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

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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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Facilitated Diffusion

ENE-2.G.4

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

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Which of the following is required for facilitated diffusion?

A. ATP

B. Concentration gradient

C. Glycolipid

D. Membrane Protein

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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.

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What types of molecules require a transport protein?

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What types of molecules require a transport protein?

Polar substances

CED: charged and large polar substances

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The transport membrane protein is specific.

A. True

B. False

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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.

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Name of the membrane protein that allows water to diffuse.

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

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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)

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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)

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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

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Charged molecules (ions) are

A. Hydrophilic

B. Hydrophobic

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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.

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How does large quantity of water move across a membrane?

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

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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.

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

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TOPIC 2.7

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

Aquaporin

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Transport proteins are specific for the material transported

A. True

B. False

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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.

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Describe how the transport protein are specific for the material

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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.

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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+

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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.

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

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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.