Properties of Life

order
reproduction
growth and development
energy processing
regulation
response to the environment
evolutionary adaptation

Prokaryotic vs. Eukaryotic Cell

DNA	✔	✔
nucleus		✔
cell membrane	✔	✔
cell wall	✔	
cytoplasm	✔	✔
ribosomes	✔	✔
mitoch-ondria		✔
organisms	bacteria	plants, animals, fungi, protists

Formation of Macromolecules

monomer	beads
polymers	necklace
dehydr-ation	create necklace, water produced
hydrolysis	take necklace apart, water consumed

Carbohydrates

monomer	monosaccharide
polymer	polysaccharide
bonded by	covalent bonds
purpose	energy and storage
ETC	hydrophilic

Carbohydrate (-saccharides)

mono	di	poly
glucose	lactose	starch
fructose	sucrose	glycogen
galactose	maltose	cellulose
		chitin

Storage and Energy

	plants	animals
energy storage	starch	glycogen
structure	cellulose	chitin

Polysaccharides

maltose	glucose + glucose
sucrose	glucose + fructose
lactose	glucose + galactose
cellulose	glucose
starch	glucose

Starch is a chain of glucose. Cellulose is made of multiple chains of glucose with hydrogen bonding to connect the chains.

The G Things

glycerol (lipids)	ALL fatty acids
glycogen (polys-accharide)	Jenna needs energy, made of glucose
glucagon (protein)	sugar in the blood is GONE

Endosymbiont theory

Mitochondria and chloroplasts were formerly small prokaryotes that began living within larger cells, may have gained entry as undigested prey or parasites. In a world that was increasingly aerobic, host benefited from endosymbiont that could use oxygen to create energy. This led to the formation of a eukaryotic cell with a mitoch-ondria. Plant cells were developed from eukaryotic cells with photosynthetic prokar-yote.

Structural Protein

What structural protein is secreted outside of cells making up 40% of the protein in your body?

> collagen

Diabetes

Type 1	insulin isn't produced, beta pancreatic cells damaged
Type 2	insulin/glucose receptors not working

Hyperglycemia (high blood sugar), hypogl-ycemia (low blood sugar). Antagonist to insulin is glucagon.

Tonic Solutions

Convert all %s to describe solvent, think about concentration gradient of solvent.

Hypertonic - full of things
Hypotonic - empty of things

Membrane Transport

What kind of materials can travel through membrane passively?

> Non-polar molecules and water.

Steroid Hormones

Why can steroid hormones pass through membranes?

> non-polar

Phosphorylation

Phosphorylation is the transfer of a phosphate from ATP to another molecule.

Hierarchy of Organization

atom	organ system
molecule	organism
organelle	population
cell	community
tissue	ecosystem

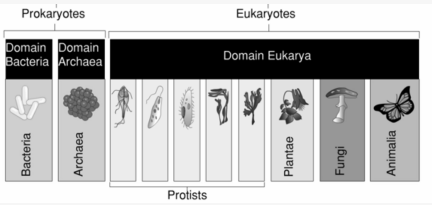
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Hierarchy of Organization (cont)

organ	biosphere

Community is a bunch of populations, ecosystem is those populations and abiotic factors.

Domains and Kingdoms



Lipids

monomer	fatty acids, glycerol
polymer	none
purpose	long-term energy storage
ETC	hydrophobic

Saturated fats are found in animals, unsaturated found in plants and is healthier. Trans fat is structured like a unsaturated fat, but straightened like a saturated fat.
Head of phospholipid is hydrophilic, tail hydrophilic. Fats are more concentrated amounts of energy than carbohydrates.

Proteins

monomer	amino acids (different R groups)
polymer	polypeptide, enzyme
bonded by	peptide bonds
ETC	shape determines function

Destroyed via denaturation. Must be in specific temp and pH.

Protein Structure

primary	chain (covalent bonds)
secondary	alpha helix, beta sheet (hydrogen bonds)
tertiary	3D shape

Protein Structure (cont)

quarternary	multiple chains

Lysosomes

Digestion, disposal and recycling of material. Malfunction can result in Tay-Sachs disease.

Chloroplasts

stroma	thick fluid
thylakoid	chips
granum	stack

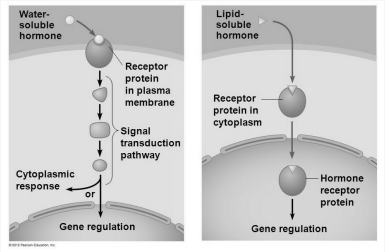
Cytoskeleton

	microtubules	microfilaments	intermediate filaments
structure	straight, hollow tubes	solid rods	supercoiled cables
protein subunit	tubulin	actin	fibrous proteins
	thickest	thinnest	
function	shape and support cell tracks along which organelles with motor proteins move, flagella and cilia	form 3D network inside plasma membrane, supporting cell shape	reinforce cell shape anchor organelles
	rapidly disassemble		permanent

Stages of Hormone Signaling

1. Reception
2. Signal transduction
3. Response

Water/Lipid-Soluble Hormone Signaling



Enzyme

Enzymes are selective in the reaction it catalyzes. It can be a protein or RNA. The specific reactant it acts on is the substrate, which fits into the active site on the enzyme. Cofactors are helps that bind to the active site and function in catalysis. Coenzymes are organic cofactors. This speeds up reactions.

Competitive inhibitors block the active site whereas noncompetitive inhibitors reshape the enzyme.

Cellular Respiration

glycolysis	cytoplasm, 2 net ATP
pyruvate oxidation	0 ATP
citric acid cycle	matrix, 2 ATP
oxidative phosphorylation	inner mitochondrial membrane, ~28 ATP

Major Themes of Biology

emergent properties of life's hierarchy & systems that arise

structure and function

exchange of matter and energy

evolution

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Theory, Hypothesis, Law

Theory - widely accepted explanatory idea that is supported by a body of evidence

Hypothesis - testable explanation for a set of observations based on the available data

Law - statement based on repeated experimental observations that describes some aspect of the universe

Law describes, theory and hypothesis explain.

Reasoning

Deductive: general --> specific

Inductive: specific --> general

Sherlock utilizes inductive reasoning. He's in the "in" and knows the details.

Nucleic Acids

monomer	nucleotides
polymer	nucleic acids, DNA, RNA
bonded by	hydrogen bonds (form helix), covalent bonds (form backbone)
purpose	genetic info

Nucleus

contains genetic information, DNA

direct protein synthesis, controlling cell's acticities

chromatin - complex of proteins and DNA

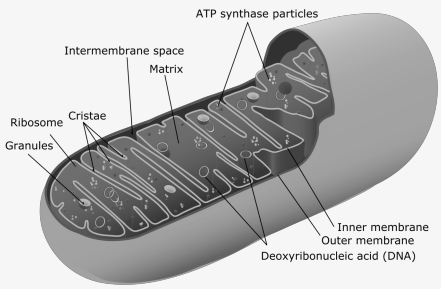
nuclear envelope - double membrane enclosing nucleus

nucleolus - where rRNA is synthesized

Ribosomes

free ribosome	proteins that function w/in cytosol
bound ribosome	proteins that are inserted into membranes, packaged in certain organelles, exported from cell

Mitochondria Diagram



Endomembrane System

nuclear envelope

endoplasmic reticulum

Golgi apparatus

lysosome

vacuole

plasma membrane

Smooth & Rough ER

smooth ER	variety of metabolic processes, synthesis of lipids, process harmful substances, storage of calcium ions
rough ER	secrete proteins, makes membranes

Functions of Cell Structures

genetic

manufacture, distribution

energy

structural support, movement, communication

Aquaporins

What if a cell has too many aquaporins?

> Too much water will be absorbed, body tissues will swell.

Exocytosis & Endocytosis



Types of Endocytosis



Phagocytosis takes in large molecules, taking them to lysosome via vacuole. Receptor-mediated endocytosis takes in specific solutes, forming a vacuole and then releasing the solute into cytoplasm.

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