

Cells

- ◆ Size limited
 - ◆ Efficiency
- ◆ Shape
 - ◆ Enhances function

Plasma Membrane

- ◆ Separates cell from surrounding
- ◆ Controls what enters and leaves
 - ◆ Semi-permeable
- ◆ Identification

Plasma Membrane

- ◆ 2 phospholipid layers
 - ◆ "tail-to-tail"
 - ◆ Polar heads
 - ◆ Polar group
 - ◆ Phosphate
 - ◆ Glycerol
 - ◆ Hydrophilic
 - ◆ Non-polar tails
 - ◆ 2 fatty acid chains
 - ◆ Hydrophobic

Plasma Membrane

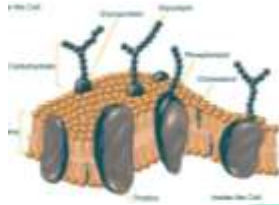
- ◆ Proteins
 - ◆ Integral
 - ◆ Stuck in membrane
 - ◆ May pass through
 - ◆ Peripheral
 - ◆ Surface of membrane
 - ◆ Transport
 - ◆ Receptors
 - ◆ Enzymes

Plasma Membrane

- ◆ Cholesterol
 - ◆ Stabilizing
 - ◆ Maintains fluidity

Plasma Membrane

- ◆ Carbohydrate
 - ◆ Outside of membrane
 - ◆ Attached to phospholipids and proteins
 - ◆ Cell identification



Cell Transport

Diffusion/Osmosis

- ◆ Passive
 - ◆ No energy (ATP) required
- ◆ Substances follow concentration gradient
 - ◆ High concentration → low concentration
- ◆ Establishes dynamic equilibrium

Osmosis

Facilitated Diffusion

- ◆ Passive
 - ◆ No energy (ATP) required
- ◆ Substances follow concentration gradient
- ◆ Requires "gate", passage, through membrane
 - ◆ Material can't cross membrane on own
 - ◆ Protein channel

Facilitated

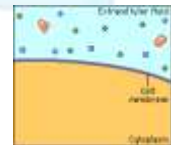
Protein Pumps

- ◆ Active
 - ◆ Requires energy (ATP)
- ◆ Substances move against gradient
 - ◆ Low → high
- ◆ Requires "gate"

Pump

Bulk Transport

- ◆ Active
 - ◆ Requires energy (ATP)
- ◆ Exocytosis
 - ◆ Secrete materials
 - ◆ Intracellular vesicle (membrane-bound sphere) fuses with plasma membrane and releases content



Bulk Transport

- ◆ Active
 - ◆ Requires energy (ATP)
- ◆ Endocytosis
 - ◆ Bringing in materials
 - ◆ Phagocytosis
 - ◆ "eating"
 - ◆ Pseudopods surrounds particles
 - ◆ Bulk-phase endocytosis (pinocytosis)
 - ◆ "drinking"
 - ◆ Pit forms in membrane

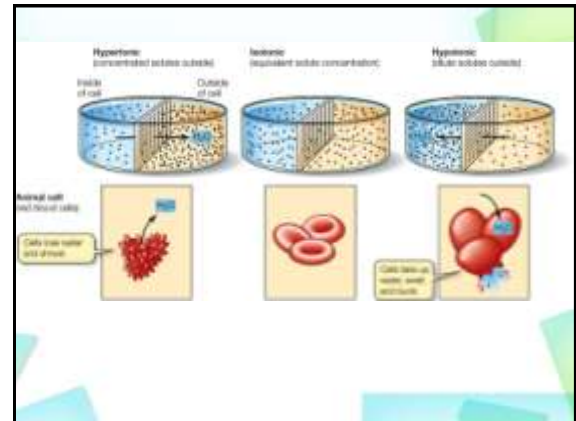
Bulk Transport

Osmosis and Tonicity

- ◆ Tonicity
 - ◆ Relative solute concentrations of two solutions separated by a semi-permeable membrane
 - ◆ Comparative

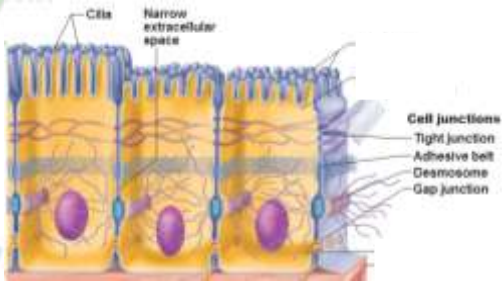


- ◆ Hypotonic
 - ◆ The solution that is less concentrated
- ◆ Isotonic
 - ◆ The solutions have the same concentrations
- ◆ Hypertonic
 - ◆ The solutions that is more concentrated



Membrane Junctions

Membrane Junctions



Membrane Junctions

- ◆ Tight Junctions
 - ◆ Adjacent membranes fuse together tightly
 - ◆ "leakproof" - impermeable
- ◆ Desmosomes
 - ◆ Anchoring
 - ◆ Prevent cells separating
 - ◆ "buttons"

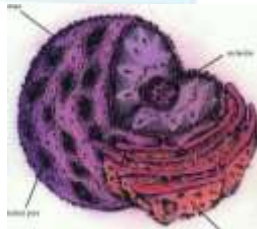
Membrane Junctions

- ◆ Gap Junctions
 - ◆ Allow communication
 - ◆ Channel between cells
 - ◆ Nutrients/ions pass between cells
 - ◆ Connexons
 - ◆ Hollow cylinders (proteins) span width of both membranes and intracellular space

Organelles

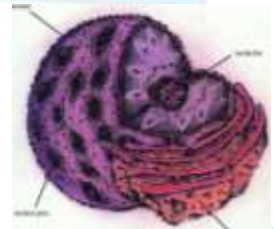
Nucleus

- ◆ Contains cellular DNA
- ◆ Controls function of cell

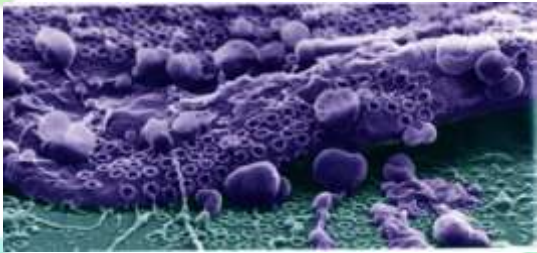


Nucleus

- ◆ Nuclear Envelope
 - ◆ Double membrane
 - ◆ Fluid between membranes
 - ◆ Nuclear pores
 - ◆ Passage to cytoplasm

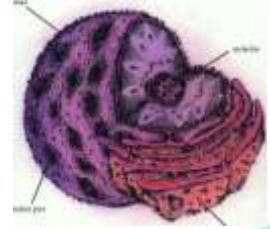


Nuclear Envelope



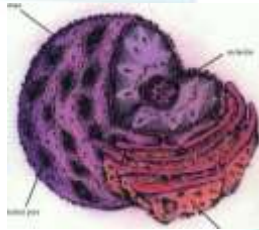
Nucleus

- ◆ Nucleoplasm
 - ◆ Jelly-like fluid
 - ◆ Cushions & protects DNA



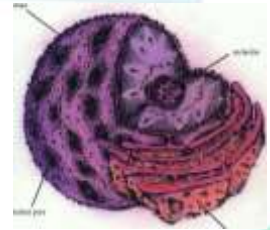
Nucleus

- ◆ Nucleolus
 - ◆ Dark-staining region
 - ◆ Proteins & nucleic acids
- ◆ rRNA transcription
- ◆ Ribosome assembly



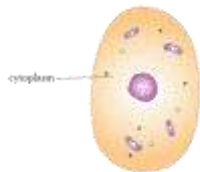
Nucleus

- ◆ Chromatin
 - ◆ Loose, thready (bumpy) DNA
 - ◆ Not dividing



Cytoplasm

- ◆ Material outside nucleus & inside plasma membrane
- ◆ Site of most cellular activity
- ◆ 3 major elements
 - ◆ Cytosol
 - ◆ Organelles
 - ◆ Inclusions



Cytoplasm

- ◆ Cytosol
 - ◆ Suspends and cushions other structures
 - ◆ Fluid portion
 - ◆ Mostly water
 - ◆ Dissolved nutrients and other solutes

Cytoplasm

- ◆ Organelles
 - ◆ "little organs"
 - ◆ Structured to carry out specific functions
- ◆ Inclusions
 - ◆ Non functioning units
 - ◆ Chemical substances
 - ◆ Present in some cells

Mitochondria

- ◆ Bean-shaped
- ◆ Double membrane
 - ◆ Outer – smooth
 - ◆ Inner – highly folded
 - ◆ Cristae
- ◆ Fluid-filled matrix
 - ◆ inside
- ◆ Own DNA
 - ◆ Circular
- ◆ Own ribosomes



Mitochondria

- ◆ Completes cellular respiration
- ◆ Generates ATP



Ribosome

- ◆ Composed of rRNA & protein
- ◆ Large & small subunit
 - ◆ Connect around mRNA
- ◆ Protein synthesis



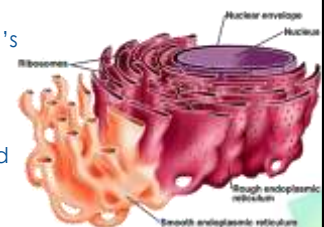
Ribosome

- ◆ Protein synthesis
 - ◆ Reads mRNA
 - ◆ Helps attach tRNA
 - ◆ Helps form peptide bond between amino acids



Endoplasmic Reticulum

- ◆ Fluid-filled tubules or canals
- ◆ Accounts for 1/2 cell's membranes
- ◆ Continuous with nuclear envelope
- ◆ Rough ER – studded with ribosomes



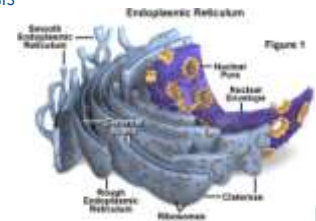
Rough ER

- ◆ Completes protein building
- ◆ Membrane factory
- ◆ Ships contents to Golgi apparatus in transport vesicles
- ◆ Abundant in cells that export proteins



Smooth ER

- ◆ Cholesterol synthesis & breakdown
- ◆ Fat metabolism
- ◆ Detoxification of drugs
- ◆ Store calcium ion
 - ◆ Muscle cells
 - ◆ Sarcoplasmic reticulum



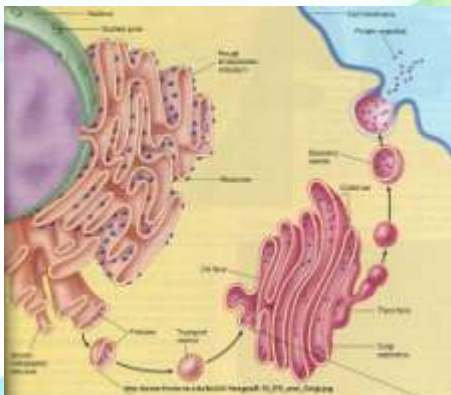
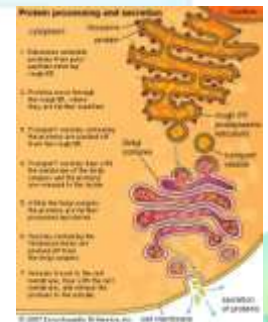
Golgi Apparatus

- ◆ Stack of flattened membranous sacs
- ◆ Found near nucleus/rough ER



Golgi Apparatus

- ◆ Modify & package proteins
 - ◆ From rough ER
- ◆ Produces lysosomes
- ◆ Produces vesicles to merge with plasma membrane



Lysosomes

- ◆ Enzyme-filled membranous sac
- ◆ Formed by Golgi apparatus



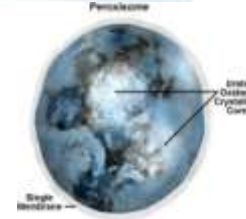
Lysosomes

- ◆ Digestion
 - ◆ Worn-out organelles and structures
 - ◆ Foreign substances
 - ◆ (ruptures result in self-digestion of cell)



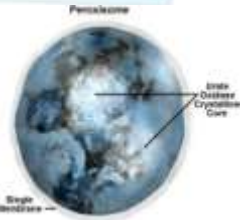
Peroxisomes

- ◆ Enzyme-filled membranous sac
- ◆ Not formed by Golgi apparatus
 - ◆ Self-replicating by pinching in half



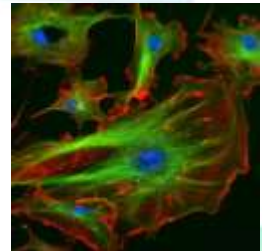
Peroxisomes

- ◆ Oxidase enzymes use O_2 to detoxify harmful substances
- ◆ Break down free radicals (high chemical activity)
 - ◆ Convert to H_2O_2
 - ◆ Convert $H_2O_2 \rightarrow H_2O$



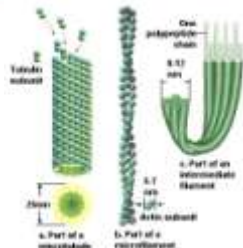
Cytoskeleton

- ◆ Internal framework
 - ◆ Cell shape
- ◆ Supports other organelles
- ◆ Helps intracellular transport
- ◆ Cell movement



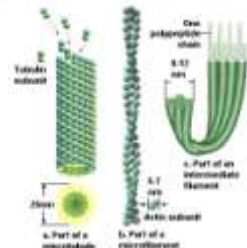
Cytoskeleton

- ◆ Microfilaments
 - ◆ Smallest
 - ◆ Cell motility
 - ◆ Cell shape



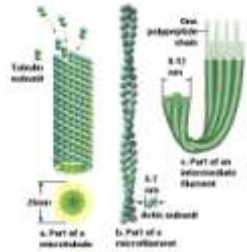
Cytoskeleton

- ◆ Intermediate filaments
 - ◆ Strong, stable, rope-like
 - ◆ Form desmosomes
 - ◆ Provide strength against pulling



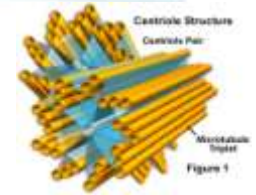
Cytoskeleton

- ◆ Microtubules
 - ◆ Tubulin
 - ◆ Overall cell shape
 - ◆ Organelle distribution
 - ◆ Cell division



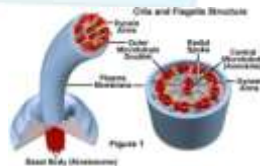
Centrioles

- ◆ Close to nucleus
- ◆ Short, rod-like
- ◆ Come in pairs
- ◆ Composed of microtubules
 - ◆ 9 triplets
- ◆ Direct formation of mitotic spindle during division?



Cilia

- ◆ Hair-like projections on cell surface
- ◆ Composed of microtubule doublets covered by plasma membrane
- ◆ Move substances along cell surface



Flagellum

- ◆ Long projection on cell surface
- ◆ Composed of microtubule doublets covered by plasma membrane
- ◆ Cell movement
- ◆ Sperm only

