

Microbiology Exam 2 Study Guide

1. Bacterial membranes have **ester** type of linkages and archaeal membranes have **ether** type of linkages.
2. **Fatty acids** compose the hydrophobic portion of bacterial membranes and **isoprene (phytanyl)** composes the hydrophobic portion of archaeal membranes.
3. Why are transport proteins necessary to the cell?
 - Some molecules are **not able to diffuse** through the cell membrane alone
 - Necessary to get certain solutes across the cell membrane
4. Name and describe the three functions of the cytoplasmic membrane.
 - **Permeability barrier**- prevents leakage and functions as a gateway for transport of nutrients into and out of the cell
 - **Protein anchor**- site of many proteins involved in transport, bioenergetics, and chemotaxis
 - **Energy Conservation**- site of generation and use of the proton motive force
5. What are the three types of simple transporters and how do they work?

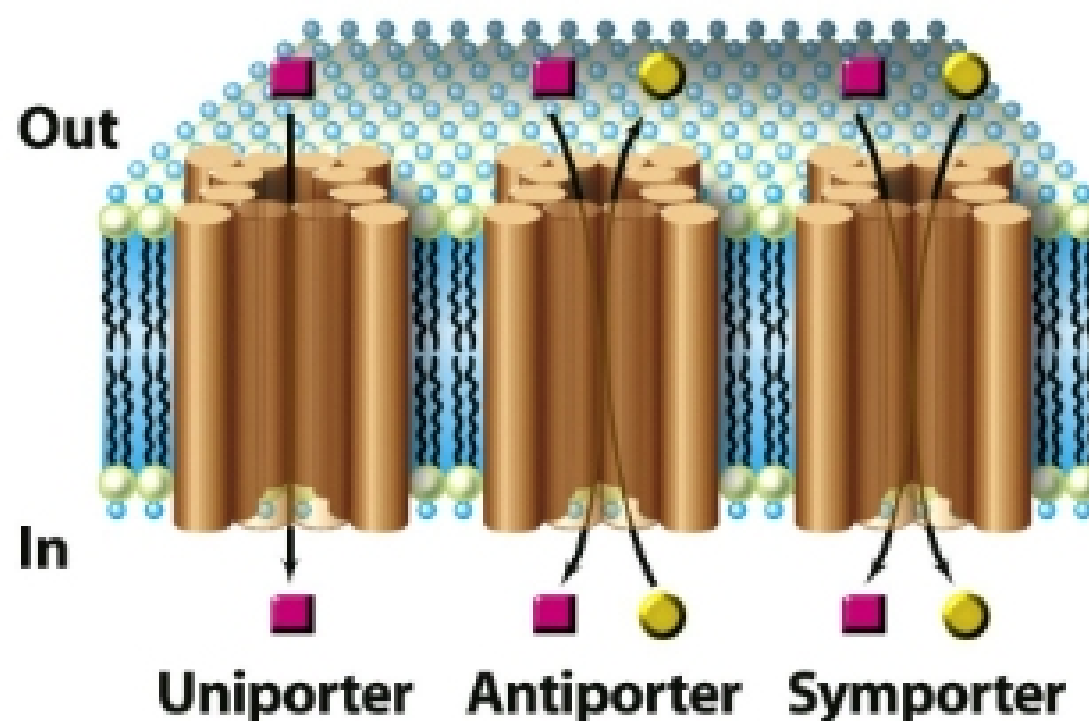


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6. What is group translocation?

Group Translocation:

- Substrate is transported across membrane by energy from PEP
- Phosphoenolpyruvate (PEP) hydrolysis is more energetic than ATP hydrolysis
- Glucose is transported into the cell in this manner

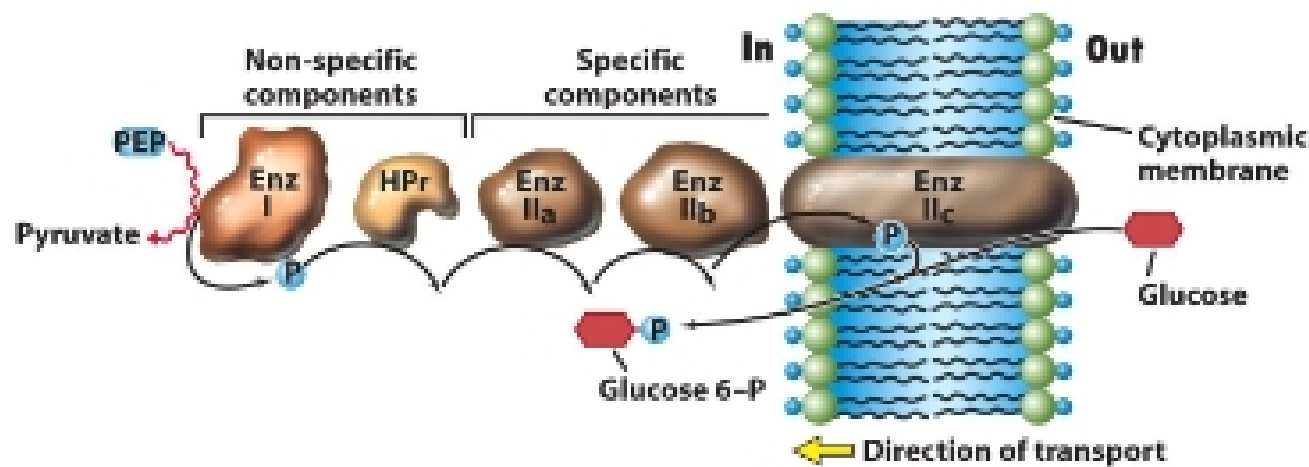


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7. What is the ABC transport system?

The ABC System:

- 3 components: periplasmic binding protein, transporter, and ATP binding cassette (ABC)
- Best for transport of nutrients in extremely low concentrations

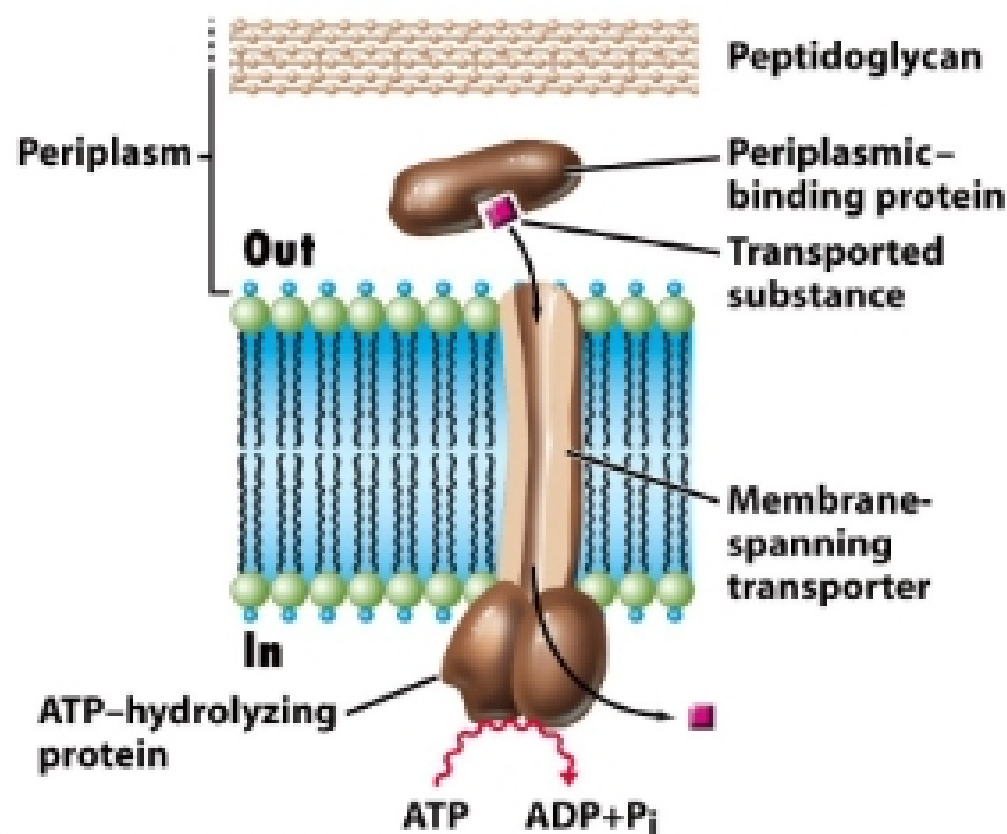


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8. Where do each of the membrane transport systems get their energy?
- **Group translocation:** *chemical modification* of the transported substance driven by phosphoenolpyruvate
 - **ABC system:** periplasmic binding proteins are involved and energy comes from **ATP**
9. Which transport system is best for transport of nutrients in extremely low concentrations?
- ABC system
10. How are proteins exported from the cell?
- Translocases
 - o Secretion of macromolecules

- Insertion into the cytoplasmic membrane
 - Ex: SecYEG (threads proteins through the membranes as it is being synthesized → the protein folds on the outside of the cell)
- Importance of protein secretion
 - Enzymatic functions are needed on the outside of the cell
 - Ex: amylase and cellulase
- 11. What is a periplasm?
 - concentrated gel-like matrix in the space between the inner cytoplasmic membrane and the bacterial outer membrane called the **periplasmic space** in gram-negative bacteria
- 12. What are porins and what is their function? Where are they found?
 - Porins allow for **permeability** across the outer membrane
 - **Create channels** that traverse the membrane
 - Found in **outer membrane** of gram negative bacteria
- 13. What are the different types of cell inclusions that we discussed in class? What are they made of/what is their structure? What is their function? What purpose do they serve for the cell?
 - **Intracellular storage**
 - Carbon storage polymers
 - Poly-β-hydroxy-alkanoate (PHA) Inclusions
 - Lipid storage of carbon
 - C4 form, poly-β-hydroxybutyrate is most common.
 - Glycogen is another common storage molecule in bacteria.
 - Used when the cell does not need the energy
 - Can make up predominate mass of cell
 - Resembles plastic
 - Other molecules
 - Phosphate
 - Sulfur
 - Iron
 - **Magnetotactic Bacteria**
 - Orient themselves in magnetic fields (like Earth's).
 - Contain **magnetosomes** [inclusion bodies of Fe₃O₄ (magnetic iron oxide, magnetite)]
 - surrounded by membranes with proteins that may help precipitate the iron
 - shapes vary with species
 - Gas vesicles
 - Made of protein
 - Planktonic bacteria produce gas vesicles to remain buoyant in the water column.