

### Surface Area

outside area of an object  
the area around the outside of a cell  
unit:  $m^2$

### Application in Living Things

increased surface area = increased diffusion  
microvilli: increases absorption in intestines  
root hairs: increases water/nutrient absorption in plants  
endomembrane system: increased folds in organelles allow for more surface area to do cellular work  
cristae of the mitochondria: folds in the inner mitochondria increase amounts of ETC (more ATP)

### Structure of Phospholipid

hydrophilic head:	hydrophobic tail:
phosphate	saturated fatty acid
glycerol	unsaturated fatty acid

### cholesterol

at warm temperatures:	at cool temperature:
restrains the movement of phospholipids and reduces fluidity	maintains fluidity by preventing tight packing

### Passive Transport

no energy  
high to low concentration  
diffusion  
osmosis  
facilitated diffusion  
ion channels

### Diffusion

passive transport  
molecules spread out to available spaces  
move down concentration gradient (high to low concentration)  
work to reach equilibrium

### Active Transport

no energy  
low to high concentration  
sodium potassium pump: 3 sodium leave and 2 potassium enter cell against the concentration gradient  
proton pump: hydrogen atoms pumped against concentration gradient  
cotransport:  $H^+$  gradient helps to bring other molecules into cell  
endocytosis and exocytosis

### Osmoregulation

organisms without cell walls that live in hypertonic or hypotonic environment must have adaptations for osmoregulation  
the control of water balance

### Plant Cells in Pure Water

pure water (hypotonic solution) will initially move into the cells  
after a period of time the cells will become turgid (swollen)  
as turgor pressure increases, water will diffuse out of the cell... eventually equilibrium will be reached

### Prokaryotic vs. Eukaryotic Cells

	Prokaryotes:	Eukaryotes:
similarities:	cell membrane, DNA, ribosomes, cytoplasm	
organelles:	no nucleus	nucleus
	no membrane bound organelles	membrane bound organelles
reproduction:	binary fission	mitosis and meiosis
average size:	smaller	larger
DNA:	DNA is circular	DNA is linear
	single chromosome	paired chromosomes



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### Volume

amount of space inside of the object

the space inside of the cell

unit:  $\text{cm}^3$

### Fluid Mosaic Model

phospholipids: provides fluidity and elasticity

proteins and other molecules embedded in membrane

### Phospholipid Bilayer

amphipathic

hydrophilic heads

hydrophobic tails

### Proteins

integral proteins:	peripheral proteins:
imbedded through the membrane (inside)	on hydrophilic portion of the cell membrane (outside)

### Carbohydrates

cell to cell recognition:	membrane carbohydrates:
cell's ability to distinguish one type of neighboring cell from another	interact with the surface molecules of other cells, facilitating cell to cell recognition

### Passive Transport (diffusion)

the tendency for molecules of any substance to spread out into available space

substances will move down a concentration gradient

high to low concentration

### Passive Transport (osmosis)

the diffusion of water

water moves from hypotonic to hypertonic

isotonic: equal solute across a membrane

hypotonic: less solute, more water

hypertonic: more solute, less water

low to high concentration

### Active Transport (endocytosis)

cell takes in macromolecules by forming vesicles from plasma membrane

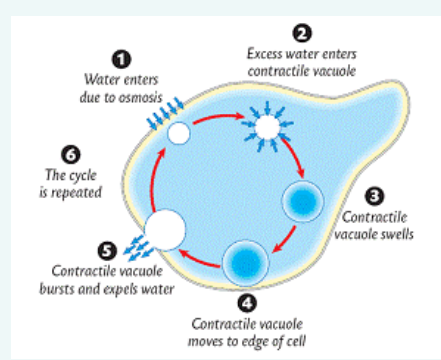
phagocytosis: "cellular eating," engulfing solids

pinocytosis: "cellular drinking," engulfing solutes

### Active Transport (exocytosis)

transport vesicles migrate to the membrane, fuse with it and release their contents

### Osmoregulation (paramecium)



### The Endosymbiotic Theory

an evolutionary theory of the origin of eukaryotic cells from prokaryotic organisms

endosymbiosis: one organism living inside another

evidence 1) chloroplasts and mitochondria multiply in the same way as ancient bacteria

evidence 2) chloroplasts and mitochondria both control their own DNA and ribosomes

evidence 3) chloroplasts and mitochondria both have two membranes (inner membrane contains different proteins than the outer membrane)

### Surface Area to Volume Ratio

a comparison between the size of the outside of an object and the amount inside

smaller cells have an increase SA:V

as the cell gets bigger, the SA:V decreases

small cells are more efficient at diffusion as they have a high ratio

### Structure of Cellular Membrane

two main components:	other important molecules:
phospholipids	cholesterol
proteins	carbohydrates

### Functions of Membrane Proteins

intercellular joinings  
enzymatic activity  
transport (active/passive)  
cell to cell recognition  
anchorage/attachment  
signal transduction

### Cell Membranes are Semipermeable

properties of molecules that can get through the phospholipid bilayer:	properties of molecules that can not get through the phospholipid bilayer:
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small	large
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nonpolar	polar
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nonionic	ionic
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hydrophobic	hydrophilic
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O<sub>2</sub> and CO<sub>2</sub>

### Passive Transport (facilitated diffusion)

transport proteins allow molecules to flow from high to low concentration

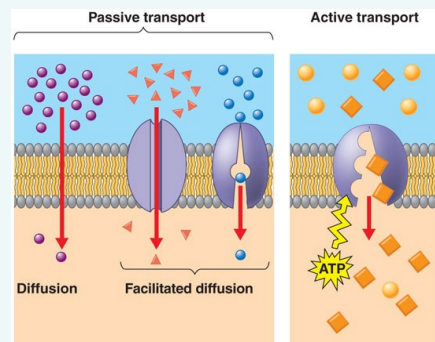
aquaporins: tunnel that allows water to go through the membrane

glut: glucose transporter

### Passive Transport (ion channels)

transport proteins allow ion to flow from a high to low concentration

### Passive and Active Transport



### Water Potential

the force responsible for movement of water in a system

solute potential: determined by solute concentration

pressure potential: results from exertion of pressure on membranes/walls as water moves in or out; can be positive or negative

### Plant vs. Animal Cell

Plant Cell:	Animal Cell:
chloroplast	cilia and flagella
central vacuole	centrioles
cell wall	lysosomes

### The Endomembrane System

a system of synthesizing proteins for export

1) Nucleus: ~transcription (DNA -> RNA)  
~make ribosomes

2) Rough ER: ~translation (RNA -> proteins) ~proteins for export

3) Vesicle: transports proteins in cells

4) Golgi Apparatus: process and package proteins

5) Vesicle: transports proteins in cells

6) Cell Membrane: exocytosis



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