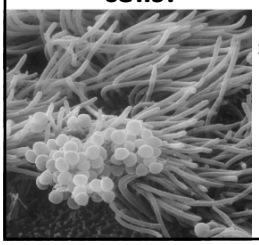
Cell Theory

1) All life made of cells, all cells come from other cells!



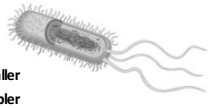
2) The Cell is the smallest subunit of life

Single celled organism

Multicellular organism

CATEGORIES OF CELLS

Figure 4.UN12

Prokaryotic Cells	Eukaryotic Cells
	
• Smaller • Simpler • Most do not have organelles Except Ribosomes • Found in bacteria and archaea	• Larger • More complex • Have organelles • Found in protists, plants, fungi, animals
	
caraudi.com	aecbusiness.com

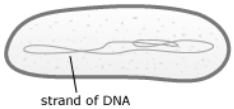
Cell Evolution

_____ cells are older than _____ cells.

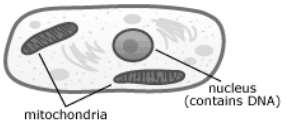
_____ appeared about **3.5 billion years ago**.

_____ appeared about **2.1 billion years ago.**

Typical prokaryote cell

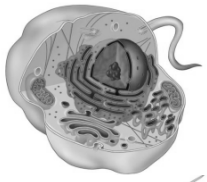


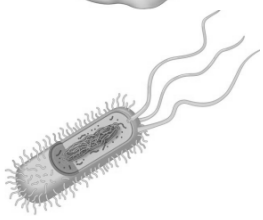
Typical eukaryote cell



All Cells Have:

- These basic features:
  1. They are all bound by a **plasma membrane**.
  2. All cells have **DNA**
     1. R**ibosomes (**tiny structures that build proteins)
  3. The region between the nucleus (Eukaryote) or nucleoid region (Prokaryote) and plasma membrane is the **cytoplasm**





CHLOROPLASTS & MITOCHONDRIA: ENERGY CONVERSION

Chloroplasts

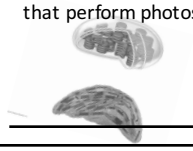
Most of the living **world runs** on the energy provided by **photosynthesis**.

- **Photosynthesis** = conversion of solar energy to chemical energy of sugar.
- **Chloroplasts** are the organelles that perform photosynthesis.

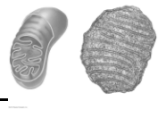
Mitochondria

Mitochondria = organelles used for cellular respiration

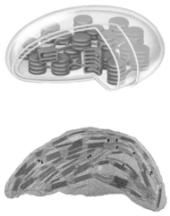
- Cell Respiration = produce ATP (energy molecules) from the energy of food molecules.
- Mitochondria are found in almost all eukaryotic cells– including plants!!!

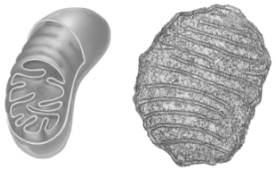


Power Plant



What do these two energy producing Organelle have in common?

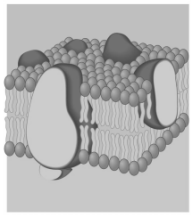




Regulation

Plasma Membrane:

- Regulates what comes in and out.
  - Semi-Permeable: Only some things can come in and only some things can get out.
    - Factors involved:
      1. Size
      2. Charge



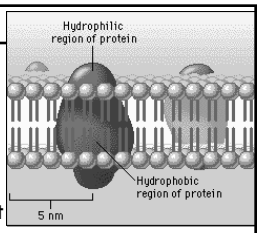
Wall Around the Town

Plasma Membrane

Fluid Mosaic Model

Because:

- Molecules move freely past one another
- Diversity of proteins that float



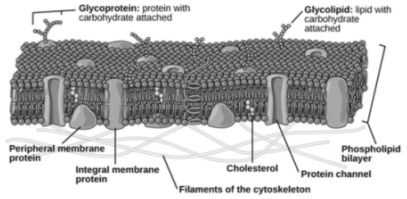


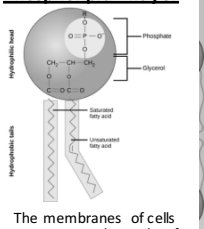
Figure 3.18 The fluid mosaic model of the plasma membrane structure describes the plasma membrane as a fluid combination of phospholipids, cholesterol, proteins, and carbohydrates.

Regulation

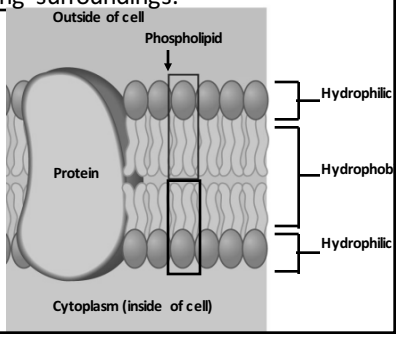
Plasma Membrane – Structure:

- The plasma membrane separates the living cell from its nonliving surroundings.

Phospholipid Bilayer



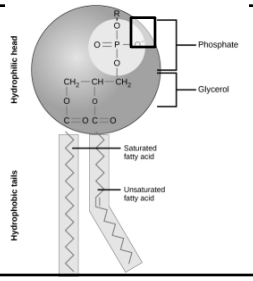
- The membranes of cells are composed mostly of
  - Phospholipids
  - Proteins



Phospholipid Structure

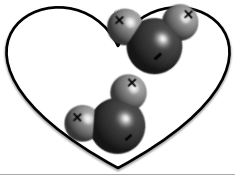
Why is the head hydrophilic?

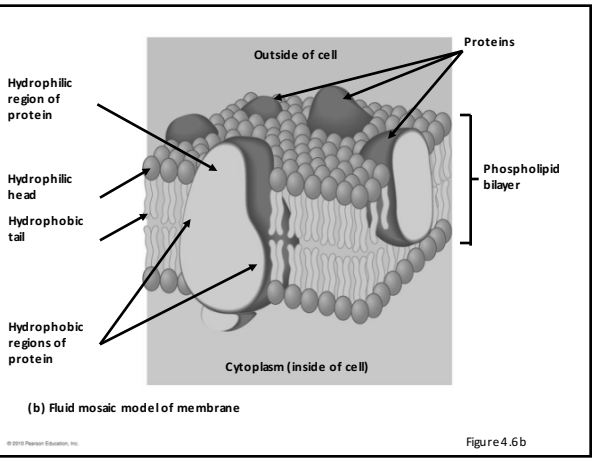
This little - charge is what makes the head hydrophilic



From your textbook

The phosphate group is electrically charged, making it hydrophilic ("water-loving"). But the two fatty acid tails are hydrophobic ("water-fearing"). Thus, phos-



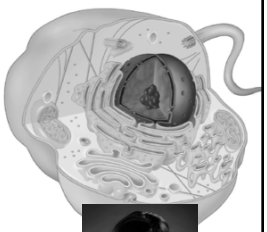


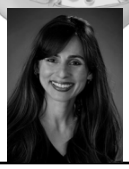
(b) Fluid mosaic model of membrane

Figure 4.6b

Nucleus

- **Command Center:** Contains the Genetic Material (DNA)
  - The nucleus is bordered by a double membrane called the **nuclear envelope**.
  - **Pores** in the envelope allow materials to move between the nucleus and cytoplasm.
  - The nucleus contains a **nucleolus** where ribosomes are made.

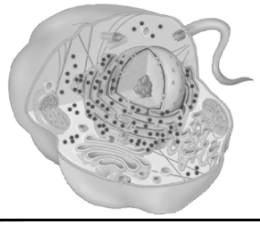


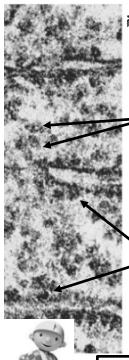


President- Management Office

Ribosomes

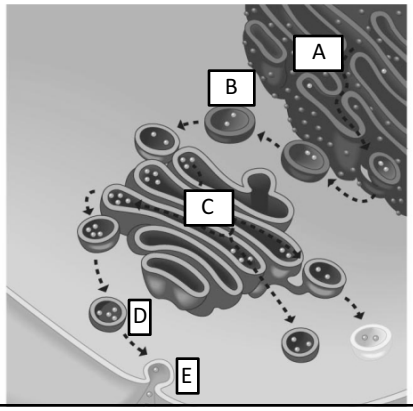
- **Ribosomes** are responsible for protein synthesis.





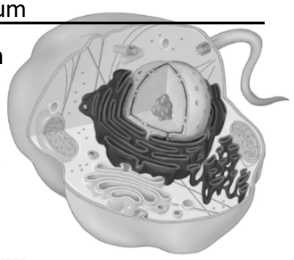
Carpenter: Make Everything

How are proteins made and moved?



Endomembrane System:
Rough Endoplasmic Reticulum

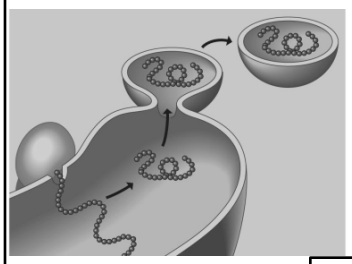
- The "rough" in the **rough ER** is due to ribosomes
- These ribosomes **produce proteins**



Conveyer Belt: Production line in a factory

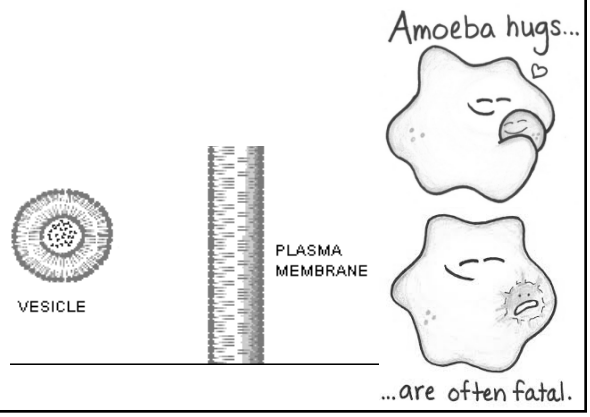
Endomembrane System:
Rough Endoplasmic Reticulum

- After the rough ER makes a protein, it packages the molecule into **transport vesicles**.

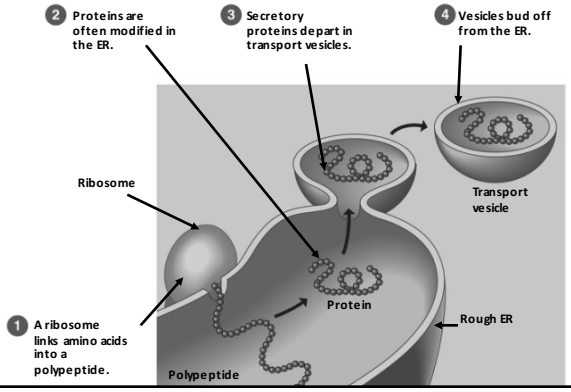


Conveyer Belt: Production line in a factory

Cell Eating = Phagocytosis

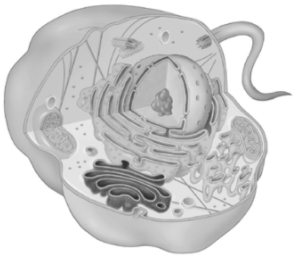


After the rough ER synthesizes a molecule, it packages the molecule into **transport vesicles**.



Endomembrane System: The Golgi Apparatus

- Works with E.R.
- Receives, refines, stores, and distributes chemical products of the cell



UPS: packaging and shipping department

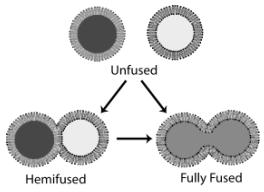
Endomembrane System: **Lysosome**

Cleaning up Wastes = a sac of digestive enzymes.

- Enzymes break down large molecules, bacteria, old organelles, etc.
- Also used for single celled eating

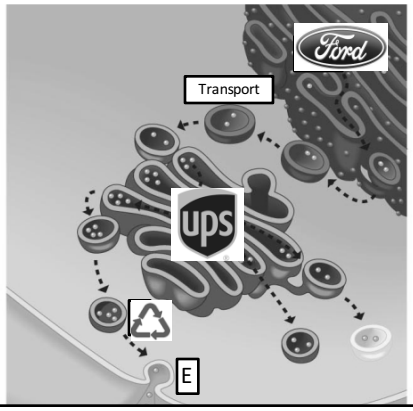
Recycling Center: Reclaim the parts for reuse

REUSE
REDUCE
RECYCLE



en.wikipedia.org

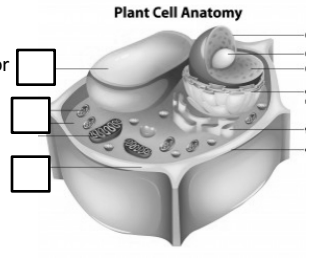
How are proteins made and moved?



Differences between plants & animal cells:

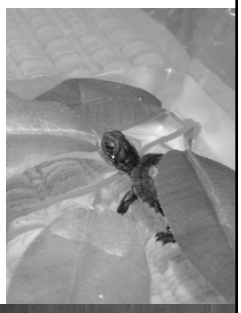
Plant Cell

1. Central Vacuole:
   - Store nutrients
   - Absorb/store water
   - May contain pigments or poisons & digestive enzymes
2. Cell Wall
   - Provide structure and support
3. Chloroplasts
   - Absorb sunlight to make energy



Biology 11

- **Pt 2: Cell Transport**
  1. Cell membrane structure & Function
  2. Moving molecules across the membrane, passive and active transport, endocytosis and exocytosis



- **Reading**: Chapter 3
- **Homework**: Finish up your blue book, due at start of exam

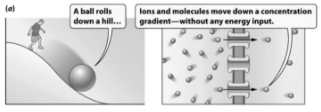
PROFESSOR ZANNIE DALLARA'S SCIENCE PAGE

WITH SUPPORT MATERIAL FOR BIOLOGY COURSE WORK

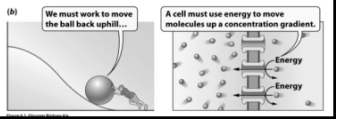
Passive and Active Transport Across the Membrane

- Concentration gradients
  - Difference in concentration across the membrane

1. Going with the Flow: **Passive transport**
   - Movement from high concentration to low
   - No energy required from cell

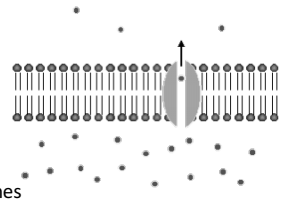


2. Going Against the Flow: **Active transport**
   - Requires added energy
   - Movement from low concentration to high



Cell MEMBRANE FUNCTION

- Cells must control flow of materials to and from the environment.
  - Semipermeable Membrane
- **Through the lipid bilayer**
- **Transport proteins**
  - Are located in membranes
  - Regulate the passage of materials into and out of the cell



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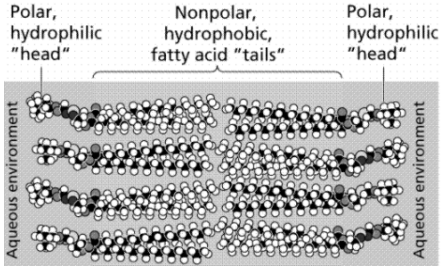
Transport Across the Membrane

- Concentration gradients: The measurement of how concentrated (close together) particles are in one place vs another.

www.mit.edu

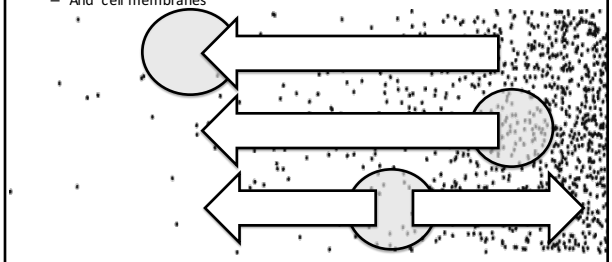
What can move in and out of a cell?
Depends on its Size and Charge

- Can't Pass if too Big
- Too Charged



Transport Across the Membrane

- Concentration gradients
  - Particles want to be equal distance apart
    - And cell membranes



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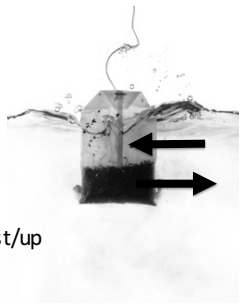
Overview of Transport

PASSIVE TRANSPORT:

1. **What:** Moving molecules with/down the concentration gradient
2. No Energy
3. Small and uncharged molecules

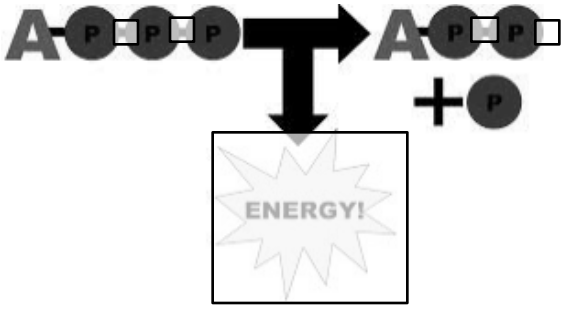


ACTIVE TRANSPORT:

1. **What:** Moving molecules against/up concentration gradient
2. Uses Energy
3. Small and charged molecules:
   1. H+, Na+, amino acids, glucose, etc.

Plus Maths

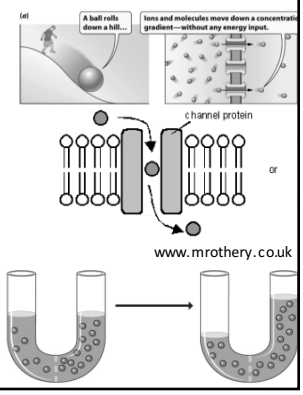
Energy used for ACTIVE TRANSPORT



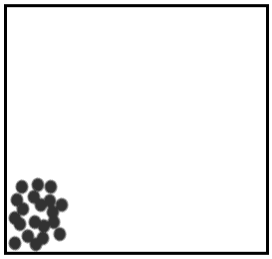
Overview of Transport

TYPES OF PASSIVE TRANSPORT:

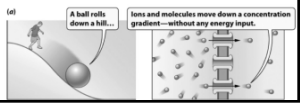
1. **Diffusion** is an example of passive transport.
   - Substances diffuse **<u>with or down</u> their <u>concentration gradient</u>**
2. **OSMOSIS** is the diffusion of **water** through a **<u>semipermeable membrane</u>**



Passive Transport: Diffusion



1. **Diffusion** is an example of passive transport.
   - Substances diffuse **<u>with or down</u> their <u>concentration gradient</u>**



Passive Transport: Osmosis

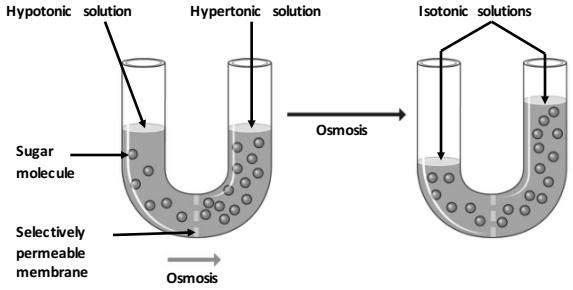


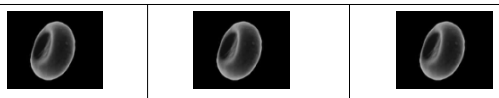
Figure 5.13-2

Solutions

If we only describe the solution OUTSIDE the cell

Has a **Lower** concentration of solute outside the cell.	Has an **equal** concentration of solute outside the cell.	Has a **Higher** concentration of solute outside the cell.

Situation: Outside the Cell
Fact: Salt SUCKS



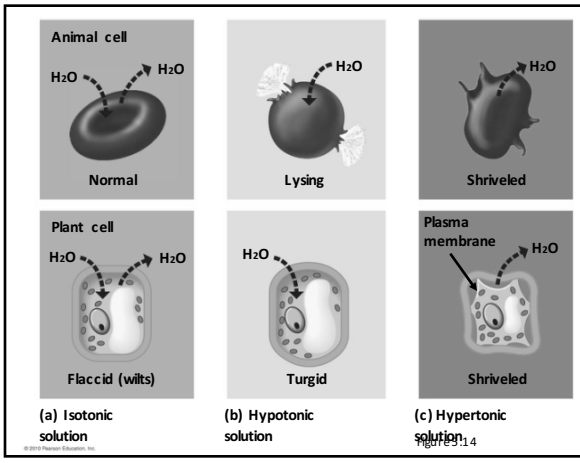
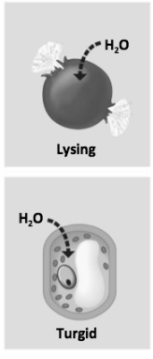


Figure 3.14

Water Balance in Plant Cells

- Plant have rigid cell walls.
- Plant cells require a hypotonic environment, which keeps these walled cells turgid.

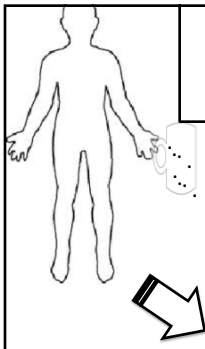


The Problem with HYPERTONIC

DANGER!

- This is why it is dangerous to drink sea water, people marooned at sea will speed up dehydration (& death) by drinking sea water.
- This is also why "salting fields" was a common tactic during war, it would kill the crops in the field, thus causing food

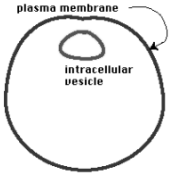
Its a myth that drinking sea water will cause you to go insa



What happens when you drink salt water?
Double Dragon

Endocytosis and Exocytosis
Moving big molecules

- Requires Energy no matter what direction materials are moving
- Used For Moving big molecules across the membrane
  - EX: proteins or starch
  - Single celled organisms eating
  - White blood cells for killing bacteria



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