



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.



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.



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.



Which is the easiest to cross the membrane unassisted?

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

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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.

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Why is it easiest for small & nonpolar to cross?



**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.**

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Which is the easiest to pass?

- A. Carbon dioxide**
- B. Glucose**
- C. Sodium ions**
- D. Water**

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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 opposite sides of carbon so its nonpolar. Glucose is polar, sodium is charged thus polar, and water is polar.

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Why do sodium ions have difficulty crossing the membrane?

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Why do sodium ions have difficulty crossing the membrane?



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

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A small amount of water can cross the membrane unassisted.

- A. True**
- B. False**

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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.

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How do small & polar substances cross the membrane?

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.



Which does NOT have a cell wall?

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

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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.

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

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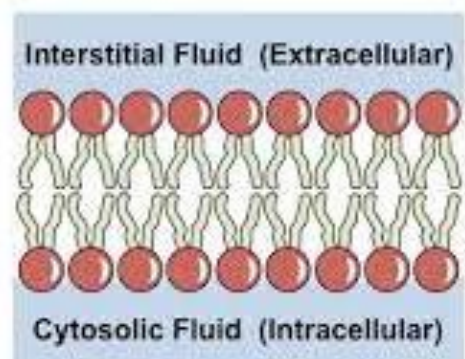
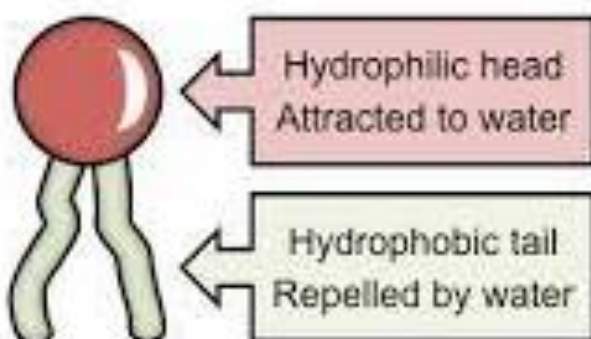
2.5



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.





Which passes through the membrane easily?

- A. Ca^{2+}**
- B. CO_2**
- C. Glucose**
- D. H_2O**

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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 opposite sides of carbon so its nonpolar. Calcium is charged thus polar, glucose is polar and water is polar.



What type of membrane protein allows water passage?

- A. Carrier protein**
- B. Channel protein**

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.

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What is the difference between endocytosis and exocytosis?

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.



**Cellular eating, use pseudopod
to engulf food**

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

**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.**



**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 extracellular fluid and solutes.



**Organelle that fuses with
product from phagocytosis**

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



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.



**Proteins made in rough ER are
secreted by**

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

**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.



**What makes up cell wall of
fungi?**

- A. Cellulose**
- B. Chitin**
- C. Peptidoglycan**

**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.**



**What makes up cell wall of
some prokaryotes?**

- A. Cellulose**
- B. Chitin**
- C. Peptidoglycan**

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.



What makes up cell wall of plants?

- A. Cellulose**
- B. Chitin**
- C. Peptidoglycan**

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**What makes up cell wall
of plants?**

A. Cellulose



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