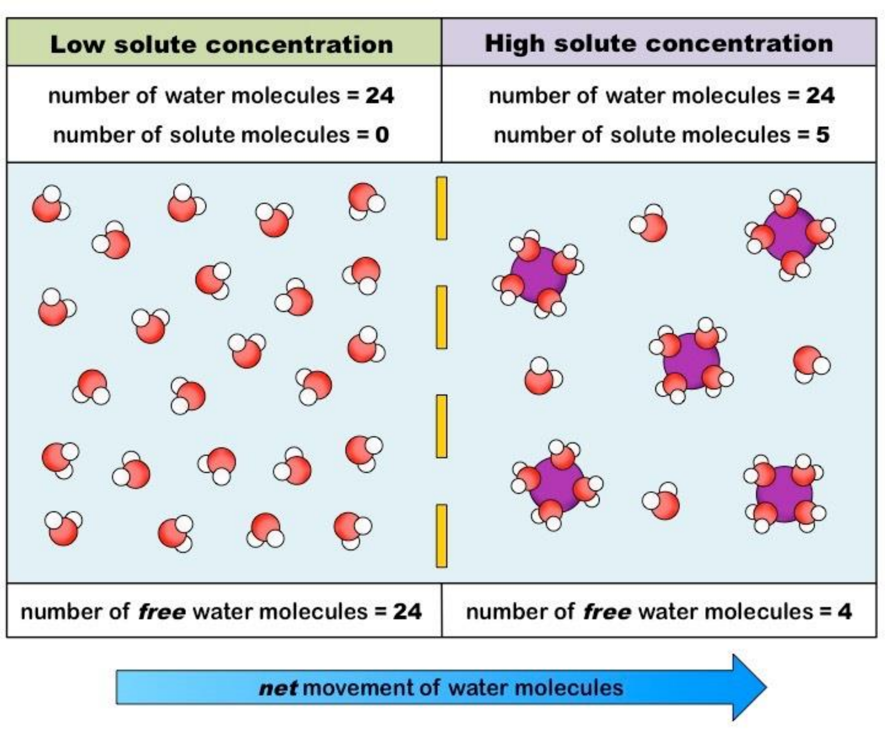
TOPIC 2.8

Note:



Nope, that wasn't an error. The concentration is telling you the concentration of the solute. The lower the solute, the higher the free water. The higher the solute, the lower the free water. The water surrounds the solute to dissolve it. So, the more items needed to be surrounded by water molecules the less are available to flow from one solution to another.

AP BIO INSTA-REVIEW

TOPIC 2.8

Describe what happens to an animal cell in hypertonic environment.

AP BIO INSTA-REVIEW

TOPIC

2.8

Describe what happens to an animal cell in hypertonic environment.

The cell is hypotonic if the environment is hypertonic. This means that the water is going to flow OUT of the cell. If the cells loses water from its cytosol then it will shrivel

SHRIVEL

AP BIO INSTA-REVIEW

TOPIC

2.8

You are dehydrated and go to the ER. The doctor calls for a bag of distilled water to be given to you (instead of the saline solution that is normally given). Describe what happens to the blood cells in this situation.

AP BIO INSTA-REVIEW

TOPIC

2.8

You are dehydrated and go to the ER. The doctor calls for a bag of distilled water to be given to you (instead of the saline solution that is normally given). Describe what happens to the blood cells in this situation.

Cell lysis

The extracellular environment is hypotonic to the intracellular environment. Water flows INTO the cell. The animal cells does not have a cell wall and the influx of water causes the plasma membrane to burst (aka cell lysis)

AP BIO INSTA-REVIEW

TOPIC

2.8

What organelle holds the water in plant cells?

A. Central vacuole
B. Endoplasmic reticulum
C. Food vacuole
D. Golgi bodies

AP BIO INSTA-REVIEW

TOPIC 2.8

What organelle holds the water in plant cells?

A. Central vacuole

The central vacuole is only found in PLANTS. This organelle will store water (and other materials) which provides the pressure for the plant to be turgid.

AP BIO INSTA-REVIEW

TOPIC 2.8

Why doesn't a plant cell burst in a hypotonic environment?

AP BIO INSTA-REVIEW

TOPIC

2.8

Why doesn't a plant cell burst in a hypotonic environment?

The cell wall provided a positive pressure to resist the influx of water.

AP BIO INSTA-REVIEW

TOPIC

2.8

How does ionic compound solute potential compare to a covalent compound?

A. Higher
B. Lower

AP BIO INSTA-REVIEW

TOPIC 2.8

How does ionic compound solute potential compare to a covalent compound?

B. Lower

The equation for the solute potential is –iCRT. The question is specifically asking the difference between the ionization constant in a ionic vs covalent compound. Covalent bonds do not ionize, so the ionic compound will have a more negative (lower) solute potential.

AP BIO INSTA-REVIEW

TOPIC

2.8

If solution A has -4.0 MPa and solution B has -2.0 MPa, which direction will water flow?

A. Out of solution A

B. Out of solution B

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AP BIO INSTA-REVIEW

TOPIC

2.8

If solution A has -4.0 MPa and solution B has -2.0 MPa, which direction will water flow?

B. Out of solution B

Water will move from where it has a HIGHER water potential to where there is a LOWER water potential. Think of these numbers of a number line, -2 > -4. So water flows OUT of solution B (-2.0 M)

AP BIO INSTA-REVIEW

TOPIC

2.8

Which organelle helps protist in freshwater?

A. Central vacuole

B. Contractile vacuole

C. Golgi bodies

D. Nucleus

AP BIO INSTA-REVIEW

TOPIC 2.8

Which organelle helps protist in freshwater?

B. Contractile vacuole

Freshwater protists are surrounded by a hypotonic solution. Water will be constantly rushing into the cell, so in order to osmoregulate, the protist needs to push excess water back out of the cell. The contractile vacuole will fill with water then contract to push the water back out of the cell.

AP BIO INSTA-REVIEW

TOPIC

2.8

In a turgid plant cell, which describes pressure potential of cell water

A. Negative

B. Positive

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AP BIO INSTA-REVIEW

TOPIC 2.8

In a turgid plant cell, which describes pressure potential of cell water

B. Positive

The pressure potential is the amount of pressure that is applied by the cell wall. The cell wall will be pushing back against the excess water, so it will have a positive pressure potential.

AP BIO INSTA-REVIEW

TOPIC 2.8

Extracellular solution is 0.5M and the cell is 1.0M – which direction will water flow?

A. Into cell towards hypertonic solution
B. Into cell towards hypotonic solution
C. Out of cell toward hypertonic solution
D. Out of cell toward hypotonic solution

AP BIO INSTA-REVIEW

TOPIC 2.8

Extracellular solution is 0.5M and the cell is 1.0M – which direction will water flow?

A. Into cell towards hypertonic solution

Water will move from where it has a **LOWER** solute concentration to **HIGHER** solute concentration. The water will move from the 0.5M solution to the 1.0M solution. Water will flow **INTO** the **HYPERTONIC** cell.

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AP BIO INSTA-REVIEW

TOPIC

2.8

Extracellular solution is 0.5M and the cell is 1.0M – what will happen to the animal cell?

A. Crenate
B. Lysis
C. Plasmolysis
D. Turgid

AP BIO INSTA-REVIEW

TOPIC 2.8

Extracellular solution is 0.5M and the cell is 1.0M – what will happen to the animal cell?

B. Lysis

Due to the water rushing into the cell from the extracellular solution, the cell will burst or lyse. Water rushes in because the extracellular solution is HYPOTONIC to the cell.

AP BIO INSTA-REVIEW

TOPIC 2.8

What organelle function with plant cell in hypotonic solution?

A. Contractile vacuole

B. Central vacuole

C. Food vacuole

D. Vesicle

What organelle function with plant cell in hypotonic solution?

B. Central vacuole

The central vacuole is responsible for storing water. When the plant is in a hypotonic environment, water rushes into the cell. Due to the cell wall and the central vacuole, the plant cell will not burst in the hypotonic environment.

AP BIO INSTA-REVIEW

TOPIC 2.8

What organelle functions with freshwater protists?

A. Contractile vacuole

B. Central vacuole

C. Food vacuole

D. Vesicle

AP BIO INSTA-REVIEW

TOPIC

2.8

What organelle functions with freshwater protists?

A. Contractile vacuole

The contractile vacuole is found in the freshwater protsts. Due to the hypotonic environment, water rushes into the cell. In order to protect the cell, the contractile vacuole will contract to remove the excess water.

AP BIO INSTA-REVIEW

TOPIC 2.8

If extracellular solution is isotonic, which direction will water move?

A. Into cell

B. Out of cell

C. Both into and out of cell

D. No water movement

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AP BIO INSTA-REVIEW

TOPIC 2.8

If extracellular solution is isotonic, which direction will water move?

C. Both into and out of cell

The isotonic solution is equal on both sides of the membrane. The water will leave the cell at the same rate as the water will enter the cell.

AP BIO INSTA-REVIEW

TOPIC

2.8

Water moves from

A. High water potential to low water potential
B. Low water potential to high water potential

AP BIO INSTA-REVIEW

TOPIC

2.8

Water moves from

A. High water potential to low water potential

Water potential is the potential for water to move. Water will move from a HIGH water potential to a LOW water potential.

AP BIO INSTA-REVIEW

TOPIC

2.8

The higher the solute concentration...

A. the higher the water potential

B. the lower the water potential

AP BIO INSTA-REVIEW

TOPIC 2.8

The higher the solute concentration...

B. the lower the water potential

The equation for solute potential is $-iCRT$. If there is a higher solute concentration, then the C value in the equation will be the difference. The more concentrated, the more negative the solute potential, and the lower the water potential.

AP BIO INSTA-REVIEW

TOPIC 2.8

Pressure potential = 0.2 MPa and solute potential = - 0.6 MPa...

A. Water Potential = -0.8MPa
B. Water Potential = -0.4 MPa
C. Water Potential = 0.4 MPa
D. Water Potential = 0.8 MPa

Pressure potential = 0.2 MPa and solute potential = - 0.6 MPa...

B. Water Potential = -0.4 MPa

Water potential is pressure potential plus solute potential.

- 0.6 Mpa + 0.2 MPa
= -0.4 MPa

AP BIO INSTA-REVIEW

TOPIC

2.8

What is the ionization constant of sucrose?

A. 0
B. 1
C. 24
D. 48

What is the ionization constant of sucrose?

B. 1

Sucrose is a covalently bound substance. This means that sucrose will not form ions when dissolved in the water. The ionization constant will be 1.

AP BIO INSTA-REVIEW

TOPIC

2.8

What is the ionization constant of sodium chloride?

A. 0
B. 1
C. 2
D. 3

AP BIO INSTA-REVIEW

TOPIC 2.8

What is the ionization constant of sodium chloride?

c. 2

When sodium chloride is added to a beaker of water, the sodium will hydrogen bond with the oxygen while the chloride will hydrogen bond with hydrogen. Since there is 1 Na^+ and 1 Cl^-, the ionization constant is 2.

AP BIO INSTA-REVIEW

TOPIC 2.9

Mechanisms of Transport

ENE-2.J.1

A variety of processes allow for the movement of ions and other molecules across membranes, including passive and active transport, endocytosis and exocytosis.

AP BIO INSTA-REVIEW

TOPIC 2.9

What moves the vesicles to the membrane for exocytosis?

A. Actin
B. Dynein
C. Kinase
D. Myosin

AP BIO INSTA-REVIEW

TOPIC 2.9

What moves the vesicles to the membrane for exocytosis?

B. Dynein

Dynein is the motor protein found in the cell. This will move along the microtubules to move the vesicles throughout the cell.

AP BIO INSTA-REVIEW

TOPIC 2.9

What provides the path for vesicles moving to membrane?

A. Intermediate filaments
B. Microfilaments
C. Microtubules
D. Cytosolic Proteins

AP BIO INSTA-REVIEW

TOPIC

2.9

What provides the path for vesicles moving to membrane?

C. Microtubules

The microtubules act as "railway" within the cell. The dynein motor protein will move the vesicles along the microtubules throughout the cell.

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AP BIO INSTA-REVIEW

TOPIC

2.9

When you die, the calcium stored in the sarcoplasmic reticulum (smooth ER in muscle cells) releases the stored Ca^{2+} that is used for contraction. This released Ca^{2+} causes contraction of the muscles (rigor mortis).

Why does rigor mortis take place?

AP BIO INSTA-REVIEW

TOPIC
2.9

When you die, the calcium stored in the sarcoplasmic reticulum (smooth ER in muscle cells) releases the stored Ca^{2+} that is used for contraction. This released Ca^{2+} causes contraction of the muscles (rigor mortis).

Why does rigor mortis take place?

There's no available ATP to pump the calcium ions back into the sarcoplasmic reticulum which is an active transport process requiring ATP.

P.S. The process of muscle contraction is not required content but it can be applied content if given the background info needed to answer the question.

AP BIO INSTA-REVIEW

TOPIC

2.9

Blood in the gills of a fish undergoes countercurrent exchange with the surrounding aqueous environment. Countercurrent exchange involves two fluids moving in opposite directions and exchanging a substance. Why does blood flow in gills undergo countercurrent exchange?

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AP BIO INSTA-REVIEW

TOPIC

2.9

Blood in the gills of a fish undergoes countercurrent exchange with the surrounding aqueous environment. Countercurrent exchange involves two fluids moving in opposite directions and exchanging a substance. Why does blood flow in gills undergo countercurrent exchange?

The surrounding water is always coming in contact with blood of lower oxygen concentration to increase efficiency of oxygen diffusion. Also, it increases the time of the two fluids in contract to allow for diffusion of the oxygen.

Oxygen is nonpolar and able to diffuse by simple diffusion (cross the membrane without the assistance of ATP or membrane protein)

AP BIO INSTA-REVIEW

TOPIC

2.9

In carrier proteins, how is it specific for transport?

A. Active site binds to the solute

B. Allosteric site binds to the solute

C. Binding site opens channel

D. ATP provides needed energy

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AP BIO INSTA-REVIEW

TOPIC

2.9

In carrier proteins, how is it specific for transport?

A. Active site binds to the solute

Transport proteins are specific to the material that they transport across the membrane (no matter if its the channel or carrier protein). The solute binds to the active site on the protein which allows for the passage of the material.

AP BIO INSTA-REVIEW

TOPIC

2.9

Passive transport

A. Does not require input of energy and moves against gradient
B. Does not require input of energy and moves with gradient
C. Requires input of energy and moves against gradient
D. Requires input of energy and moves with gradient

AP BIO INSTA-REVIEW

TOPIC 2.9

Passive transport

B. Does not require input of energy and moves with gradient

Passive by definition does not require any energy. It does not require an input of energy because the substance is moving with its concentration gradient. This means that it is moving from HIGH concentration to LOW concentration.

AP BIO INSTA-REVIEW

TOPIC 2.9

Active transport

A. Does not require input of energy and moves against gradient
B. Does not require input of energy and moves with gradient
C. Requires input of energy and moves against gradient
D. Requires input of energy and moves with gradient

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AP BIO INSTA-REVIEW

TOPIC

2.9

Active transport

C. Requires input of energy and moves against gradient

Active transport by definition means that it requires an input of energy. The input of energy is required due to the material moving against its concentration gradient which means it is moving from LOW concentration to HIGH concentration.

AP BIO INSTA-REVIEW

TOPIC

2.9

Facilitated diffusion

A. Does not use transport proteins and is a type of active transport

B. Does not use transport proteins and is a type of passive transport

C. Uses transport proteins and is a type of active transport

D. Uses transport proteins and is a type of passive transport

AP BIO INSTA-REVIEW

TOPIC 2.9

Facilitated diffusion

D. Uses transport proteins and is a type of passive transport

Facilitative diffusion is a type of passive transport so it does not require an input of energy as the material is moving down its concentration gradient (HIGH to LOW concentration). The material is polar or charged so it needs a transport protein.

AP BIO INSTA-REVIEW

TOPIC 2.9

Endocytosis

A. Does not require ATP and allows large particles to enter the cell

B. Does not require ATP and allows large particles to leave the cell

C. Requires ATP and allows large particles to enter the cell

D. Requires ATP and allows large particles to leave the cell

AP BIO INSTA-REVIEW

TOPIC 2.9

Endocytosis

C. Requires ATP and allows large particles to enter the cell

Endocytosis is a type of bulk transport. Due to the need to create a vesicle to surround the material, this requires ATP.
There are three types: Phagocytosis (cellular eating), Pinocytosis (cellular drinking), or Receptor-Mediated Endocytosis.

AP BIO INSTA-REVIEW

TOPIC

2.9

How does Ca^{2+} move across membrane from high to low?

A. Active transport
B. Bulk transport
C. Facilitated transport
D. Simple diffusion

AP BIO INSTA-REVIEW

TOPIC 2.9

How does Ca^{2+} move across membrane from high to low?

C. Facilitated transport

The calcium ion is charged. Due to this charge, it is hydrophilic and is unable to readily cross the plasma membrane. It will require a transport protein. The prompt states that it is doing from HIGH to LOW, so it will be a type of passive transport.

Passive transport with a protein is facilitated diffusion.

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TOPIC
2.9

How are secreted proteins moved across the membrane?

A. Active transport

B. Bulk transport

C. Facilitated transport

D. Simple diffusion

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TOPIC 2.9

How are secreted proteins moved across the membrane?

B. Bulk transport

The proteins are polar and unable to cross the plasma membrane. This process that releases them is exocytosis. The transport vesicle fuses with the plasma membrane to release the proteins to the extracellular fluid. This is a type of bulk transport.

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TOPIC

2.9

How does oxygen enter blood cells in the lungs?

A. Active transport
B. Bulk transport
C. Facilitated transport
D. Simple diffusion

AP BIO INSTA-REVIEW

TOPIC 2.9

How does oxygen enter blood cells in the lungs?

D. Simple diffusion

Oxygen is a small, nonpolar molecule. This means that it is able to cross the plasma membrane without the use of a protein. The oxygen needs to enter the blood cells to be carried around the body, so it will be moving from HIGH to LOW which describes passive transport.

Passive transport without a transport protein is called simple diffusion.

AP BIO INSTA-REVIEW

TOPIC
2.10

Compartmentalization

ENE-2.K.1

Membranes and membrane-bound organelles in eukaryotic cells compartmentalize intracellular metabolic processes and specific enzymatic reactions.

ENE-2.L.1

Internal membranes facilitate cellular processes by minimizing competing interactions and by increasing surface areas where reactions can occur.

Which of the following does not have a large surface area?

A. Endoplasmic reticulum
B. Golgi Bodies
C. Lysosome
D. Mitochondria

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TOPIC

2.10

Which of the following does not have a large surface area?

C. Lysosome

This question was looking at which does NOT have large surface area. The endoplasmic reticulum is highly folded, Golgi bodies are made up of multiple cisternae, and the inner membrane of the mitochondria is highly folded. The lysosome is just a single sac of hydrolytic enzymes.

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TOPIC 2.10

What is the function of the membrane in lysosome?

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TOPIC 2.10

What is the function of the membrane in lysosome?

To separate the hydrolytic enzymes from the cytosol of the cell.

Lysosome is responsible for digestion. The enzymes within the lysosome will break down materials. The membrane keeps those enzymes within this compartment for this specialized function.

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TOPIC 2.10

How is the lysosome formed?

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TOPIC

2.10

How is the lysosome formed?

Hydrolytic enzymes are synthesized in the Rough ER. The enzymes are packaged in the Golgi bodies. Then when it buds from the Golgi, the lysosome is formed.

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TOPIC 2.10

What is the function of increase surface area in mitochondria?

A. More sites for fermentation
B. More sites for glycolysis
C. More sites for Krebs cycle
D. More sites for oxidative phosphorylation

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TOPIC
2.10

What is the function of increase surface area in mitochondria?

D. More sites for oxidative phosphorylation

The inner membrane (cristae) of the mitochondria has a large surface area. The last step of cellular respiration (oxidative phosphorylation) takes place on this membrane.

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TOPIC

2.10

What is the function of the increase in surface area of rough ER?

A. More sites for ATP synthesis
B. More sites for digestion
C. More sites for lipid synthesis
D. More sites for protein synthesis

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TOPIC 2.10

What is the function of the increase in surface area of rough ER?

D. More sites for protein synthesis

The rough ER has a large surface area. The membrane of the ER provides locations for ribosomes to bind to synthesize membrane proteins or proteins for secretion. More surface area provides more space for protein synthesis.

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TOPIC

2.10

What is the function of the increased surface area in Golgi Bodies?

A. More sites for ATP synthesis
B. More sites for lysosome formation
C. More sites for protein modification
D. More sites for protein synthesis

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TOPIC

2.10

What is the function of the increased surface area in Golgi Bodies?

C. More sites for protein modification

The Golgi bodies are made up of multiple sacs called cisternae. The function of the Golgi is for sorting and modifying the products from the rough ER (proteins) so an increase of surface area provides more sites for that process.

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TOPIC

2.10

Why must the cell be compartmentalized?

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TOPIC

2.10

Why must the cell be compartmentalized?

To allow for the increased size of the cell.

Remember to increase the volume of the cell, there must be an increase in surface area. In order to "decrease" the volume, there are compartments made to divide the volume.

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TOPIC

2.10

Which process takes place on the cristae of the mitochondria?

A. Calvin Cycle

B. Krebs Cycle

C. Light Reactions

D. Oxidative Phosphorylation

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TOPIC 2.10

Which process takes place on the cristae of the mitochondria?

D. Oxidative Phosphorylation

The inner membrane of the mitochondria (cristae) is the site for oxidative phosphorylation. This is the last step of cellular respiration which includes the electron transport chain and chemiosmosis.

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TOPIC

2.10

Which process takes place on the thylakoid membrane?

A. Calvin Cycle
B. Krebs Cycle
C. Light Reactions
D. Oxidative Phosphorylation

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TOPIC

2.10

Which process takes place on the thylakoid membrane?

C. Light Reactions

The thylakoid is the sac structure in chloroplasts. In the membrane of the thylakoid is chlorophyll for photosynthesis. The light is absorbed here for the light reactions.

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TOPIC

2.10

How are eukaryotic cells larger than prokaryotic cells?

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TOPIC

2.10

How are eukaryotic cells larger than prokaryotic cells?

Eukaryotic cells have membrane bound organelles. These organelles provide for compartmentalization which allows for larger cells.

Prokaryotic cells do not have membrane bound organelles.

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TOPIC

2.10

Which organelles are highly folded?

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TOPIC 2.10

Which organelles are highly folded?

Rough ER
Golgi Complex
Mitochondria
Chloroplast

Origins of Cell Compartmentalization

EVO-1.A.1

Membrane-bound organelles evolved from once free-living prokaryotic cells via endosymbiosis.

EVO-1.A.2

Prokaryotes generally lack internal membrane-bound organelles but have internal regions with specialized structures and functions.

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TOPIC

2.11

Origins of Cell Compartmentalization

EVO-1.A.3

Eukaryotic cells maintain internal membranes that partition the cell into specialized regions.

EVO-1.A.1

Membrane-bound organelles evolved from once free-living prokaryotic cells via endosymbiosis.

EVO-1.A.2

Prokaryotes generally lack internal membrane-bound organelles but have internal regions with specialized structures and functions.

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TOPIC 2.11

Origins of Cell Compartmentalization

EVO-1.A.3

Eukaryotic cells maintain internal membranes that partition the cell into specialized regions.

EVO-1.B.1

Membrane-bound organelles evolved from previously free-living prokaryotic cells via endosymbiosis.

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TOPIC

2.11

Which organelle do prokaryotes have?

A. Endoplasmic reticulum

B. Lysosome

C. Nucleus

D. Ribosomes

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TOPIC

2.11

Which organelle do prokaryotes have?

D. Ribosomes

Prokaryotes do NOT have membrane bound organelles. This means the only organelle they have is the ribosome.

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TOPIC

2.11

Which is larger?

A. Eukaryotic cells
B. Prokaryotic cells

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TOPIC

2.11

Which is larger?

A. Eukaryotic cells

Eukaryotic cells are larger than prokaryotic cells. This is due to the compartmentalization found in eukaryotic cells that is not found in prokaryotic cells.

How are eukaryotic cells able to be larger?

AP BIO INSTA-REVIEW

TOPIC

2.11

How are eukaryotic cells able to be larger?

Eukaryotic cells have membrane bound organelles that compartmentalize the cell. Each organelle completes a function for the cell and it divides up the volume, so it aids to allow the volume to be larger but still efficient.

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TOPIC

2.11

What is the endosymbiotic theory?

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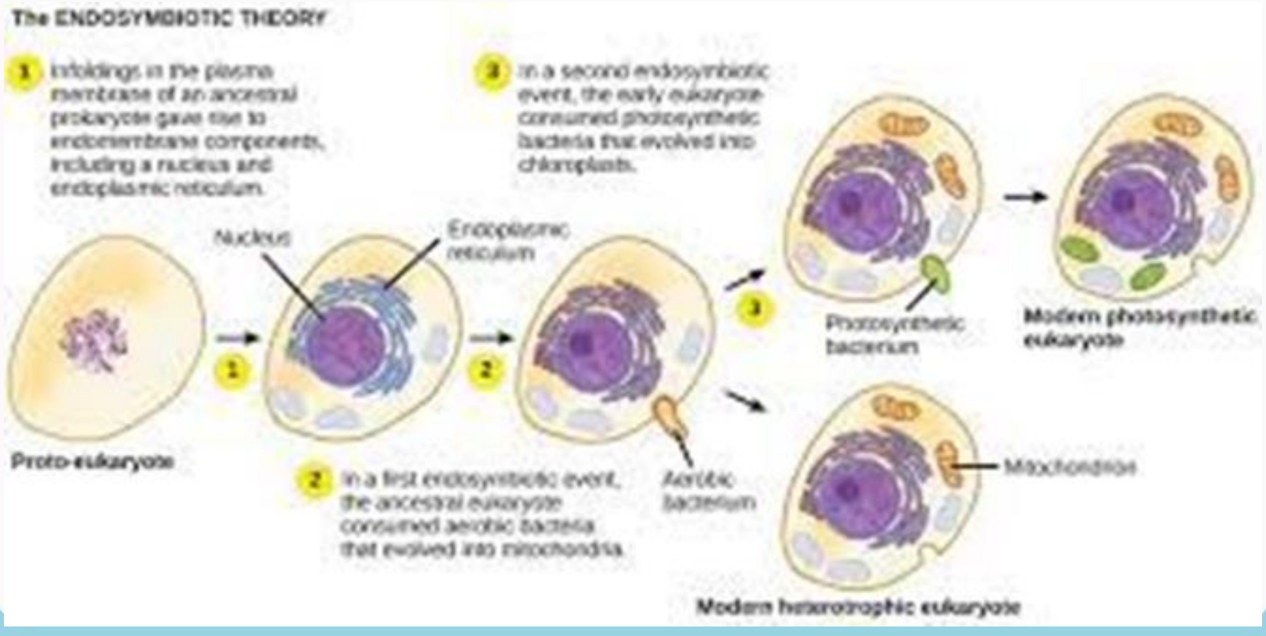
2.11

What is the endosymbiotic theory?

Endosymbiotic theory states that an ancestral eukaryotic cells engulfed a prokaryotic cell.



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TOPIC

2.11

Which was engulfed first?

A. Chemosynthetic prokaryote
B. Photosynthesis prokaryote

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TOPIC

2.11

Which was engulfed first?

A. Chemosynthetic prokaryote

The chemosynthetic prokaryote was engulfed first because ALL eukaryotic cells have mitochondria (chemosynthetic prokaryote) but only some eukaryotic cells have a chloroplast (photosynthetic prokaryote)

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TOPIC

2.11

What evidence do we have that chemosynthetic prokaryotes were engulfed first?

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TOPIC

2.11

What evidence do we have that chemosynthetic prokaryotes were engulfed first?

All eukaryotes have a mitochondria (aka the chemosynthetic prokaryote) but not all have a chloroplast (aka the photosynthetic prokaryote).

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2.11

What evidence do we have of endosymbiotic theory?

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TOPIC

2.11

What evidence do we have of endosymbiotic theory?

* Mitochondria and chloroplast are similar in size to prokaryotes
* Mitochondria and chloroplast have circular DNA
* Mitochondria and chloroplasts can divide by binary fission
* Mitochondria and chloroplasts have ribosomes similar to prokaryotic ribosomes

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TOPIC

2.11

Prokaryotes have regions with specialized structures and functions

A. True

B. False

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TOPIC

2.11

Prokaryotes have regions with specialized structures and functions

A. True

Even though they are not broken into compartments by membrane bound organelles, they are still able to undergo a lot of the same reactions within regions with specialized structures.

What is a BIG difference between prokaryotes and eukaryotes?

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TOPIC

2.11

What is a BIG difference between prokaryotes and eukaryotes?

Prokaryotes lack membrane-bound organelles.

Eukaryotes have membrane-bound organelles.

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TOPIC
2.11

Mitochondria & Chloroplast are theorized to be endosymbionts

A. True
B. False

AP BIO INSTA-REVIEW

TOPIC

2.11

Mitochondria & Chloroplast are theorized to be endosymbionts

A. True

The endosymbiotic theory states that an ancestral cell engulfed a chemosynthetic prokaryote (mitochondria) and a photosynthetic prokaryote (chloroplast)

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TOPIC

2.11

Identify evidence of the mitochondria and/or chloroplast being an endosymbiont?

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TOPIC
2.11

Identify evidence of the mitochondria and/or chloroplast being an endosymbiont?

* Circular DNA
* Ribosomes (similar size to prokaryotes)
* Replicates by binary fission
* Double membrane

AP BIO INSTA-REVIEW

TOPIC

2.11

Which was engulfed first...

A. Chemosynthetic prokaryotes
B. Photosynthetic prokaryotes

AP BIO INSTA-REVIEW

TOPIC 2.11

Which was engulfed first...

A. Chemosynthetic prokaryotes

The chemosynthetic prokaryote was engulfed first which describes why all eukaryotic cells have a mitochondria but not all have a chloroplast (which comes from the photosynthetic prokaryote)

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TOPIC

2.11

What evidence do you have the chemosynthetic prokaryotes engulfed first?

AP BIO INSTA-REVIEW

TOPIC

2.11

What evidence do you have the chemosynthetic prokaryotes engulfed first?

All eukaryotes have a mitochondria (chemosynthetic prokaryote) but not all eukaryotes have a chloroplast (photosynthetic prokaryote)