

Fairfield Public Schools Biology Department

Biology 21: Midterm Study Guide 2015-2016

Introduction to Biology

- List and Define the characteristics of life

Characteristic	Example

- Use the scientific method to design and analyze and experiment.
- Use and define the following: controlled experiment, independent variable, dependent variable, control group, variables held constant, validity
- Read graphs and create a graph with a title, plotted points and properly labeled axes.

Graphing Practice – Problem 1

Age of the tree in years	Average thickness of the annual rings in cm. Forest A	Average thickness of the annual rings in cm. Forest B
10	2.0	2.2
20	2.2	2.5
30	3.5	3.6
40	3.0	3.8
50	4.5	4.0
60	4.3	4.5

A. The thickness of the annual rings indicates what type of environment was occurring at the time of its development. A thin ring usually indicates a lack of water, forest fires, or a major insect infestation. A thick ring indicates just the opposite.

B. Make a line graph of the data.

C. What is the dependent variable?

D. What is the independent variable?

E. What was the average thickness of the annual rings of 40 year old trees in Forest A? in Forest B?

F. Based on this data, what can you conclude about Forest A and Forest B?

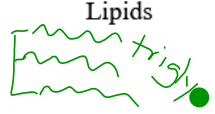
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Biochemistry

- Identify why all organic compounds all contain carbon

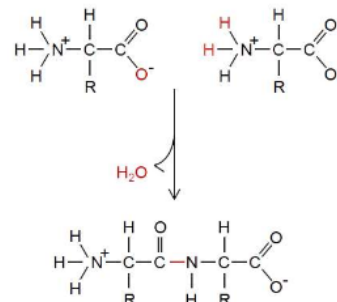
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- State the structure and function of the four major types of organic compounds by completing the table:

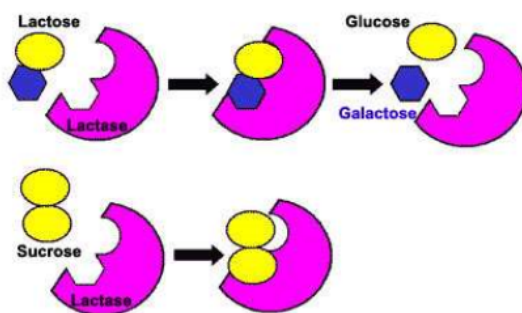
Macromolecule	Monomer	Polymer	Function
Carbohydrates	mono-saccharide ex. glucose	di, polysacch. starch (plant) glycogen (animal)	energy cell wall (cellulose)
Proteins	amino acids (alanine, valine)	di, polypeptides	channel protein hormones enzymes hemoglobin growth/repair
Lipids 	fatty acid glycerol	triglyceride cholesterol	phospholipid memb. long term storage
Nucleic Acids	nucleotide	DNA RNA	make proteins

- Describe the creation of polymers and monomers by dehydration synthesis and hydrolysis.

- Label the reaction and describe what is happening.
- What is the monomer? What is the polymer?



- Describe enzyme specificity.



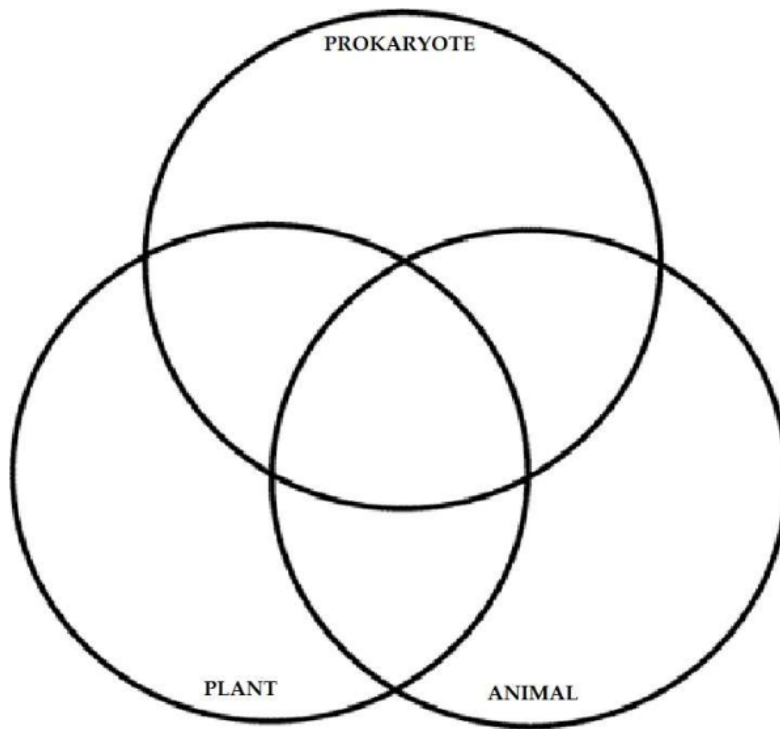
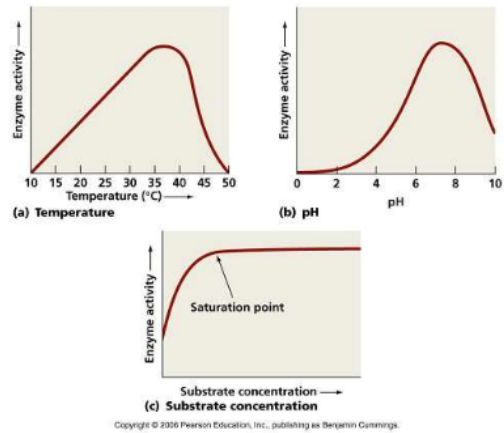
- Describe the structure and function of enzymes. Explain how enzymes do their function.

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- Describe how factors affecting enzyme function (temperature and pH)

Cell Structure and Function

- Apply the Cell Theory
- Identify the difference between the cell structures in prokaryotes vs. eukaryote cells
- Compare and contrast the cell structure in plant vs. animal cells



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- Describe the structure and function of the cell membrane, nucleus and other organelles (ribosome, vacuoles [food, water, contractile], lysosomes, Golgi body, mitochondria, chloroplast, cell wall)

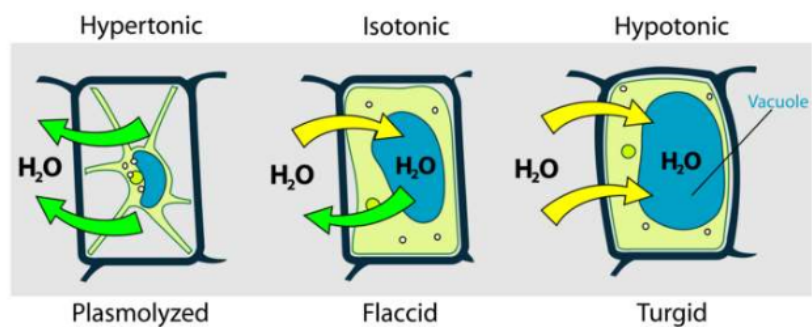
MB = memb. bound

ORGANELLE	STRUCTURE	FUNCTION	IN WHAT TYPES OF CELLS
Cell membrane	phospholipid	move. in/out	all
Nucleus	MB		euk
Ribosome	-		all
Food vacuole	MB		hetero
Water vacuole	MB		plants
Contractile vacuole	MB	pumps out H ₂ O	protist
Lysosome	MB		hetero
Golgi body	MB		euk
Mitochondria	MB		euk
Chloroplast	MB	photo make food	auto euk
Cell Wall	cellulose		plants

- Describe how the various organelles work together to complete the functions of the cells.

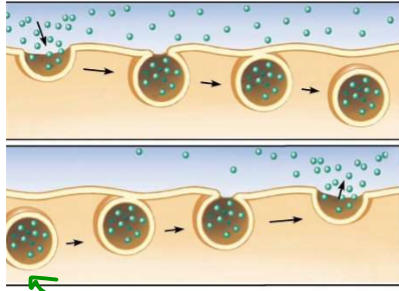
- Identify molecules that can pass through a membrane passively and actively.

- Describe how osmosis will affect a plant and animal cell differently. (turgor pressure vs. cytolysis)

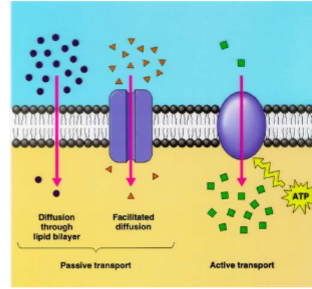


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- Describe the process of endocytosis and exocytosis, including the organelles and how they are used.



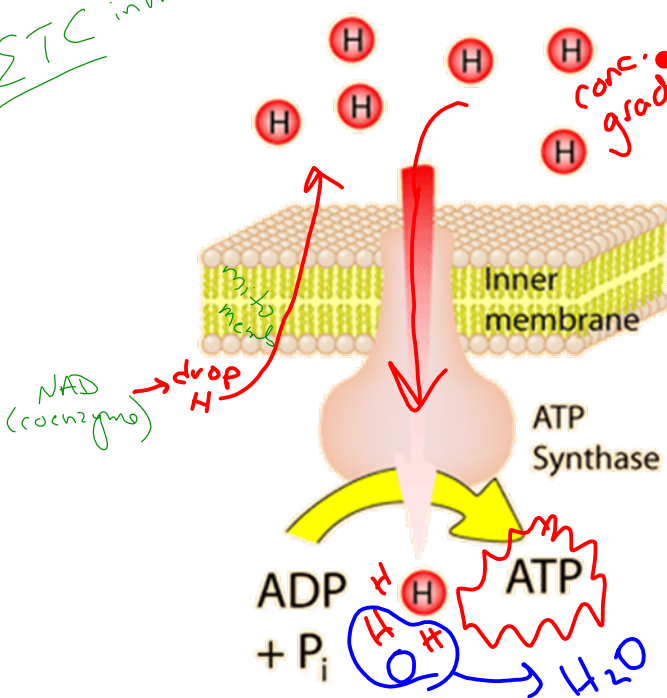
undig. food / hormone / enzyme / secretion



- Describe the role of proteins in the cell membrane.
- Compare and contrast passive transport vs. active transport (concentration gradient, hypertonic, hypotonic, isotonic, ion pumps)

Type of Transport	Passive or Active	Definition	Examples of Molecules Transported
Osmosis	P	high to low	H ₂ O only
Diffusion	P	high to low	CO ₂ O ₂ monomers
Facilitated Diffusion	P	high to low thru protein	glucose, ETC (H)
Ion Pumps	A	low to high	K ⁺ Nat. ions
Exocytosis	A	remove waste / hormones from Golgi	enzymes, hormones, waste
Endocytosis phagocytosis	A	pseudopod "eat"	other cells, large food

ETC immito

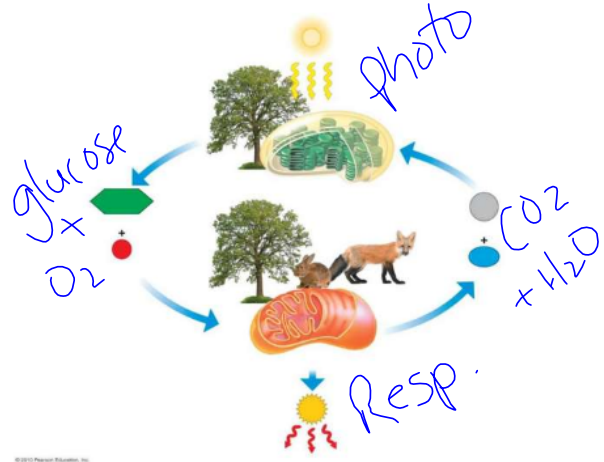


energy ion pump protein in memb.
channel protein facilitated diff. = passive

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Cell Energetics (Cellular Respiration and Photosynthesis)

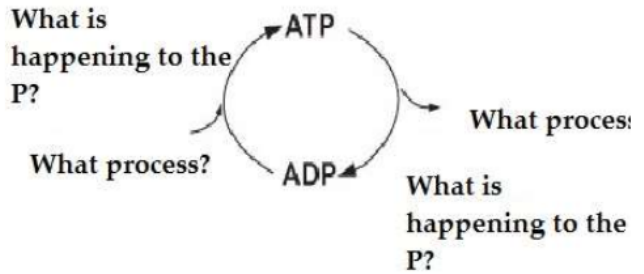
- Describe the complementary roles of photosynthesis in producers and cellular respiration in all living things
- Compare and contrast autotrophs and heterotrophs.
- Identify the location and summarize each of the following processes: glycolysis, aerobic and anaerobic energy pathways (including fermentation)
- Identify the end products of fermentation, aerobic respiration and photosynthesis.



	LOCATION	SUMMARIZE	END PRODUCT
GLYCOLYSIS	cyto	split gluc	2 pyruvate, 1 ATP
AEROBIC	mito	use O ₂ to break gluc	CO ₂ + H ₂ O, ATP
ANAEROBIC	cyto	break gluc no O ₂	lactic acid
FERMENTATION	cyto	after glycoling O ₂	alcohol + CO ₂
PHOTOSYNTHESIS	chloroplast	make food	glucose + O ₂

and ATP cycles.

Describe the ADP

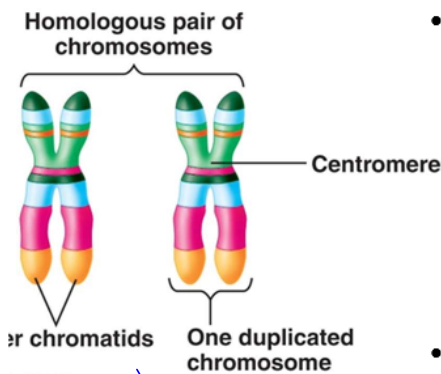
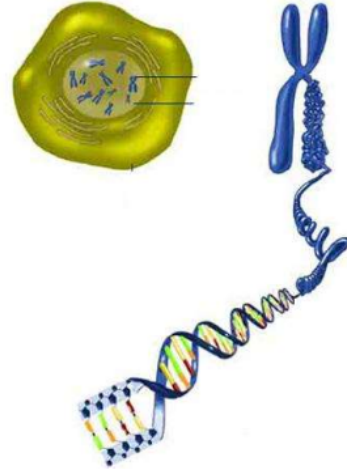


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- Describe how humans are affected by a lack of oxygen.
- Compare and contrast the production of ATP through aerobic vs. anaerobic pathways

DNA, RNA, and Protein Synthesis

- Describe the relationship between nucleotides, genes, chromosomes and DNA.



- Identify the structure of a chromosome and the importance of replicated strands and homologous chromosomes.

- Describe how adenine, guanine, cytosine, thymine and uracil are complementary.

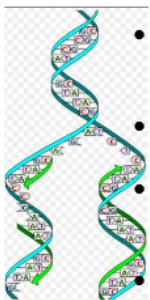
DNA Rep.

GAT AAATCTGGTCTTATTTC

CTATTAGACCAG AAT AAAGG

- Compare and contrast the structure and function of DNA and RNA (mRNA and tRNA)

	Structure	Function
DNA		
mRNA		
tRNA		



- Describe the process of DNA replication
- Define and describe transcription (DNA to mRNA)
- Define and describe translation (mRNA to protein)
- Translate and transcribe a nucleotide sequence.

DNA → mRNA

GAT AAATCTGGTCTTATTTC

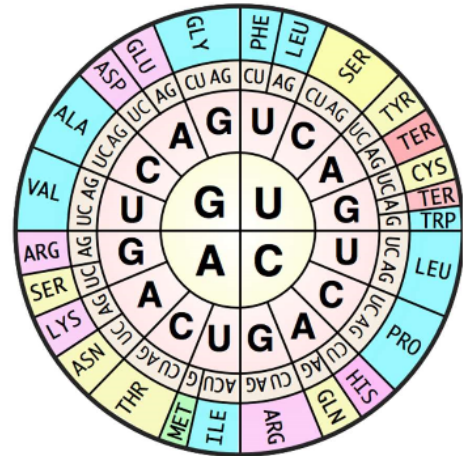
CUAUUAGACCAGAAUAAAGG

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- Use the codon chart to determine the amino acid sequence of a gene

Codons Found in Messenger RNA

		Second Base				
		U	C	A	G	
First Base	U	Phe Phe Leu Leu	Ser Ser Ser Ser	Tyr Tyr Stop Stop	Cys Cys Stop Trp	U C A G
	C	Leu Leu Leu	Pro Pro Pro	His His Gln	Arg Arg Arg	U C A G
	A	Ile Ile Ile Met	Thr Thr Thr Thr	Asn Asn Lys Lys	Ser Ser Arg Arg	U C A G
	G	Val Val Val Val	Ala Ala Ala Ala	Asp Glu Gly Glu	Gly Gly Gly Gly	U C A G



causes frameshift

- Identify DNA mutations (deletion, substitution, frame-shift)

~~GAT~~ AAATCTGGTCTTATTTCC

deletion → frameshift

CAT AAATCTGGTCTTATTTCC

substitution

GAT AAATCTGGTCTTATTTCC

- Read and analyze a karyotype (male or female? Is it "normal?" What is wrong?)



Down's

XY

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