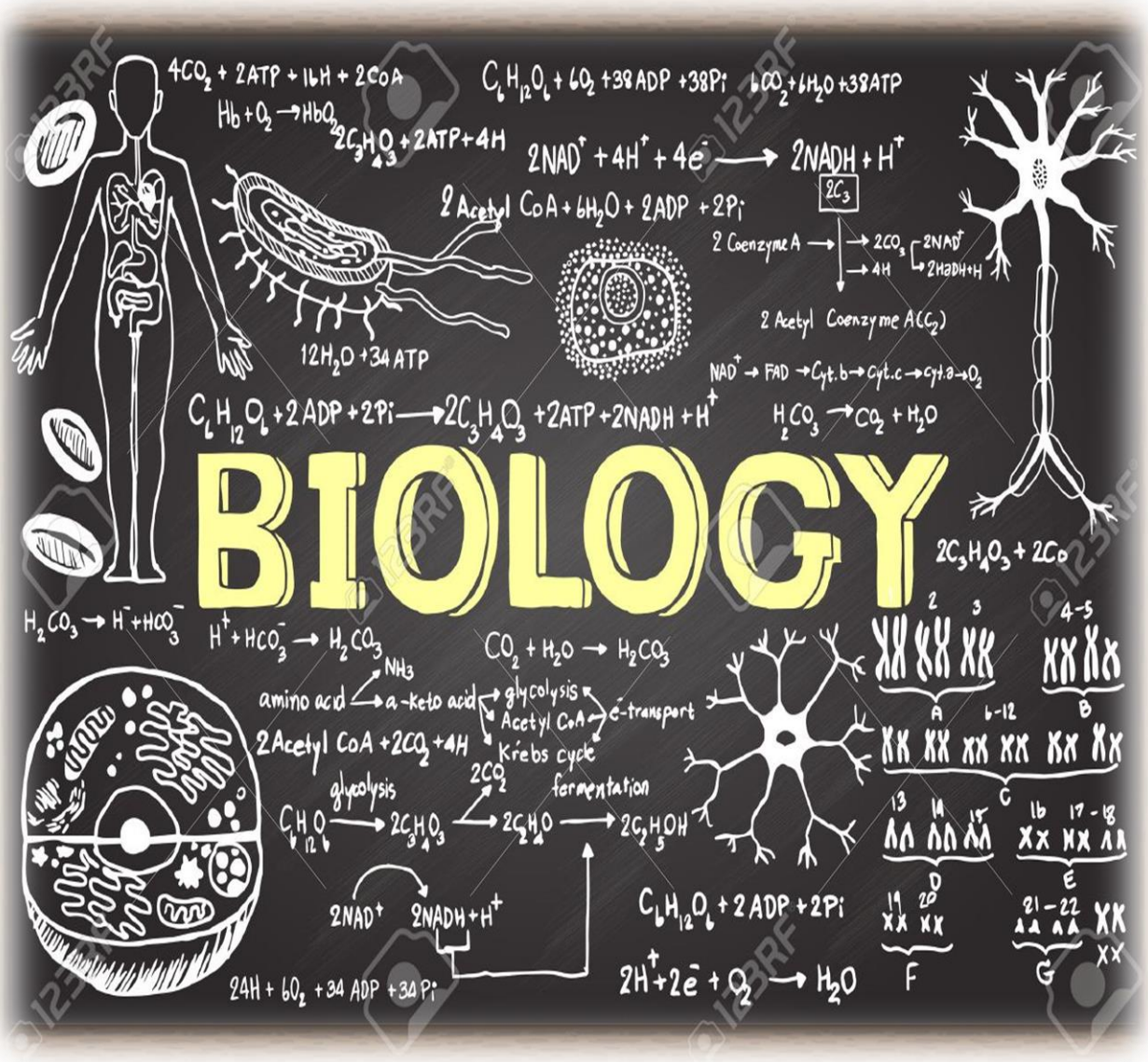
MS-BIOLOGY I
MAAP STUDY GUIDE
RE-TESTERS

Need Help Passing?



Created and complied by Dr. Jessica E Johnson, MSTA High School Science Representative

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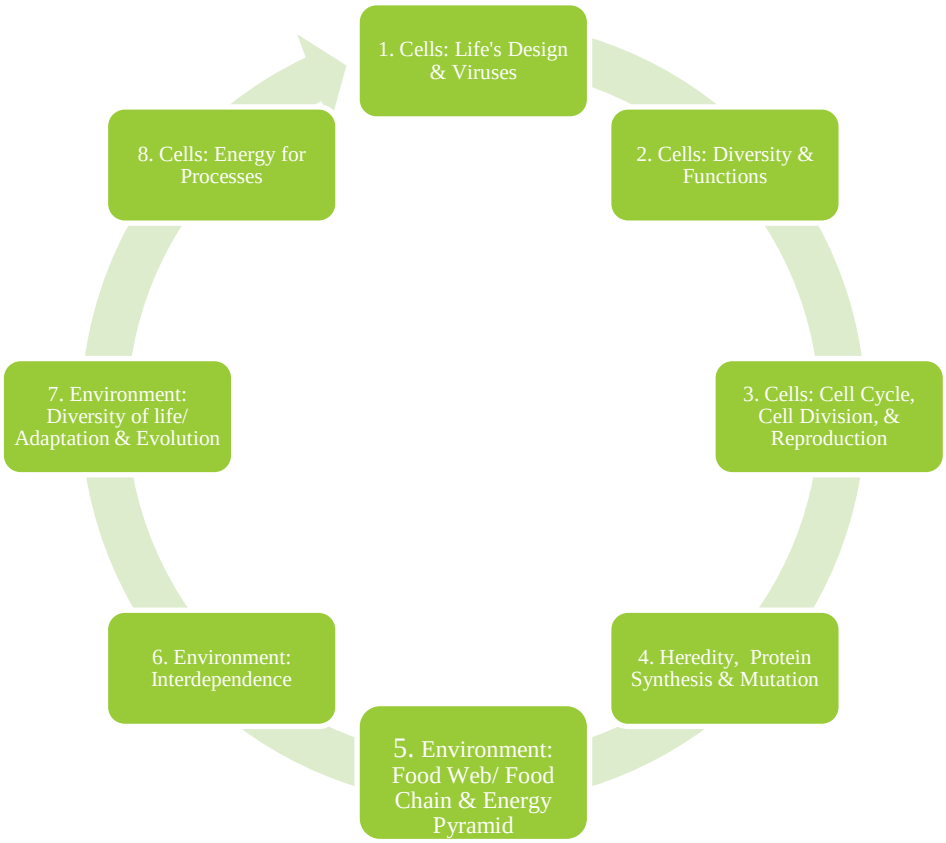
Conceptual Understanding Cycle for the Study Guide



Purpose:

The purpose of this study guide is to assist Biology I re-testers who have taken the MAAP- Biology I assessment multiple times. The study guide can be used independently or as a teacher tool to assist re-testers who no longer have a class to assist them in passing the End of the Year (EOY) exam.

Utilization Plan:

The first six sections are to be studied heavily, including all preparatory materials. Re-testers can choose to review section seven, section eight or both sections in addition to the first six sections. Much of the test is covered in the first six sections. The last two sections involve lesser weighted concepts on the EOY exam. First-time test takers must review all sections to obtain proficiency or higher.

Hoss Chart for Biology MAAP Assessment					
	PL 1 (Minimal)	**PL 2 (Basic)**	**PL 3 (Passing)**	**PL 4 (Proficient)**	**PL 5 (Advanced)**
MAAP Scale Scores	1000-1037	1038-1049	1050-1064	1065-1094	1095-1180
Raw Cut Scores	0-33%	34-43%	44-57%	58-81%	82-100%

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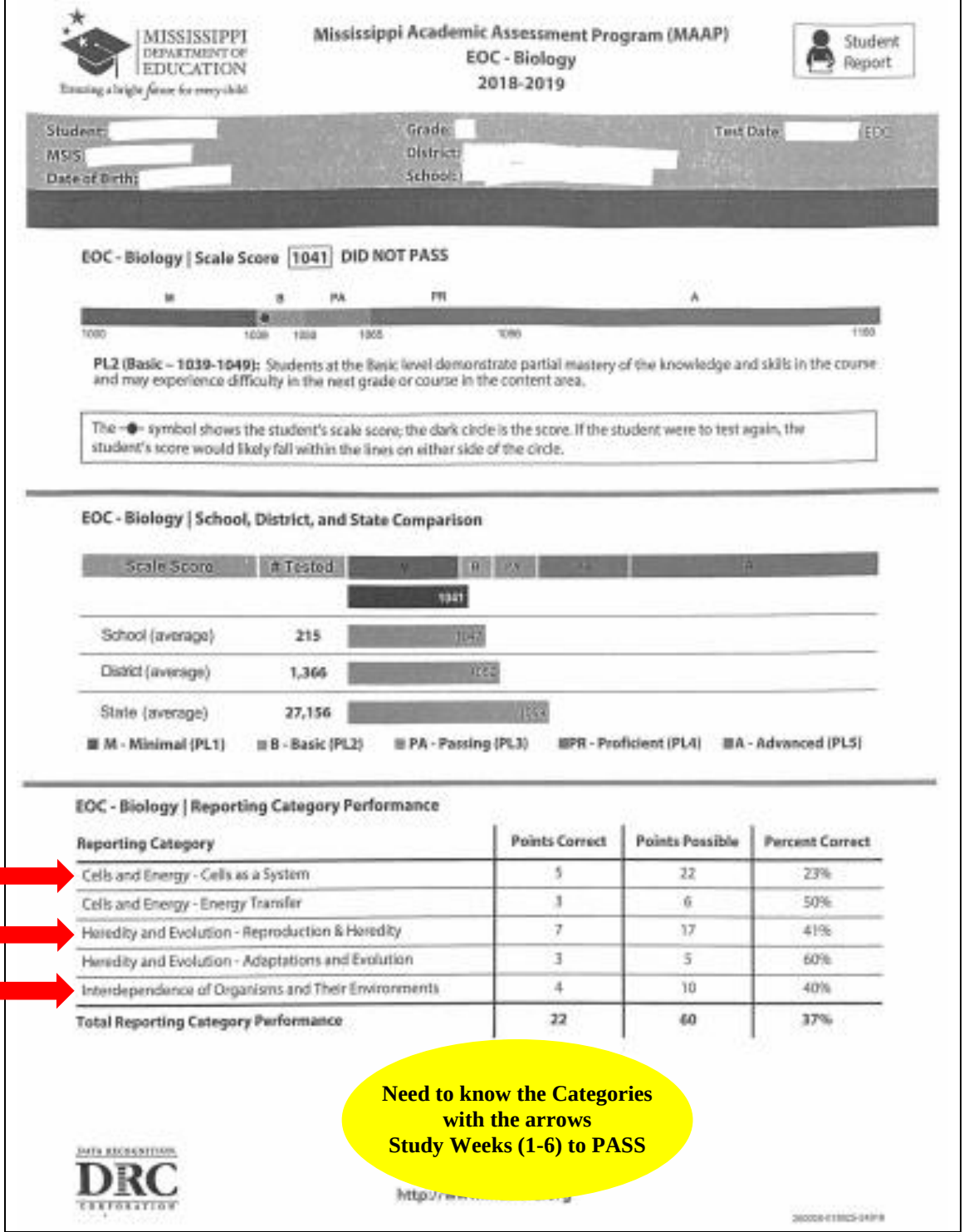
Student Report
(How to use this to know what to study to PASS)



MISSISSIPPI DEPARTMENT OF EDUCATION

Mississippi Academic Assessment Program (MAAP)
EOC - Biology
2018-2019

Student Report

Student:
MSIS:
Date of Birth:
Grade:
District:
School:
Test Date: EOC

EOC - Biology | Scale Score 1041 DID NOT PASS

M B PA PR A

1000 1039 1050 1065 1080 1100

PL2 (Basic – 1039-1049): Students at the Basic level demonstrate partial mastery of the knowledge and skills in the course and may experience difficulty in the next grade or course in the content area.

The ⊣●⊢ symbol shows the student's scale score; the dark circle is the score. If the student were to test again, the student's score would likely fall within the lines on either side of the circle.

EOC - Biology | School, District, and State Comparison

	Scale Score	# Tested
School (average)	1042	215
District (average)	1044	1,366
State (average)	1054	27,156

M - Minimal (PL1) B - Basic (PL2) PA - Passing (PL3) PR - Proficient (PL4) A - Advanced (PL5)

EOC - Biology | Reporting Category Performance

Reporting Category	Points Correct	Points Possible	Percent Correct
Cells and Energy - Cells as a System	5	22	23%
Cells and Energy - Energy Transfer	3	6	50%
Heredity and Evolution - Reproduction & Heredity	7	17	41%
Heredity and Evolution - Adaptations and Evolution	3	5	60%
Interdependence of Organisms and Their Environments	4	10	40%
Total Reporting Category Performance	**22**	**60**	**37%**

Need to know the Categories with the arrows Study Weeks (1-6) to PASS

DRC

In order to pass, you must score 1050. Therefore, since more of the questions come from the areas with the arrows pointing to it, your focus should be on those concepts and how you will be assessed on those concepts.

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DO NOT STUDY THE ENTIRE STUDY GUIDE!!!!!!!!!!!!

How to Use this Guide

- Obtain your most current Biology I EOC STUDENT REPORT
- At the bottom of the report (STUDENT REPORT), it outlines your performance in each category
- Look at how you performed in the following categories ONLY: 1, 3, & 5.
- Based on how you performed in 1, 3, and 5, start your review in the section you had the least amount correct. Ex.

STANDARD

	Reporting Category	Average Items Correct	Number of Items	Average Percent Correct
1	Cells and Energy-Cells as a System	5	22	
2	Cells and Energy- Energy Transfer	2	6	
3	Heredity and Evolution-Reproduction & Heredity	11	17	
4	Heredity and Evolution-Adaptations & Evolution	2	5	
5	Interdependence of Organisms and Their Environments	3	10	

- Your plan would be to **study 1, 5, then 3.**
- Start with looking over the suggested review plan and go over any weeks 1st that have 1 in the Parentheses **Ex. (Bio. 1A. 1-4) or (Bio. 1E. 1-2)**
- Then study the weeks with the standards with 5 at the beginning and so forth.

When going through the sections based on your individual results, do the following:

- 1st - read the concepts you will be reviewing from the Suggested Review Plan, one week at a time (as you study)
- 2nd – look at the cover sheets and key vocabulary (quizlet) and make review notes on the key concepts you will need to review
- 3rd -watch the videos linked to the concepts, draw out and label processes
- 4th -complete the content review section, and get your teacher to validate your answers or work with a fellow peer to see if you understand and go the answers correct
- Once you feel comfortable, complete the MAAP TEST PREP

When you finish review those sections: 1, 3, & 5 choose either 2 or 4 (the one you did the best in) and review that section.

Finally, before you take your test again, take the 25-question test using the following QR code:

If you get 11 or more correct, you passed!!!!!

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Suggested Review Plan for Re-testers	
Week	**Concepts & Standards to Review Weekly**
1	**Cells: Life's Design & Viruses** (Bio. 1A.1-4) • Life's Design is based on the Cell Theory. • Life is organized and systematic. • A cell, like life, is organized systematically to survive and prosper (make more of itself). • Viruses are not alive but share similar characteristics.
2	**Cells: Diversity & Functions** (Bio. 1C. 1-3) • Cells and Viruses strive to survive. • The structure of both the cell and virus aids to its function for survival. • Diversity (difference) amongst the cells and viruses assists in understandings its role and with survival. • The placement of organelles within cell helps it survive and reproduce. • Viruses are not alive and must use living cells to reproduce (survive & make more of itself)
3	**Cells: Cell Cycle, Cell Division & Reproduction** (Bio 1E. 1-4 & 3A. 1-2) • The cell cycle is the process or system used to replicate and to differentiate cells into their preferred roles. • The cycle has specific steps (process/system) during replication. • Problems within cell division can lead to cancer. • Cross-over in Meiosis allows for genetic variation. • Relate the different types of reproduction of cells to asexual reproduction in simple organism (Survival) • In asexual reproduction- DNA is same in both parent and daughter cell. • In sexual reproduction- DNA is different in the daughter cell than in the parent.
4	**Cells: Heredity, Protein Synthesis & Mutation**s (3A. 3, 3B. 1-4 & 3C. 1-5) • We can calculate possible variations in populations of expressed traits and determine patterns for disease. • The structure and base sequence of DNA determines the proteins that carry out essential function of life (prosper) • Gregor Mendel is the father of genetics from his work with pea plants. • Genes are factors that determine characteristics of an individual passed down from one generation to another. • Punnett squares are used as a tool to predict what offspring may obtain from previous generations. • DNA is made of deoxyribose nucleic acid.

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	• RNA is made of ribose nucleic acid. • DNA is a double helix that spirals with four bases: Adenine, Thymine, Cytosine, and Guanine. • RNA is singled stranded and contains, Adenine, Uracil, Cytosine, and Guanine. • DNA codes for all genetic traits of an organism. • Errors to the structure of DNA and the base sequence causes mutations.
5	**Environment: Food Web, Food Chain & Energy Pyramid** (Bio. 5. 1-4) • There is an organization in the interactions between organisms and their environment (interdependence). • Earth cycles matter aiding to the flow of energy used in the interdependence between organisms and the environment. • Energy is lost as you go through the Energy Pyramid.
6	**Environment: Interdependence** (Bio. 5. 5-9) • Relationships in the environment are important to organism's survival. • Certain factors affect the environment and can either benefit or devastate the survival of the organisms within it. • Symbiotic relationships exist between at least two different species living near each other. • Carry capacity can be affected through density dependent factors and density independent factors. • After major disturbances in the ecosystem, succession will occur.
7	**Environment: Diversity of Life, Adaptations & Evolution** (Bio. 4. 1-7) • Organisms (living things) are diverse due to its capability to adapt and evolve in order to survive. • Evidence exist to explain evolution. • Theory of evolution states that gradual changes have occurred in organisms over time. • Charles Darwin is the Father of Evolution. • Natural selection= organisms with adaptations that are best suited for their environment that helps them survive (survival of the fittest) • Lack of necessary resources (i.e., water, food, shelter) aids in competition which leads to unequal reproductive success (natural selection)
8	**Cells: Energy for Processes** (Bio. 1B. 1-2, 1D. 1-2 & 2. 1-4) • Cells store energy in the bonds of ATP. • ATP is made of nitrogen, 5-carbon sugar, and three phosphate bonds. • Macromolecules are key to life processes.

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	• The cell membrane's structure aids transportation in and out of the cell. This is essential to maintain homeostasis. • Cells transform energy used to conduct functions to survive through photosynthesis and cellular respiration. • When chemical bonds are broken, energy is released. • When chemical bonds are formed, energy is stored. • Autotrophs produce glucose through photosynthesis. • Glucose is used by both autotrophs and heterotrophs to produce energy molecules=ATP • Photosynthesis' reactants include water, light energy, and carbon dioxide. Products= Oxygen and glucose. • Cellular respiration's reactants= glucose and oxygen and the products= water, carbon dioxide, and ATP.

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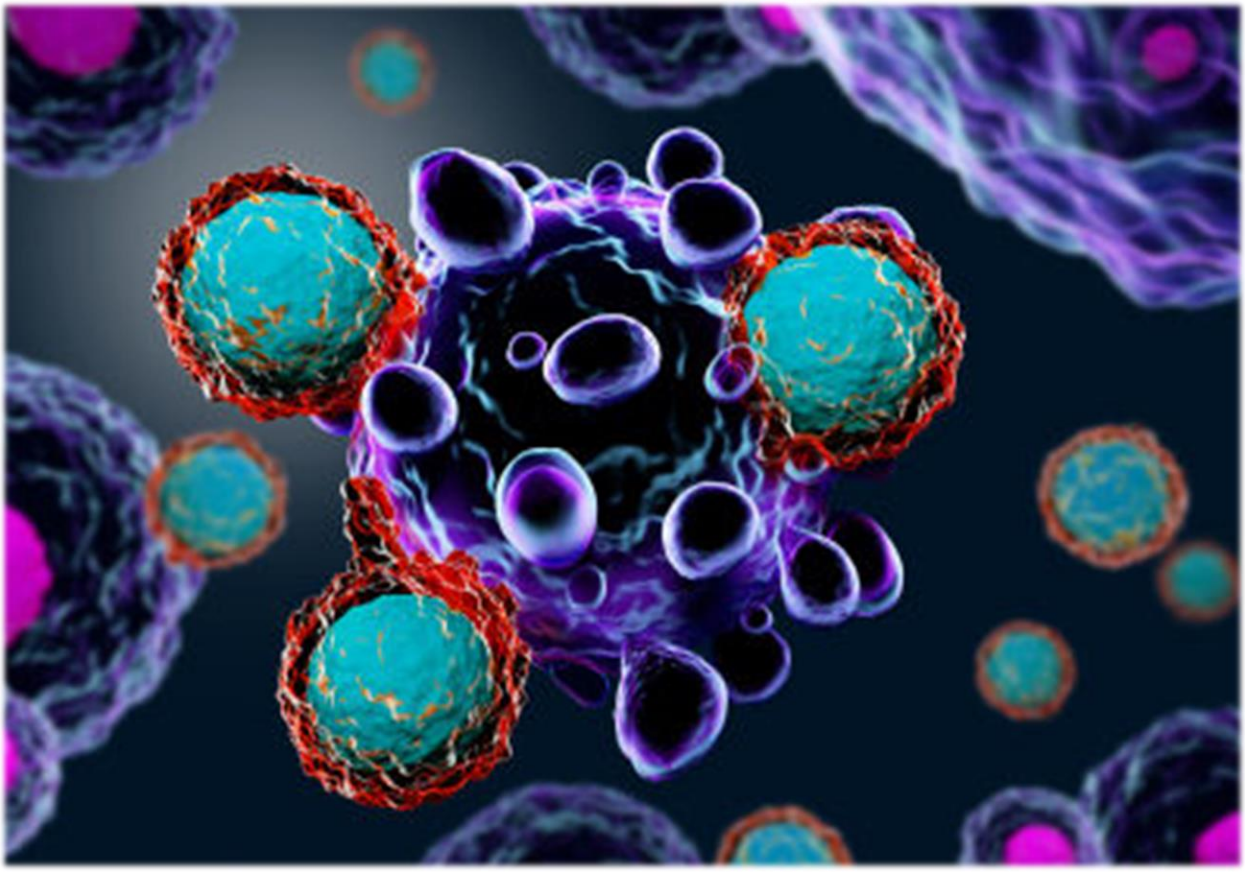
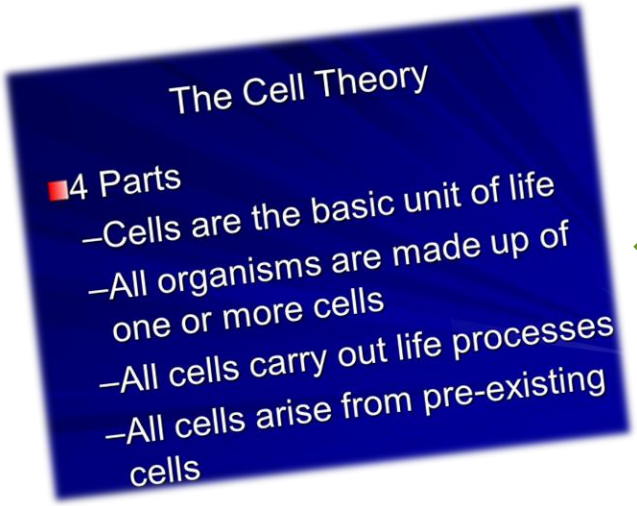
SECTION 1
CELLS: LIFE'S DESIGN & VIRUSES





EVERYTHING in Biology, you will review, are based on these 4 ideas…

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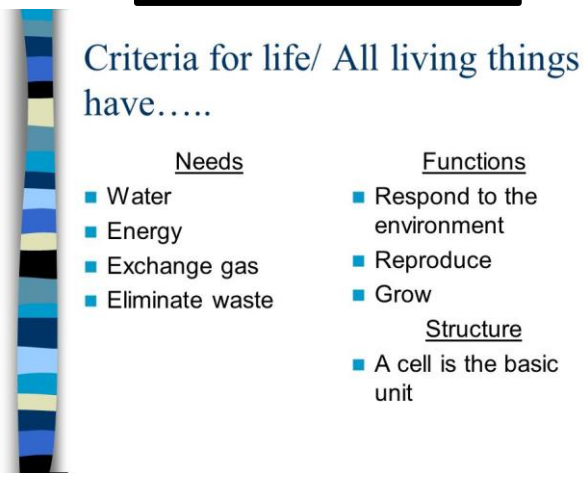
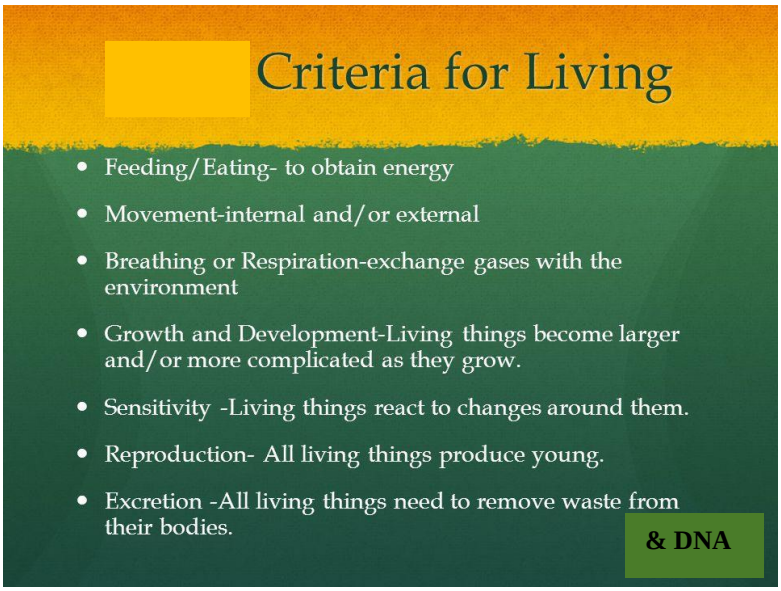
KEY CONCEPTS ABOUT CELLS: LIFE'S DESIGN & VIRUSES

MS-CCR Standard(s):
Bio. 1A. Students will demonstrate an understanding of the characteristics of life and biological organization.
BIO. 1A. 1. Develop criteria to differentiate between living and non-living things
BIO. 1A. 2. Describe the tenets of cell theory and the contributions of Schwann, Hooke, Schleiden, and Virchow.
BIO. 1A. 3. Using specific examples, explain how cells can be organized into complex tissues, organs, and organ systems in multicellular organisms.
BIO. 1A. 4. Use evidence from current scientific literature to support whether a virus is living or non-living.

BIO. 1A. 1/4

Criteria to be living… if it doesn't have this it's NOT alive!





Characteristics of Living/Non-living things (Not to lame or boring!!!) It's only 3:38 minutes and gives a visual to the information above….why virus or not living…

Okay they are lame, but they do explain the concept

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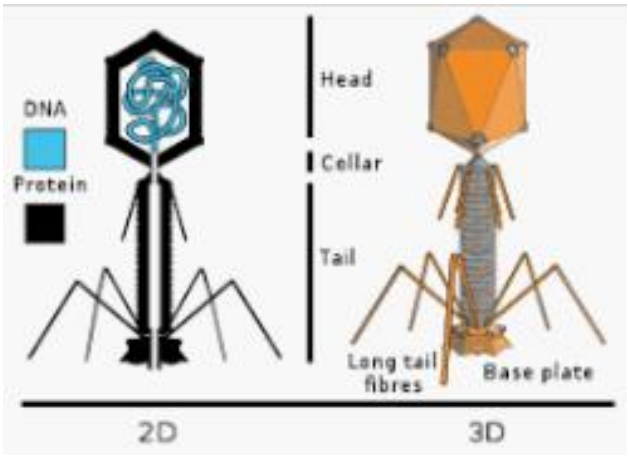
Are viruses living or non-living?

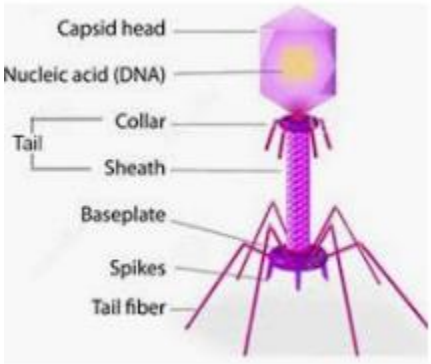
Nonliving
- Not cells
- Few of life's criteria
- No respiration
- No growth
- No development
- Can be crystalline, dormant

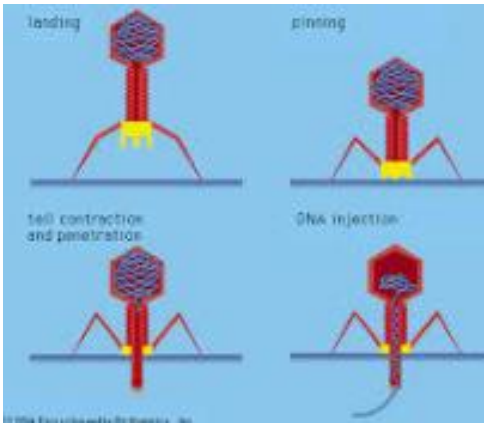
Living
- Replicate (with host)
- Contain DNA,RNA
- Contain protein coat



Bacteriophage (Virus) Video

Parts labeled, how it invades, and a video below to show both!





You just need to know why viruses are not considered living and how Bacteriophage destroys cells.

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BIO. 1A. 2

Tenets (principles) of the Cell Theory

No cool visuals just recalls

The modern tenets of the Cell Theory include:

1. All known living things are made up of cells.
2. The cell is structural & functional unit of all living things.
3. All cells come from pre-existing cells by division. (Spontaneous Generation does not occur).
4. Cells contains hereditary information which is passed from cell to cell during cell division.
5. All cells are basically the same in chemical composition.
6. All energy flow (metabolism & biochemistry) of life occurs within cells.

3.1 Cell Theory

- Many scientists contributed to the cell theory.

Scientist	Theory
Hooke	Identified cells through a microscope; responsible for the name cell
Leeuwenhoek	Observed living cells from pond water; made better lenses for microscope
Schleiden	First to view PLANT cells
Schwann	First to view ANIMAL cells; concluded all living things are made of cells
Virchow	All cells come from other cells

Memorized their contributions! You will be asked

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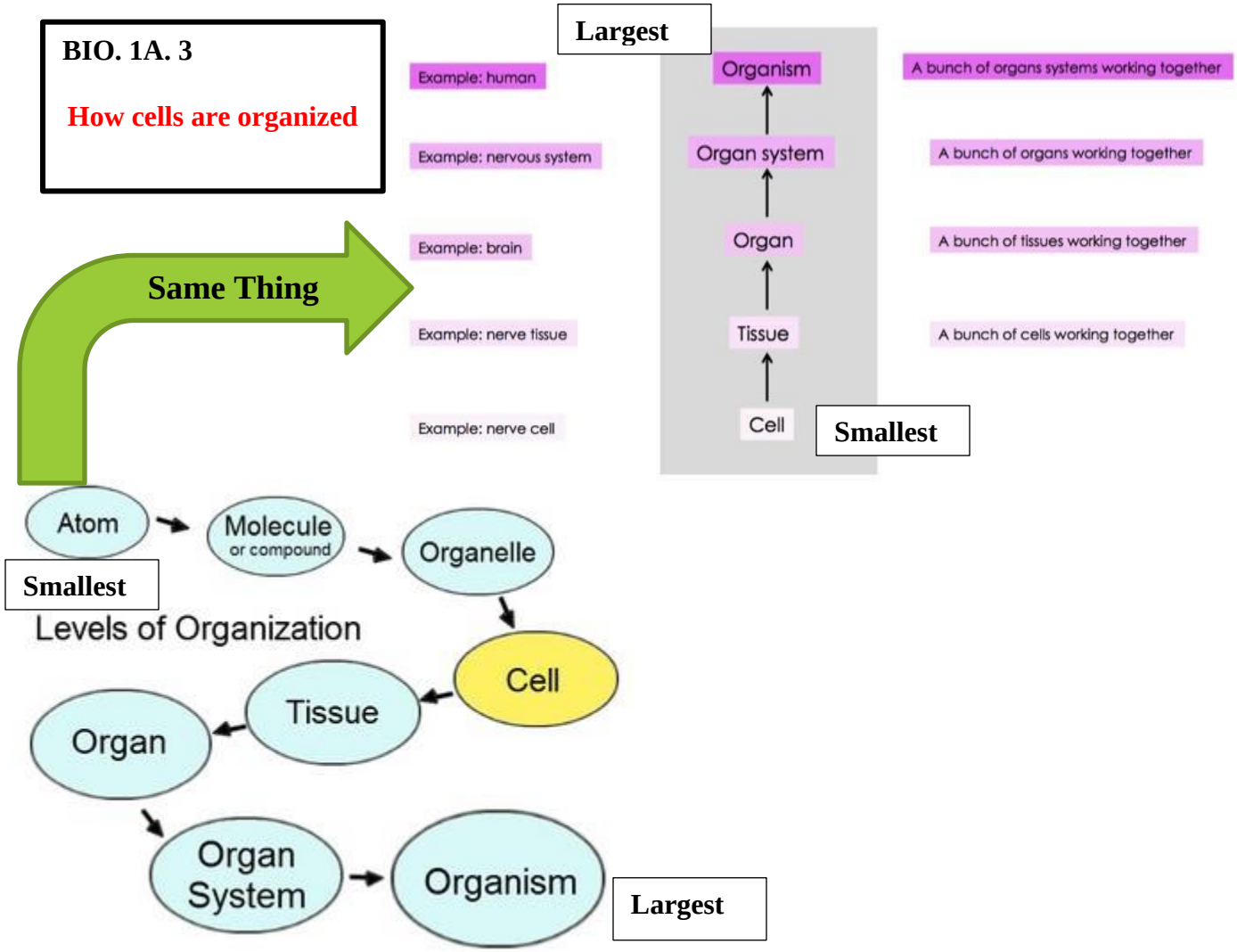
BIO. 1A. 3

How cells are organized



Important Hint: Know the levels of organization both ways with words and through pictures. Study all pictures. (Its just a few questions on the test, but they are easy if you review this information.

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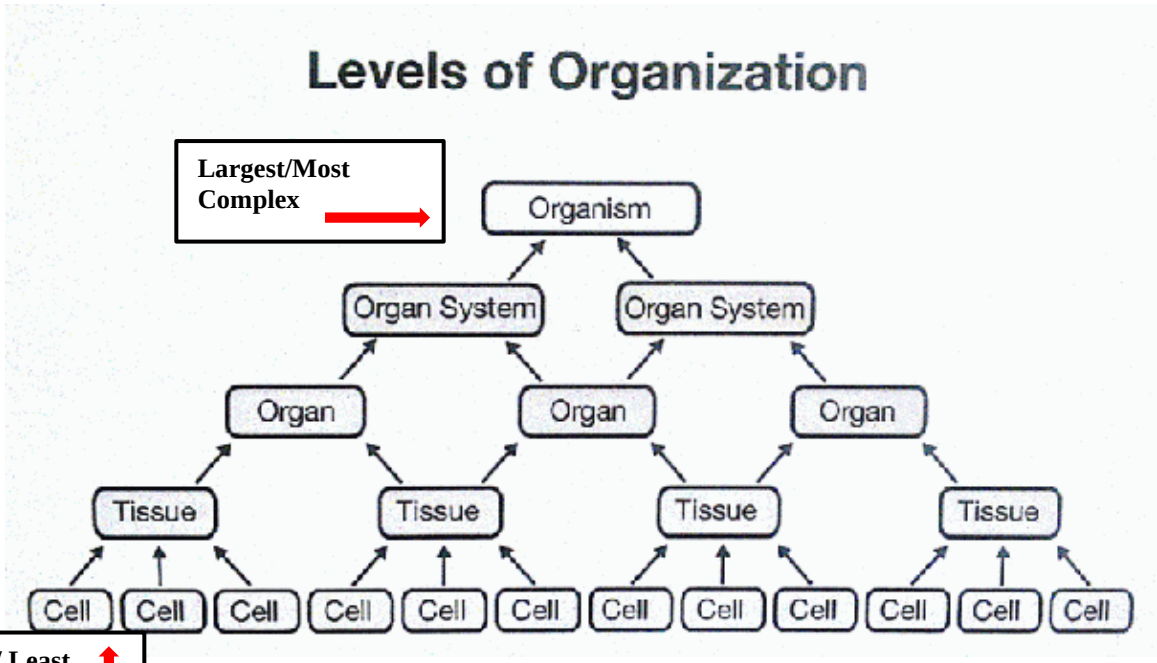
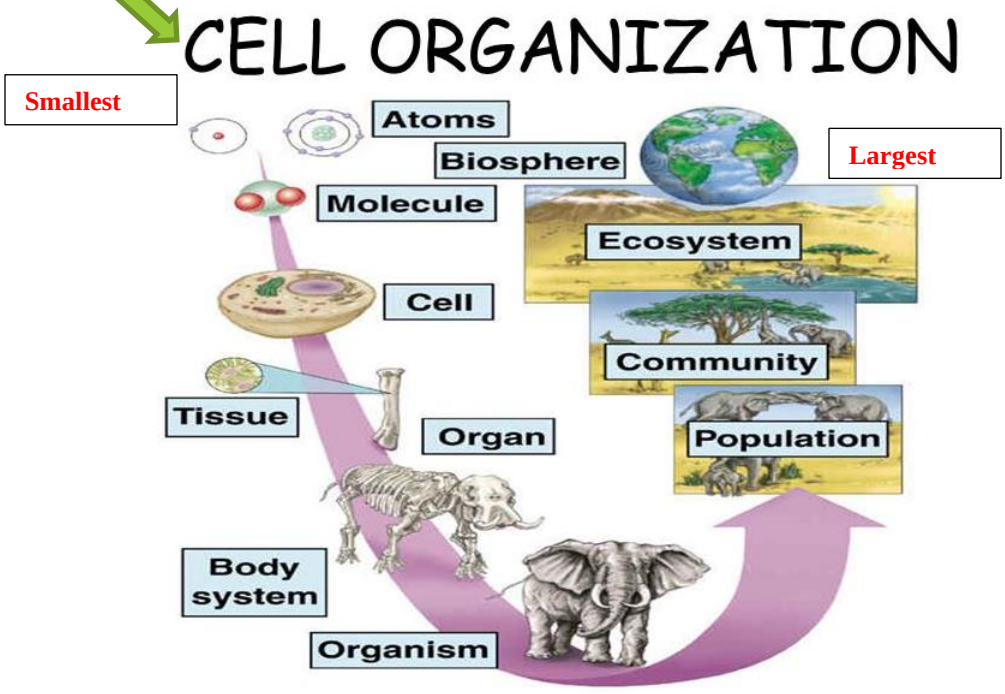


Below is another way they may ask…Review this picture as well



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KEY VOCABULARY TERMS ABOUT CELLS: LIFE'S DESIGN & VIRUSES

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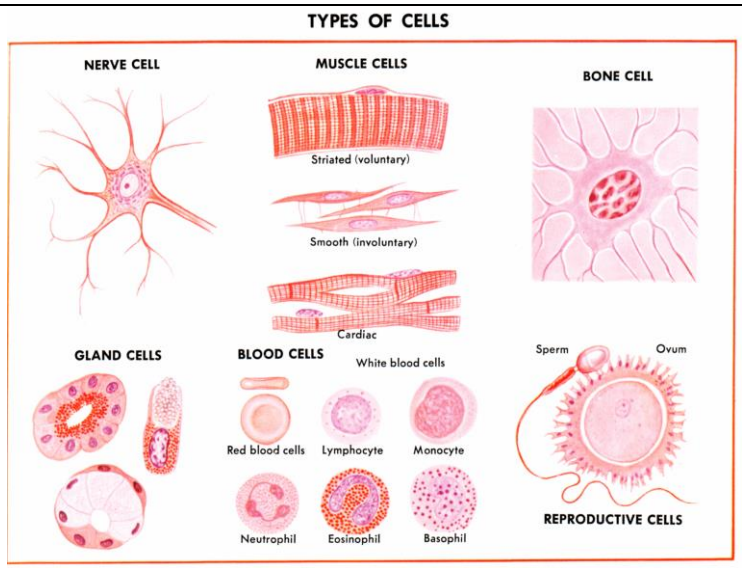
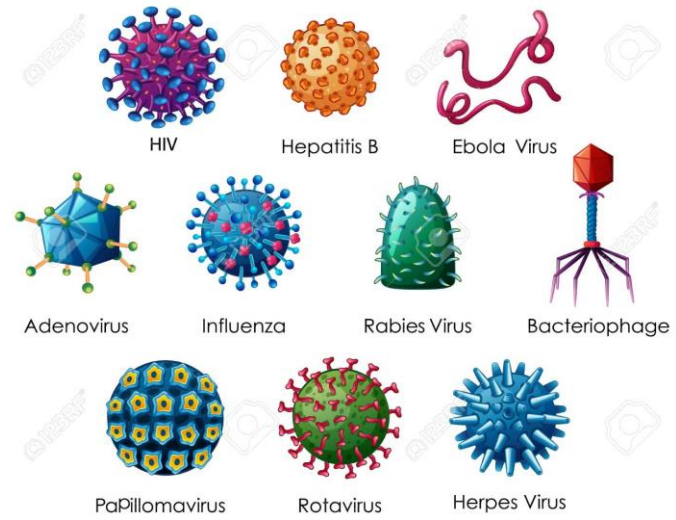
BIO. 1A. 3. Using specific examples, explain how cells can be organized into complex tissues, organs, and organ systems in multicellular organisms.
BIO. 1A. 4. Use evidence from current scientific literature to support whether a virus is living or non-living.

Cells	
Virus	

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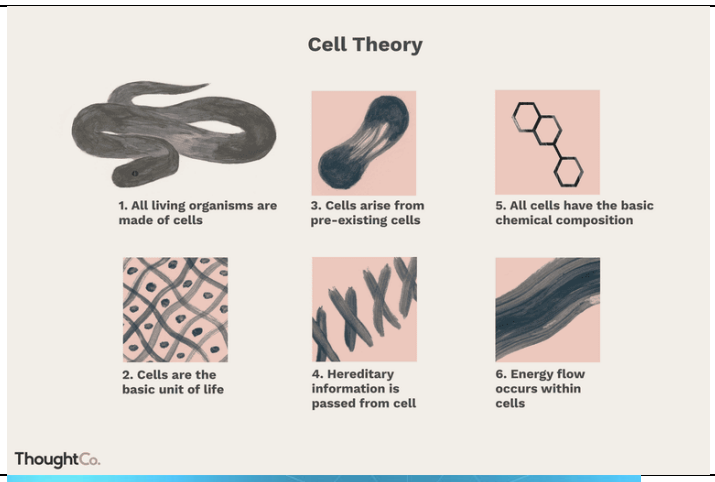
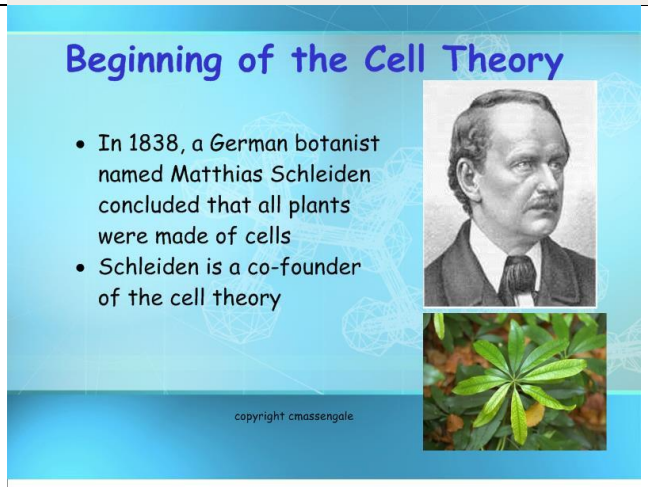
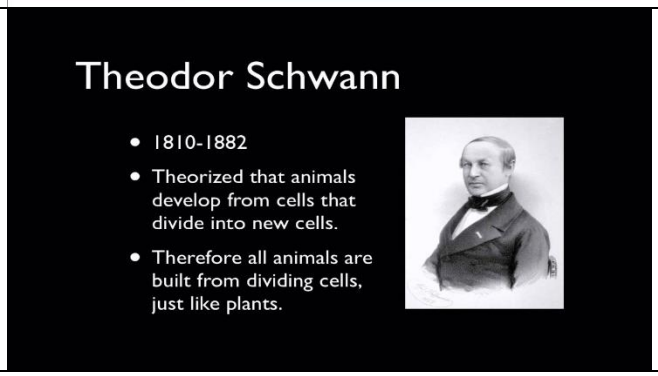
Cell Theory	
Schleiden	
Schwann	

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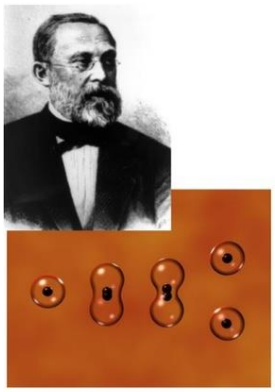
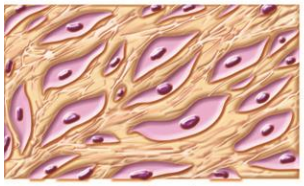
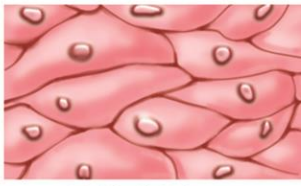
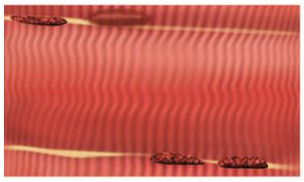
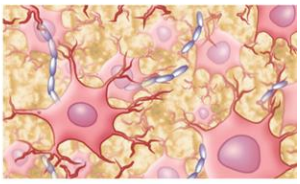
Hooke	 *"By the help of microscopes, there is nothing so small, as to escape our inquiry; hence there is new visible world discovered to the understanding."* **Robert Hooke** **(1635-1703)** **English natural philosopher** • The first person too see a cell under a microscope • The first to describe the unit life to be called a cell • He Invented the compound microscope • He became a scientist in the year 1655 when he was only 20 years old • When Robert Hooke was 27 years old he was appointed Curator of Experiments
Virchow	**History of Cell Theory** In **1855** the German scientist Rudolph **Virchow stated that every cell originates from another existing cell.** Virchow demonstrated the first evidence of cell division. 
Tissue	**Four types of tissue**  Connective tissue  Epithelial tissue  Muscle tissue  Nervous tissue

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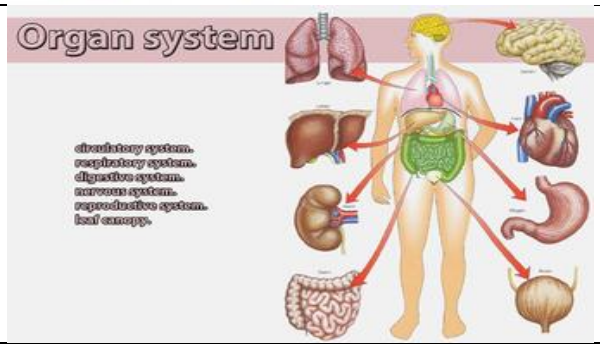
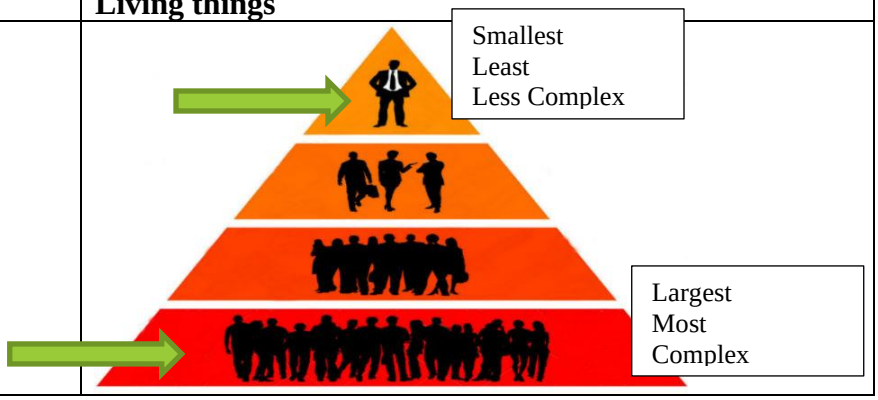
Organ	
Organ System	
Organism	**Living things**
Hierarchy	

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REVIEW & TEST PREP FOR CELLS: LIFE'S DESIGN & VIRUSES

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BIO. 1A. 3. Using specific examples, explain how cells can be organized into complex tissues, organs, and organ systems in multicellular organisms.
BIO. 1A. 4. Use evidence from current scientific literature to support whether a virus is living or non-living.

CONTENT REVIEW

1) Identify which of the following characteristics are shared by all living organisms. Write a Y by the characteristics that are shared by all living organisms. Write an N by the characteristics that are not shared by all living organisms.
   a. _____ share a universal genetic code
   b. _____are able to make their own food
   c. _____ are made of protein
   d. _____are made of one or more cells
   e. _____ must use the energy from something else
   f. _____ are able to respond to changes in their environment
   g. _____ need to breathe in oxygen
   h. _____ maintain a fairly stable internal environment

2) _____ English scientist that cut a thin slice of cork and looked at it under his microscope. To him, the cork seemed to be made up of empty little boxes, which he named cells.

3) _____Dutch naturalist who created a very powerful (for the time period) single lends microscope, He observed pond water. In pond scum he discovered small animals he called animalcules, or little animal (Protista) ,and also discovered bacteria while examining scarping of crud from his teeth.

4) _____ German botanist who determined plants are composed of cells.

5) _____ German physiologist and histologist who in 1838 and 1839 identified the cell as the basic structure of plant and animal tissue

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6) _____A doctor who stated that all living cells come from other living cells (part 3 of the cell theory)

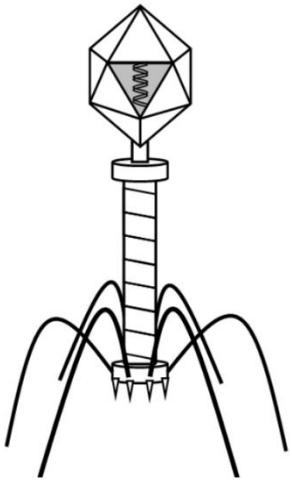
7) What are the three parts of cell theory?

   a. _____

   b. _____

   c. _____

8) Label the parts of the virus pictured below



a) _____

b) _____

c) _____

d) _____

e) _____

f) _____

g) _____

h) _____

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1)

Blood, which includes leukocytes and erythrocytes, is pumped by the heart and is circulated through blood vessels throughout the human body. The heart, the blood, and the blood vessels together form the circulatory system in the human body.

Which option *correctly* identifies the levels of organization of the components of the circulatory system?

A

blood	organ
erythrocyte	cell
heart	system
leukocyte	cell

B

blood	tissue
erythrocyte	cell
heart	organ
leukocyte	cell

C

blood	organ
erythrocyte	cell
heart	system
leukocyte	tissue

D

blood	system
erythrocyte	cell
heart	organ
leukocyte	tissue

a) Define the following terms from the question above:

Organ system

Organ

Tissue

Cell

b) Rewrite the question in your own words. What are they really asking?

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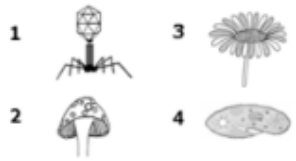
c) What is the correct answer and WHY? (you will not get credit without an explanation)

2)

Use the diagram to answer the question.



Which number represents a unicellular organism?

A 1

B 2

C 3

D 4

a) Define the following terms from the question above:

Unicellular

Multicellular

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

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3)

The image shows the microbe that causes influenza and a bulleted list of characteristics of the microbe.

Which other characteristic can be included in the bulleted list?

A considered a nonliving particle

B larger than a prokaryotic cell

C reproduces slowly outside the host's body

D contains mitochondria for energy production

a) Define the following terms from the question above:

Microbe

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY?

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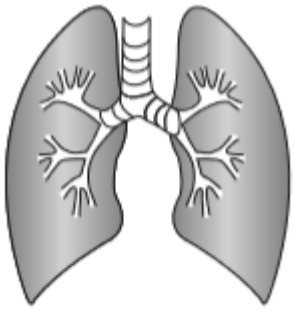
MAAP TEST PREP
MDE PT 1. # 7

Which diagram represents the highest level of organization within an organism?

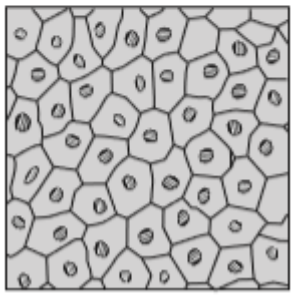
A

C



B

D



Answer B. **Clues-** "highest level". B is the digestive systems which an organ system is right below an organism (the highest). A is a cell, D is tissue and C is an organ.

MDE PT. 1 # 58

Which of the following structures demonstrates the highest level of organization in organisms?

F Nerve cell
G Muscle tissue
H Small intestine
J Endoplasmic reticulum

Answer H. **Clues-** "highest level". J is an organelle which help makes up a cell.

MDE PT. 2 # 27

Which of the following correctly sequences the level of organization from simplest to most complex in a multicellular organism?

A Organ → system → cell → tissue
B Organ → tissue → system → cell
C Cell → tissue → organ → system
D Cell → system → tissue → organ

Answer C. **Clues-** "Level of organization", "simplest" to "most complex".

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MDE PT. 2 #65

Which of these describes the level of organization of the digestive system?

A Different tissues carrying out similar functions
B Similar cells contributing to a particular function
C Different organs working together to perform a particular function
D Similar organelles working together to perform different functions

Answer C. **Clues-** "level of organization" of "digestive system". An organ system is made of a "group of organs". C is the only answer choice that states that information.

MDE PT.3 # 28

Which of the following is an example of connective tissue?

F Ribs
G Cartilage
H Skeletal muscle
J Intestinal linings

Answer G. **Clues-** "connective tissue".

MDE PT. 3 # 32

Blood moves through the blood vessels to all parts of the body due to the contractions of which tissue?

F Connective
G Muscle
H Nervous
J Epithelial

Answer G. **Clues-** "contractions".

MDE PT. 3 # 53

Which example represents the lowest level of organization within an organism?

A An organ that removes wastes products from the blood
B An organ system that transmits nerve impulses
C A tissue that secretes mucus
D A cell that carries oxygen

Answer D. **Clues-** "lowest level of organization". The cell is the lowest level.

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13. Write the characteristics in the boxes in the chart to compare living and nonliving things.

Characteristics of Living and Nonliving Things

Living Characteristics	Nonliving Characteristics

Characteristics:

cannot grow

can reproduce

can respond to stimuli

can release energy for work

exists without taking in energy

Answer. Living=Can respond…, Can release…, Can reproduce / Non-living= Cannot…, exist without…. **Clues:** "Can" for living and "Cannot/Without"

17. The discovery of cells was made possible by the invention and refinement of the microscope. Over the years, different individuals provided evidence for what is now known as the cell theory. Four scientists are primarily credited with establishing the three basic concepts of the cell theory.

Mark one box in each row of the table below to identify the scientist(s) **most** associated with the cell theory concept listed.

	Schleiden and Schwann	Hooke	Virchow
All living things are made of cells; plants and animals are made of cells.			
Cells come from cells; diseased cells produce diseased cells.			
The cell is the basic unit of life; cells can be studied scientifically.			

Answer.

and Schwann	Hooke	Virchow
X		
		X
	X	

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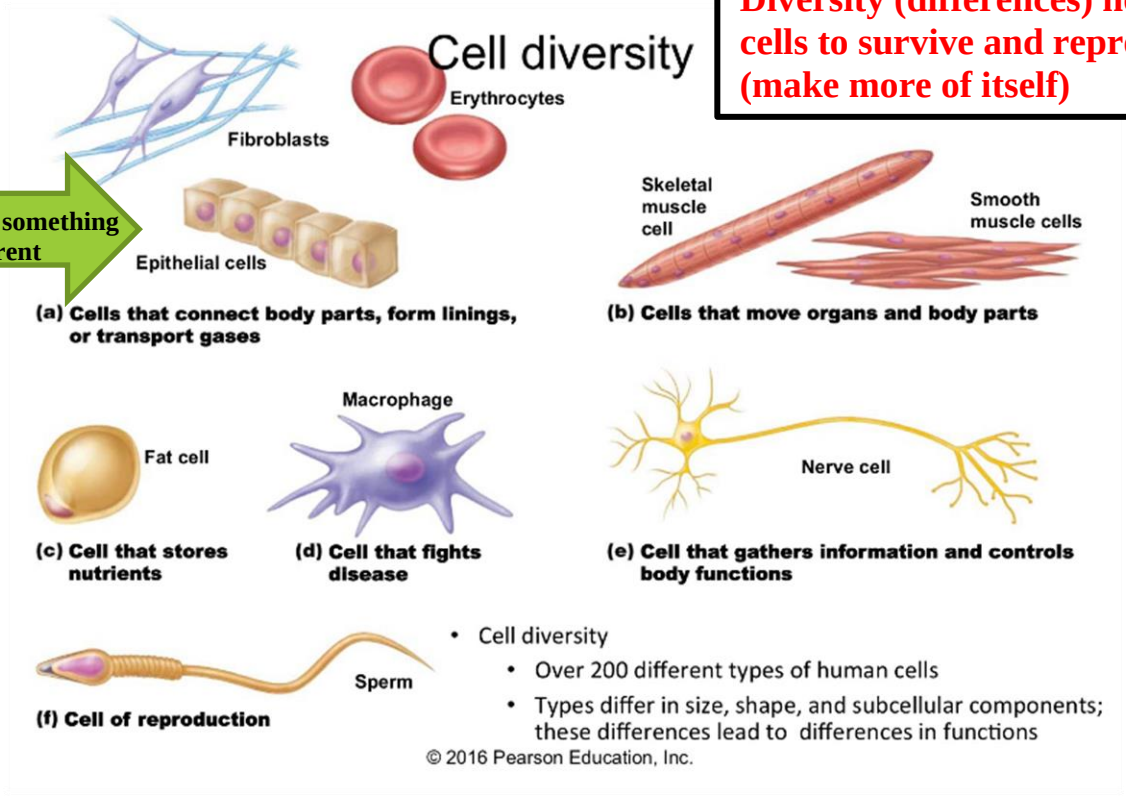
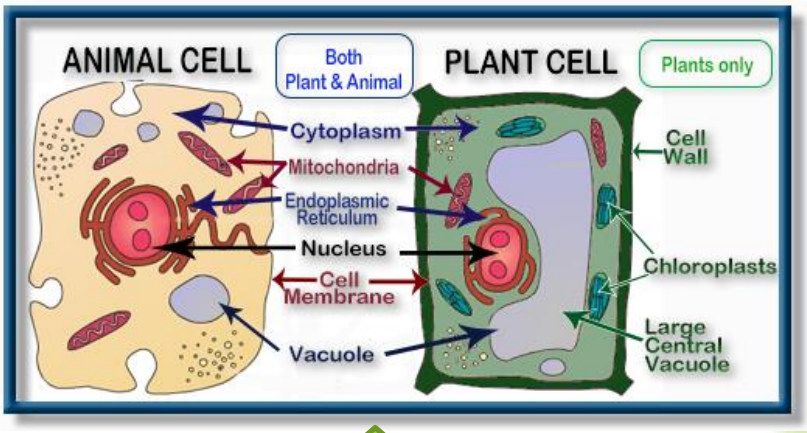
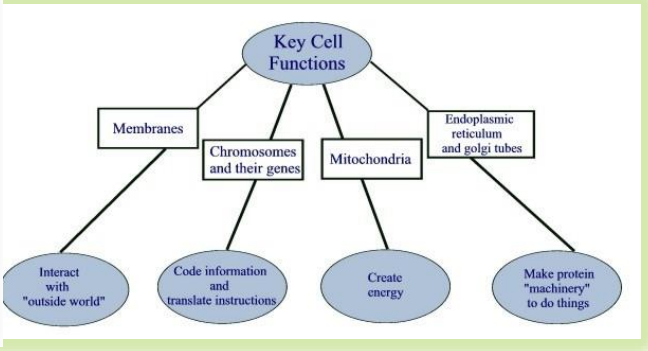
SECTION 2
CELLS: DIVERSITY & FUNCTIONS

Diversity (differences) helps cells to survive and reproduce (make more of itself)

All Cells do something different







Animal Cells are just for animals and not plants, vice versa

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KEY CONCEPTS ABOUT CELLS: DIVERSITY & FUNCTIONS

MS-CCR Standard(s):

Bio. 1C. Students will relate the diversity of organelles to a variety of specialized cellular functions.

BIO. 1C. 1. Develop and use models to explore how specialized structures within cells (e.g., nucleus, cytoskeleton, endoplasmic reticulum, ribosomes, Golgi apparatus, lysosomes, mitochondria, chloroplast, centrosomes, and vacuoles) interact to carry out the functions necessary for organism's survival.

BIO. 1C. 2. Investigate to compare and contrast prokaryotic cells and eukaryotic cells, and plant, animal, and fungal cells.

BIO. 1C. 3. Contrast the structure of viruses with that of cells and explain why viruses must use living cells to reproduce.

Bio. 1D. Students will describe the structure of the cell membrane and analyze how the structure is related to its primary function of regulating transport in and out of cells to maintain homeostasis

BIO. 1D. 1. Plan and conduct investigations to prove that the cell membrane is a semi-permeable, allowing it to maintain homeostasis with its environment through active and passive transport processes.

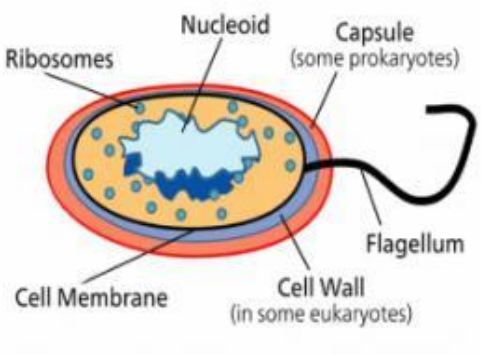
BIO. 1D. 2. Develop and use models to explain how the cell deals with imbalances of solute concentration across the cell membrane (i.e., hypertonic, hypotonic, and isotonic conditions, sodium/potassium pump).

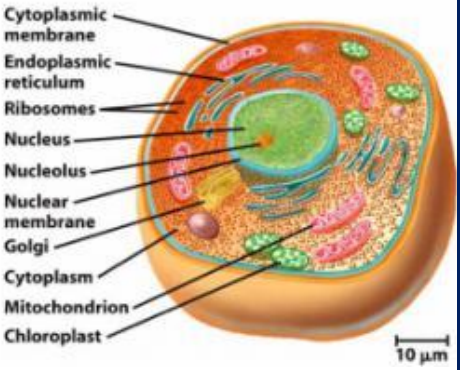
BIO. 1C. 2
<u>Compare/Contrast</u>
Prokaryotic Cells & Eukaryotic Cells=plant, animal, and fungal cells.

ALL CELLS ARE EITHER PROKARYOTIC OR EUKARYOTIC

Uni-cellular (bacteria) **Multi-cellular (animal/plants)**

Prokaryotes vs Eukaryotes





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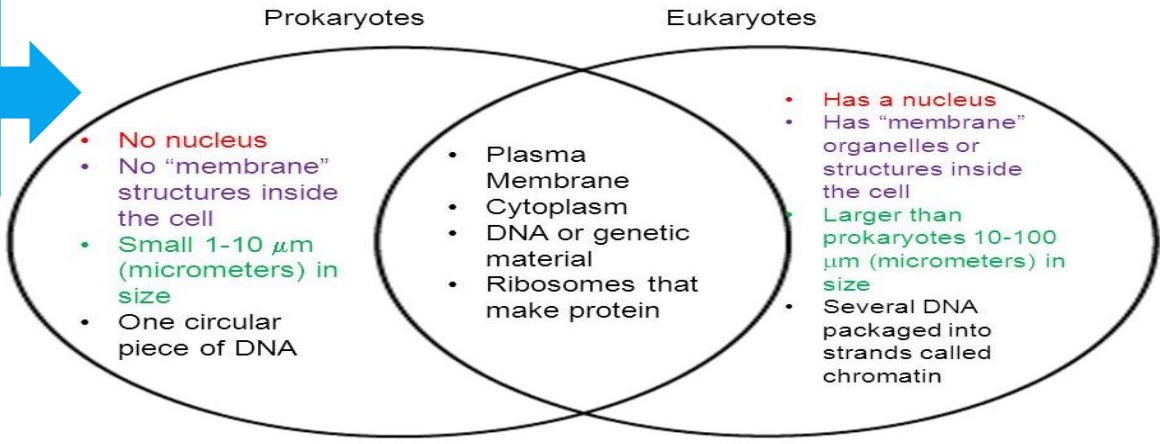
Review by drawing out this Venn diagram

Differences and similarities between Prokaryotes and Eukaryotes



Video: (Short video on the differences between prokaryotic (bacteria) & eukaryotic (plants, animals, & fungi, etc.)

Watch this video a couple of times to see the organelles inside moving to see how they are important to help the overall cell function.

What does it mean to be multicellular and unicellular? Watch this 2 min. video below.

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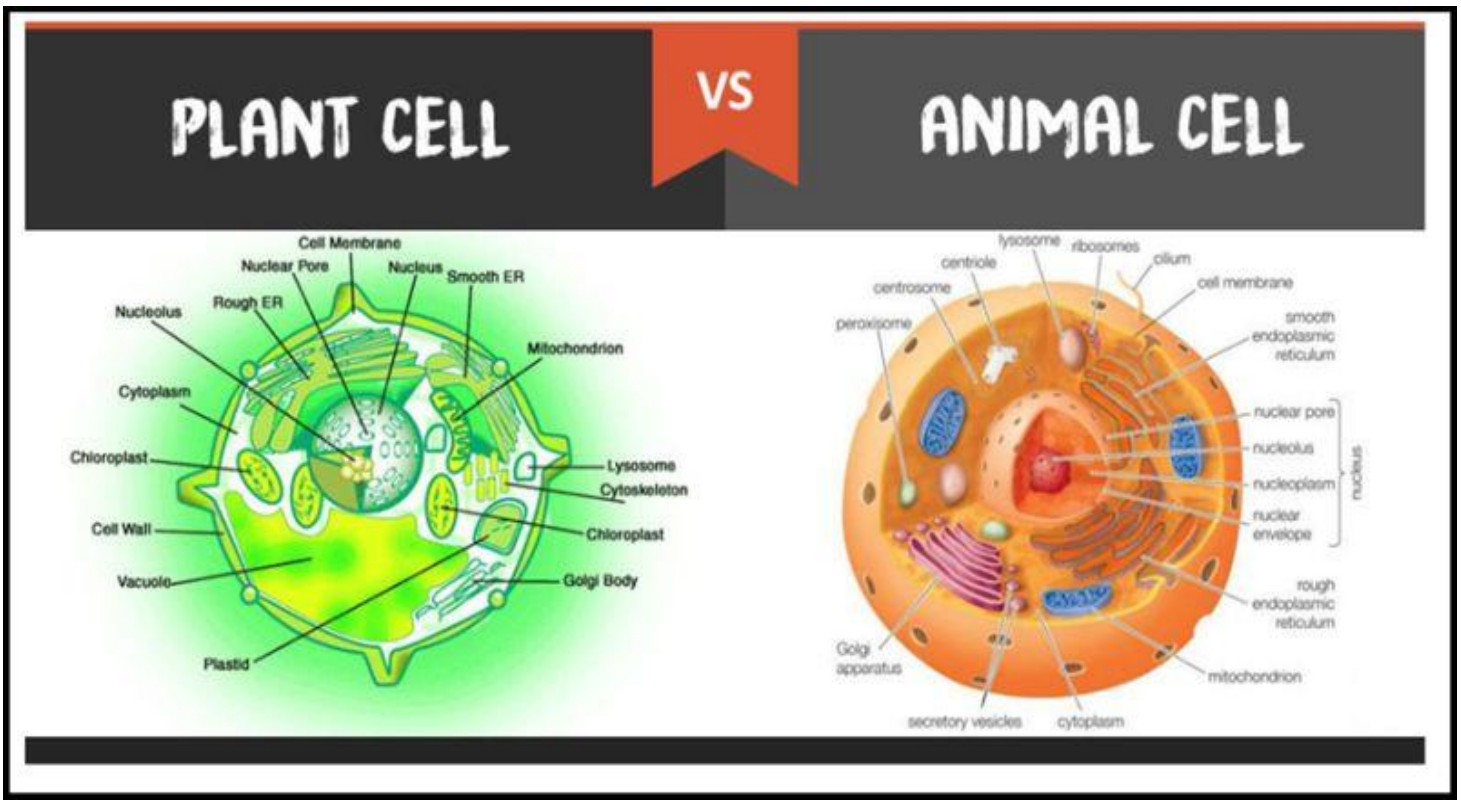
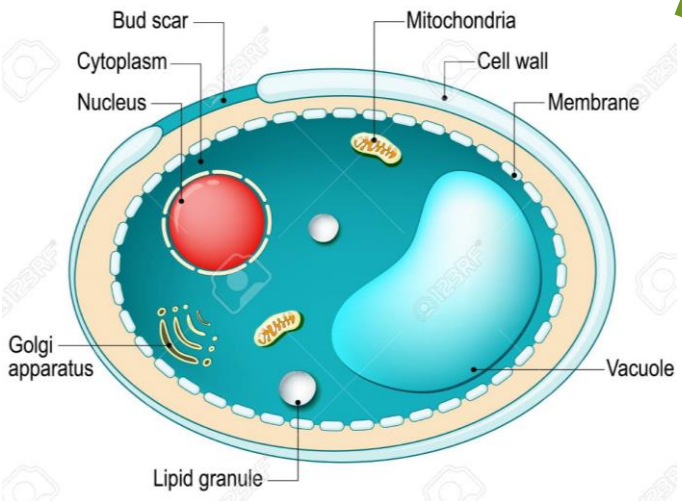


On the MAAP, the main Eukaryotic Cells are Plants, Animals, and Fungi Cells

YEAST CELL

(Fungal Cell)



Really know the key organelles (labeled parts). Organelles are like our organs in our body. Our organs help our body to function. <u>Organelles (little organs) help the different cells (body) function.</u>

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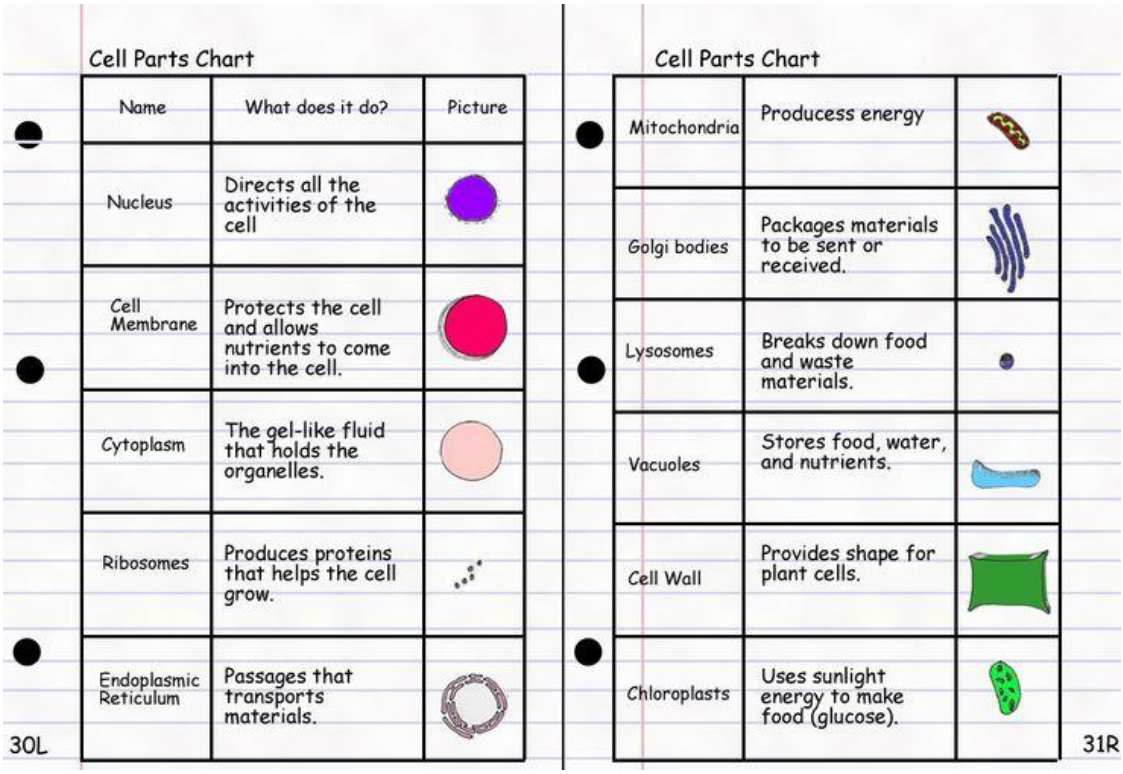
Key Organelles (little organs): Memorize the Highlighted/Underlined functions

- **Nucleus contains genetic information in the form of DNA**
- **Nucleolus is inside the nucleus and creates ribosomes**
- **Ribosomes travel through endoplasmic reticulum and makes (synthesize) proteins**
- **Endoplasmic reticulum helps makes lipids (fats) and transporting nutrients in the interior (inside) of the cell**
- **Golgi Apparatus (Golgi Bodies) prepares/packages protein to be imported (taken in) and exported (taken out) of the cell to be used**
- **Mitochondria makes energy for the cell to do all of its functions**
- **In the plant, the chloroplast creates a nutrient source (food) for the plant cell**
- **Cytoskeleton is network of protein fibers to help give the cell shape (like our bones)**
- **Vacuoles serves as storage for cells (like water & nutrients)**
- **Prokaryotic cells are simple in their structure w/o a membrane bound nucleus**
- **Eukaryotic cells are more complex with a membrane bound nucleus**
- **Viruses contains either RNA or DNA**
- **Viruses must have a host cell to reproduce.**



Cell Parts Chart

Name	What does it do?	Picture
Nucleus	Directs all the activities of the cell	
Cell Membrane	Protects the cell and allows nutrients to come into the cell.	
Cytoplasm	The gel-like fluid that holds the organelles.	
Ribosomes	Produces proteins that helps the cell grow.	
Endoplasmic Reticulum	Passages that transports materials.	

30L

Cell Parts Chart

Mitochondria	Producess energy	
Golgi bodies	Packages materials to be sent or received.	
Lysosomes	Breaks down food and waste materials.	
Vacuoles	Stores food, water, and nutrients.	
Cell Wall	Provides shape for plant cells.	
Chloroplasts	Uses sunlight energy to make food (glucose).	

31R

Cell Functions

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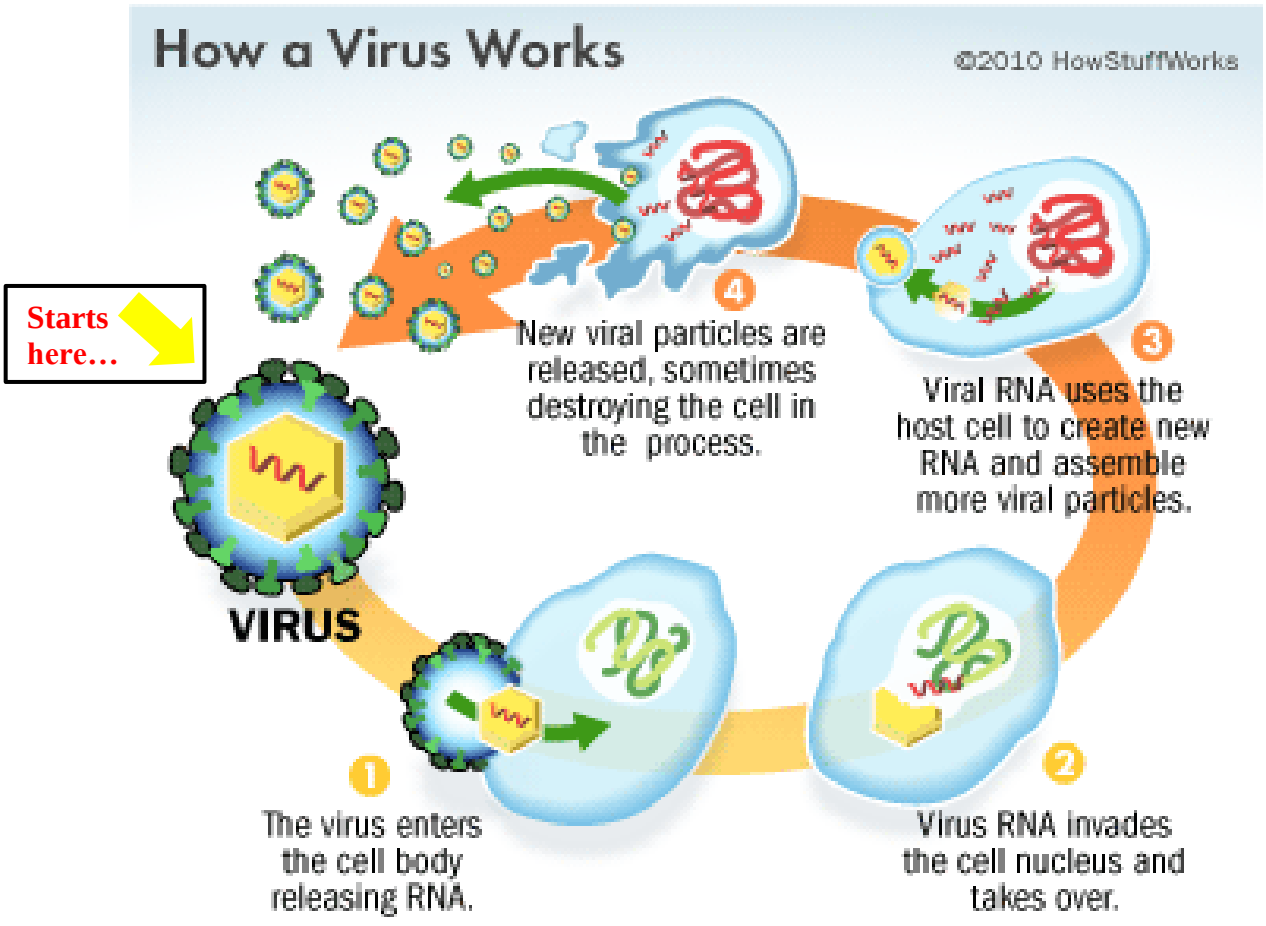
VERY IMPORTANT TO REMEMBER!!!!

Viruses are **not cells, nor** are they **alive**, **BUT** they possess a lot of the characteristics of what is alive (from week one).

Viruses must **use living cells** by taking over it (cell) to reproduce more itself (more viruses) = **Very BAD Relationship** (one-sided, benefits one side), the



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KEY VOCBULARY: DIVERSITY & FUNCTIONS

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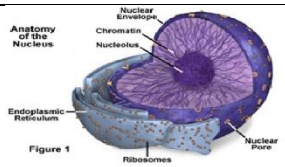
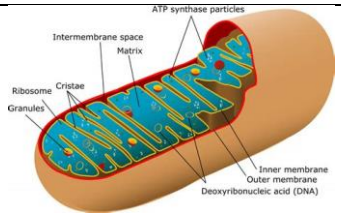
BIO. 1D. 2. Develop and use models to explain how the cell deals with imbalances of solute concentration across the cell membrane (i.e., hypertonic, hypotonic, and isotonic conditions, sodium/potassium pump).

Name Organelle (Part) that aids to the cell survival	**Picture**	**Function (Job/Purpose) that aids with survival**	**Located in the Plant Cell, Animal Cell or in Both**
Nucleus		-controls the cell -contains the genetic material (DNA) -surrounded by the Rough/Smooth ER -in Eukaryotic Cells	Both
Mitochondria		-"powerhouse of cell" -acts like a battery for the entire cells -mostly in Eukaryotic Cells -double membraned bounded which	Both

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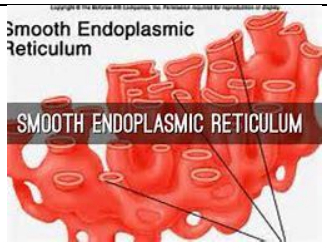
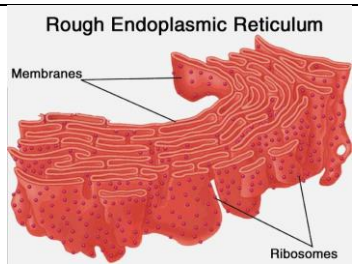
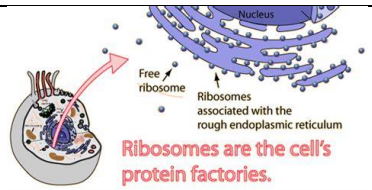
		forms like a "maze" in the center. -uses ATP produced during cellular respiration	
Smooth ER		-associated with protein synthesis (making of proteins) - moves cellular materials -attached to the Rough ER which is also attached to the nucleus	Both
Rough ER		-makes proteins for export to the outside of the cell and enzymes to be incorporated into cellular organelles such as lysosomes. -attached to the Rough ER which is also attached to the nucleus	Both
Ribosomes		-site of biological protein synthesis (translation). Ribosomes link amino acids together in the order specified by messenger RNA (mRNA) molecules.	Both
Golgi bodies (apparatus/complex)		-often thought of to be represented by a Postal office. it sorts proteins and other substances into vesicles. vesicles then send the proteins throughout the **cell**. It can also be seen as	Both (Mostly in animal)

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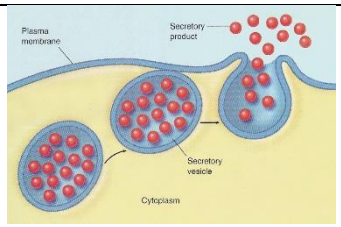
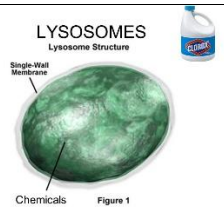
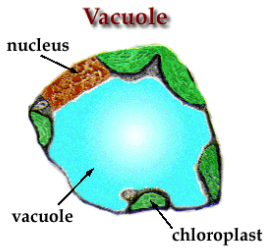
		shipping and receiving as the **cell** is a factory. They move stuff in a **cell**.	
Vesicles		-the bubble-like membranous structure that stores and transports cellular products, and digests metabolic wastes within the **cell**. The **cell** forms **vesicles** during exocytosis, endocytosis, and intracellular transport.	Both
Lysosomes		-are membrane-enclosed organelles that contain an array of enzymes capable of breaking down all types of biological polymers—proteins, nucleic acids, carbohydrates, and lipids. Lysosomes function as the digestive system of the cell	Mostly in Animal
Vacuoles		-vacuoles tend to be very large and are extremely important in providing structural support, as well as serving functions such as storage, waste disposal, protection, and growth	Plant (mostly)

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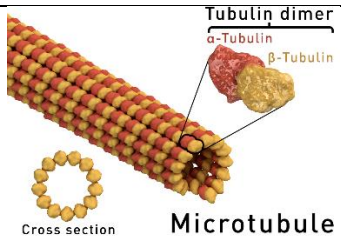
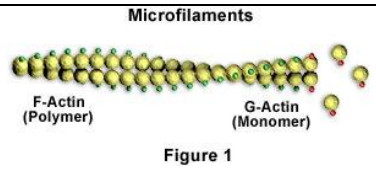
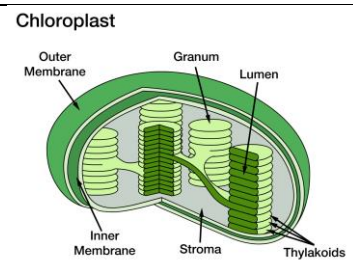
Microtubules		-Are proteins that help define cell structure and movement, - microtubules are thick, strong spirals of thousands of subunits. Those subunits are made of the protein called **tubulin**. - got their name because they look like a tube.	Both
Microfilaments		-Are proteins that help define cell structure and movement - are thin, strong spirals of thousands of subunits. Those subunits are made of the protein called **tubulin**. - got their name because they look like a tube.	Both
Chloroplast		- are organelles found in plant cells and eukaryotic algae that conduct photosynthesis. -absorb sunlight and use it in conjunction with water and carbon dioxide gas to produce food for the plant. -capture light energy from the sun to produce the free energy stored in ATP and NADPH through a process	Plant

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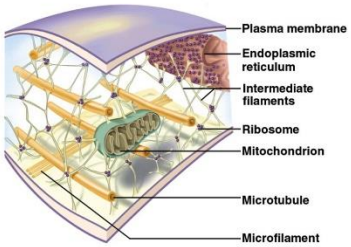
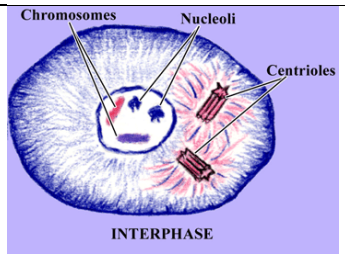
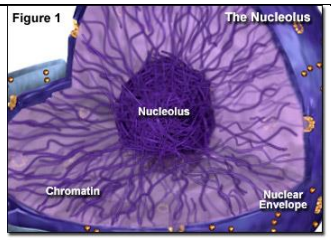
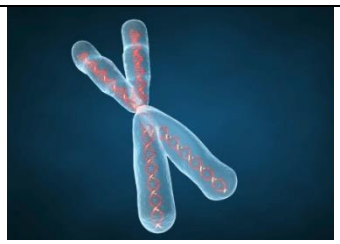
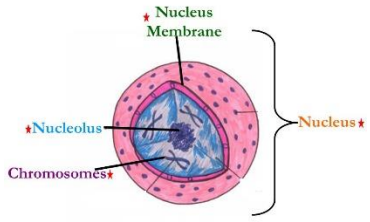
		called photosynthesis	
Cytoskeleton	Cytoskeleton Diagram 	a microscopic network of protein filaments and tubules in the cytoplasm of many living cells, giving them shape and coherence	Both
Centrioles		-are self-replicating organelles made up of nine bundles of microtubules and are found only in animal cells. They appear to help in organizing cell division	Both
Nucleolus		-largest structure in the nucleus of eukaryotic cells, where it primarily serves as the site of ribosome synthesis and assembly	Both
Chromosomes		-containing most of the DNA of a living organism -structured by being wrapped around protein complexes called nucleosomes	Both
Nuclear Membrane	Nucleus; Nucleolus; Nuclear membrane 	a **semi** permeable protective layer that covers the surface of the nucleus. The nuclear membrane protects the nucleus. One	Both

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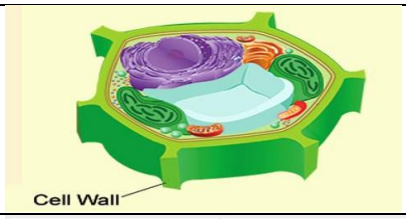
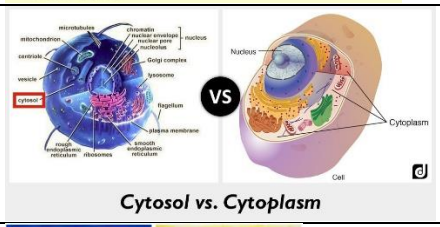
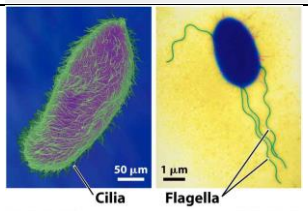
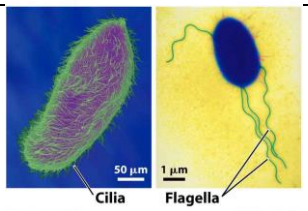
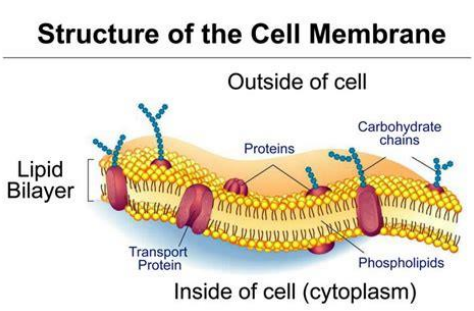
		function of the nuclear membrane is materials pass through this double membrane by going through pores.	
Cell Wall		- is the rigid, semi-permeable protective layer -Found on the outside of plants	Plants
Cytosol/ Cytoplasm		-the water-soluble components of cell cytoplasm	Both
Cilia		-are microscopic, hair-like structures that extend outward from the surface of many animal cells	Animal
Flagella		-a slender threadlike structure, especially a microscopic whiplike appendage that enables many protozoa, bacteria, spermatozoa, etc., to swim	Prokaryotes like Bacteria
Cell membrane		-The cell membrane is selectively permeable to ions and organic molecules and controls the movement of substances in and out of cells.	In both but on the outside of Animal

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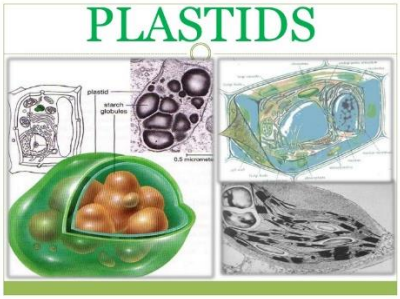
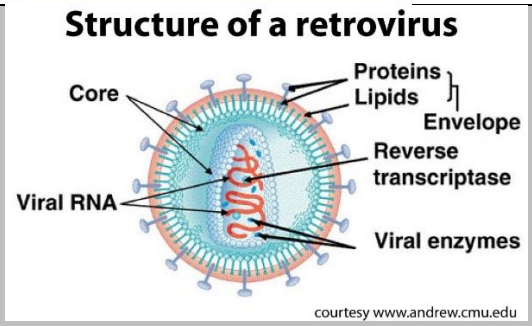
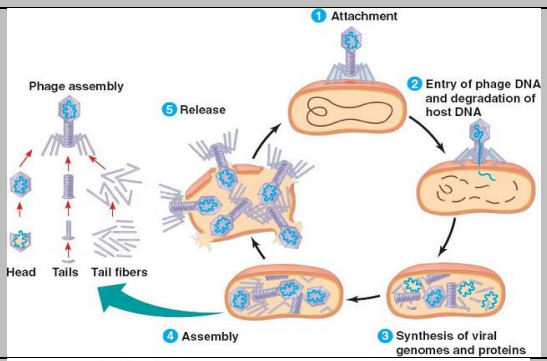
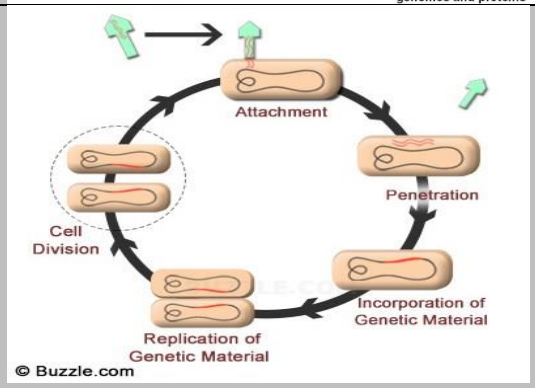
		-Bilayer (two layers)	
Plastids		-any of a class of small organelles, such as chloroplasts, <u>in the cytoplasm of plant cells, containing</u> pigment or food	Plants
Retrovirus		-type of **RNA virus** that inserts a copy of its genome into the DNA of a host cell that it invades, thus changing the genome of the cell, like HIV	Any Cell
Lytic Cycle		-**virus** results in the destruction of the infected cell and its membrane (ex. attack of a bacteria with a **bacteriophage)**	Any Cell
Lysogenic Cycle		-**a viral** mode of reproduction whereas time goes by. Although dormant (not active), it replicates itself by letting the host cell copy the virus' genetic material in cell division.	Any Cell

Video on the difference between the Lytic and Lysogenic Cycle on how Viruses reproduce itself.

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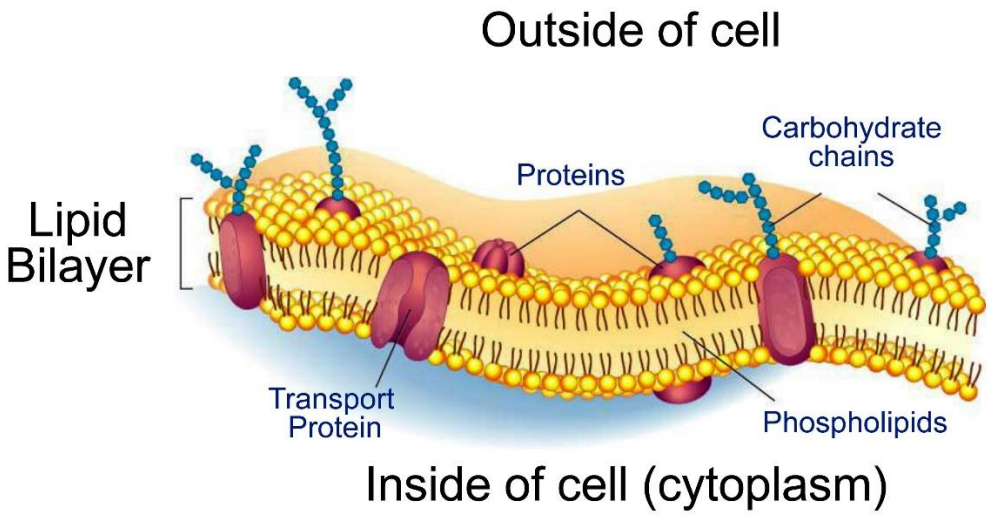
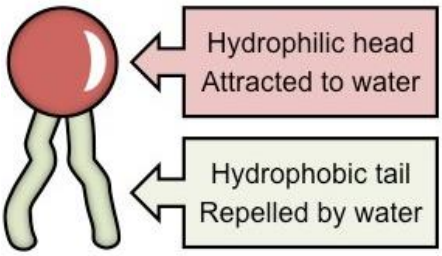
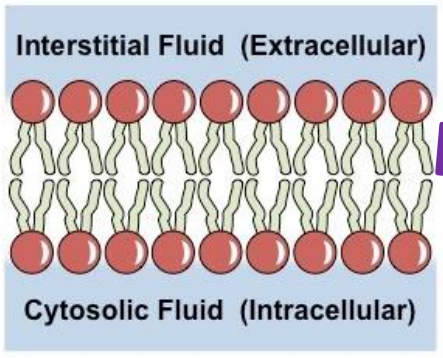
CELL MEMBRANE- BIO 1.D. 1-2

Structure of the Cell Membrane



Cell membrane acts as a door and allows certain materials in, out, and back into the cell.





Cell Membrane is the door

As materials go in and out of the cell and back in the cell, materials from high concentration to low concentration or vice versa through Active Transport & Passive Transport

The free flow of materials from inside the cell to the outside (vice versa) creates HOMESTATISIS – a steady stable equilibrium between elements

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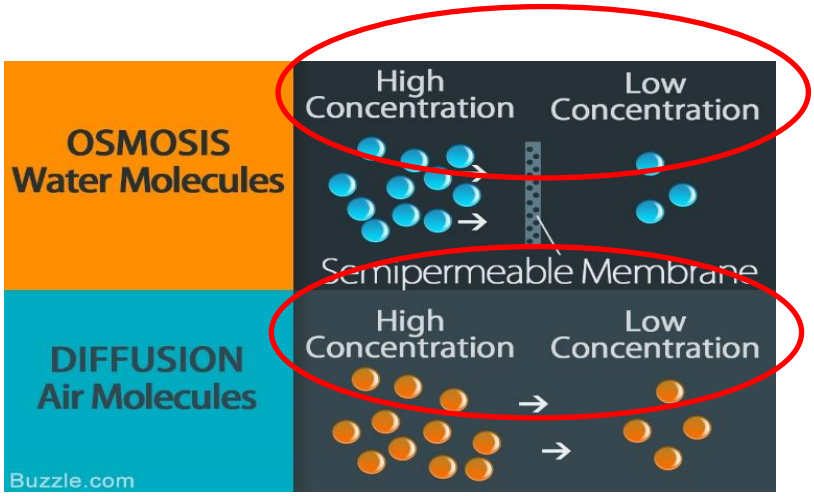
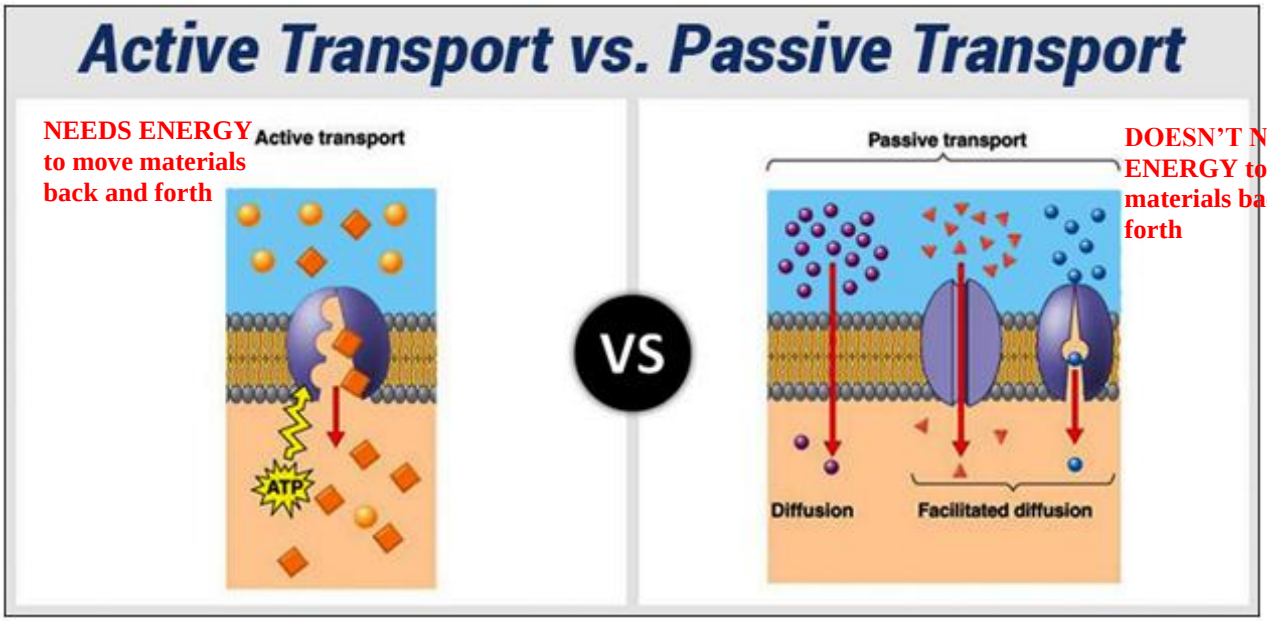
KNOW THIS KEY INFORMATION:



Aids in cell survival when moving from high concentration to low concentration and back (Homeostasis)

.



Passive vs. Active Transport

	Diffusion	Osmosis	Facilitated Diffusion	Gated Channel	Pumps	Endocytosis/ Exocytosis
Direction	High to Low	High to Low	High to Low	High to Low	Low to High	N/A
Transport Mechanism	Pores	Pores	Channels	Gated Channels	Pumps	Membrane
Energy Required?	No	No	No	No	Yes	Yes
Type of Particle	small nonpolar	water	small-medium	small-medium	ions	small-large
Examples of Particles	CO_2, O_2	H_2O	Glucose, Fructose, Na^+, Ca^{+2}	Glucose, Fructose, Na^+, Ca^{+2}	Na^+, K^+, H^+	food, waste

WATCH THIS

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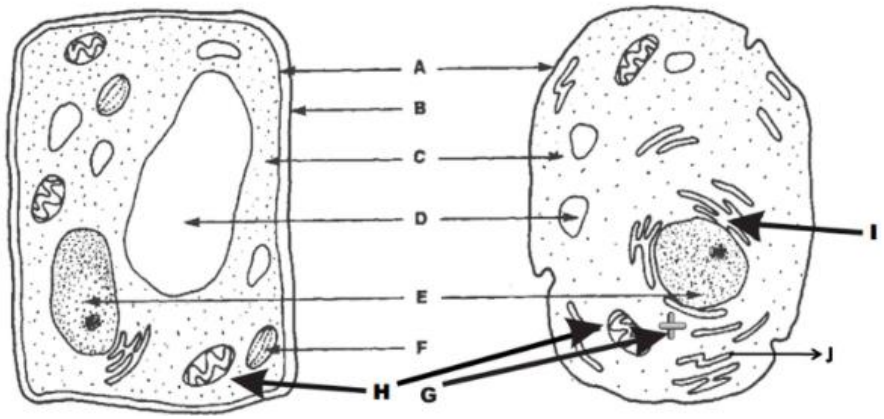
CONCEPTS REVIEW

1) Construct a hierarchy of life from cells to the biosphere.
   a. _____
   b. _____
   c. _____
   d. _____
   e. _____
   f. _____
   g. _____
   h. _____
   i. _____
   j. _____

2) label the parts of the plant and animal cells

_____cell _____ cell



Place the correct letter from above next to its name in the box below. Then uses these names to correctly fill in #'s 3-24.

Cytoplasm	Cell wall	Chromatin (DNA)	Nucleus
Cell Membrane	Golgi body	Chloroplast	Vacuole
Nuclear Membrane	Mitochondria	Cytoskeleton	Lysosome
Nucleolus	Rough ER	Smooth ER	Ribosome

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3) _____ cells lack a nucleus and membrane bound organelles.

4) A _____ cell is an example of a prokaryotic cell.

5) _____ cells have a nucleus and membrane bound organelles.

6) _____ and _____ cells are eukaryotic cells

7) The _____ are responsible for making (synthesizing) proteins.

8) The _____ provides a framework for the cell.

9) The _____ _____ acts as a selectively permeable barrier around the cell.

10) The tail (whip-like projections) of a cell that allows it to move from place to place is called a _____

11) The tiny hair-like projections on the outside of a cell that allows it to move form place to place are called _____.

12) The _____ is the jello-like interior of the cell that holds all of the organelles.

13) The _____ _____ is the membrane that surrounds the nucleus.

14) The _____ is the site of ribosome synthesis.

15) The _____ _____ provides structure and support for the plant cell.

16) The _____ _____ modifies, sorts, and packages proteins for transport in and out of the cell.

17) The _____ is the powerhouse of the cell, making the energy needed to carry out cellular functions.

18) The _____ _____ serves as a transport system within the cell.

19) The _____ endoplasmic reticulum has ribosomes attached to it.

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20) The _____ endoplasmic reticulum is the site of carbohydrate and lipid production.

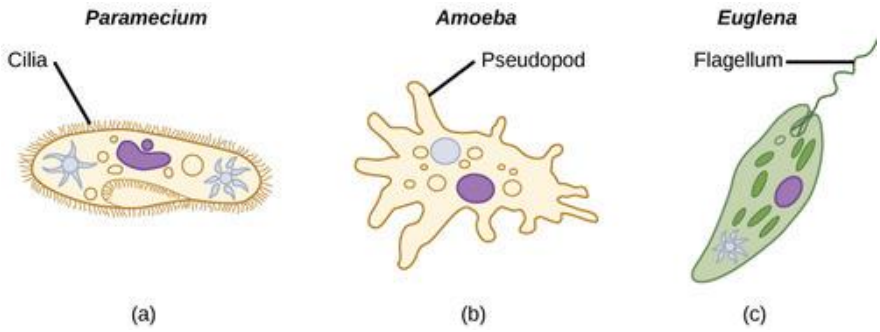
21) The _____ is specialized plant cell structure that makes food with energy form the sun.

22) The _____is the control center of the cell and stores all of the genetic information (DNA) of the cell.

23) _____ are the storage facilities of the cell.

24) _____ contain digestive enzymes and are found mainly in animal cells.

25) Identify how each of the cells below move in their environment: flagella, cilia, pseudopodia.



26) Place the following stages of the virus life cycle (lytic cycle) in the correct order by number the statements 1-5

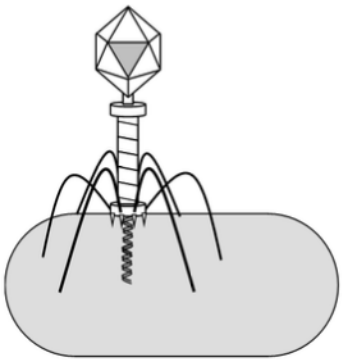
_____ A. The host cell lyses, or bursts, releasing copies of the replicated virus which are free to infect other cells.

_____ B. The sheath contracts, and the tail plunges into the host cell, injecting DNA into the host's cytoplasm.

_____ C. Tail fibers attach to specific receptors on the host cell and the base plate pins attach to the cell membrane.

_____ D. The virus' DNA is copied, transcribed, and translated to synthesis viral proteins.

_____ E. Capsid proteins are assembled around the replicated viral DNA forming multiple copies of the bacteriophage.



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MAAP TEST PREP

1)

Which structures distinguish plant cells from animal cells?

A	ribosomes and vacuoles
B	vacuoles and mitochondria
C	chloroplasts and cell membranes
D	chloroplasts and cell walls

a) Define the following terms from the question above:

Distinguish

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

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2)

A scientist is studying a cell that has a rigid cell wall with many hair-like projections on the outer surface. The genetic material is not enclosed by a membrane.

Which cell is the scientist observing?

A	a cheek cell
B	a leaf cell
C	a blood cell
D	a bacterial cell

a) Define the following terms from the question above:

Projections

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

3)

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E. coli **and a mammalian cell both contain DNA. However,** ***E. coli*** **is a prokaryotic cell, and a mammalian cell is a eukaryotic cell.**

What is one reason for classifying ***E. coli*** **as a prokaryotic cell?**

A The DNA of *E. coli* contains fewer base pairs.

B The DNA of *E. coli* does not undergo transcription.

C The DNA of *E. coli* replicates twice prior to cell division.

D The DNA of *E. coli* is not enclosed in a nuclear membrane.

a) (circle the correct answer) E.Coli are (Prokaryotes / Eukaryotes) where as mammalian cells are (Prokaryotes / Eukaryotes)

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

4)

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The chart lists a few structural characteristics of viruses.

1. Viruses are extraordinarily small in size.
2. Viruses are not specific to their hosts.
3. Viruses contain either DNA or RNA as genetic material.
4. Viruses lack cellular organization.

Based on the information, which characteristic explains why viruses are unable to reproduce on their own?

A	characteristic 1
B	characteristic 2
C	characteristic 3
D	characteristic 4

a) Define the following terms from the question above:

Extraordinarily

Host

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

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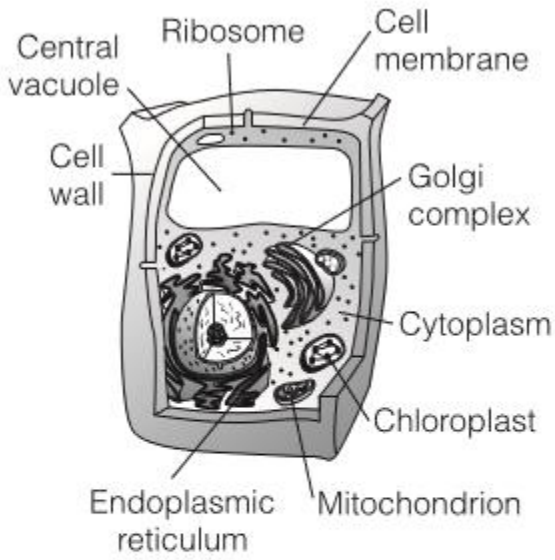
MDE PT. 1 # 42

A diagram of a cell is shown.



The cell shown in the diagram is found in which type of organism?

F Bacterium
G Moss
H Paramecium
J Yeast

Answer G: **Clues-** "Moss" is a plant. Plants have central vacuoles. F is a prokaryotic not a eukaryotic, Same for H. Yeast do not have vacuoles.

MDE PT. 2 # 4

After a protein is constructed at the ribosome, it can be transported to the Golgi complex for modification.

What cellular structure is used in this transport?

F Lysosome
G Mitochondrion
H Nuclear pore
J Endoplasmic reticulum

Answer J. **Clues**- "construction of protein" this occurs in J. F's job is to clean the cell, G provide energy, and H does allow for transport but doesn't have anything to construct protein.

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MDE PT. 2. # 16

What part of the cell has a similar function to a school security guard, whose job it is to control who enters and leaves the school?

F Nucleus
G Golgi body
H Mitochondrion
J Cell membrane

Answer J. **Clues-** "Controls what enters and leaves". F, G, and H are inside the cell and serve different functions for the survival of the cell.

MDE PT. 2. # 36

When red blood cells are placed in distilled water, the cells swell as water molecules enter them.

By what process do water molecules move into the cells?

F Facilitated diffusion
G Active transport
H Endocytosis
J Osmosis

Answer J. **Clues-**"Cell Swells"- Increase of concentration. F is the spreading out of concentration. G is the overall process and H is the entrance of molecules into the cells.

MDE PT. 2 # 56

In the grana of a chloroplast, sunlight energy is used to split water molecules and provide cellular energy.

In the cells of which type of organism would this process occur?

F Tree frog
G Bread mold
H Bermuda grass
J Monarch butterfly

Answer H. **Clues-** "chloroplast" = plant. Plants only have chloroplast and the rest of the answer choices are not plats. They are animal or fungi.

MDE. PT. 3 # 1

Which cell structure does a bacterial cell lack?

A Ribosome
B Cell wall
C Lysosome
D Cytoskeleton

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Answer C. **Clues-** "Lack". This means that the bacterial cell has everything except one.

MDE PT. 3 # 5

Which of the following organelles are most common in a plant cell?

A Centrioles
B Flagella
C Lysosomes
D Plastids

Answer: D. **Clues-**"most common in plant". Answers A, B, C are mostly in animal cells.

MDE PT. 3 # 11

Which of the following functions is controlled by the cell membrane?

A Excreting waste
B Replicating DNA
C Producing energy
D Assembling proteins

Answer A. **Clues-** "Excretes" = out . Cell membrane controls what enters and exits out of the animal cell.

MDE PT.3 # 65

Which organelle performs digestive functions for the cell?

A Ribosome
B Lysosome
C Golgi body
D Endoplasmic reticulum

Answer B. **Clues-** "digestive function". The only answer choice that digest within the cell are lysosomes. A make proteins, C, transports, and D. assembles the ribosomes.

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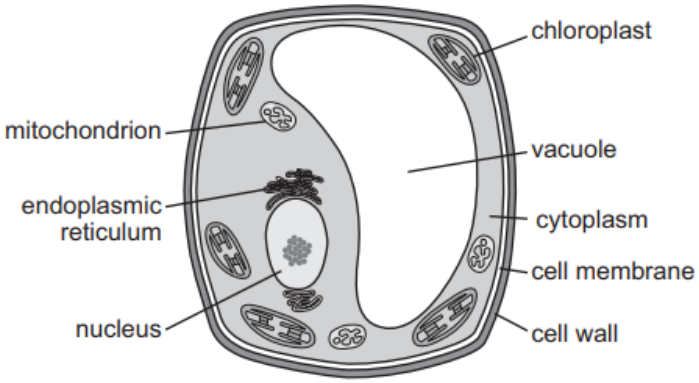
19. A labeled model of a plant cell is shown below.

Plant Cell Model



Which organelles work together to help a plant cell store and remove excess nutrients?

A. cytoplasm, nucleus, and vacuole

B. vacuole, cell membrane, and cell wall

C. chloroplast, mitochondrion, and cell wall

D. nucleus, endoplasmic reticulum, and chloroplast

Answer: B. Clues: "Storage" ….Vacuole "Stores" and so does the membrane and well (proteins & carbohydrates, etc."

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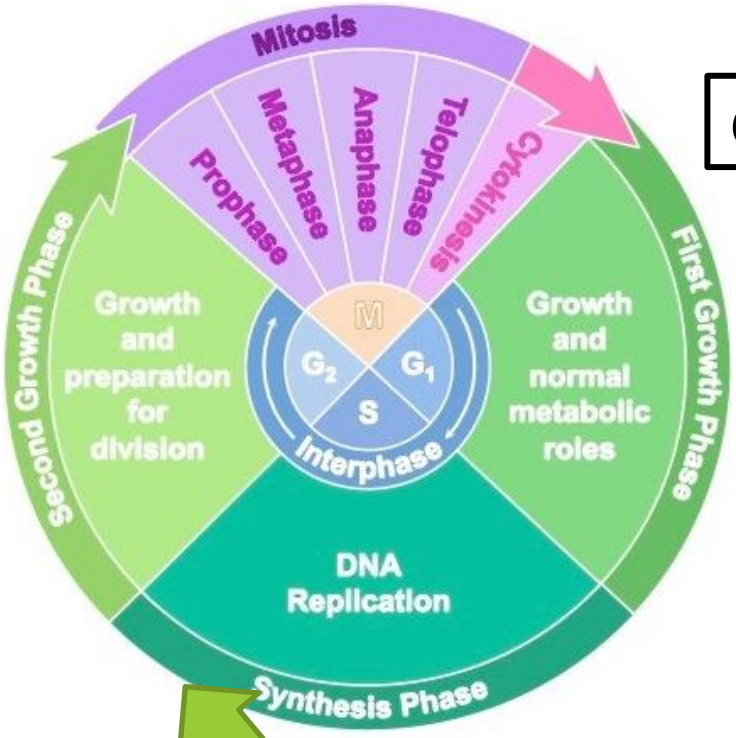
SECTION 3
CELLS: CELL CYCLE, CELL DIVISION, AND REPRODUCTION

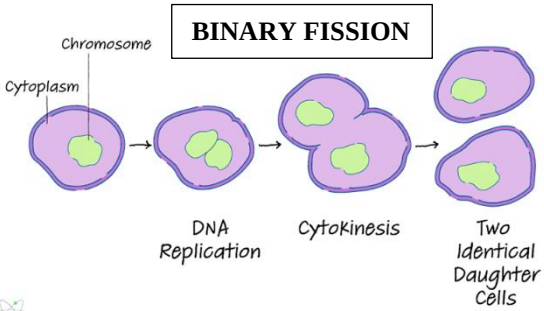
Important Relationship:
Cell Cycle leads to Cell Division

BIO. 1 E. 1-2/ 3A. 1-3

Cell Division

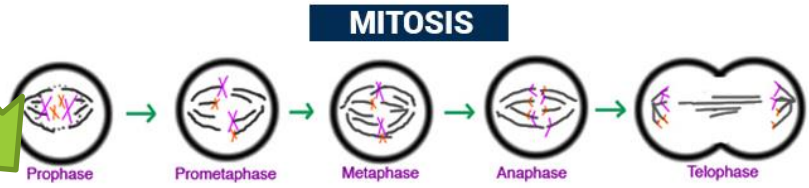
CELL CYCLE

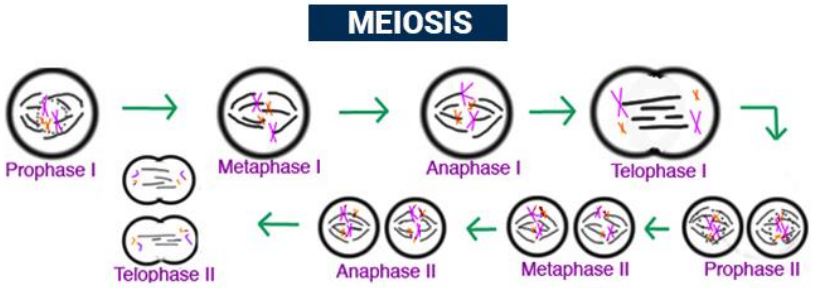




EXPLAINS BOTH

Types of Cell Division





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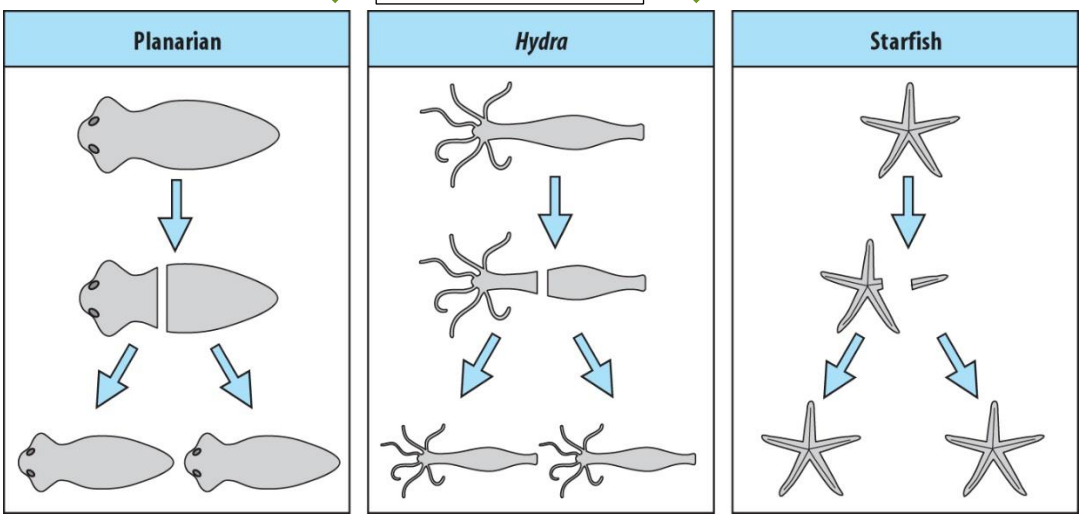
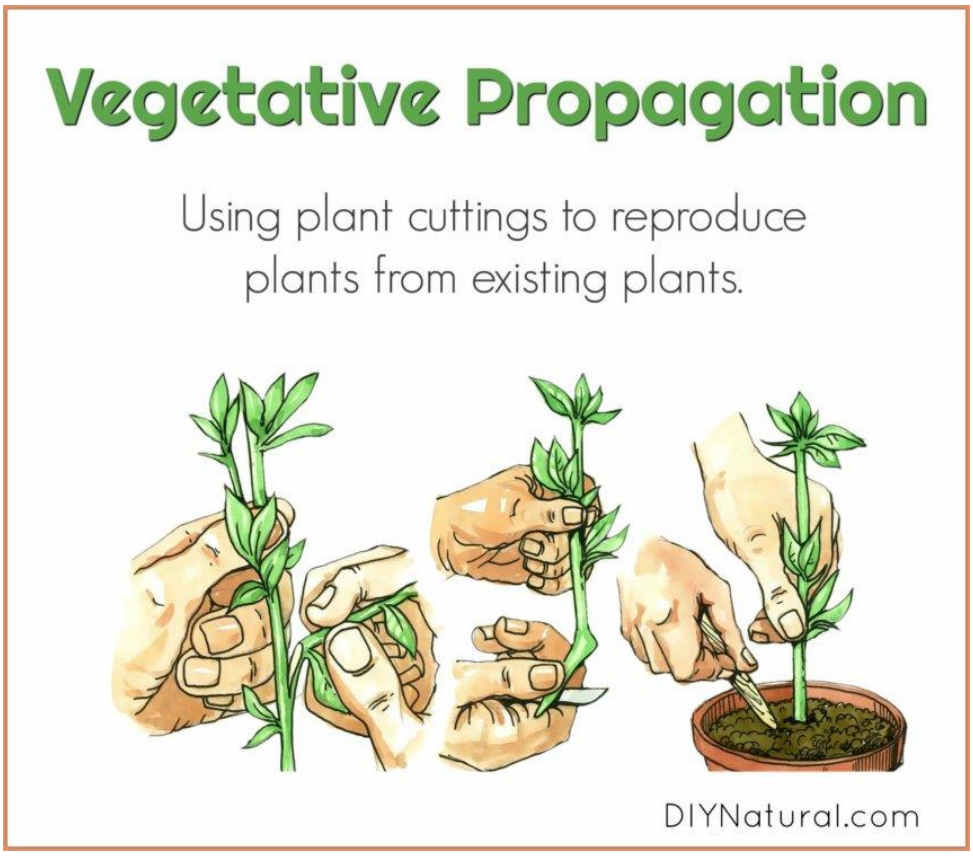
REGENEARTION





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KEY CONCEPTS ABOUT CELLS: CELL CYCLE, CELL DIVISION, AND REPRODUCTION

MS-CCR Standard(s):

Bio. 1E. Students will relate the diversity of organelles to a variety of specialized cellular functions.

BIO. 1E. 1. Construct models to explain how the processes of cell division and cell differentiation produce and maintain complex multicellular organisms.

BIO. 1E. 2. Identify the describe the changes that occur in a cell during replication. Explore problems that might occur if the cell does not progress through the cycle correctly (cancer).

BIO. 1E. 3. Relate the processes of cellular reproduction to asexual reproduction in simple organisms (i.e., budding, vegetative propagation, regeneration, binary fission. Explain why the DNA of the daughter cells is the same as the parent cell.

BIO 1E. 4. Enrichment: Use an engineering design process to investigate the role of the stem cells in regeneration and asexual reproduction, then develop application of stem cell research to solve human medical conditions.

BIO. 3A. Students will develop and use models to explain the role of meiosis in the production of haploid gametes required for sexual reproduction.

BIO. 3A. 1. Model sex cell formation (meiosis) and combination (fertilization) to demonstrate the maintenance of chromosome number through each generation in sexually reproducing populations. Explain why the DNA of the daughter cells is different from the DNA of the parent cell.

BIO. 3A. 2. Compare and contrast mitosis and meiosis in terms of reproduction.

Important: Types of Cell Division based on reproduction to study

Type of Cell Division	Asexual Reproduction	Sexual Reproduction	What are the offspring called?
Mitosis	✓		**Daughter cells**
Meiosis		✓	**Daughter cells**
Binary Fission	✓		**Daughter cells**
Vegetative Propagation	✓		**Uniform Offspring**
Regeneration	✓		**Uniform Offspring**
Budding	✓		**Uniform Offspring**

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(1) Types of Reproduction

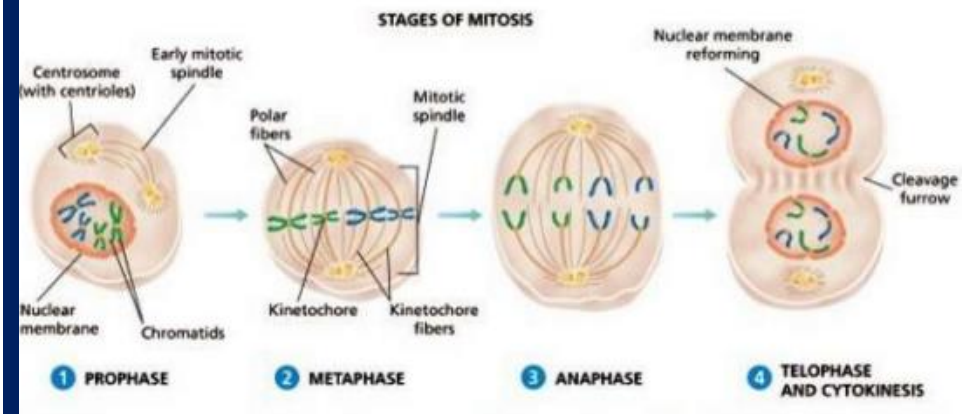
SEXUAL	ASEXUAL
• Requires 2 parent organisms.	• Requires 1 parent organism.
• Sperm + Egg fertilize one another to form a Zygote.	• The single organism makes a copy of itself and divides.
• The offspring are genetically unique from the parents, but contain a random combination of parental genes.	• The offspring are genetically identical to the parent.
• Used by humans, other animals and plants.	• Used by yeast, sponges, and bacteria.
• Pros → Produces genetically different babies, increasing the survival rate of the population. • Cons → Requires a lot of time and effort.	• Pros → Extremely efficient. • Cons → If the parent has genetic defects / deficiencies, all of its offspring will also be "weak".

Let's take a deeper look

Stages of Mitosis

Key Information:

- End of Mitosis ends with 2 daughter cells
- Miosis= somatic or body cells



Clues

Prophase- chromosomes are bunch up/about to divide

Metaphase- chromatids line up in the middle

Anaphase- separate/ move to opposite sides of the cells

Telophase- 2 new nuclear membrane starts to form.

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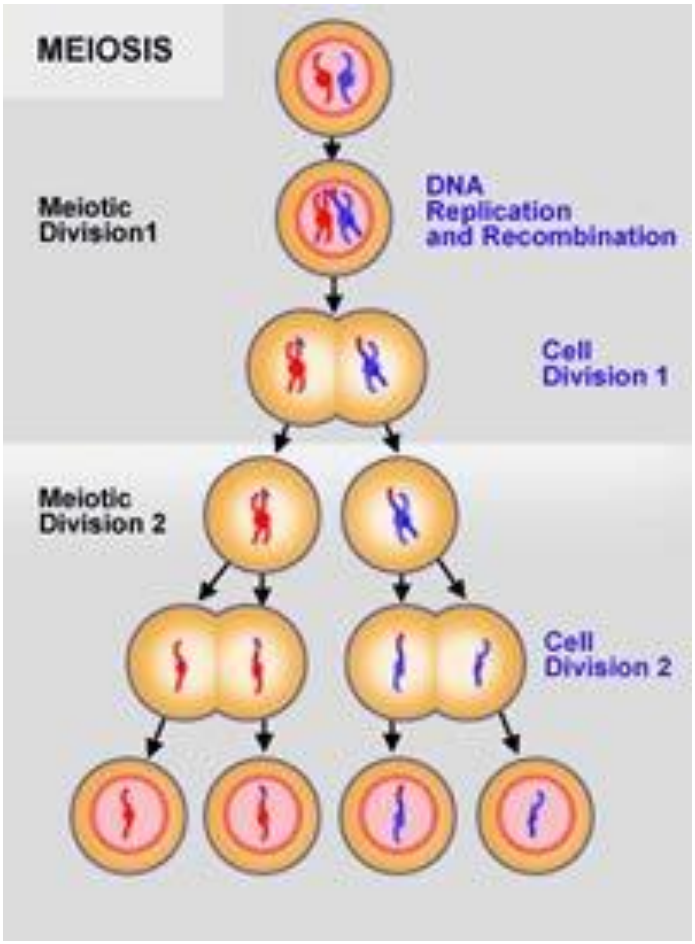
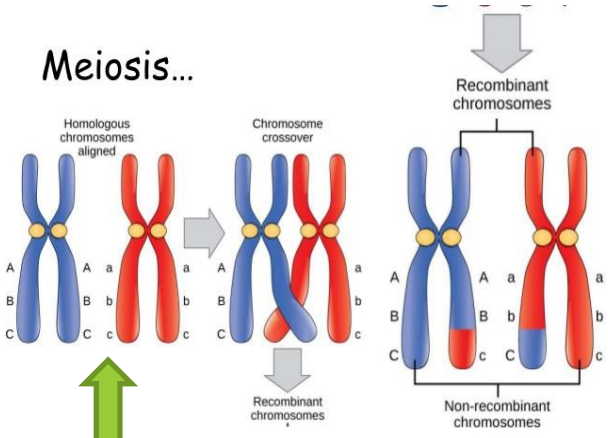


Remember
-During cross over below, genetic variation increases

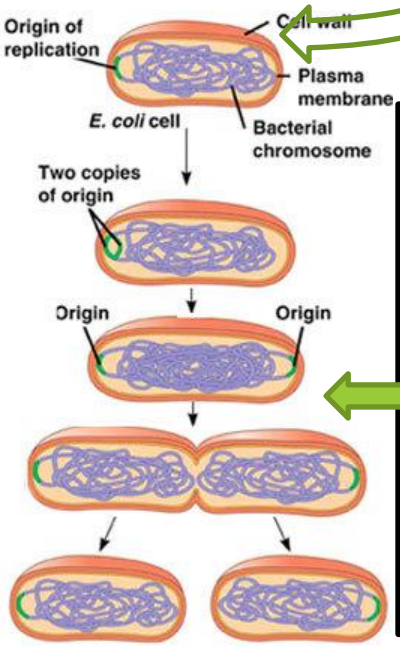


Key Information:

- Meiosis makes the sex cells called gametes (sperm=male & egg=female)
- At the end of Meiosis 4 gametes. 4 sperm survive and 1 out of the 4 eggs survives
- Meiosis- zygotes ends up with half of the parent's chromosome.

BINARY FISSION

1. Chromosome replication begins. Soon thereafter, one copy of the origin moves rapidly toward the other end of the cell.
2. Replication continues. One copy of the origin is now at each end of the cell.
3. Replication finishes. The plasma membrane grows inward, and new cell wall is deposited.
4. Two daughter cells result.



Key Information:

- DNA of bacterium uncoils and duplicates.
- DNA is pulled to separate poles of the bacterium.
- a growing (new) cell wall begins to separate the bacterium.
- the complete development of the cell wall results in the. split of the bacterium.
- the daughter cells have tightly coiled DNA rods, ribosomes, and. plastids.

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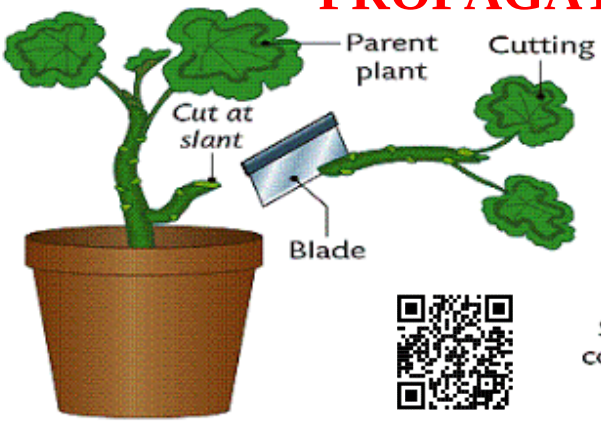
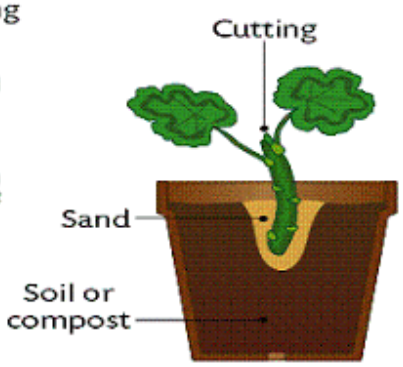
VEGATATIVE PROPAGATION





Key Information:

- DNA of bacterium uncoils and duplicates.
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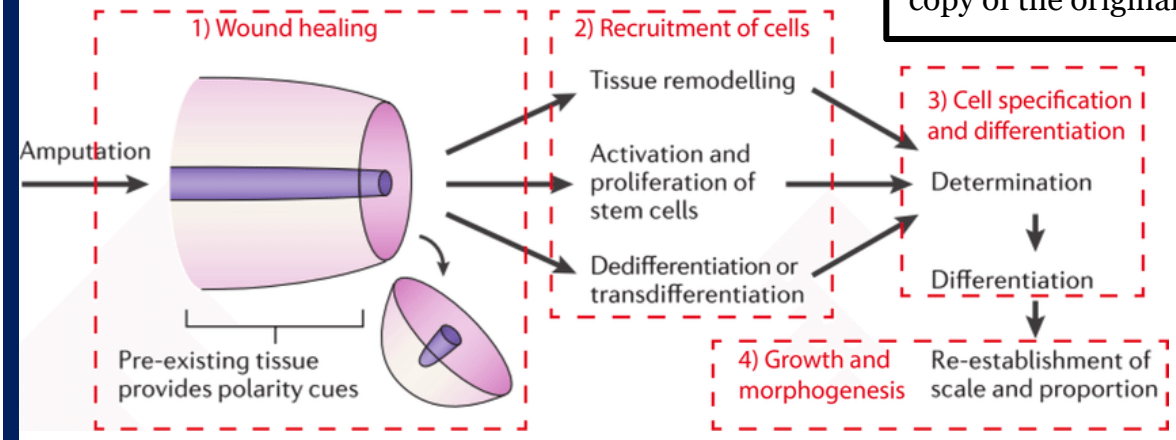
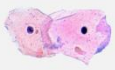
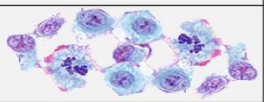
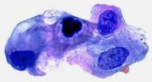
REGENERATION

Remember
-During regenartion, a piece cut off, comes back as the exact length and copy of the original



Problems within cell division can lead to cancer….

Normal	Cancer	
		Large, variably shaped nuclei
		Many dividing cells; Disorganized arrangement
		Variation in size and shape
		Loss of normal features

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KEY VOCABULARY CELLS: CELL CYCLE, CELL DIVISION, AND REPRODUCTION

MS-CCR Standard(s):

Bio. 1E. Students will relate the diversity of organelles to a variety of specialized cellular functions.

BIO. 1E. 1. Construct models to explain how the processes of cell division and cell differentiation produce and maintain complex multicellular organisms.

BIO. 1E. 2. Identify the describe the changes that occur in a cell during replication. Explore problems that might occur if the cell does not progress through the cycle correctly (cancer).

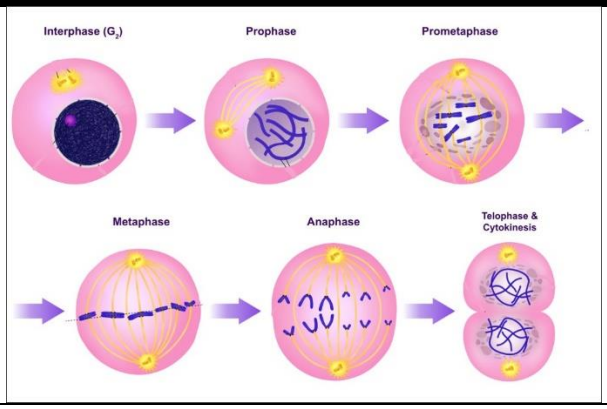
BIO. 1E. 3. Relate the processes of cellular reproduction to asexual reproduction in simple organisms (i.e., budding, vegetative propagation, regeneration, binary fission. Explain why the DNA of the daughter cells is the same as the parent cell.

BIO 1E. 4. Enrichment: Use an engineering design process to investigate the role of the stem cells in regeneration and asexual reproduction, then develop application of stem cell research to solve human medical conditions.

BIO. 3A. Students will develop and use models to explain the role of meiosis in the production of haploid gametes required for sexual reproduction.

BIO. 3A. 1. Model sex cell formation (meiosis) and combination (fertilization) to demonstrate the maintenance of chromosome number through each generation in sexually reproducing populations. Explain why the DNA of the daughter cells is different from the DNA of the parent cell.

BIO. 3A. 2. Compare and contrast mitosis and meiosis in terms of reproduction.

KEY TERMS	KEY IMAGE	CLUES TO REMEMBER
Cell division		- Two main types (mitosis/meiosis) - Result of the Cell cycle

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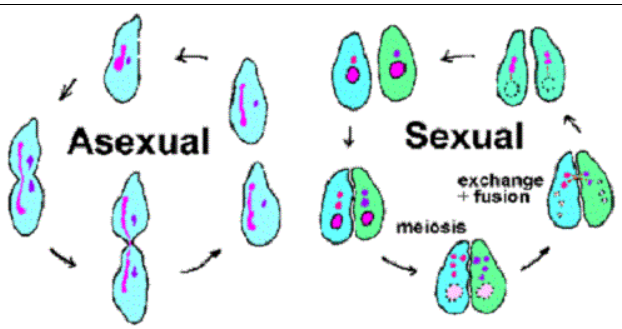
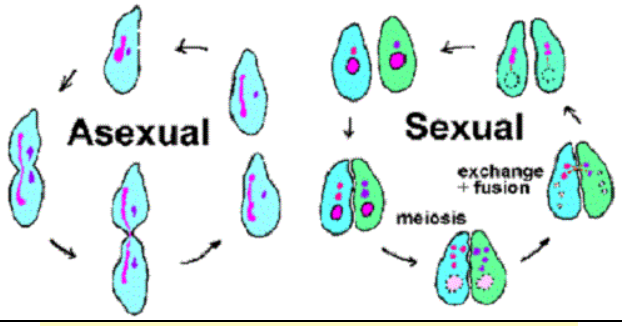
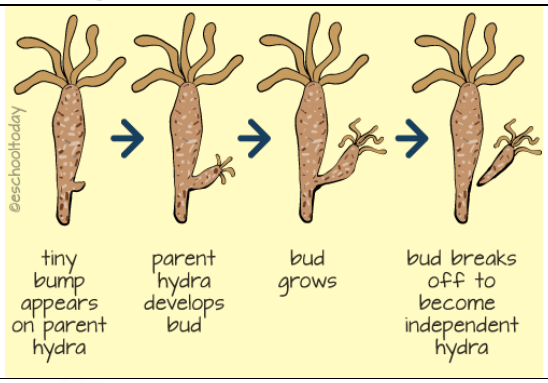
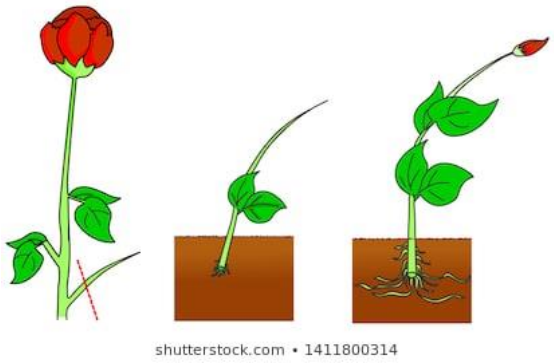
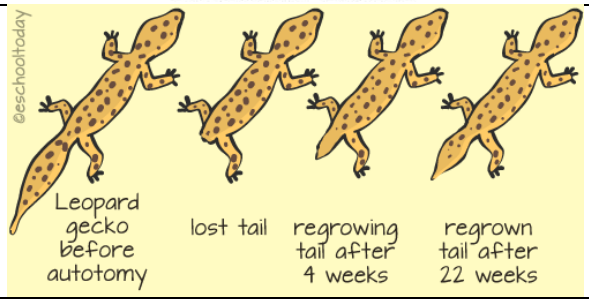
Asexual Reproduction		- Produces identical offspring from ONE single parent cell
Sexual Reproduction		- Produces genetically different offspring from TWO parent cells
Budding		- Type of asexual reproduction - Results in an exact copy of the parent cell
Vegetative Propagation		- Type of asexual reproduction - Results in an exact copy of the parent cell
Regeneration		- Type of asexual reproduction - Results in an exact copy of the parent cell

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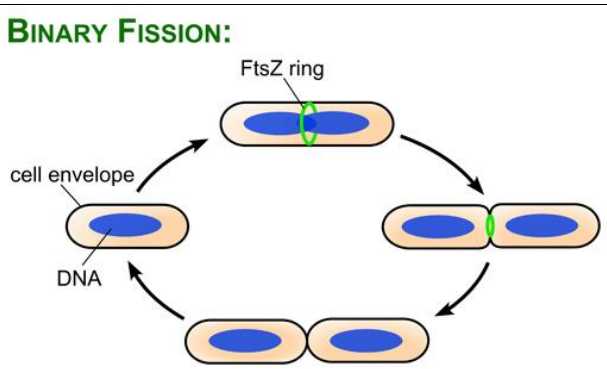
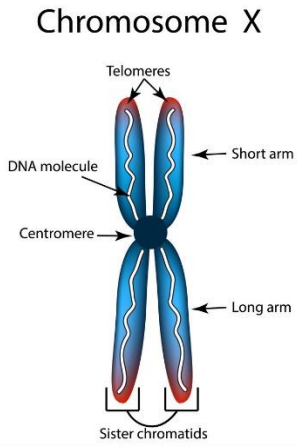
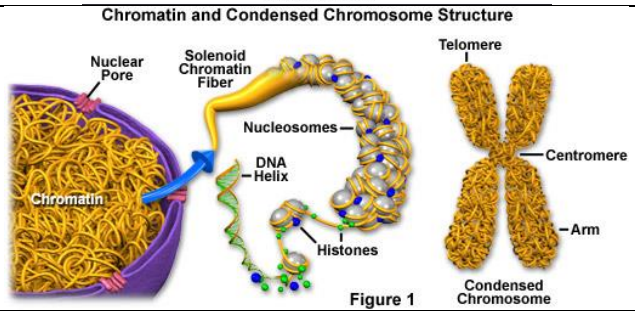
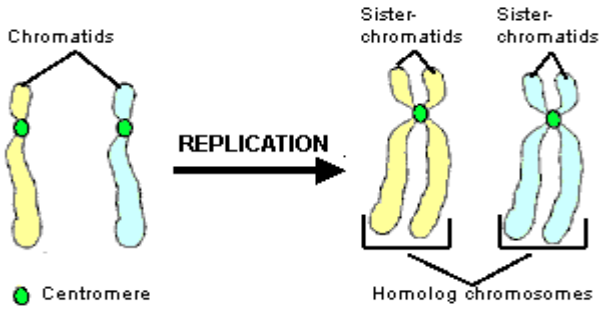
Binary Fission		- Type of asexual reproduction - Results in an exact copy of the parent cell
Chromosome		- In cell division, the chromosome replicates in the nucleus
Chromatin		- Composed of DNA & proteins that condense (shrink) to form chromosomes in cell division.
Chromatid		- One side of the chromosome

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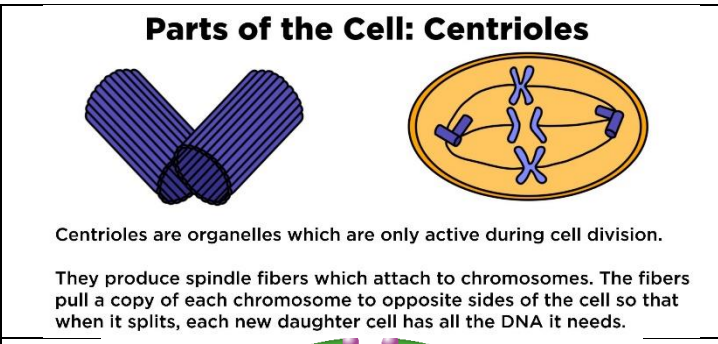
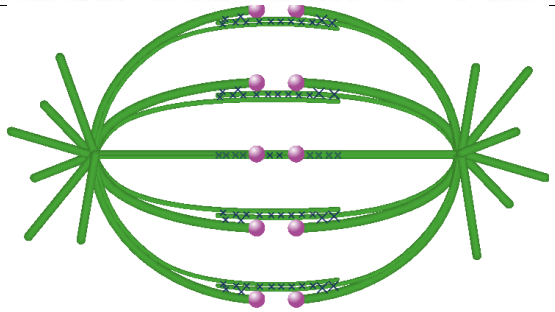
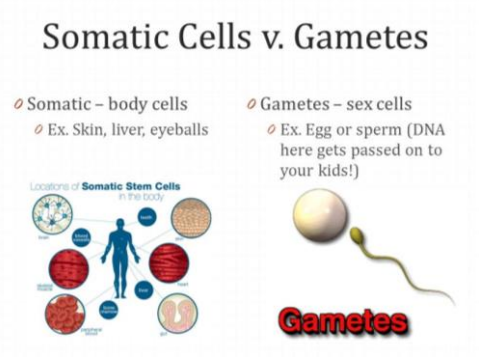
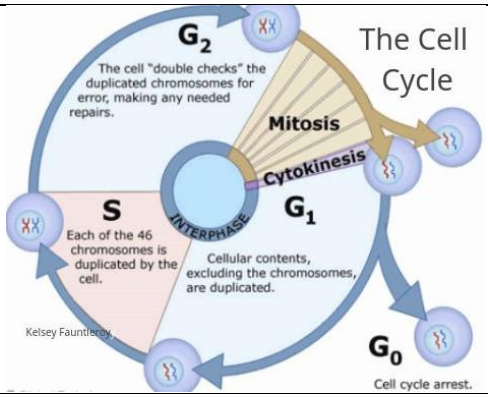
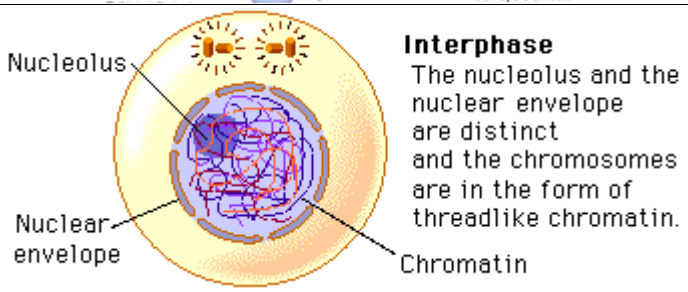
Centriole		- Helps form the spindle fibers that are used to separate the chromosomes
Spindle Fibers		- Separate the chromosomes during Anaphase of Cell division
Somatic Cells		- Body cell (none sex cells)
Cell Cycle		- Process used to reproduce cells resulting in two daughter cells
Interphase		- Cell mostly stays in this phase and copies its DNA waiting to divide

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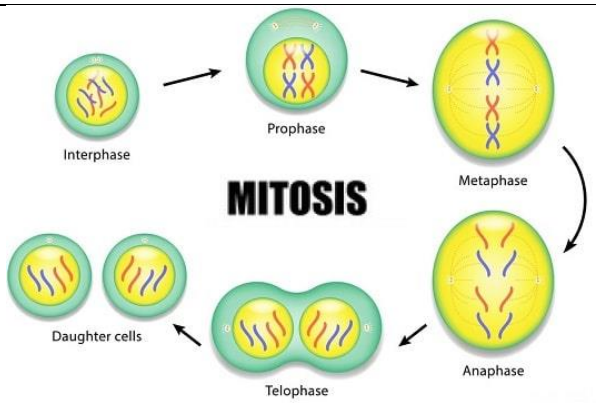
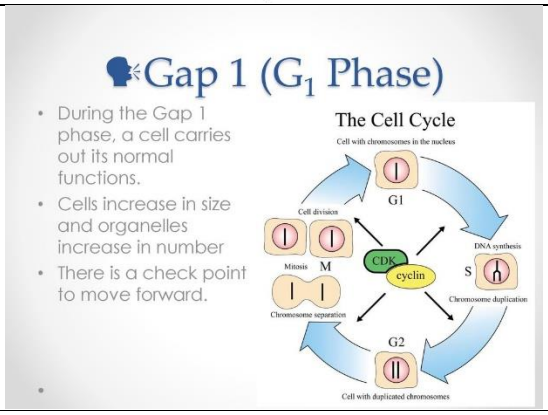
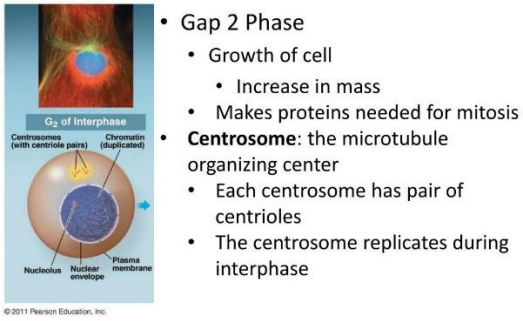
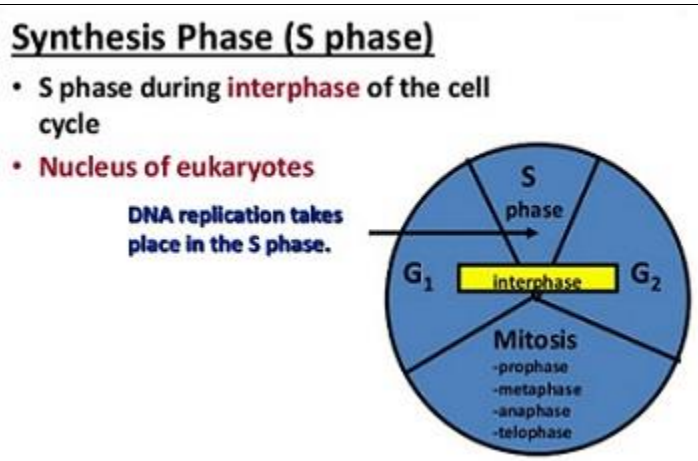
Mitosis		- a part of the cell cycle when replicated chromosomes are separated into two new nuclei
Gap 1 Phase		- the first of four phases of the cell cycle, the cell synthesizes mRNA and proteins in preparation for subsequent steps leading to mitosis
Gap 2 Phase		- the third subphase of interphase in the cell cycle directly preceding mitosis, the cell's DNA is replicated
Synthesis Phase		- DNA is packaged into chromosomes and replicated. This event is an essential aspect of the cell cycle because replication allows for each cell created by cell division to have the same genetic make-up.

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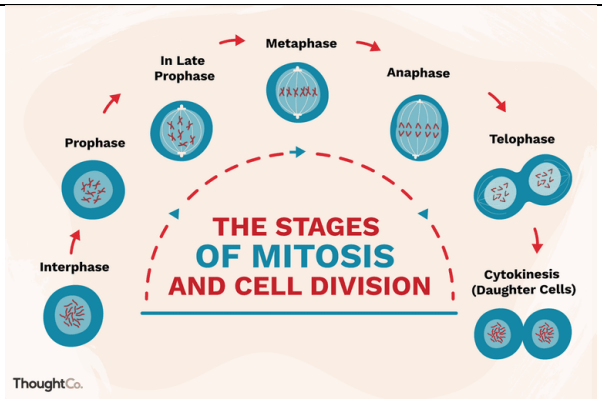
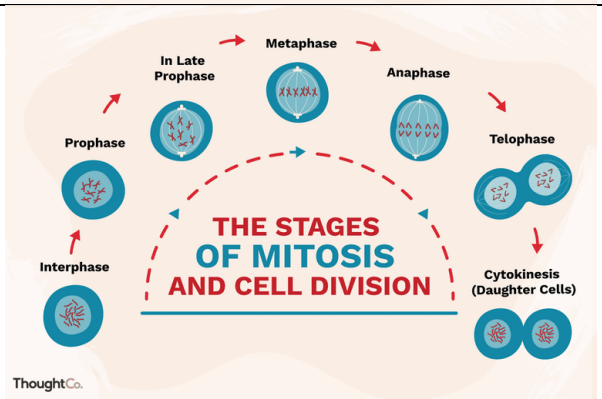
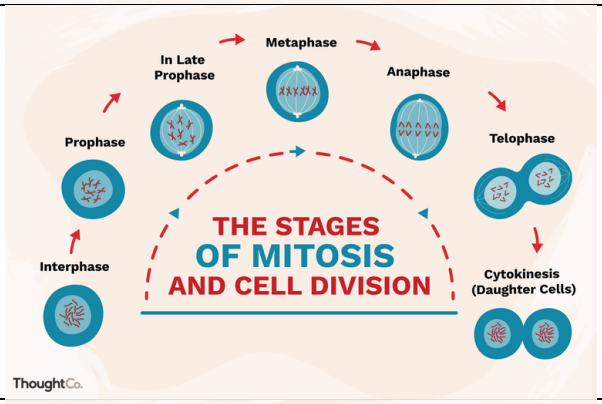
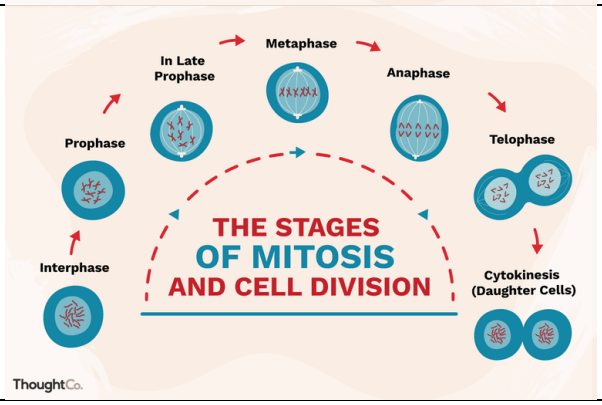
Cytokinesis		- the cytoplasm of a single eukaryotic cell divides into two daughter cells
Prophase		- first stage of cell division, Beginning after interphase, condensation of the chromatin and the disappearance of the nucleolus
Metaphase		- chromosomes are at their second-most condensed and coiled stage, align in the equator of the cell before being separated into each of the two daughter cells
Anaphase		- after the process of metaphase, replicated chromosomes are split and the newly copied chromosomes are moved to opposite poles of the cell

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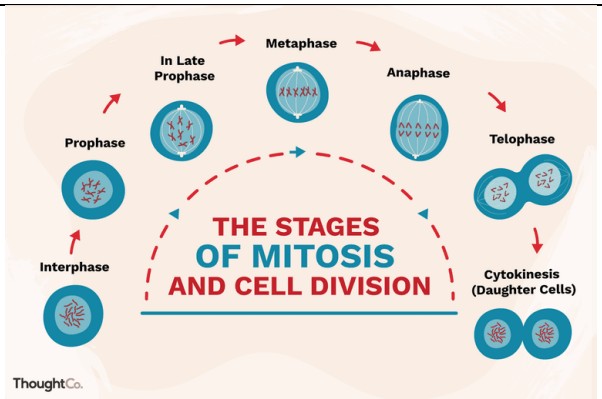
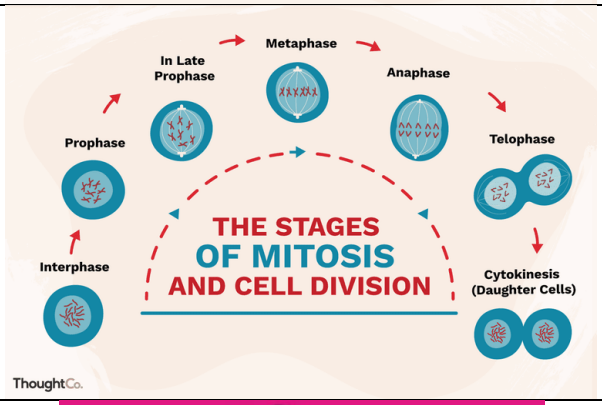
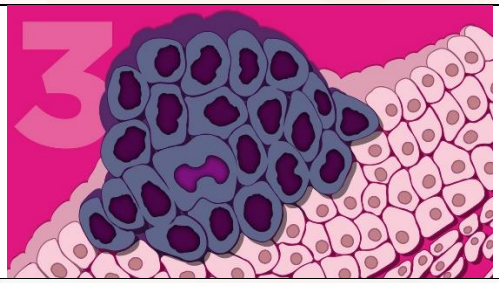
Telophase		- the final stage in both meiosis and mitosis, the effects of prophase
Daughter Cell		- are genetically identical to the parent cell because they contain the same number and type of chromosomes
Cancer		- Uncontrolled cell growth causing tumors to form
Tumor		- mass of tissue that's formed by an accumulation of abnormal cells

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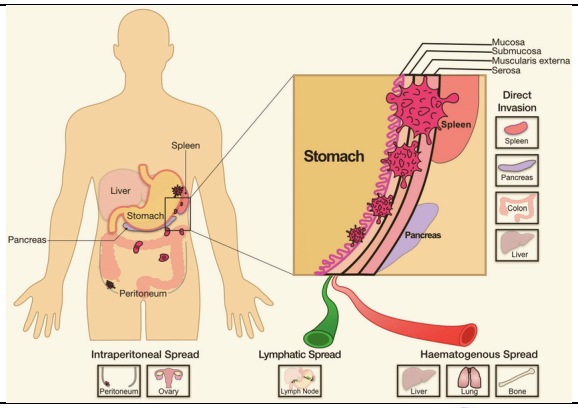
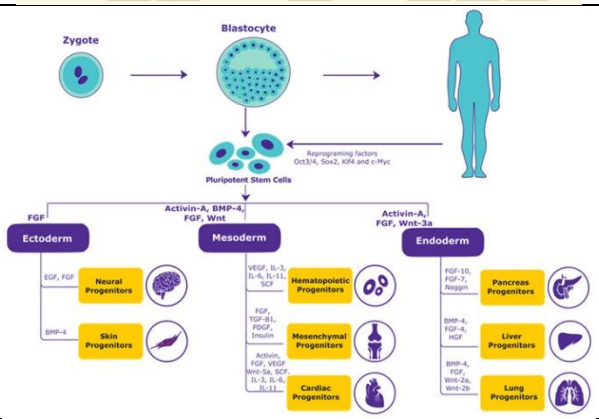
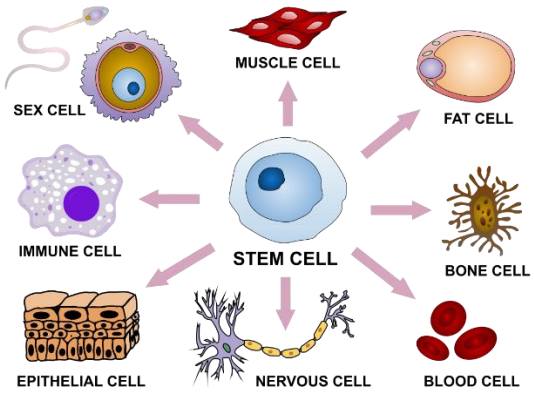
Metastasis		- pathogenic agent's spread from an initial or primary site to a different or secondary site within the host's body
Growth Factor		- naturally occurring substance capable of stimulating cellular growth
Stem Cell		- Unspecialized cells that can form differentiated cells
Embryo		- an early stage of development of a multicellular organism

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CONCEPT REVIEW

1) The growth phase of the cell cycle is called _____.

2) The 3 substages of interphase are: _____, _____, & _____.

3) During the _____ stage, DNA is replicated

4) Mitosis occurs in _____or body cells

5) The end result of mitosis is _____ daughter cells with the

   _____ number of chromosomes.

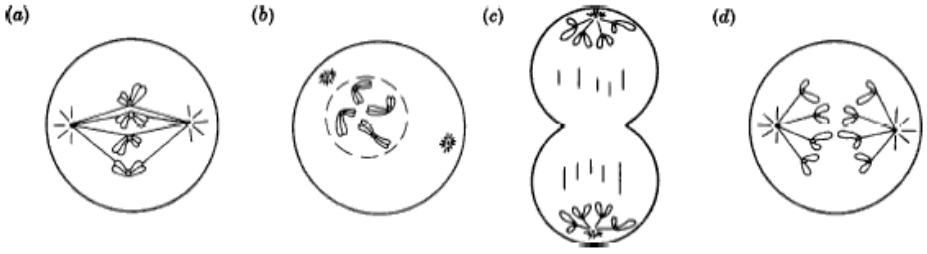
6) Daughter cells are _____ or 2n

7) In _____ the chromatids pair up. In _____

   the chromatids line up and down the equator of the cell. In _____ the

   chromatids pull apart. In _____ 2 cells are made.

8) Identify the following stages of mitosis.



a)_____ b) _____ c) _____ d) _____

9) _____ Disorder in which some of the body's own cells cannot stop dividing; they have lost the ability to control the cell cycle.

10) _____ Mass of growing tissue that may form when a cell or group of cells begins to grow and divide uncontrollably.

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11) Examples of **asexual reproduction** include:

a.

b.

c.

d.

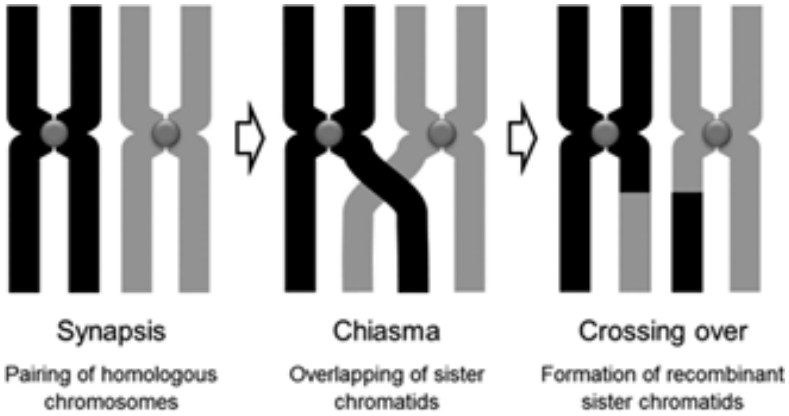
1) Meiosis produces _____ cells or gametes.

2) The two types of gametes are _____ and _____

3) Meiosis produces #_____ gametes that are _____(n).

4) Meiosis 1 involves the separation of _____ _____, while Meiosis 2 involves the separation of _____ _____

5) Crossing over occurs in _____



6) _____ reduces the number of chromosomes.

7) If a gamete of an organism has 6 chromosomes, the body cells have _____ chromosomes.

8) If a liver cell of an organism has 32 chromosomes, a muscle cell of the same organism will have _____ chromosomes and a gamete will have _____ chromosomes.

9) Complete the chart below by checking off which cell division has which characteristics.

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Description	Mitosis	Meiosis	neither
Cell division in body cells			
Cell division in gametes			
Eukaryotic cells			
Produces haploid cells			
Produces diploid cells			
Produces 2 cells			
Produces 4 cells			
Used by bacteria to divide			

MAAP TEST PREP

1)

When is a cell categorized as a specialized cell?

A when it selectively activates or inactivates certain genes

B when it is able to communicate with the surrounding cells

C when all its genes are activated

D when it is able to undergo mitosis

a) Define the following terms from the question above:

Specialized

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b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

2)

DNA replication occurs before a cell divides to form new daughter cells. What is the significance of DNA replication before mitosis?

A	It ensures that all body cells in a multicellular organism have the same size.
B	It ensures that all body cells in a multicellular organism carry the same genetic information.
C	It ensures that all reproductive cells in a multicellular organism grow faster than other cells.
D	It ensures that all reproductive cells in a multicellular organism have the same genetic information.

a) Define the following terms from the question above:

Significance

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

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3)

What will *likely* happen if all cell cycle checkpoints stop working?

A The cell will increase its cytoplasmic content.

B The cell will undergo uncontrolled cell division.

C The cell will initiate biochemical processes for cell death.

D The cell will begin to break down and lose cell volume.

a) When are the cell cycle checkpoints?

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

4)

Budding is a form of reproduction that can be seen in simple animals. The new organism grows attached to the old one and does not separate until it is mature.

How would this new organism be described?

A It contains genetic material that is identical to half of the parent.

B It contains genetic material that is different from the parent.

C It contains genetic material that is identical to the parent.

D It contains genetic material that is two times the amount of the parent.

a) Define the following terms from the question above:

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Budding

b) Rewrite the question in your own words. What are they really asking?

What is the correct answer and WHY? (you will not get credit without an explanation)

1)

What happens during crossing over in meiosis?

A replication of DNA

B production of four identical gametes

C movement of homologous chromosomes to opposite ends of a cell

D exchange of genetic material between homologous chromosomes

a) Define the following terms from the question above:

Crossing over

DNA replication

Homologous chromosomes

b) Rewrite the question in your own words. What are they really asking?

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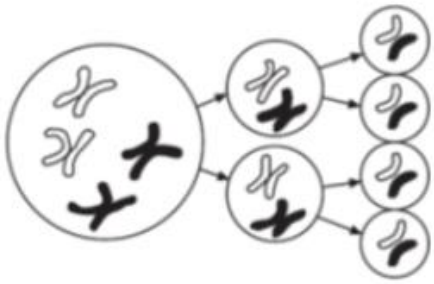
c) What is the correct answer and WHY? (you will not get credit without an explanation)

2)

Observe the diagram.



What cellular process is illustrated?

A fertilization

B meiosis

C mitosis

D replication

a) What are the products of mitosis?

b) What are the products of meiosis?

c) Rewrite the question in your own words. What are they really asking?

d) What is the correct answer and WHY? (you will not get credit without an explanation)

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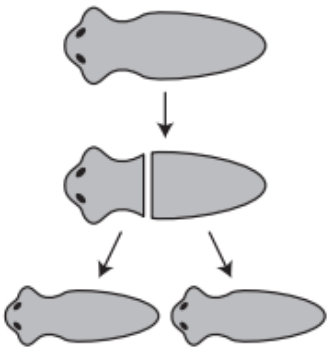
16. A planarian is a type of multicellular organism. A process that occurs in a planarian is represented in the model below.

Planarian



Circle one word or phrase in each set of parentheses to **best** describe this process.

The model represents the process of (budding / regeneration / vegetative propagation).

This process is a type of (asexual / sexual) reproduction that is most similar to (meiosis / mitosis).

The two organisms that result from this process contain DNA that is (identical / different).

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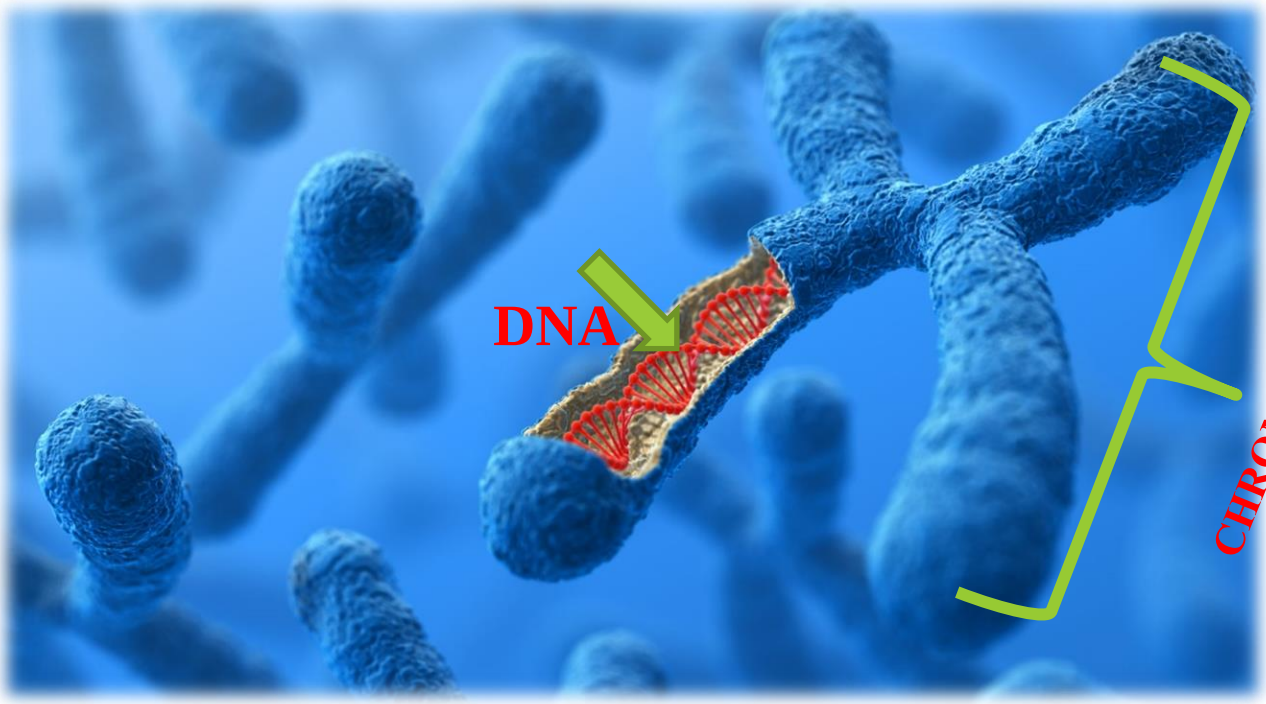
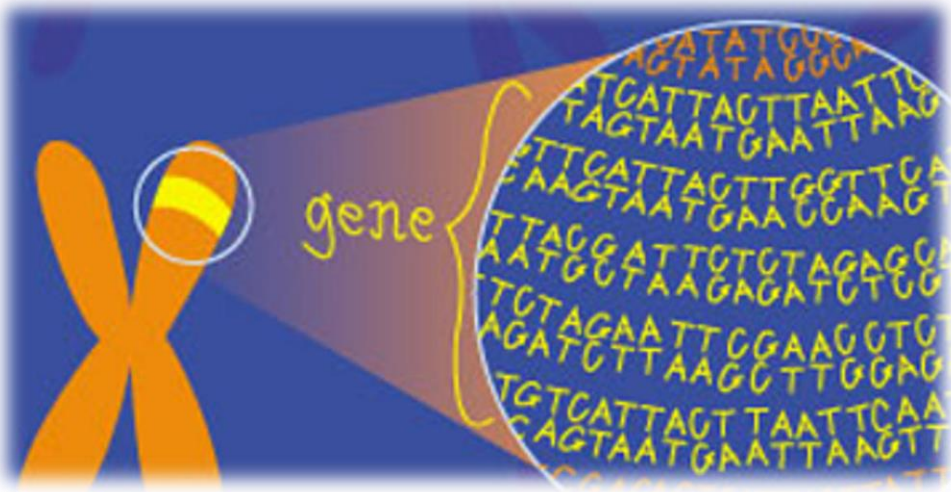
SECTION 4
CELLS: HEREDITY, PROTEIN SYNTHEIS, AND MUTATIONS





Adenine binds with Thymine= A-T
Thymine binds with Adenine= T-A
Guanine binds with Cytosine= G-C
Cytosine binds with Guanine= C-G

DNA (DEOXYRIBOSE NUCLEIC ACID)- Holds the genetic material that makes you who you are through (sexual reproduction) & (Meiosis/cell division)

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KEY CONCEPTS CELLS: HEREDITY, PROTEIN SYNTHEIS, AND MUTATIONS

MS-CCR Standard(s):

BIO. 3A. Students will develop and use models to explain the role of meiosis in the production of haploid gametes required for sexual reproduction.

BIO. 3A. 3. Investigate chromosomal abnormalities (e.g., Down Syndrome, Turner's syndrome, and Klinefelter syndrome) that might arise from errors in meiosis (nondisjunction) and how these abnormalities are identified (karyotypes).

BIO. 3B. Students will analyze and interpret data collected from probability calculations to explain the variation of expressed traits within a population.

BIO. 3B. 1. Demonstrate Mendel's law of dominance and segregation using mathematics to predict phenotypic and genotypic ratios by constructing Punnett squares with both homozygous and heterozygous allele pairs.

BIO. 3B. 2. Illustrate Mendel's law of independent assortment using Punnett squares and/or the product rule of probability to analyze monohybrid cross.

BIO. 3B. 3. Investigate traits that follow non-Mendelian inheritance patterns (e.g., incomplete dominance, codominance, multiple alleles in human blood types, and sex linkage).

BIO. 3B. 4. Analyze and interpret data (e.g., pedigrees, family, and population studies) regarding Mendelian and complex genetic traits (e.g., sickle-cell anemia, cystic fibrosis, muscular dystrophy, color-blindness, and hemophilia) to determine patterns of inheritance and disease risk.

BIO. 3C. Students will construct an explanation based on evidence to describe how the structure and nucleotide base sequence of DNA determines the structure of proteins or RNA that carry out essential functions of life.

BIO. 3C. 1. Develop and use models to explain the relationship between DNA, genes, and chromosomes in coding and instructions for the traits transferred from parent to offspring.

BIO. 3C. 2. Evaluate the mechanisms of transcription and translation in protein synthesis.

BIO. 3C. 3. Use models to predict how various changes in the nucleotide sequence (e.g., point mutations, deletions, and additions) will affect the resulting protein product and the subsequent inherited trait.

BIO. 3C. 4. Research and identify how DNA technology benefits society. Engage in scientific argument from evidence over the ethical issues surrounding the use of DNA technology (e.g., cloning, transgenic organisms, stem cell research, and the Human Genome Project, gel electrophoresis).

BIO. 3C. 5. Enrichment: Investigate current biotechnological applications in the study of the genome (e.g, transcriptome, proteome, individualized sequencing, and individualized gene therapy)

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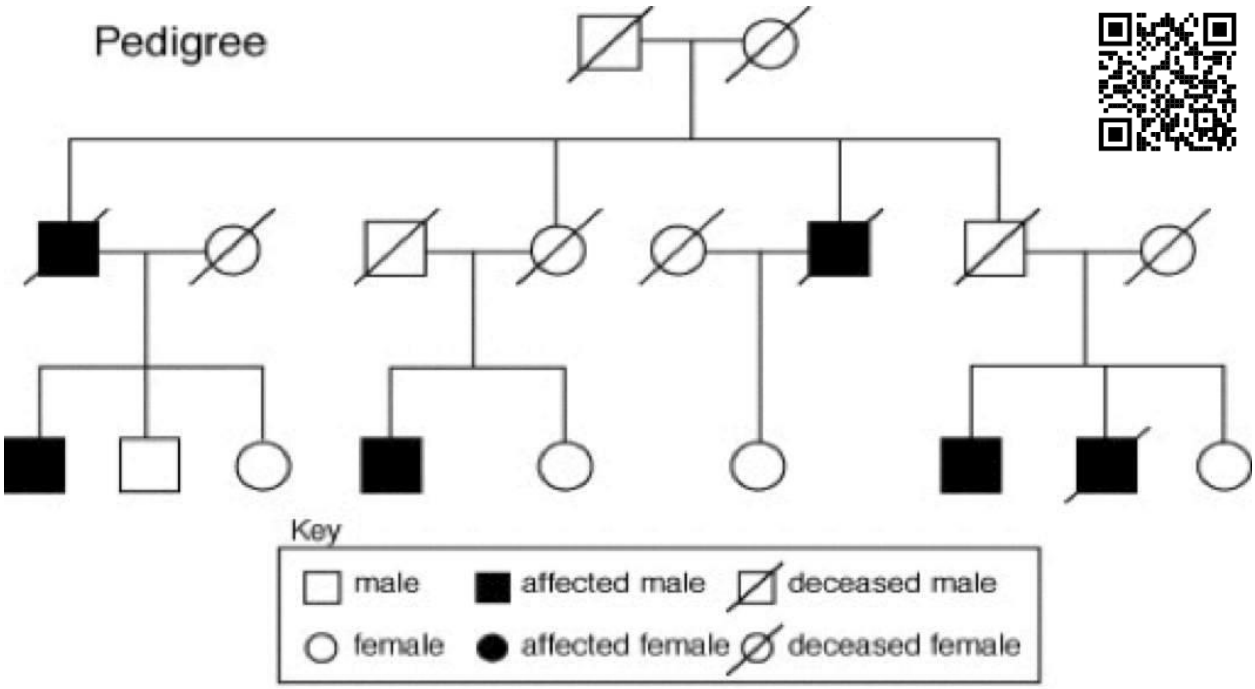

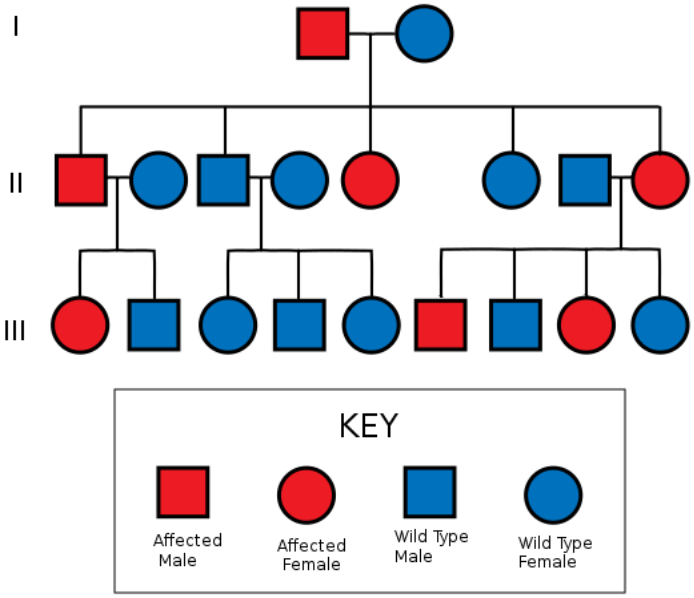

BIO. 3A.3 & BIO. 3B. 1-4

Pedigrees, Karyotypes, Gel Electrophoresis, and Punnett Squares are tools where scientists analyze and interpret data to determine patterns of inheritance.

Autosomal= **Any chromosome that is NOT a SEX chromosome!!!!!!!**

Each row represents a generation so in the red/blue example there are 3 generations, I= grandparents, II= Parents/Aunts/Uncles, and III= children/cousins

Pedigrees deal with disorders so alleles will be representing with the chromosomes XX for females and XY for males/with

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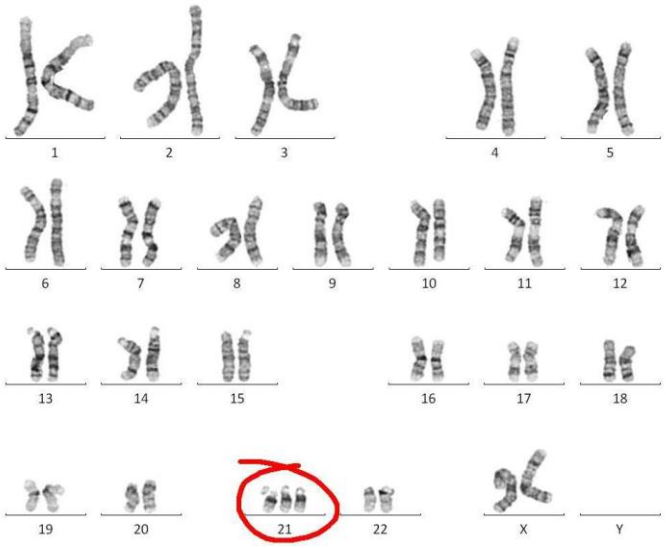
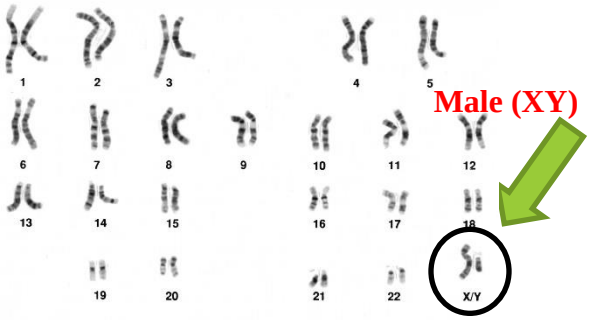
KARYOTYPES-
Show the chromosome **pairs** (23 total) of an individual, show diseases, and gender (last pair #23)

Down syndrome karyotype

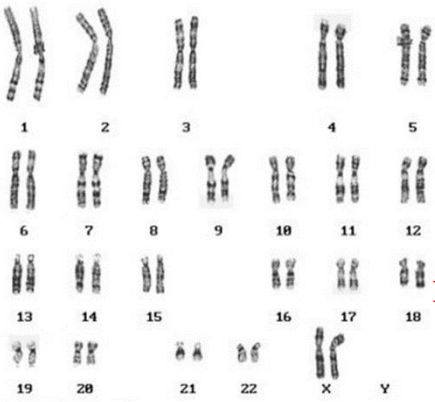




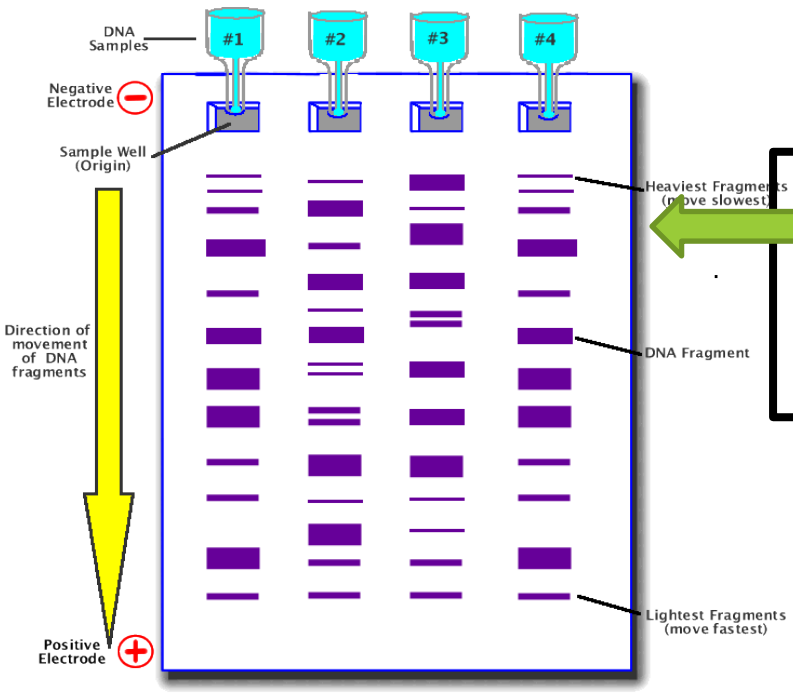
Male (XY)

Normal Karyotype

Human Female



Female (XX)



Gel Electrophoresis
(Creating a DNA Profile)

Gel Electrophoresis-
Make of the columns with the most matches
(# 1 & #4 from the picture)

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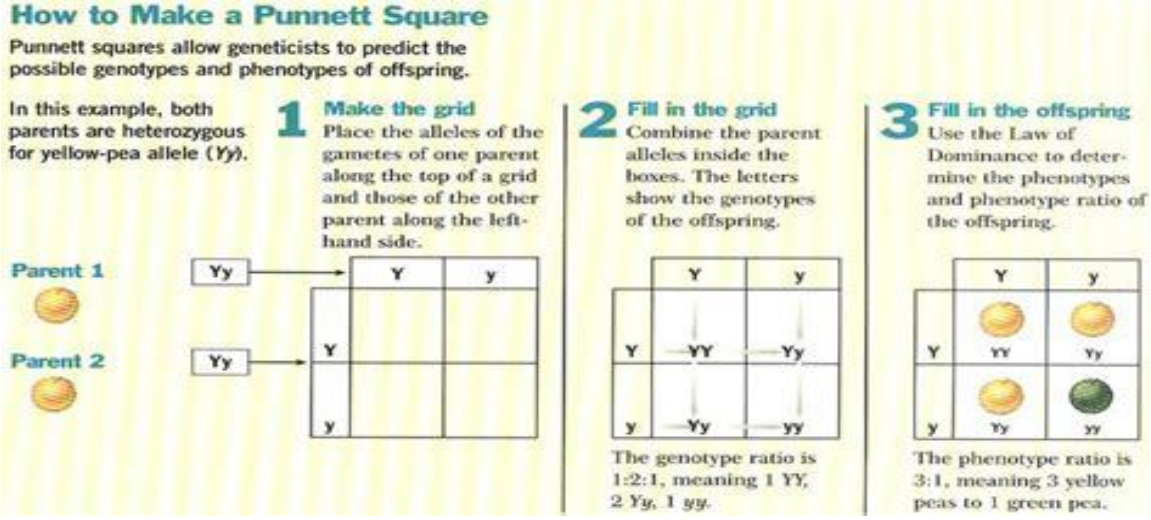
Punnett Squares-
Cross to show prediction of offspring traits (characteristics)

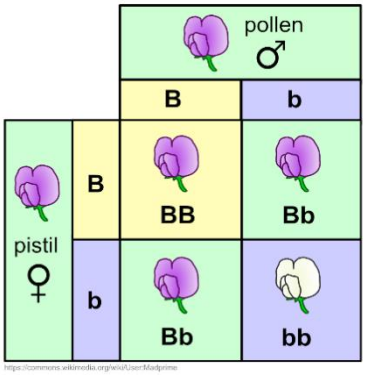
"Monohybrid (ONE TRAIT CROSS)/Dihybrid (TWO TRAIT CROSS) = AUTOSOMAL

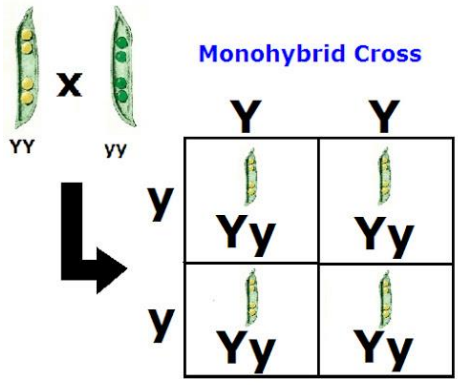


Genotype and Phenotype

Percentages Cheat Sheet for Monohybrid
(it's like making a $1 using quarters):
1 Box with the same Phenotype/Genotype= 25%
2 Boxes with the same Phenotype/Genotype= 50%
3 Boxes with the same Phenotype/Genotype= 75%
4 Boxes with the same Phenotype/Genotype=100%

Phenotype:	purple flower	white flower
Genotype: (partial)	AA or Aa	aa





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Monohybrid cross

	T	t
T	TT	Tt
t	Tt	tt

AUTOSOMAL!!
No X's or Y's just regular ABCs

Key Vocabulary:

Heterozygous= Tt, Bb, Aa, Dd (different size alleles that represent different characteristics of a particular trait)

Homozygous= AA, aa, TT, tt, DD, dd (same size alleles that represent either a dominant characteristic or a recessive characteristic of a trait.

Dominant= A, B, C (an uppercased allele that represents characteristics that are visible

Recessive= a, b, c, (a lowercased allele that represents characteristics that are NOT visible/unless both alleles are recessive which will make the non-visible characteristic visible

Other Key Vocabulary:

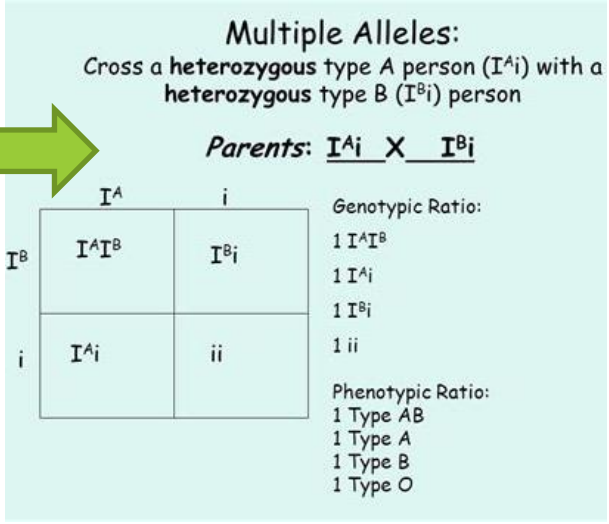
Alleles- represented characteristics of traits using alphabets

Phenotype= tall, short, blue eyes, brown eyes: represented characteristics of a trait through word descriptions

Genotype= Aa, AA, aa: represented characteristics of a trait through paired alphabets

AUTOSOMAL!!
No X's or Y's just regular ABCs

Other Monohybrid Punnett squares can determine blood types (multiple alleles), sex-linked diseases and codominance/dominance



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MULTIPLE ALLELES – BLOOD TYPING

- Blood typing alleles:
  - I^A and I^B both are codominant
  - The third allele, i is recessive
- Blood typing genotypes and phenotypes
  - ii yields type O
  - I^AI^B yields type AB
  - I^AI^A or I^Ai yields type A
  - I^BI^B or I^Bi yields type B

Blood Type	Genotype		Can Receive Blood From:
A	i^Ai i^Ai^A	AA AO	A or O
B	i^Bi i^Bi^B	BB BO	B or O
AB	i^Ai^B	AB	A, B, AB, O
O	ii	OO	O

AUTOSOMAL!!
No X's or Y's just regular ABCs

	X^H	Y
X^H	X^HX^H	X^HY
X^h	X^HX^h	X^hY

Notice there are no alleles on the Y

One male offspring will be affected

Sex-linked (NOT Autosomal!!!)

XX= FEMALE **XY=MALE**

SEX-LINKED

cross between a carrier female (X_hX) and a normal male (XY)

	X_h	X
X	X_hX	XX
Y	X_hY	XY

offspring
25% X_hX = 25% carrier female
25% XX = 25% normal female
25% X_hY = 25% hemophiliac male
25% XY = 25% normal male

cross between a carrier female (X_hX) and a hemophiliac male (X_hY)

	X_h	X
X_h	X_hX_h	X_hX
Y	X_hY	XY

offspring
25% X_hX_h = 25% hemophiliac female
25% X_hX = 25% carrier female
25% X_hY = 25% hemophiliac male
25% XY = 25% normal male

With **Sex-linked Punnett Squares**, you can predict diseases with your offspring and determine how the different genders will be affected.

Sex-linked trait **crosses** are when certain traits correspond to one of the **sex** chromosomes **X** and **Y**

Percentages Cheat Sheet for Monohybrid
(it's like making a $1 using quarters):
1 Box with the same Phenotype/Genotype= 25%
2 Boxes with the same Phenotype/Genotype= 50%
3 Boxes with the same Phenotype/Genotype= 75%
4 Boxes with the same Phenotype/Genotype=100%

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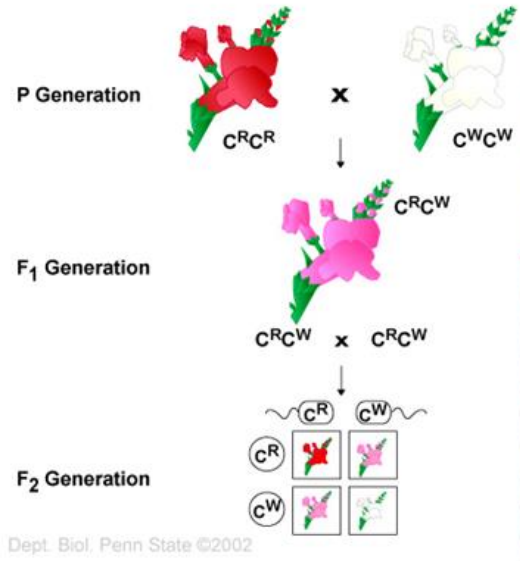
AUTOSOMAL!!
No X's or Y's just regular ABCs

A quick review

Incomplete Dominance

(Phenotype is in-between)

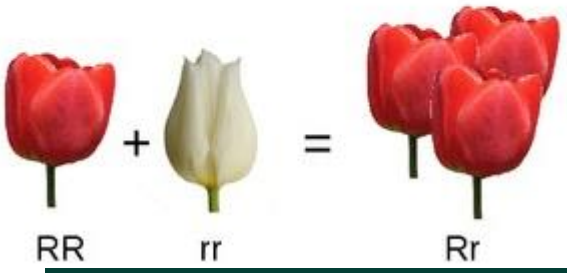


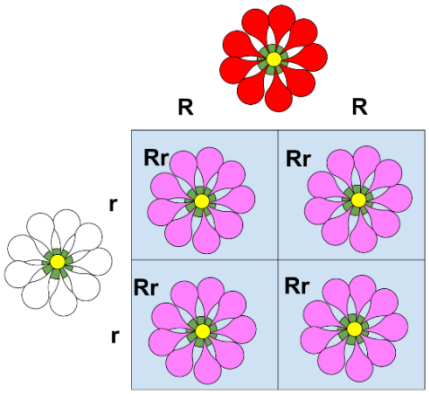
Codominance

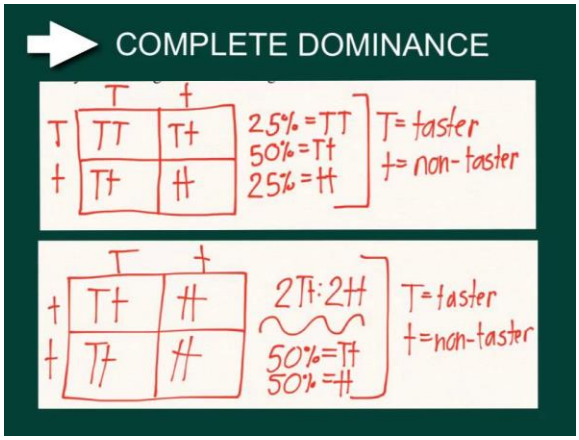
(both Phenotypes are present)

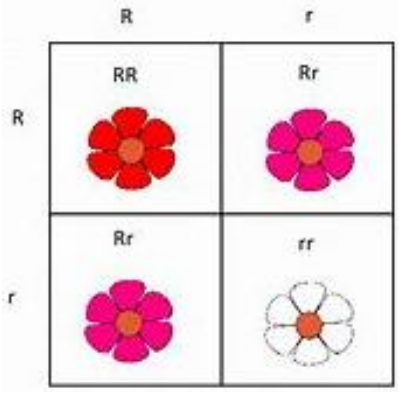
Complete Dominance

- With complete dominance, the dominant allele completely masks the recessive one









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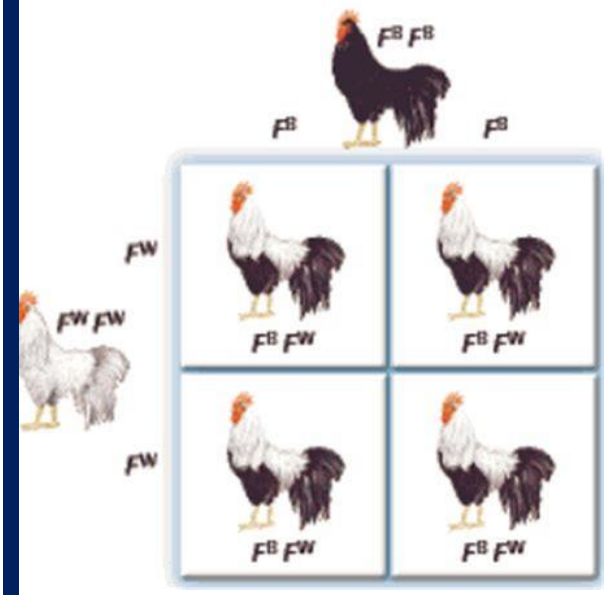
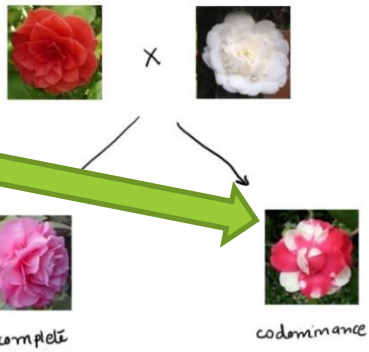


Codominance=both alleles **are equally strong** and both alleles are visible

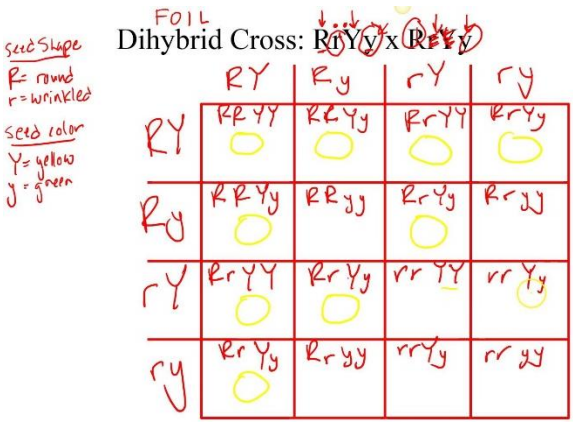


Incomplete dominance= inheritance in which one allele for a specific trait is not completely expressed over its paired allele. This results in a third phenotype in which the expressed physical trait is a combination of the phenotypes of both alleles.

DIHYBRID PUNNETT SQUARES- TWO TRAIT CROSS= 16 SQUARES AUTOSOMAL (NO X'S OR Y'S JUST REGULAR ABSCs)

AaBb x AaBb

	AB	Ab	aB	ab
AB	AABB	AABb	AaBB	AaBb
Ab	AABb	AAbb	AaBb	Aabb
aB	AaBB	AaBb	aaBB	aaBb
ab	AaBb	Aabb	aaBb	aabb



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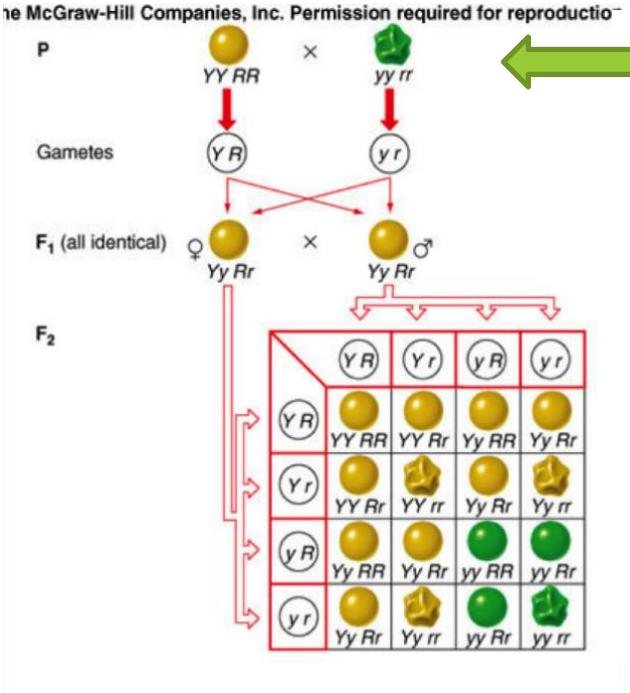


DIHYBRID CROSSES

SEED SHAPE	SEED COLOR
R = round	Y = yellow
R = wrinkled	y = green

RRYY x rryy

X

F O I L

First Out Inside Last

D = Dominant traits (R & Y)
R = recessive traits (r & y)

1	0	0	0
D - D	D - R	R - D	R - R

RRYY rryy

RY RY RY RY

ry ry ry ry

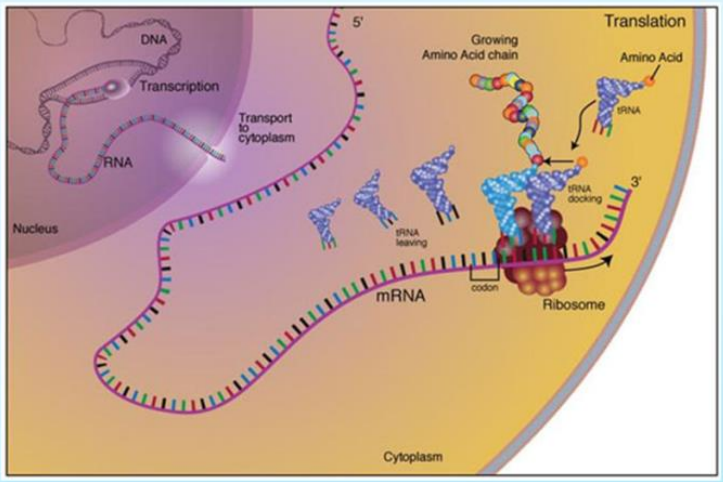
GET RID OF REPETITIONS!

RY

ry

RrYy
round with yellow seeds

The Process of Protein Synthesis



1. DNA in nucleus as a template.
2. mRNA is processed and released into cytoplasm.
3. mRNA binds to ribosomes.
4. tRNA carries amino acid to mRNA.
5. Anticodon-codon complementary base pairing occurs.
6. Peptide chain is transferred from resident tRNA to incoming tRNA.
7. tRNA departs.
8. Protein modification after translation.

DNA → **RNA** → **Protein**

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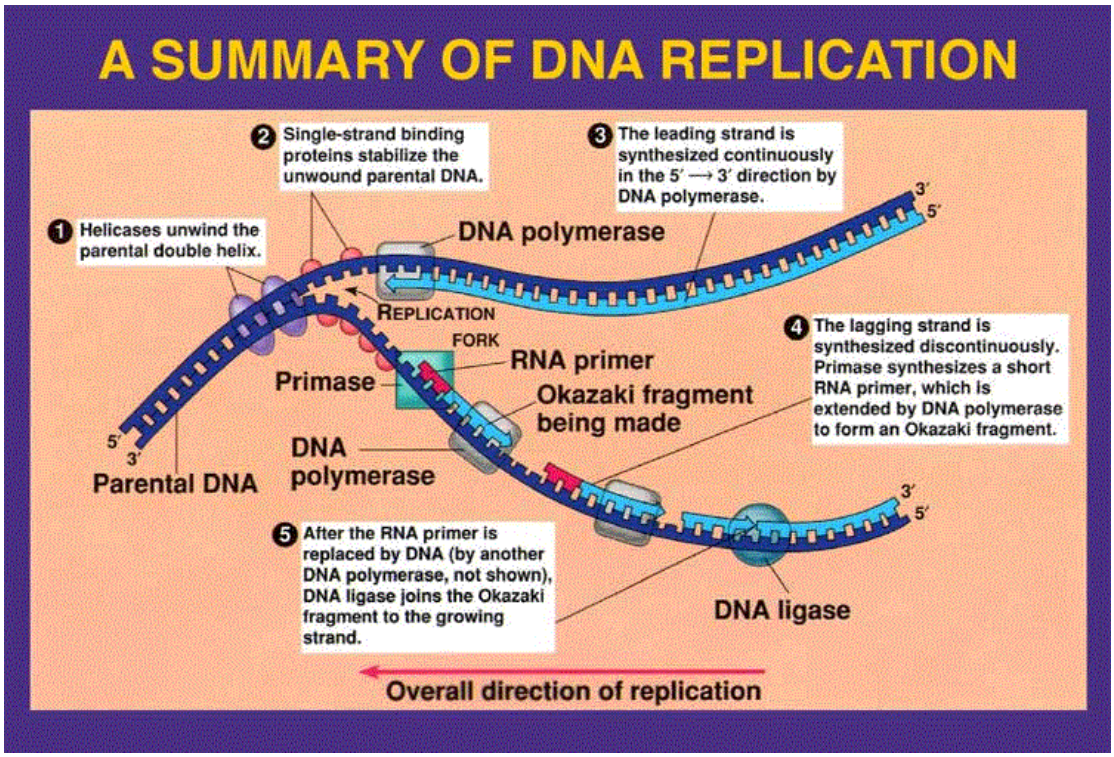
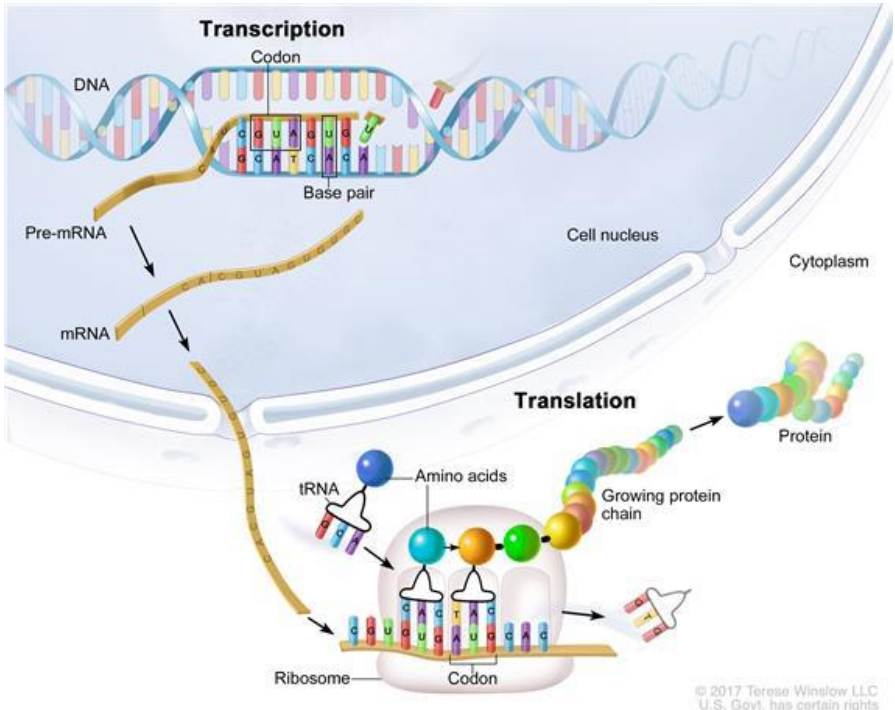
Step 1: DNA Replication



Step 2: Transcription



Step : Translation

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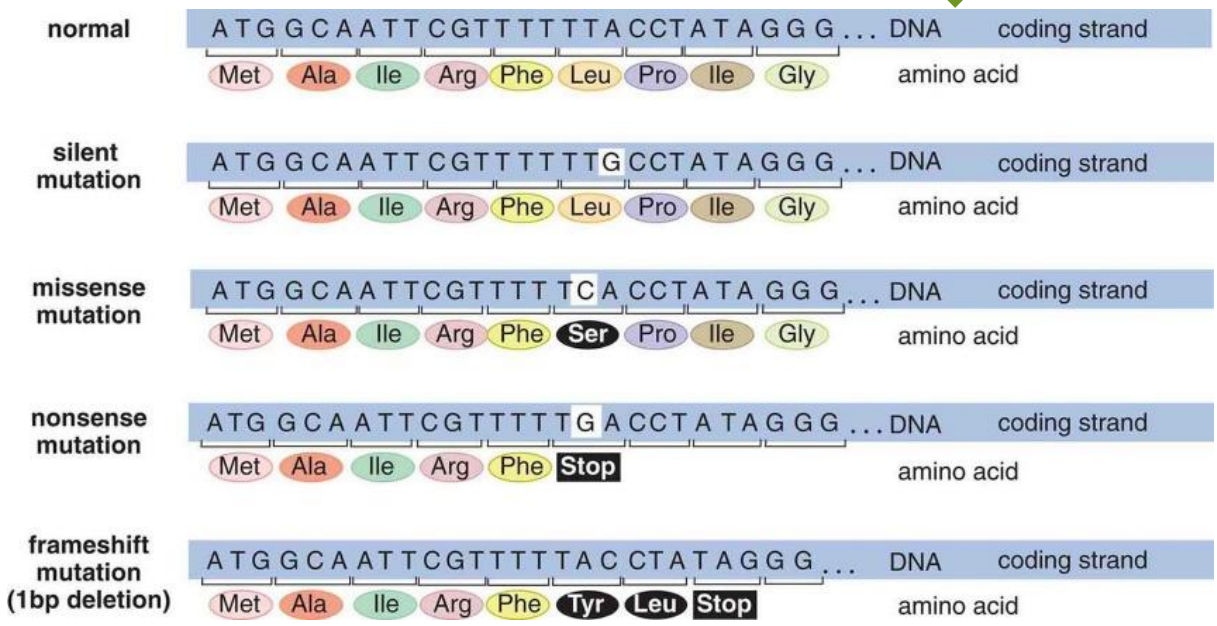
Translation- outlines needed proteins in the body for survival and other processes.



How to use the Codon Chart:

1. Use the left side to find the first letter in the codon
2. Use the top to find the second letter in the codon
3. Use the right side to find the third letter of the codon
4. Go to where ALL three overlap on the chart

First Letter	Second Letter				Third Letter
	U	C	A	G	
U	phenylalanine	serine	tyrosine	cysteine	U
	phenylalanine	serine	tyrosine	cysteine	C
	leucine	serine	stop	stop	A
	leucine	serine	stop	tryptophan	G
C	leucine	proline	histidine	arginine	U
	leucine	proline	histidine	arginine	C
	leucine	proline	glutamine	arginine	A
	leucine	proline	glutamine	arginine	G
A	isoleucine	threonine	asparagine	serine	U
	isoleucine	threonine	asparagine	serine	C
	isoleucine	threonine	lysine	arginine	A
	(start) methionine	threonine	lysine	arginine	G
G	valine	alanine	aspartate	glycine	U
	valine	alanine	aspartate	glycine	C
	valine	alanine	glutamate	glycine	A
	valine	alanine	glutamate	glycine	G

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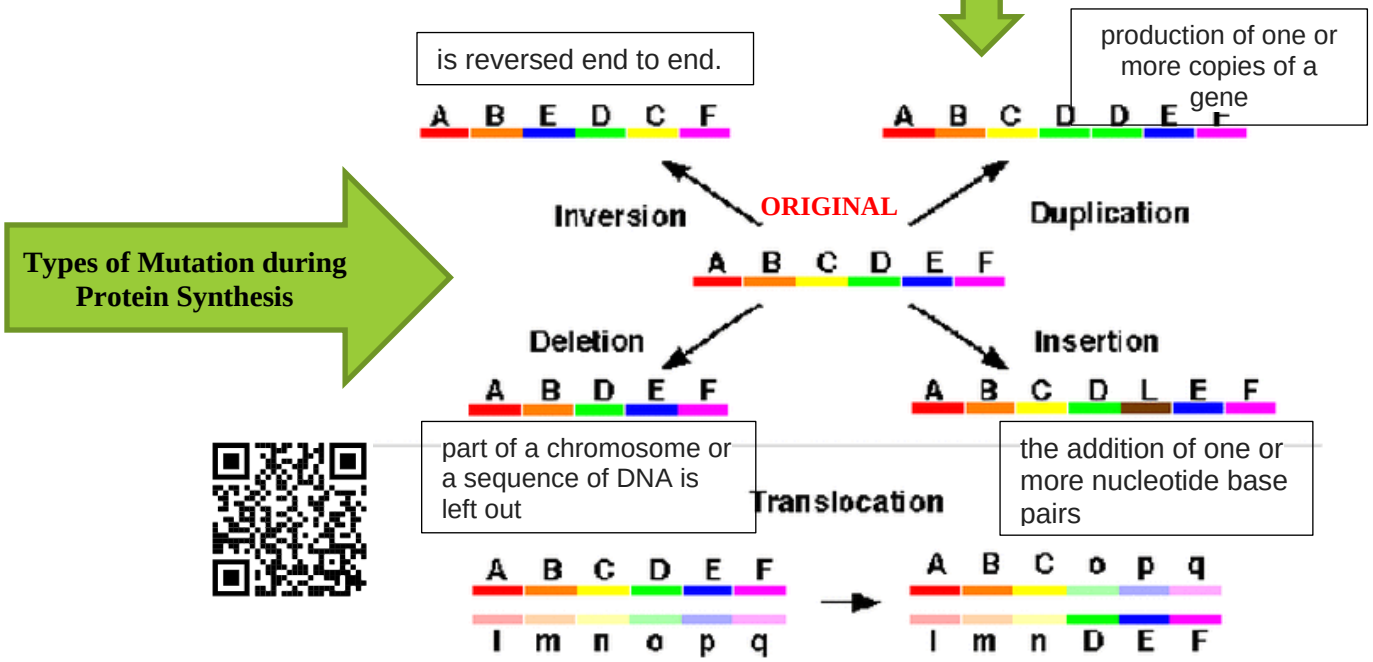
A	wild type	TACAACGTCACCATT AUGUUGCAGUGGUAA ↓ met-leu-gln-trp-STOP	DNA mRNA protein
B	silent mutation	TACAATGTCACCATT AUGUUACAGUGGUAA ↓ met-leu-gln-trp-STOP	DNA mRNA protein
C	missense mutation	TACAAGGTCACCATT AUGUUCCAGUGGUAA ↓ met-phe-gln-trp-STOP	DNA mRNA protein
D	nonsense mutation	TACAACGTCACTATT AUGUUGCAGUGAUAA ↓ met-leu-gln-STOP	DNA mRNA protein
E	frameshift mutation	TATCAACGTCACCATT AUAGUUGCAGUGAUAA ↓ ile-val-gly-val-ile-	DNA mRNA protein

Mutation is a change is the DNA which causes a change in the replication process.

Types of Mutation during Protein Synthesis



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BIO. 3B. 2. Illustrate Mendel's law of independent assortment using Punnett squares and/or the product rule of probability to analyze monohybrid cross.

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BIO. 3B. 4. Analyze and interpret data (e.g., pedigrees, family, and population studies) regarding Mendelian and complex genetic traits (e.g., sickle-cell anemia, cystic fibrosis, muscular dystrophy, color-blindness, and hemophilia) to determine patterns of inheritance and disease risk.

BIO. 3C. Students will construct an explanation based on evidence to describe how the structure and nucleotide base sequence of DNA determines the structure of proteins or RNA that carry out essential functions of life.

BIO. 3C. 1. Develop and use models to explain the relationship between DNA, genes, and chromosomes in coding and instructions for the traits transferred from parent to offspring.

BIO. 3C. 2. Evaluate the mechanisms of transcription and translation in protein synthesis.

BIO. 3C. 3. Use models to predict how various changes in the nucleotide sequence (e.g., point mutations, deletions, and additions) will affect the resulting protein product and the subsequent inherited trait.

BIO. 3C. 4. Research and identify how DNA technology benefits society. Engage in scientific argument from evidence over the ethical issues surrounding the use of DNA technology (e.g., cloning, transgenic organisms, stem cell research, and the Human Genome Project, gel electrophoresis).

BIO. 3C. 5. Enrichment: Investigate current biotechnological applications in the study of the genome (e.g, transcriptome, proteome, individualized sequencing, and individualized gene therapy)

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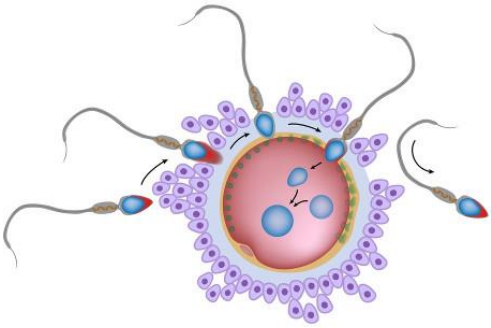
TERM	KEY IMAGE	CLUES
Genetics		- is a branch of biology concerned with the study of genes, genetic variation, and heredity in organisms.
Gregor Mendel		- Gregor Mendel, through his work on pea plants, discovered the fundamental laws of inheritance. He deduced that genes come in pairs and are inherited as distinct units, one from each parent. Mendel tracked the segregation of parental genes and their appearance in the offspring as dominant or recessive traits.
Fertilization		- is the fusion of haploid gametes, egg and sperm, to form the diploid zygote.

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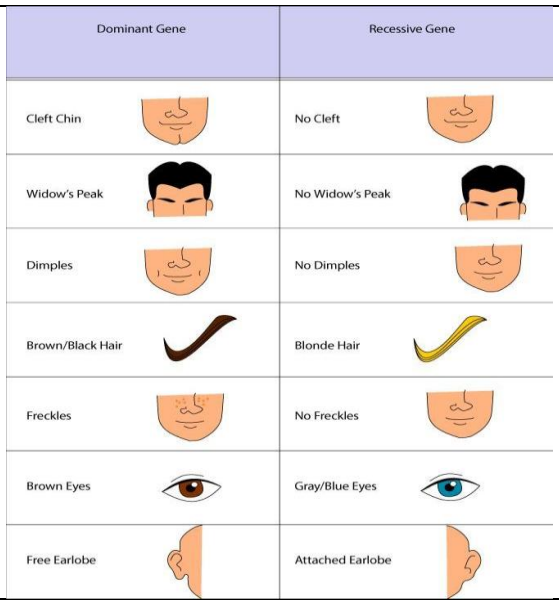
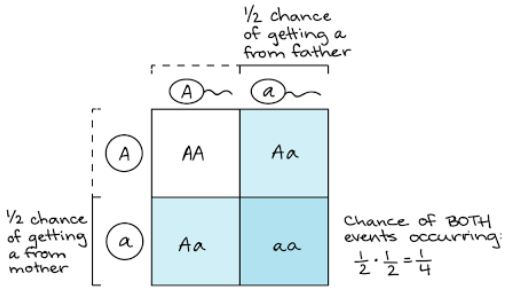
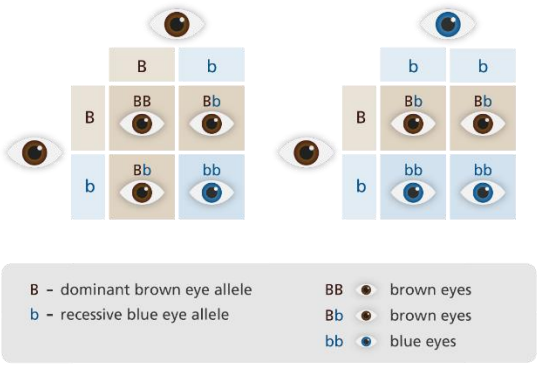
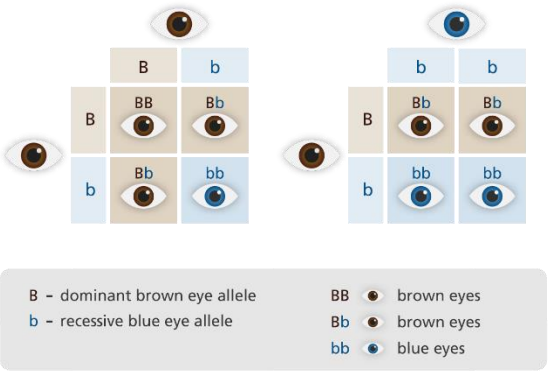
Trait		- a distinguishing quality or characteristic, typically one belonging to a person. it may be either inherited or determined environmentally, but typically occurs as a combination of the two.
Probability		- used to predict the chance of gametes and offspring having certain alleles.
Dominant		- is the phenomenon of one variant of a gene on a chromosome masking or overriding the effect of a different variant of the same gene on the other copy of the chromosome.
Recessive		- a gene that can be masked by a dominant gene. In order to have a trait that is expressed by a recessive gene, such as blue eyes, you must get the gene for blue eyes from both of your parents.

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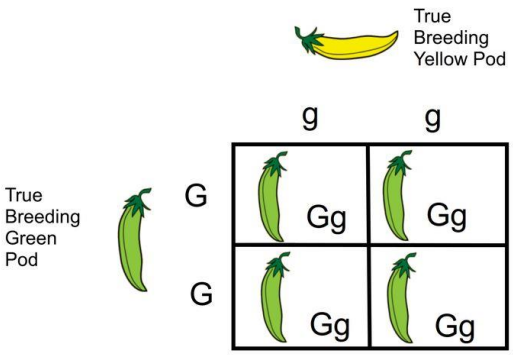
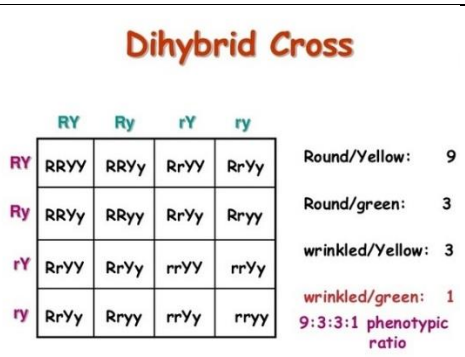
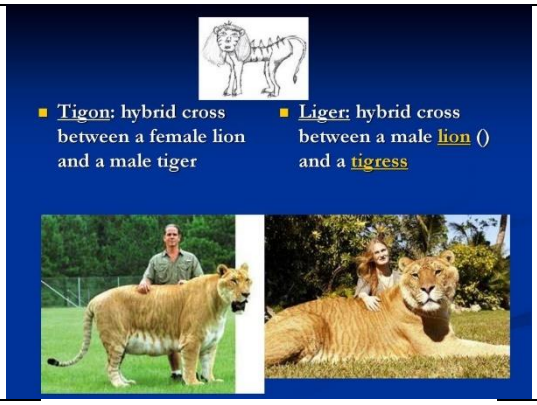
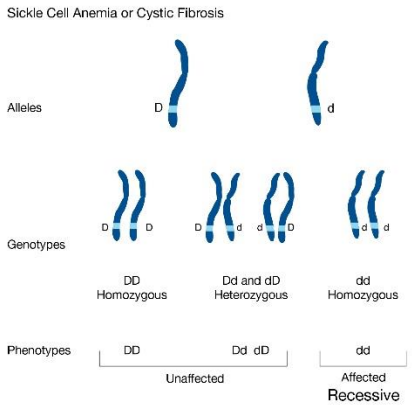
Monohybrid cross		- is a cross between two organisms with different variations at one genetic chromosome of interest.
Dihybrid cross		- is a cross between two different lines/genes that differ in two observed traits.
Hybrid		- is the offspring resulting from combining the qualities of two organisms of different breeds, varieties, species or genera through sexual reproduction.
Allele		- one of two or more alternative forms of a gene that arise by mutation and are found at the same place on a chromosome.

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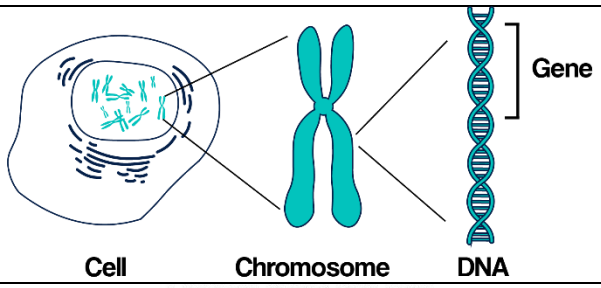
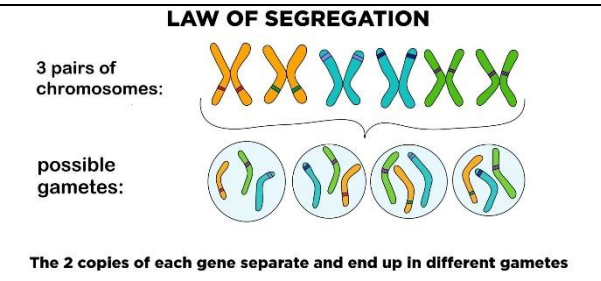
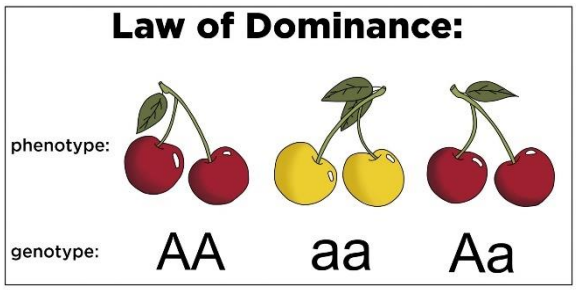
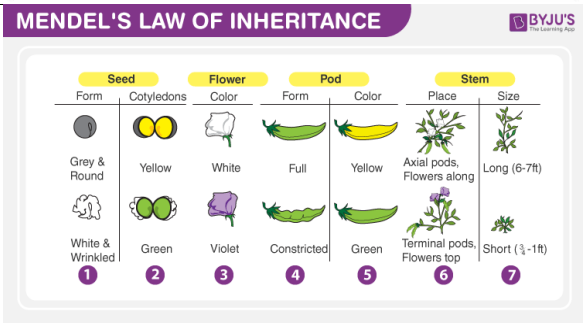
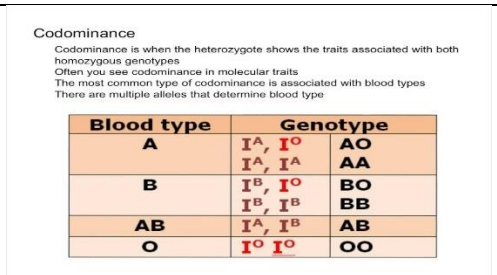
Gene		- a unit of heredity which is transferred from a parent to offspring and is held to determine some characteristic of the offspring.
Segregation		- the law states that copies of genes separate or segregate so that each gamete receives only one allele from each parent.
Principal of Dominance		- says that when an organism is heterozygous for a trait, only the dominant allele will produce a phenotype.
Independent assortment		- Mendel's law of independent assortment states that the alleles of two (or more) different genes get sorted into gametes independently of one another. In other words, the allele a gamete receives for one gene does not influence the allele received for another gene.
Multiple alleles		- Three or more alternative forms of a gene (alleles) that can occupy the same locus.

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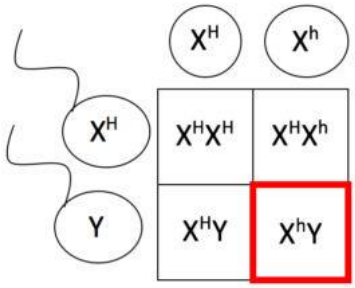
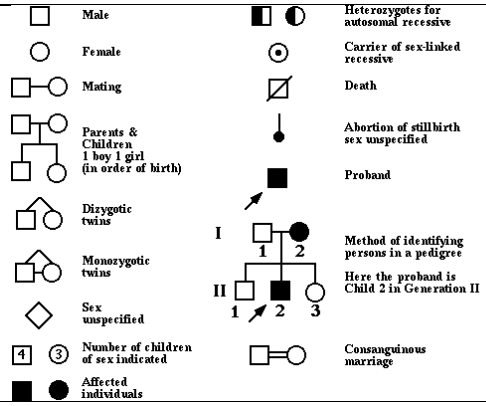
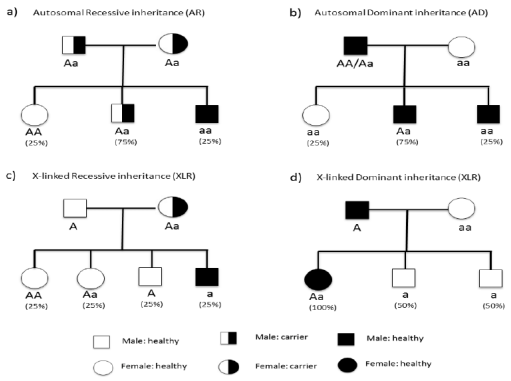
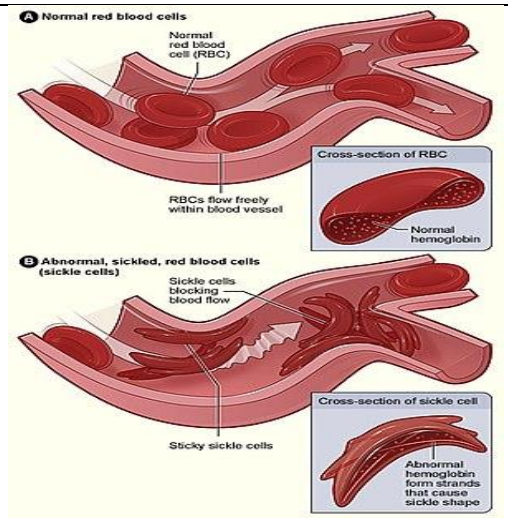
Sex-linked (X-linked)		- is a trait in which a gene is located on a sex chromosome.
Pedigree Chart		- representation of a family tree that diagrams the inheritance of a trait or disease though several generations.
Autosomal		- to a chromosome that is not a sex chromosome.
Sickle-cell anemia		- is an inherited red blood cell disorder in which there aren't enough healthy red blood cells to carry oxygen throughout your body.

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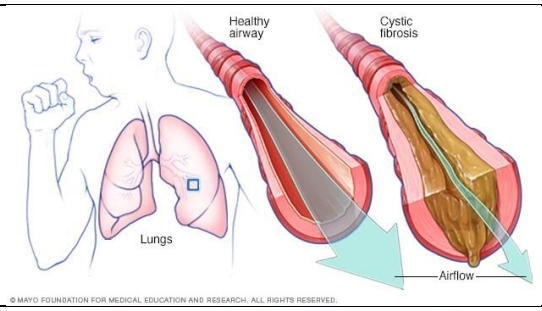
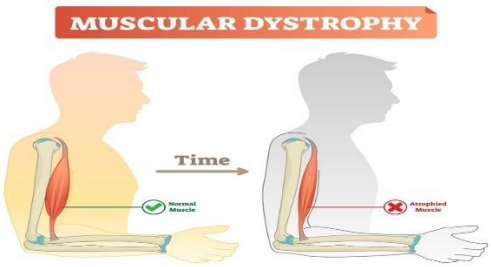
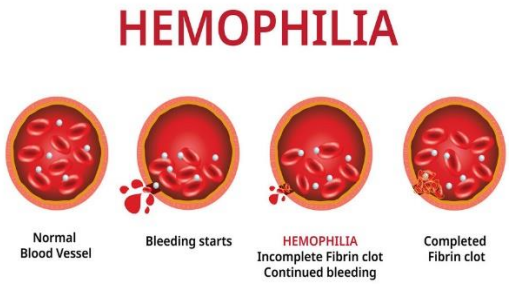
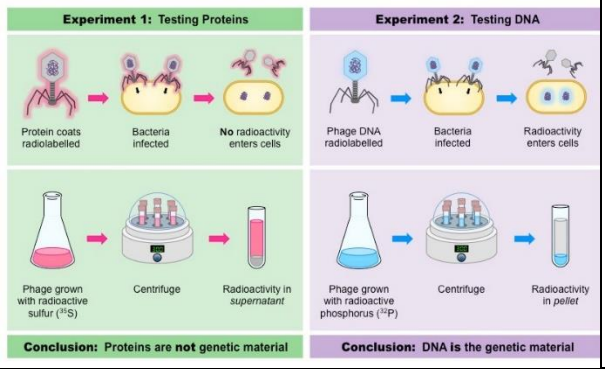
Cystic fibrosis		- is a hereditary disease that affects the lungs and digestive system.
Muscular dystrophy		- is a group of diseases that cause progressive weakness and loss of muscle mass.
Color-blindness		- occurs when you are unable to see colors in a normal way.
Hemophilia		- A disorder in which blood doesn't clot normally.
Hersey and Chase		- were a series of experiments conducted in 1952 by Alfred Hershey and Martha Chase that helped to confirm that DNA is genetic material.

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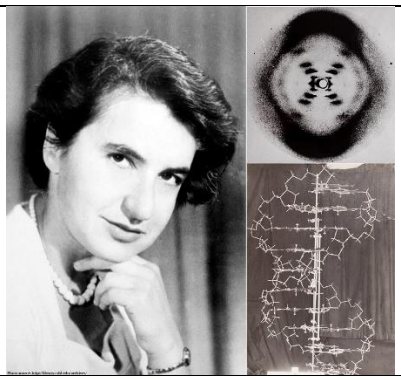
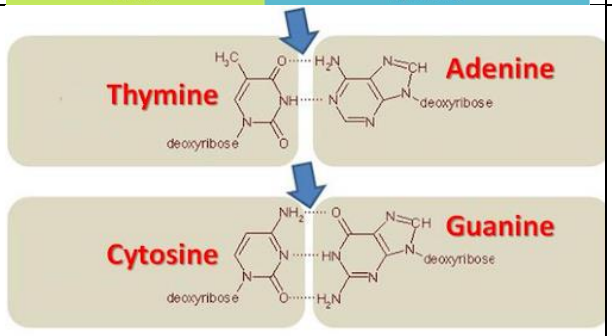
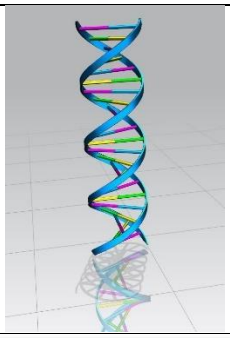
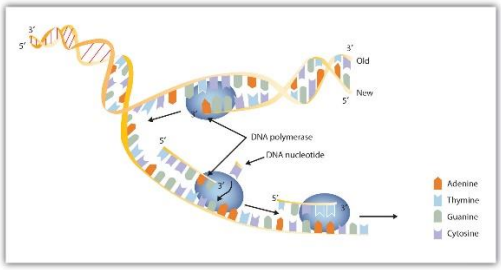
Rosalind Franklin		- was an English chemist and X-ray crystallographer whose work was central to the understanding of the molecular structures of DNA, RNA, viruses, coal, and graphite.
Nitrogenous base		- is an organic molecule with a nitrogen atom that has the chemical properties of a base.
Base pair		- is a unit consisting of two nucleobases bound to each other by hydrogen bonds. They form the building blocks of the DNA double helix and contribute to the folded structure of both DNA and RNA.
Double helix		- the description of the structure of a DNA molecule. A DNA molecule consists of two strands that wind around each other like a twisted ladder.
Replication		- the process in which a cell makes an exact copy of its own DNA (copy DNA -> DNA).

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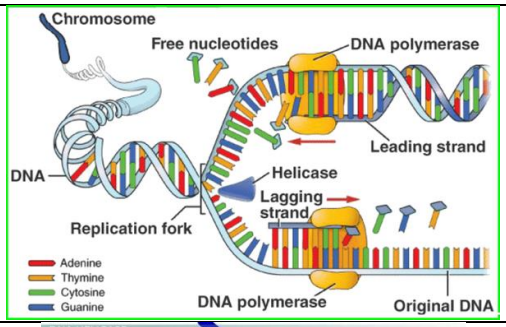
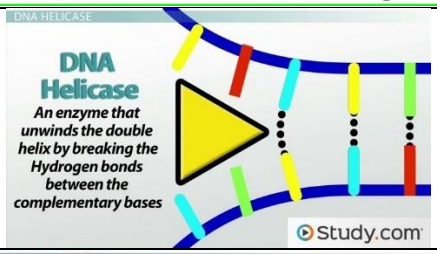
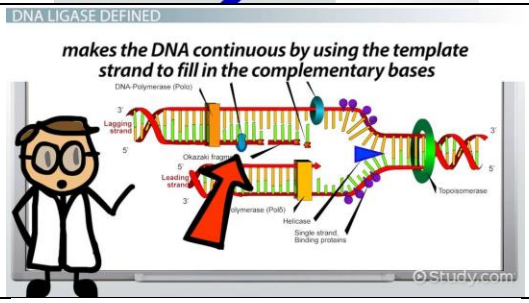
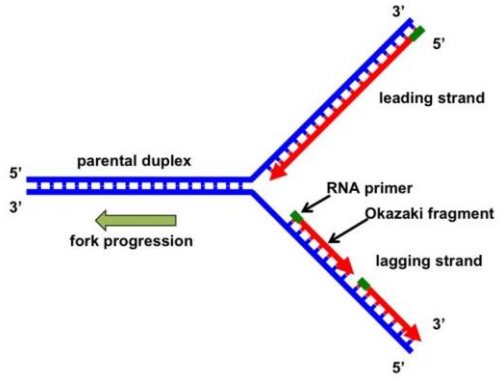
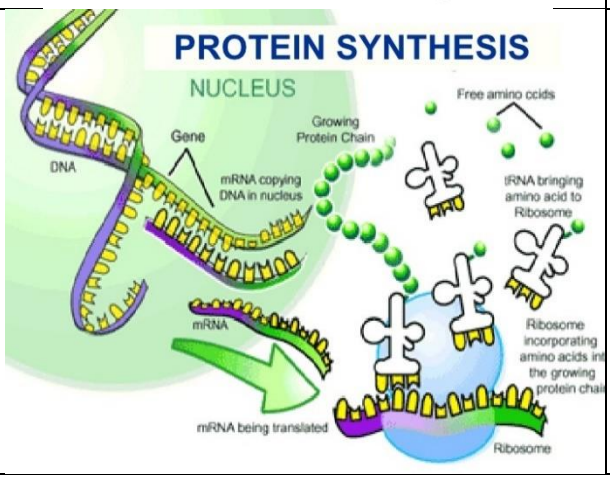
DNA Polymerase		- is an enzyme that synthesizes DNA molecules from deoxyribonucleotides, the building blocks of DNA.
Helicase		- are enzymes that bind and may even remodel nucleic acid or nucleic acid protein complexes.
Ligase		- is an enzyme that can catalyze the joining of two large molecules by forming a new chemical bond
Replication Fork		- is the area where the replication of DNA will actually take place.
Protein synthesis		- is the biological process by which cells generate proteins from RNA.

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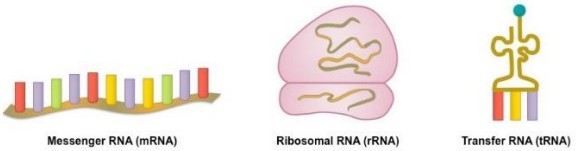
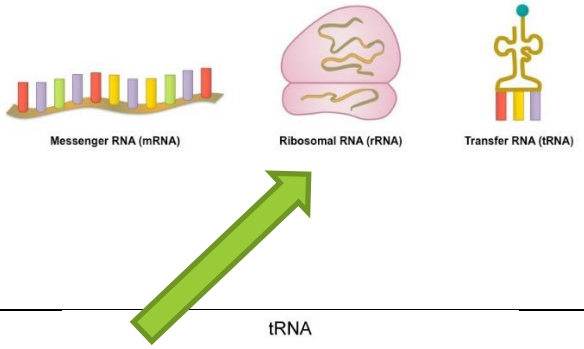
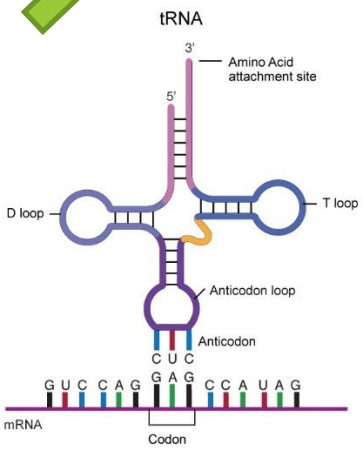
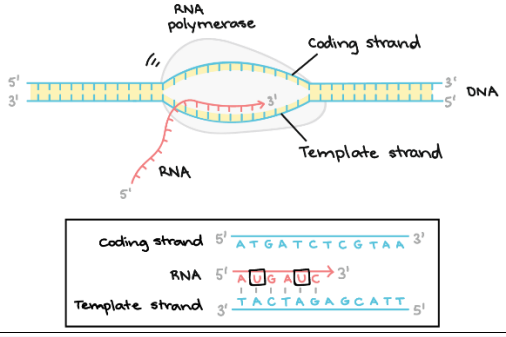
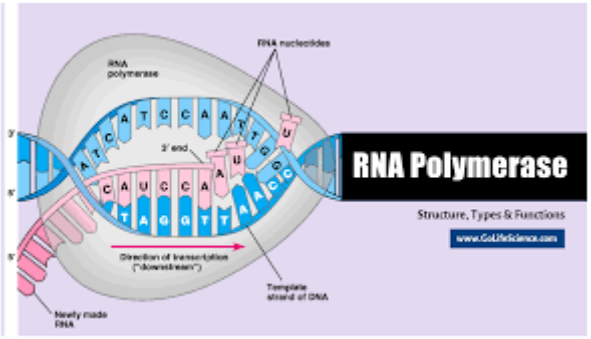
Messenger RNA		- the form of RNA in which genetic information transcribed from DNA as a sequence of bases is transferred to a ribosome.
Ribosomal RNA		- molecule in cells that forms part of the protein-synthesizing organelle known as a ribosome and that is exported to the cytoplasm to help translate the information in messenger RNA (mRNA) into protein.
Transfer RNA		- RNA consisting of folded molecules which transport amino acids from the cytoplasm of a cell to a ribosome.
Transcription		- is the first of several steps of DNA based gene expression, in which a particular segment of DNA is copied into RNA by the enzyme RNA polymerase.
RNA Polymerase		- an enzyme that is responsible for copying a DNA sequence into an RNA sequence, during the process of transcription.

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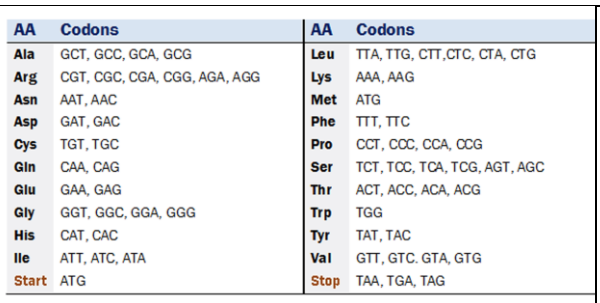
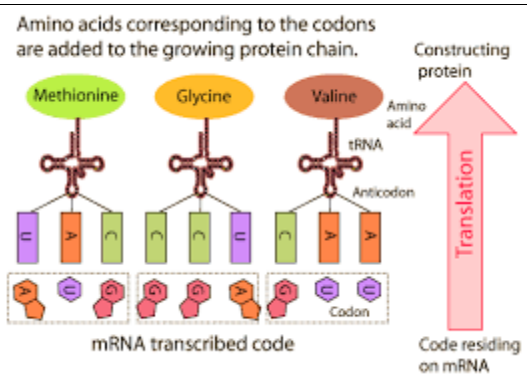
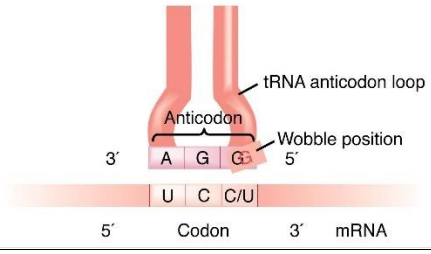
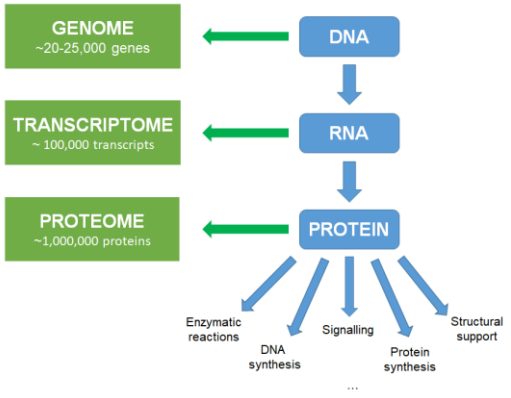
Codon		- a sequence of three nucleotides which together form a unit of genetic code in a DNA or RNA molecule.
Translation		- After DNA is transcribed into a messenger RNA (mRNA) molecule during transcription, the mRNA must be translated to produce a protein. In translation, mRNA along with transfer RNA (tRNA) and ribosomes work together to produce proteins.
Anticodon		- a sequence of three nucleotides forming a unit of genetic code in a transfer RNA molecule, corresponding to a complementary codon in messenger RNA
Genome		- the complete set of genes or genetic material present in a cell or organism.

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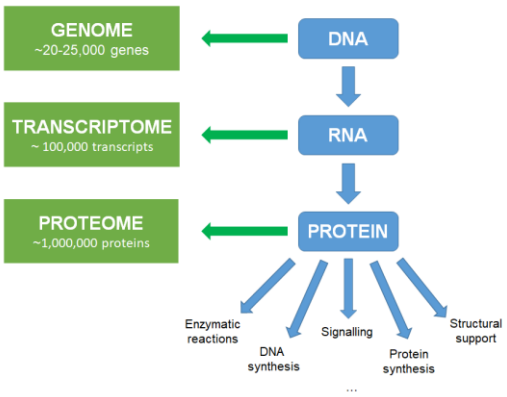
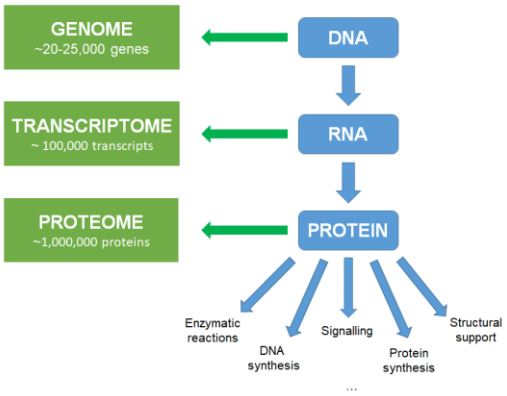
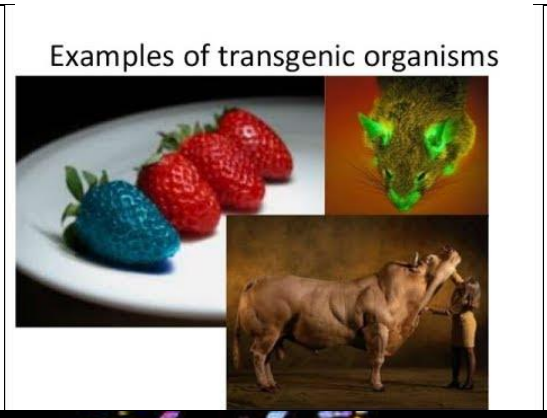
Transcriptome		- is the set of all RNA molecules in one cell or a population of cells. It is sometimes used to refer to all RNAs, or just mRNA
Proteome		- is the entire set of proteins that is, or can be, expressed by a genome, cell, tissue, or organism at a certain time.
Transgenic Organism		- A genetically modified organism is any organism whose genetic material has been altered using genetic engineering techniques.
Human Genome Project		- an international scientific research project with the goal of determining the base pairs that make up human DNA, and of identifying and mapping all of the genes of the human genome from both a physical and a functional standpoint.

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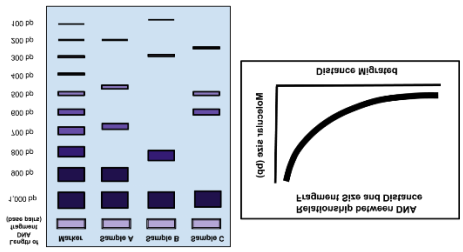
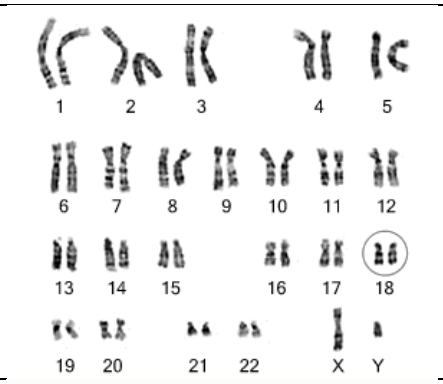
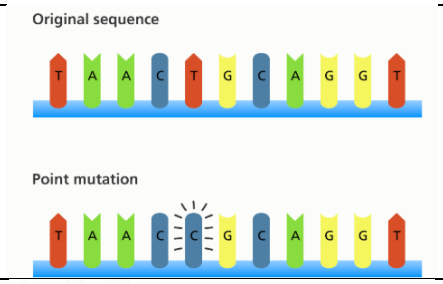
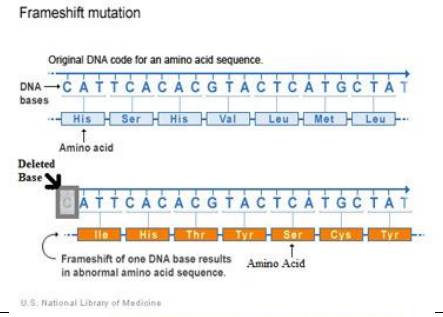
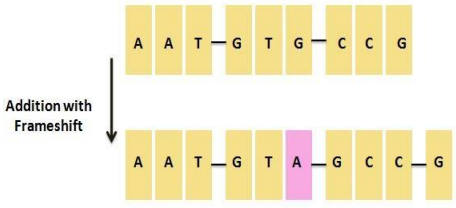
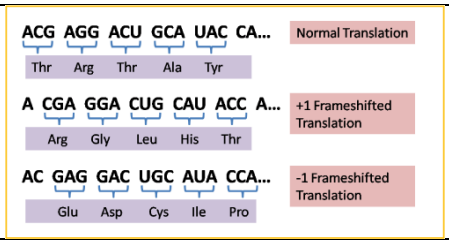
Gel electrophoresis		- is a technique used to separate DNA fragments according to their size.
Karyotype		- is the process by which photographs of chromosomes are taken in order to determine the chromosome complement of an individual, including the number of chromosomes and any abnormalities.
Point mutation		- is a genetic mutation where a single nucleotide base is changed, inserted or deleted from a sequence of DNA or RNA.
Deletion Mutation		- a part of a chromosome or a sequence of DNA is left out during DNA replication.
Addition (Insertion) Mutation		- also called an insertion mutation) is the addition of one or more nucleotide base pairs into a DNA sequence.
Frameshift Mutation		- is a genetic mutation caused by a deletion or insertion in a DNA sequence that shifts the way the sequence is read

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CONTENT REVIEW

1) The "father" of genetics is _____ _____, who was a monk and worked with pea plants

2) For each of the following genotypes, determine if they are homozygous (Ho) or heterozygous (He)

    a. AA _____
    b. Bb_____
    c. Cc_____
    d. dd_____
    e. Ee_____

3) For each of the following genotypes, determine the phenotypes
    a. Brown eyes are dominate to blue eyes
        i. BB _____
        ii. Bb_____
        iii. bb_____
    b. Round seeds are dominate to wrinkled
        i. RR _____
        ii. Rr_____
        iii. rr_____
    c. bobtails are recessive (long tails are dominant)
        i. TT _____
        ii. Tt_____
        iii. tt_____

4) Genes are carried on _____ and human beings have 46 of them.

5) 22 pairs of chromosomes are _____, while the other pair is _____

6) A change in a gene is called a _____.

7) Each parent gives their offspring _____copy of a gene, so their offspring has 2 genes for each trait.

8) What gametes are possible from the following genotypes?

    a) AaBB _____

    b) DDEE_____

    c) FfGg_____

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9) Probabilities of a genetic cross are shown in a _____ _____, a grid used to predict possible offspring between 2 individuals.

10) If tall (T) is dominant to short (t), what is the genotype for short?
11) If a pure tall plant (TT) is crossed with a short plant, what will be the phenotype of the offspring? _____

12) If a hybrid tall plant is crossed with a short plant, what will be the genotype of offspring? _____ The phenotypes? _____

13) A red flower is crossed with a white flower and produces all pink flowers. This is an example of _____.

14) A person with type A blood has children with a person that has type B blood. They have a type O baby. How is this possible? Use a Punnett square.

15) In plants, yellow pods (Y) is dominant over green pods (y) and axial flowers (A) are dominant over terminal flowers (a). A hybrid plant for both pod color and flower position is crossed with a green, terminal plant. What are the phenotypes and genotypes of the offspring.

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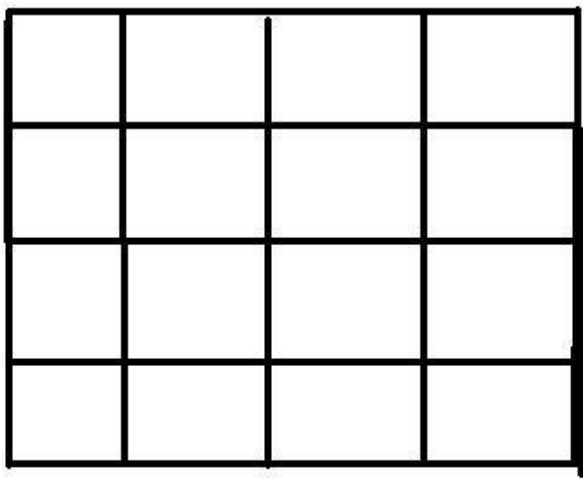

16) _____ Shows traits that are inherited on the sex chromosomes.

17) For an_____ trait, mostly males are the recipients because they do not have another X Chromosome.

18) _____ _____ occurs when two extreme phenotypes are mixed together.

19) _____ occurs when the two extreme phenotypes are equally expressed.

20) Blood types are example of _____ _____.

21) Compare and contrast the structure and function of DNA and RNA

	DNA	RNA
Shape		
Bases		
Sugar		
Located where?		
Function		

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22) The sides of a DNA molecule are made from _____and _____

23) _____bonds form between the base pairs on each side of the DNA molecule.

24) _____bonds with thymine in DNA and uracil in RNA, while _____bonds with cytosine.

25) A _____ is made of phosphate, 5-carbon sugar, and a nitrogenous base.

26) Describe the processes of replication, transcription, and translation in the table below

	Replication	Transcription	Translation
Purpose			
Nucleic acid involved?			
Occurs where?			

27) DNA is copied through a process called _____. This occurs during the _____ stage of interphase before the cell is ready to _____

28) DNA contains the information to make the organic macromolecule _____

29) The process of making RNA from DNA is called _____ and occurs in the _____ of the cell.

30) The 3 types of RNA are _____, _____, and _____.

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31) The _____ takes the genetic code from the nucleus to the ribosomes. The _____ brings amino acids to the ribosomes to build protein.

32) The ribosomes are made of _____.

33) The process of making a protein from mRNA is called _____ and occurs in the _____ of the cell.

Use the DNA strand below to answer the following questions.

T A C A C G C G C T A T

34) What is the complimentary DNA to the strand of DNA above?

_____

35) What is the mRNA to the strand above?

_____

36) Using a codon chart, what is the sequence of amino acids from this mRNA molecule?

_____

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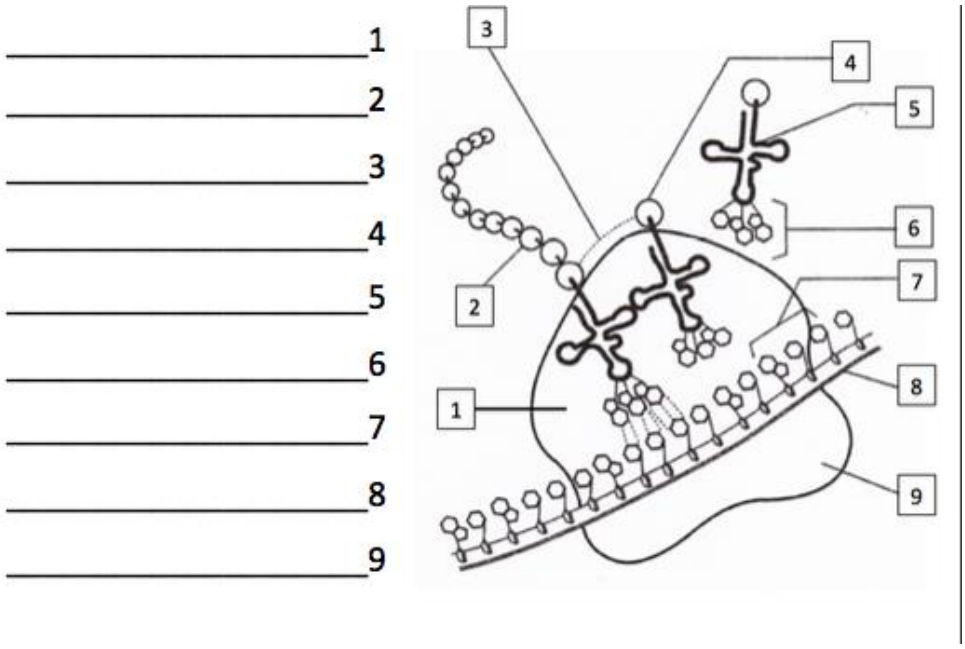
Second Letter

1st letter	U	C	A	G	3rd letter
U	UUU Phe UUC UUA Leu UUG	UCU UCC UCA Ser UCG	UAU Tyr UAC UAA Stop UAG Stop	UGU Cys UGC UGA Stop UGG Trp	U C A G
C	CUU CUC Leu CUA CUG	CCU CCC Pro CCA CCG	CAU His CAC CAA Gln CAG	CGU CGC Arg CGA CGG	U C A G
A	AUU AUC Ile AUA AUG Met	ACU ACC Thr ACA ACG	AAU Asn AAC AAA Lys AAG	AGU Ser AGC AGA Arg AGG	U C A G
G	GUU GUC Val GUA GUG	GCU GCC Ala GCA GCG	GAU Asp GAC GAA Glu GAG	GGU GGC Gly GGA GGG	U C A G

37) Label the diagram below using the following words: ribosome, mRNA, tRNA, amino acid, protein, codon, anticodon



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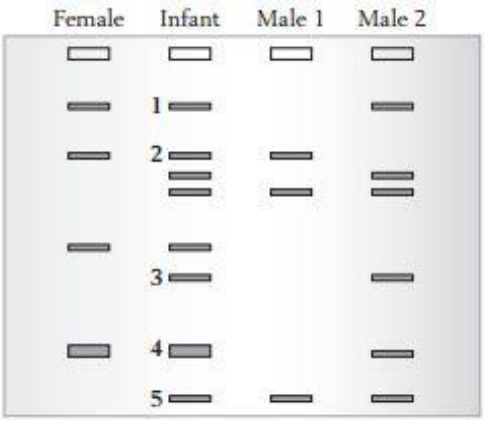
38) The picture below is an example of a(n) _____.



39) In the diagram above , the father of the baby is _____

40) A _____mutation is a change in a single base.

41) A _____ mutation that shifts the "reading frame" of the genetic message by inserting or deleting a nucleotide.

42) A _____ is a mutation that occurs when a sequence of nucleotides is taken out of the DNA sequence.

43) An _____ occurs when a sequence of nucleotides is taken out of the DNA and reinserted backwards.

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MAAP TEST PREP

3)

An infant has a small nose, upward slant eyes, and abnormally shaped ears. The doctor suspects that the infant has Down syndrome and asks the parents to consent to genetic testing of the child.

Which method would be used to determine if the infant has Down syndrome?

A karyotype analysis

B linkage map

C pedigree analysis

D Punnett square

a) Define the following terms from the question above:

Karyotype

Linkage map

Pedigree analysis

Punnett square

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

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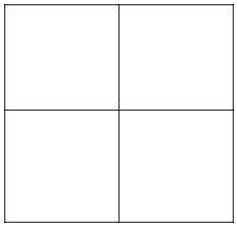
1)

Humans have four basic blood types (A, B, AB, and O) that are determined by three alleles, A (I^A), B (I^B), and O (i). Alleles A and B are codominant, and both these alleles are dominant over allele O. A father with blood type AB (I^AI^B) and a mother with a blood type A (I^Ai) have a child.

What is the chance that a child of these parents will have blood type B?

A	0%
B	25%
C	50%
D	75%

a) Complete the Punnett square for the above question:



b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

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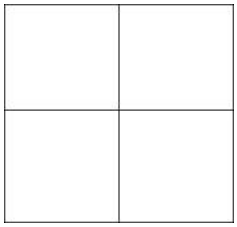
2)

In a species of mouse, brown fur (B) is dominant over white fur (b). If a heterozygous brown mouse is crossed with a white-colored mouse, what would be true of their possible offspring?

A	100% BB
B	25% BB, 25% bb, and 50% Bb
C	50% Bb and 50% bb
D	75% BB and 25% Bb

a) Complete the Punnett square for the above question:



b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

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In wrens, feather color inheritance is an example of incomplete dominance, so B represents black feathers, and W represents white feathers. If a wren with genotype WW is mated with a wren with genotype BB, what is the likelihood that their offspring will have grey feathers?

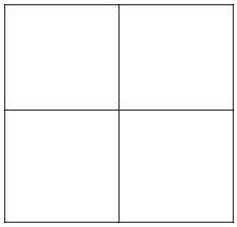
A 25%

B 50%

C 75%

D 100%

a) Complete the Punnett square for the above question:



b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

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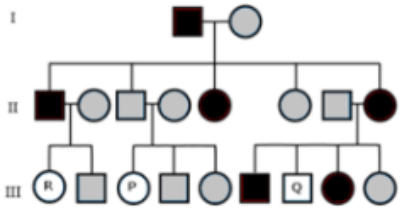
4)

Examine the pedigree which shows the inheritance pattern of an autosomal dominant genetic disorder.



What is the probability that female P will inherit the disorder from her parents?

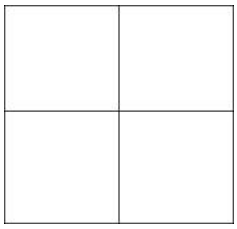
A 0%

B 25%

C 50%

D 100%

a) Complete the Punnett square for the above question:



b) Rewrite the question in your own words. What are they really asking?

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c) What is the correct answer and WHY? (you will not get credit without an explanation)

1)

The sequence of nitrogen bases in a strand of DNA is AGTCCG. What is the sequence for the complementary strand?

A TGACCG

B GACTTA

C CTGAAT

D TCAGGC

a) What nucleotide base matches with Adenine?

b) What nucleotide base matches with Cytosine?

c) Define the following terms from the question above:

Complementary-

d) Rewrite the question in your own words. What are they really asking?

e) What is the correct answer and WHY? (you will not get credit without an explanation)

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2)

A scientist injected a drug into a mouse that inhibits the formation of mRNA in either the sperm or egg cells.

What could be the result of this alteration?

A	The process of DNA replication will stop.
B	The process of protein synthesis will stop.
C	The process of DNA replication will become uncontrolled.
D	The process of protein synthesis will become uncontrolled.

a) Define the following terms from the question above:

Inhibits-

Alteration-

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

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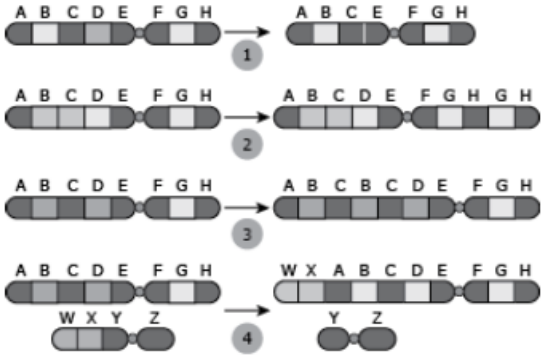
3)

The image shows various types of mutations.



Which part of the image represents a deletion mutation?

A 1

B 2

C 3

D 4

a) What type of mutation is shown in 1?

b) What type of mutation is shown in 2?

c) What type of mutation is shown in 3?

d) What type of mutation is shown in 4?

e) Rewrite the question in your own words. What are they really asking?

f) What is the correct answer?

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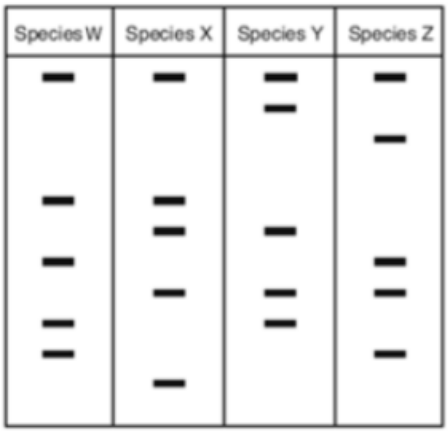
4)

The diagram shows the results of DNA electrophoresis for four related species.



According to the diagram, the DNA digest of which species contained the smallest piece?

A Species W

B Species X

C Species Y

D Species Z

a) What is DNA Electrophoresis used for?

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

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MDE PT. 1 # 16

In guinea pigs, rough coat (R) is dominant to smooth coat (r). What is the expected percentage of smooth-coated guinea pigs when a heterozygous rough-coated guinea pig is crossed with a smooth-coated guinea pig?

F 0%
G 25%
H 50%
J 75%

Answer H. **Clues-** Identify the dominant trait and the recessive trait. "smooth-coated" "heterozygous"

X	R	r
r	Rr Smooth	Rr Rough
r	Rr Smooth	Rr Rough

50%= Smooth 2/4 boxes or 2:4=1:2
50%= Rough 2/4 boxes or 2:4=1:2

MDE PT. 1 # 23

The table lists the traits for fruit color where allele R exhibits incomplete dominance over allele R′.

Genotype	Phenotype
RR	Red
R′R′	Yellow
RR′	Orange

Heterozygous fruit have orange phenotypes. What percent of offspring are expected to have an orange phenotype if the parent plants are orange (RR′) and yellow (R′R′)?

A 25%
B 50%
C 75%
D 100%

Answer B.

X	R	R'
R'	RR' Orange	R'R' Yellow
R'	RR' Orange	R'R' Yellow

50%= Orange 2/4 boxes or 2:4=1:2
50%= Yellow 2/4 boxes or 2:4=1:2

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MDE PT. 1# 33

In fruit flies the presence of wings (W) is dominant to the absence of wings (w), and red eyes (R) are dominant to brown eyes (r). A wingless fly that is heterozygous for eye color is crossed with a fly that is heterozygous for wings and has brown eyes. What is the probability that the offspring would be homozygous recessive for wings and eye color?

A 100%
B 75%
C 50%
D 25%

d) Answer D. **Clues-** " wingless/heterozygous eye color= **wwRr**" x "heterozygous wing and brown eyes=**Wwrr**" "Homozygous recessive for wings and eye color=**wwrr 4/16**

x	wR	wr	wR	wr
Wr	WwRr	Wwrr	WwRr	Wwrr
Wr	WwRr	Wwrr	WwRr	Wwrr
wr	wwRr	wwrr	wwRr	wwrr
wr	wwRr	wwrr	wwRr	wwrr

Percentages Cheat Sheet for Dihybrid

4 Boxes with the same Phenotype/Genotype= **25%**
8 Boxes with the same Phenotype/Genotype= **50%**
12 Boxes with the same Phenotype/Genotype= **75%**
16 Boxes with the same Phenotype/Genotype=**100%**

MDE PT. 3 # 16

A student is studying the inheritance of human blood types. Types A and B are codominant and O is recessive to both.

If a woman with blood type A and a man with blood type B would have children, what would be the largest expected percentage for offspring with blood type O?

F 0%
G 25%
H 50%
J 100%

Answer G.

X	I^A	I^i
I^B	AB Type AB	Bi Type B
I^i	Ai Type A	ii TypeO

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MDE PT. 2 # 15

Colorblindness (X^c) is a sex-linked recessive trait in humans.

If a colorblind daughter is born to a couple, which Punnett square represents the probable genotypes of the parents?

A

	X^C	X^c
X^C		
Y		

C

	X^c	X^c
X^C		
Y		

B

	X^C	X^c
X^c		
Y		

D

	X^C	X^C
X^c		
Y		

X	X^C	X^c
X^c	X^CX^c Female-carrier	X^cX^c Female-colorblind
Y	X^CY Male-Not colorblind	X^cY Male-colorblind

Answer B.

MDE PT. 1 # 3

An unmutated segment of DNA containing 40 molecules of adenine will contain an equal number of which of the following?

A Uracil
B Cytosine
C Guanine
D Thymine

Answer D. **Clues-** "unmutated=not mutated" which means the DNA double helix is uncompromised and is "normal". "Adenine" pairs with Thymine in DNA. Cytosine binds with Guanine and Uracil doesn't appear until Transcription (mRNA).

MDE PT. 1 # 8

Which of the following carries amino acids to the site of protein synthesis?

F mRNA
G rRNA
H tRNA
J nRNA

Answer H. **Clues-** "carries amino acids" = transports which is done by the tRNA (transfer RNA) which appear during translation in protein synthesis. mRNA appear during the transcription part of protein synthesis. nRNA doesn't exist and rRNA is essential for protein synthesis, it doesn't carry the amino acids.

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MDE PT. 1 #22

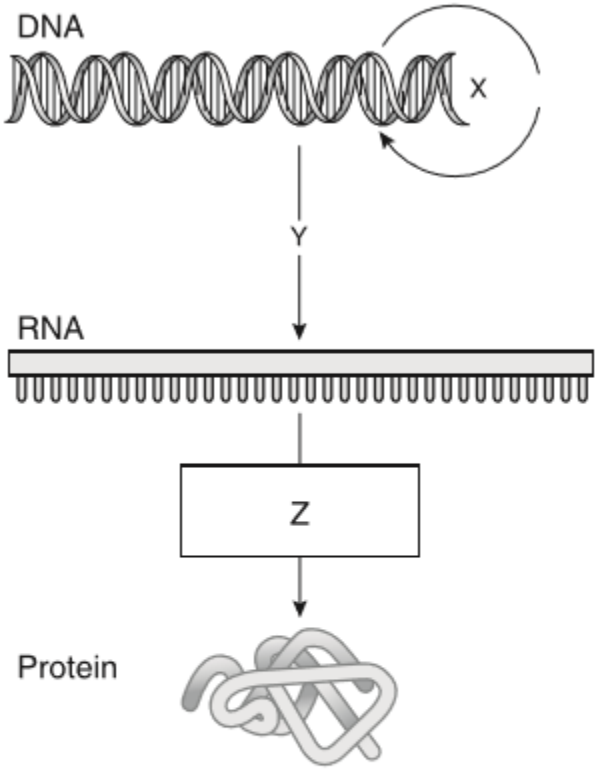
Which molecule directs the synthesis of a polypeptide at a ribosome?

F ADP
G ATP
H DNA
J RNA

Answer J. **Clues-** "Ribosome" "polypeptide=protein". RNA directs the process in both transcription and translation of protein synthesis.

MDE PT. 1 # 34

A diagram of a cellular process is shown below.



Which of the following identifies the process shown at point Z?

F Translation
G Translocation
H Replication
J Transcription

Answer F. **Clues-**" DNA to RNA to Protein"= protein synthesis. The first step is Replication (X) of the DNA, then transcription (Y) where DNA turns into mRNA and then finally, translation (Z) occurs when mRNA carries the amino acids using tRNA to make protein.

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MDE PT. 2 # 11

In a cell, which molecule is used as a messenger to carry instructions from the nucleus into the cytoplasm?

A ADP
B DNA
C RNA
D ATP

Answer C. **Clues-** "messenger" "from the nucleus". ADP is involved in another cellular process and is a byproduct of ATP. DNA replicates in the nucleus and doesn't leave.

MDE PT. 2 # 25

Genes provide the instructions for protein synthesis.

Which molecule serves as a link between a gene and a protein?

A ATP
B DNA
C NAD^+
D RNA

Answer D. **Clues-**"protein synthesis" "protein". Don't let gene (DNA) confuse you. Whenever you see protein, the answer will be amino acids, RNA, or ribosome. This is true for the others: amino acids, RNA, and ribosome.

MDE PT. 2 #59

The color of a rose is an inherited trait.

The molecular basis for the expression of the color trait depends directly on which of these cell functions?

A Respiration
B Photosynthesis
C Protein synthesis
D Hormone production

Answer C. **Clues-** "Color Trait" "Inherited Trait". A and B are cellular process that involve gas exchange and not protein synthesis. D, hormones production regulates other things within an organism like growth, metabolism and body composition not directly traits.

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MDE PT. 2 # 66

This sequence of nucleotides represents one side of a double-stranded DNA molecule.

-ATTGC-

What is the correct sequence for the opposite side?

F ATTGC

G TAACG

H UAACG

J TAACU

Answer G. **Clues-** " double-stranded DNA" "opposite side". The nitrogenous bases of DNA bind accordingly, A-T, T-A, G-C, and C-G. U=Uracil only occurs in RNA, therefore, H and J can be eliminated. F isn't the answer because it's the exact same as the original strand and not connected to its appropriate paired partner.

MDE PT. 3 # 9

James Watson and Francis Crick are credited with discovering the structure of DNA.

Which of the following characteristics of DNA did this discovery help explain?

A Why DNA exists in all living cells

B The amount of DNA in a chromosome

C How DNA passes on genetic information

D The number of base pairs in a DNA molecule

Answer C. **Clues-** "structure of DNA" "genetic information" "characteristics".

MDE PT. 3 #15

Which diagram correctly models the process of protein synthesis?

A

B

C

D

Answer B. **Clues-**"DNA (Replication) to RNA (Transcription) to Protein (Translation)"= protein synthesis

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MDE PT. 3 # 49

The order of bases on a segment of DNA is represented by C-A-C-T-G-A.

What would be the end result of transcription for this sequence?

A G-T-G-A-C-T

B C-U-C-A-G-U

C G-U-G-A-C-U

D C-A-C-T-G-A

Answer C. **Clues-** " DNA and Transcription". The nitrogenous bases of DNA bind accordingly, A-T, T-A, G-C, and C-G. U=Uracil only occurs in RNA. Transcription lets you know you have moved to RNA there for, The nitrogenous bases paring changes: A-U, T-A, G-C, and C-G.

MDE PT.3 # 63

RNA structure is different from DNA structure because only RNA has which of the following?

A Phosphate groups

B Thymine bases

C Adenine bases

D Ribose sugars

Answer D. **Clues-** "DNA different from RNA". DNA is Deoxyribose sugar + a Phosphate group + a Nitrogenous base. RNA is Ribose sugar + a Phosphate group + a Nitrogenous base

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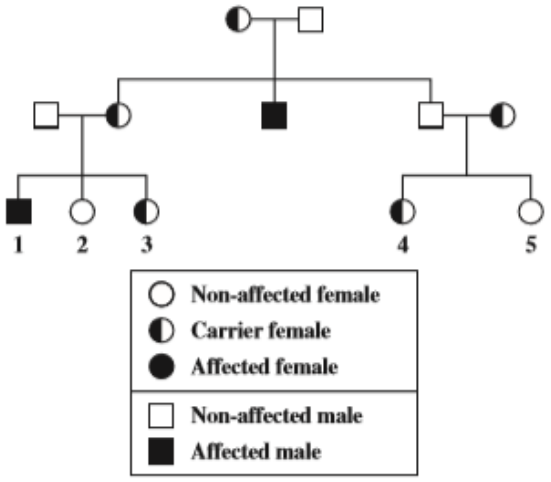
MDE PT. 3 # 14

The pedigree below shows the transmission of a disorder within a family.



Which statement describes the offspring that would result if individual 1 has children with a woman that does not carry the allele for this disorder?

F None of the daughters will inherit the allele for the disorder.

G All of the sons will inherit the allele for the disorder.

H All of the daughters will be affected by the disorder.

J None of the sons will be affected by the disorder.

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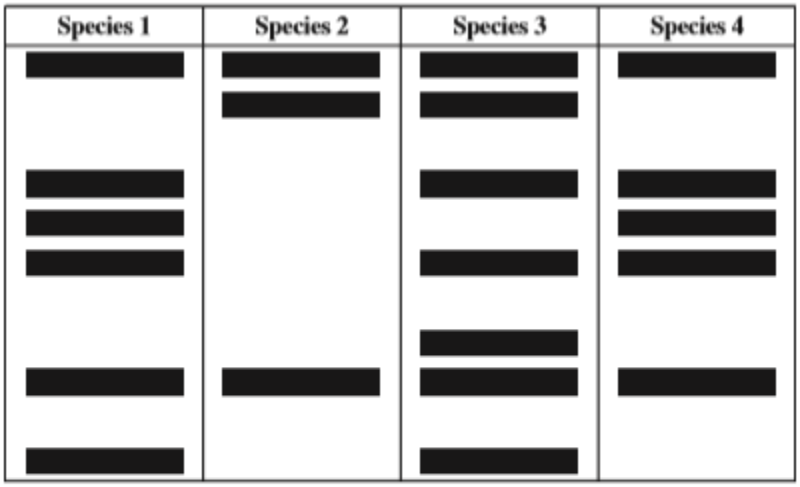
Answer J. **Clues-** "disorders=sex-linked" so you will use a Punnett square to help you.

X	X^A	X^A
X^a	$X^A X^a$ FEMALE-CARRIER	$X^A X^a$ FEMALE-CARRIER
Y	$X^A Y$ MALE-NORMAL	$X^A Y$ MALE-NORMAL

MDE PT. 3 # 26

The diagram below depicts the DNA fingerprints of four fish species.



Which two species of fish are most closely related?

F 1 and 4
G 1 and 2
H 2 and 3
J 3 and 4

Answer F. **Clues-** "DNA fingerprints" You're looking for the two columns that match the most horizontally.

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MDE PT. 3 # 34

The table below is a codon chart.

First Letter	Second Letter				Third Letter
	U	C	A	G	
U	phenylalanine	serine	tyrosine	cysteine	U
	phenylalanine	serine	tyrosine	cysteine	C
	leucine	serine	stop	stop	A
	leucine	serine	stop	tryptophan	G
C	leucine	proline	histidine	arginine	U
	leucine	proline	histidine	arginine	C
	leucine	proline	glutamine	arginine	A
	leucine	proline	glutamine	arginine	G
A	isoleucine	threonine	asparagine	serine	U
	isoleucine	threonine	asparagine	serine	C
	isoleucine	threonine	lysine	arginine	A
	(start) methionine	threonine	lysine	arginine	G
G	valine	alanine	aspartate	glycine	U
	valine	alanine	aspartate	glycine	C
	valine	alanine	glutamate	glycine	A
	valine	alanine	glutamate	glycine	G

What is the likely effect of a mutation that causes the sequence CGC to become CGG?

F The reading frame will be shifted.
G The protein formed will be unchanged.
H The protein will be translated incorrectly.
J The translation process will stop prematurely.

Answer G. **Clues-** "CGC=Arginine & CGG=Arginine"

MDE PT. 3 # 42

People who inherit hemophilia type A are unable to make a protein required to clot blood.

This disorder is directly related to which of the following?

F A mutation in one gene
G A chromosome that is duplicated
H A gene that was incorrectly copied
J A trait acquired from the environment

Answer F. "hemophilia" is caused by a mutation in the production of protein.

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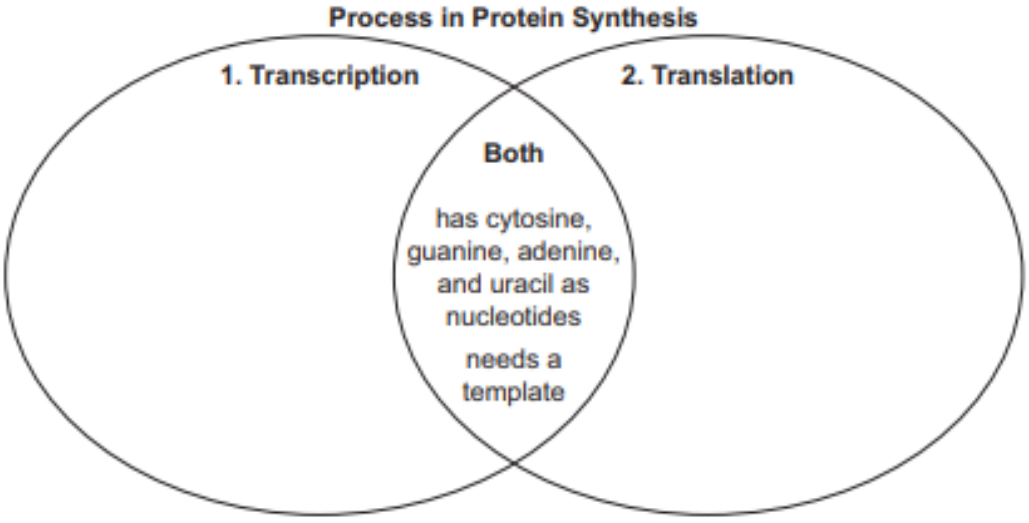
21. A student uses a Venn diagram to compare the mechanisms of transcription and translation during protein synthesis. The incomplete diagram is shown.



Write the number 1 or 2 next to each descriptor to identify whether it should be grouped with transcription (1) or translation (2) in the Venn diagram.

has mRNA as a product ☐

occurs in ribosomes ☐

has polypeptide as a product ☐

occurs in the nucleus ☐

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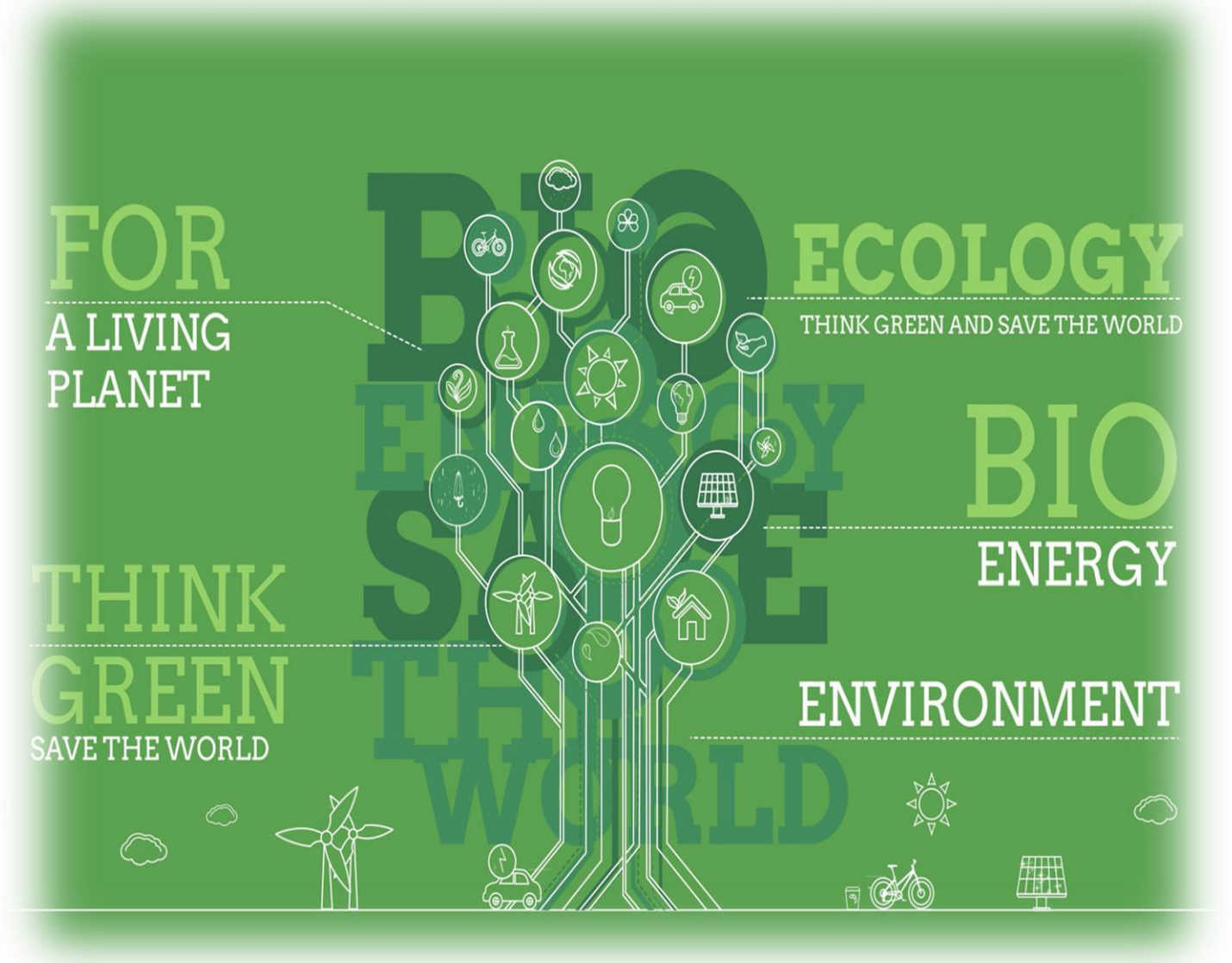
SECTION 5
ENVIRONMENT: FOOD WEB, FOOD CHAIN, AND ENERGY PYRAMID



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KEY CONCEPTS ENVIRONMENT: FOOD WEB, FOOD CHAIN, AND ENERGY PYRAMID

MS-CCR Standard(s):

BIO. 5. Students will Investigate and evaluate the interdependence of living organisms and their environment.

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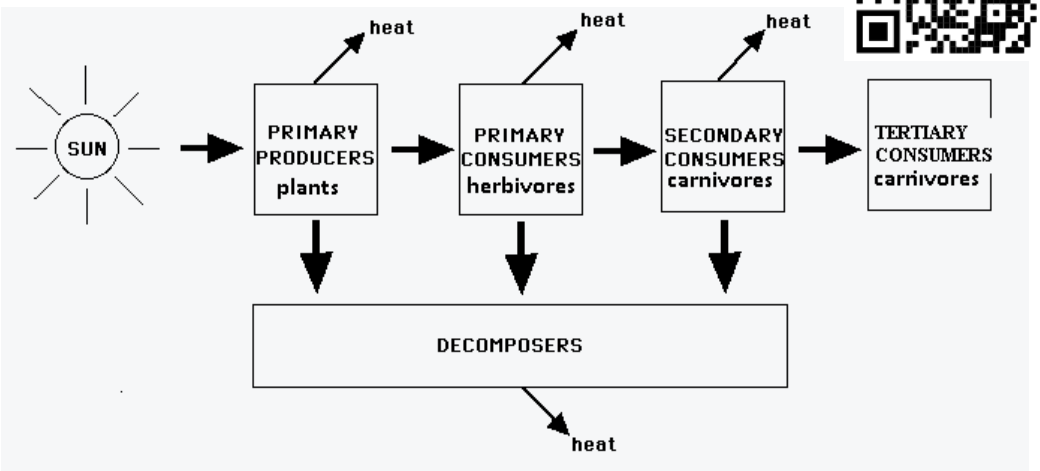
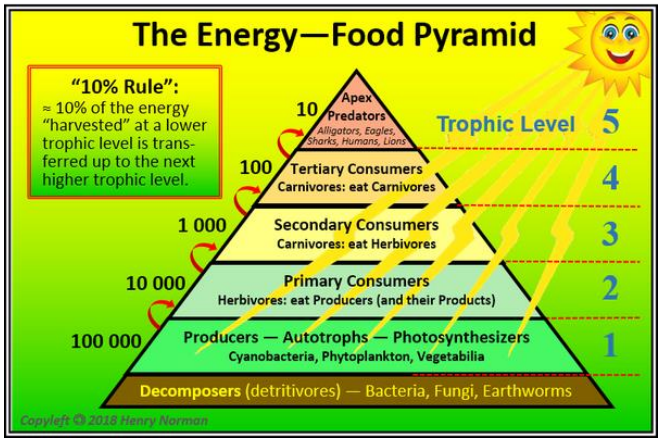
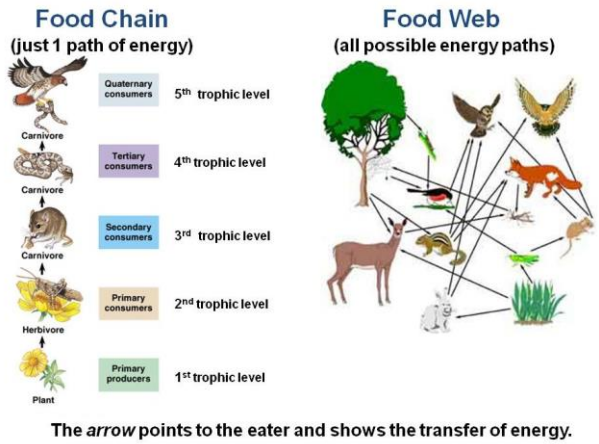
BIO. 5. 3. Analyze and interpret quantitative data to construct an explanation for the effects of greenhouse gases on the carbon dioxide cycle and global climate.

BIO. 5. 4. Develop and use models to describe the flow of energy and amount of biomass through food chains, food webs, and food pyramids.

Energy Flow







The *arrow* points to the eater and shows the transfer of energy.

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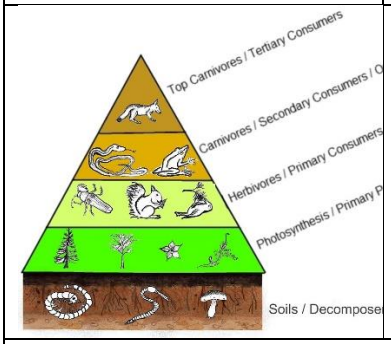
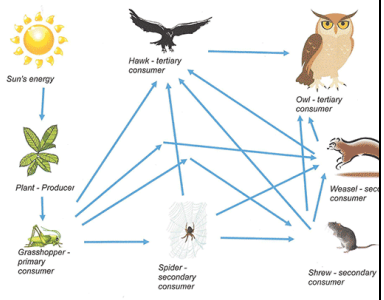
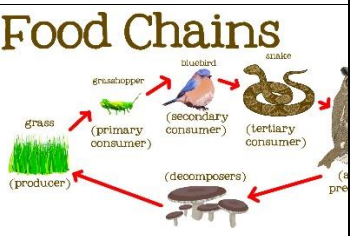
(Will be shown either through an Energy Pyramid, Food Chain, or Food Web)

Key Factors to Remember:

- Heat/energy is released during each step
- 10% of heat/energy is lost during each step/as you go up
- Producers (grass on land/plankton in water)/are autotrophs (make their food)
- Primary (1st) consumers (eat their food) = herbivores (eat producers)
- Secondary (2nd) consumers (eat their food) = carnivores (eat herbivores)
- Tertiary (3rd) consumers (eat their food)= omnivores (eat all)

ENERGY PYRAMID	ENERGY FOOD WEB	ENERGY FOOD CHAIN
		
Look for(s)/ Clues:		
• Pyramid • Levels • As you go up, energy decreases	• Tangled arrows/web- A → B • **A =Arrow end** (what is being eaten) • **B= Arrow head** (consumer)	• Arrow go in order A → B • **A =Arrow end** (what is being eaten) • **B= Arrow head** (consumer)

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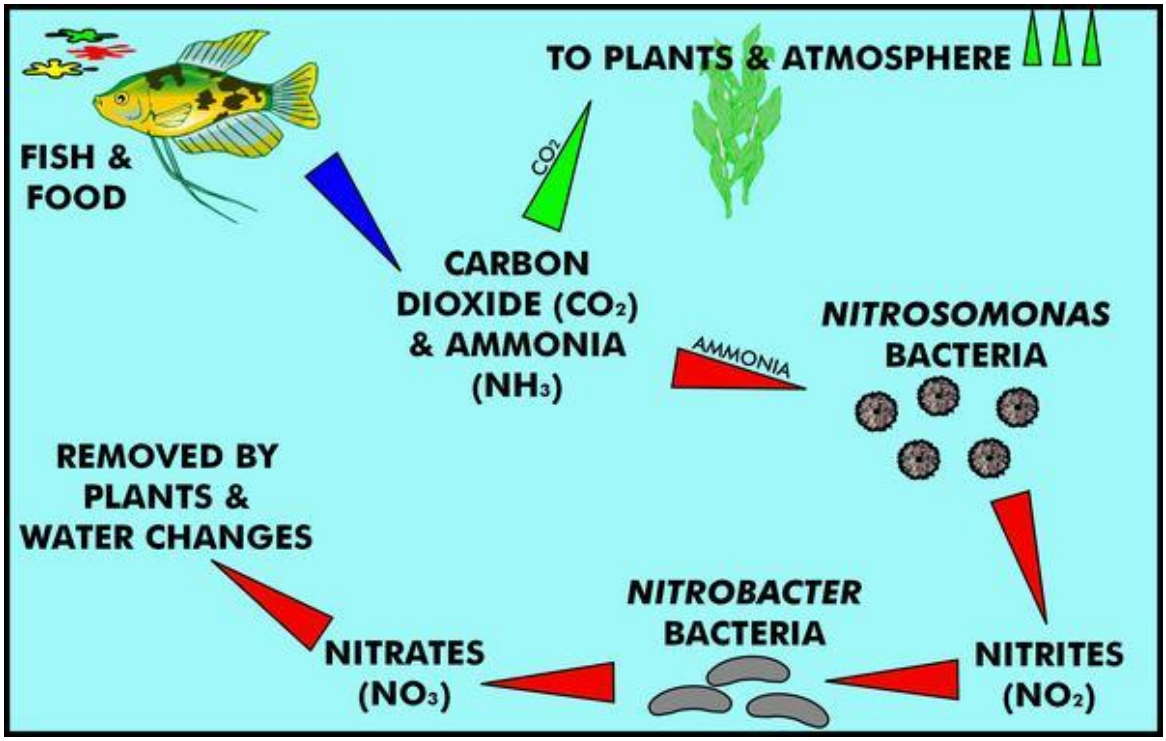
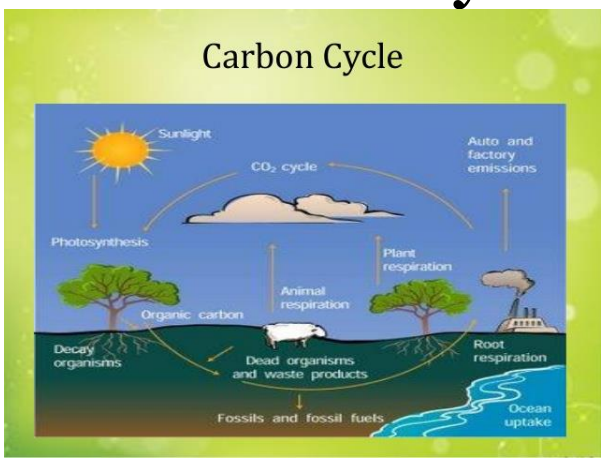
Roles of Beneficial Bacteria



- Very Important to Food Web/Chains
- Breaks down Nitrogen in the air for plants. We eat plants which is how we get needed nitrogen for survival purposes.
- Helps with decomposition/decay
- Helps in food productions
- Big role in symbiosis as microorganisms

Main Cycles of Matter in an Ecosystem to Study



Key Information

- Carbon (C) deals with organic (earth) matter
- Carbon (C) enters the ecosystem as C or CO2/CO gas: when things die, living things exhale, things burn (black smoke)

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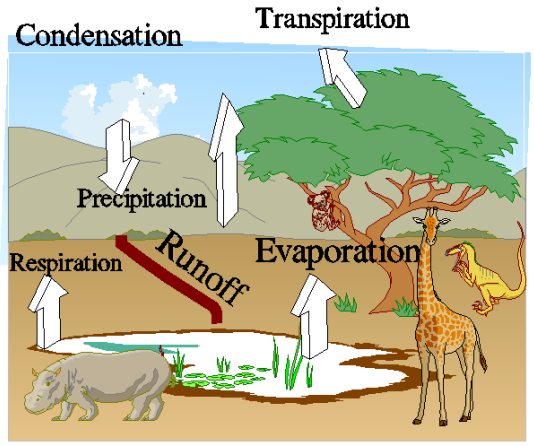
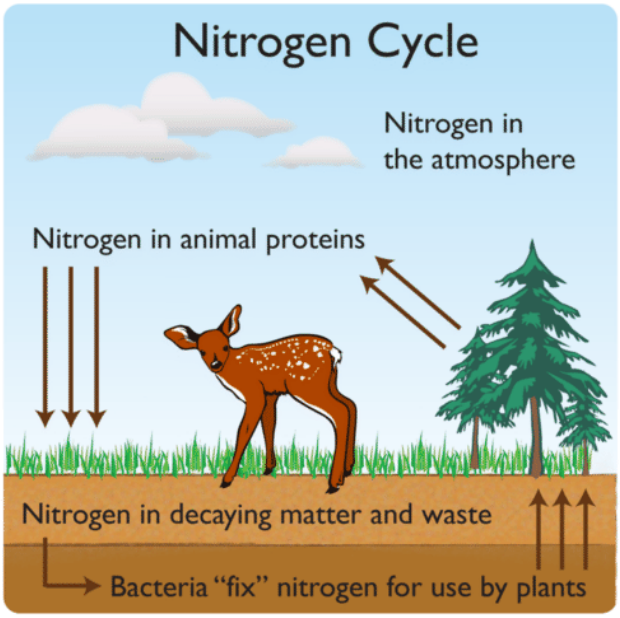


The Water Cycle

Key Information

- Water(H2O) enters the ecosystem through water vapor (in air and when you talk) Condensation (gas to liquid=dew on your shoes), Precipitation (Rain, sleet, or snow), or through using the potty.
- Water (H2) exits the ecosystem through Transpiration (plants sweating) and Evaporation (liquid to gas)



Key Information

- Nitrogen (N2) is the most abundant gas in the atmosphere
- We need it to survive. Therefore, the **ONLY** way **we get Nitrogen** is to **EAT IT** not through breathing

How do get Nitrogen(N):

1. N2 from air is decomposed (broken down) by bacteria
2. Nitrogen(N) released by decaying matter and waste is also decomposed by bacteria
3. We (living things like herbivores and plants) take the Nitrogen(N) produced in the ground from the bacteria, eat it or absorb it for survival purposes
4. The cycle is repeated

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KEY VOCABULARY ENVIRONMENT: FOOD WEB, FOOD CHAIN, AND ENERGY PYRAMID

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BIO. 5. 4. Develop and use models to describe the flow of energy and amount of biomass through food chains, food webs, and food pyramids.

Biomes (Most common on test)	**Picture of the environment**	**Living organisms** (animals/plants species)	**Climate**	**Adaptation Characteristics of** (animal/plant species)
Deserts		Camels Rattle Snakes Cobras **Cactus Plant** **Desert Fox** Huge Lizards Kangaroos **Antelopes**	**Hot! Hot! Hot!** Little to no rain.	**Animals**- no fur, survive with little to no water and in extreme heat **Plants**- (Cactus) stores water due to little rain. Long tap roots to reach underground water
Tundra		Penguins **Polar bears** Artic Wolves Artic Foxes **Sandpipers** **(not all white animals)** Short plants if any	 **Very Cold! Ice/snow/icy water** **(Happy Feet)**	**Animals**- a lot of fur to keep warm **Plants**-very little plants, mostly ice/snow
Taiga		**Most animals are all white here!** Polar bears Bears **Bobcats** **Owls** **Foxes** **Hares** (rabbits)	**Very Cold like Tundra but with trees!!!** A lot of snow/ Winter Wonderland	**Animals**- a lot of fur, very white to blend in with their environment **Plants**- tall trees, bushes & short shrubs

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Grassland		**Zebras** Elephants **Buffalo** **Gazelles**	**Skinny tall Grass, Grass, & more Grass!** 	**Animals**-have broad/flat-top teeth to feed on grass. Some have Long legs/paws to burrow in the ground **Plants**-survive heavy grazing (many herbivores feeding on them)
Temperate/Deciduous (D)/ Coniferous (C) Forest		**Racoons** Woodpecker Red Cardinal **White-tailed deer** **Opossums** Red foxes Porcupines **Hawks** Snakes Trees w/leaves (D) Trees w/ Pine Cones (C)	**Mississippi in the Fall!!! Think Forest!!!** 	**Animals** - adapt to changing seasons (cold winters/hot summers) **Plants- (D)**-lot of leaves no pine needles/cones **(C)**-lot of pine needles(cones)
Savanna		**Zebra** Horses **Giraffes** **Lions** **Cheetahs** **African Elephants**	**Think Lion King! Don't play, you're trying to pass!** 	**Animals-** little to no fur/adapt to survive droughts **Plants-** long tap roots due to periods of drought, thick bark on trees resistant to annual fires, trunks are used as water storage.
Tropical Rainforest		Insects Butterflies Exotic/colorful flowers **Colorful Frogs and toads** Snakes Monkeys Gorillas Parrots Jaguars Anacondas Spiders **Canopy Trees**	**Rain, Rain, and more Rain! Very Wet!** **"Jungle"** **Remember the Canopy trees!** A lot of Precipitation	**Animals-** live mostly in the trees and rarely on ground to hide from predators **Plants-** Canopy trees- tall to reach rain, provide shelter, block sunlight so very little plant life on ground. Infertile soil

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CONTENT REVIEW

1) _____ factors are living factors in an organism's environment.

2) Two examples of biotic factors include _____ and _____

3) _____ factors are nonliving factors in an organism's environment.

4) Two examples of abiotic factors include _____ and _____

5) The main steps to the water cycle are _____, _____ and_____

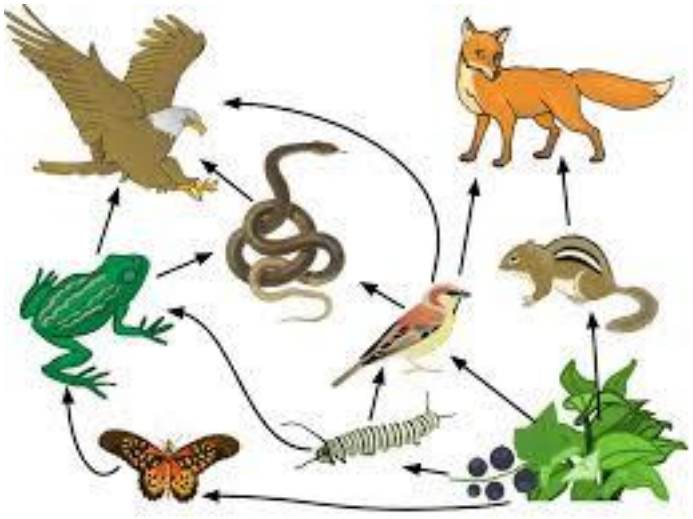
6) The short term carbon/oxygen is processes of _____ and _____ _____

7) _____ must be fixed by bacteria before it can be used by plants to make proteins.

8) A _____ _____ is a simple picture depicting how energy flows from producers to consumers.

9) _____ always begin a food chain.

10) Label the food web below using the following terms: produce, primary consumer, secondary consumer, tertiary consumer, quaternary consumer, herbivore, carnivore and omnivore



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Use terms for number 11- 16 produce, primary consumer, secondary consumer, tertiary consumer, quaternary consumer, herbivore, carnivore, decomposers, and omnivore

11) _____ make their own food

12) _____ must eat others for their food

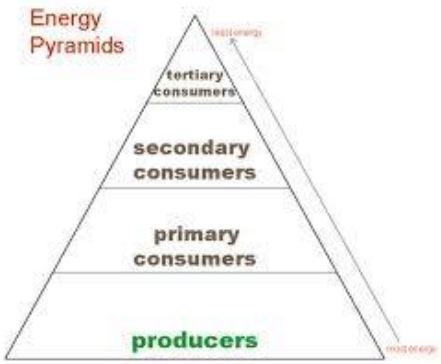
13) _____ eat meat

14) _____ eat plants

15) _____ eat both plants and animals.

16) _____ are heterotrophs that decompose organic material and return the nutrients to the soil, air, and water, making the nutrients availability to other organisms.

17) Color the energy pyramid below. Color the producers green, the primary consumers yellow, the secondary consumers red, and the tertiary consumers blue.



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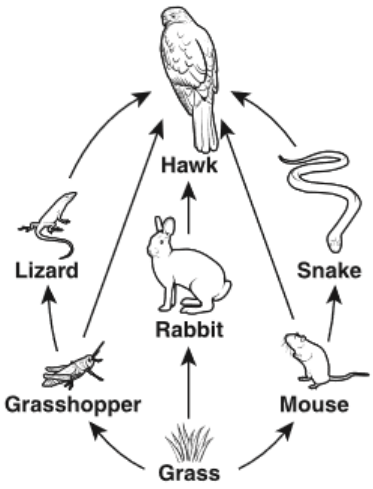
MAAP TEST PREP

MDE PT.1 # 2

A diagram of a food web is shown below.



Which organism in the food web receives the least amount of energy from the producers?

F Hawk
G Rabbit
H Grasshopper
J Mouse

Answer F. **Clues:** least amount of energy (energy is lost as you go up), all the arrow heads are going to the hawk so it's the highest (least energy)

MDE PT. 1 #6

Which of the following introduces carbon dioxide into the carbon cycle?

F Using a windmill to pump water
G Absorbing solar energy
H Burning organic material
J Generating hydroelectric power

Answer H. **Clues:** "Organic Material" =big factor/component in the carbon cycle. F & J are associated with the water cycle and G. discuss solar(sun) energy absorption not introducing CO_2 into the carbon cycle.

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MDE PT 1. # 14

Mycorrhiza is a symbiotic relationship between plant roots and fungi. The fungi grow around the plant roots and increase the surface area for the absorption of water and nutrients by the plant. The plant roots, in turn, provide nutrients for the fungi. What type of symbiotic relationship is mycorrhiza?

F Commensalism
G Competition
H Parasitism
J Mutualism

Answer J. **Clues:** "in turn" =both are helping each other. F., G., and H. only one benefits.

MDE PT 1. # 46

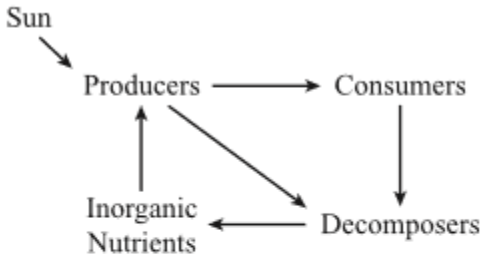
How is atmospheric nitrogen made available to plants and animals?

F Nitrogen is transformed into nitrates by soil bacteria.
G Nitrogen is converted into nitrates as groundwater is filtered.
H Nitrogen is breathed in along with oxygen and discarded as nitrate waste.
J Nitrogen is released rapidly by the weathering of rocks and absorbed by vegetation.

Answer F. **Clues:** "bacteria". Nitrogen is changed into an usable form by bacteria. In G, (N) is changed by water (incorrect), and while H does have waste in the answer choice, you can't breathe in Nitrogen. Finally, J says N is released by weathering (also incorrect).

MDE PT 1. # 65

The diagram shows the cycling of nutrients in an ecosystem.



The removal of which of the following groups would cause an immediate decrease in the amount of energy flowing through the system?

A Producers
B Consumers
C Decomposers
D Inorganic nutrients

Answer A. **Clues:** "immediate decrease of energy". Since the energy flow in an ecosystem is greatest at the lowest level ("producers"). B is further up the energy

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pyramid and C help the process to help the producers make their own food. D. is also added to assist producers in making their own food (autotrophs).

MDE PT 2. # 3

Which function is typical of a decomposer in an ecosystem?

A Consuming green plants
B Preying on white-tailed deer
C Competing with coyotes for resources
D Breaking down dead trees into soil nutrients

Answer D. **Clues:** "breaking down". All the other verbs used in the other answer choices do not reflect decomposers responsibilities.

MDE PT 2. # 17

The diagram represents feeding relationships in a Gulf ecosystem.

Phytoplankton → Sand shrimp → Bluefish → Summer flounder → Osprey

Based on the food chain shown above, what organism is FEEDING on a secondary consumer?

A Sand shrimp
B Bluefish
C Summer flounder
D Osprey

Answer C. **Clues:** Producers= Phytoplankton, Primary Consumer=Shrimp, Secondary Consumer=Bluefish. The Summer flounder is eating the bluefish "arrowhead" not arrow tail. A. Shrimp eats plankton, B. Bluefish is eating the shrimp, and the Osprey is eating the Tertiary consumer, flounder.

MDE PT 2. #40

Oxpeckers are a type of bird that feed on pests like the ticks and flies found on animals like zebras and giraffes. The oxpeckers also help keep wounds on animals clean and free from maggots, thereby reducing the chance of infection.

This interaction is an example of what type of relationship?

F Predation
G Parasitism
H Mutualism
J Commensalism

Answer H. **Clues:** "also help" = both are helping each other. F., G., & J. One only benefit.

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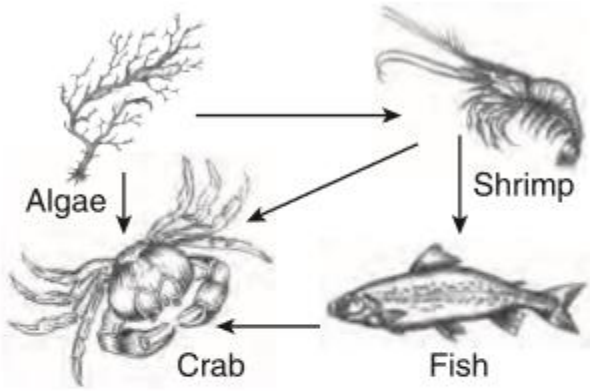
MDE PT 3. # 50

A marine food web is shown below.



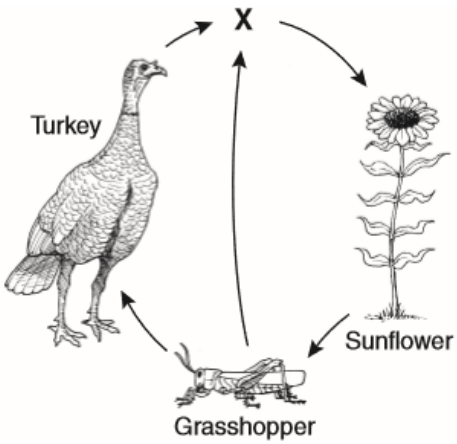
Which statement accurately describes a relationship in the food web?

F The fish is a predator.
G The crab is a producer.
H The shrimp is a decomposer.
J The algae is a primary consumer.

Answer F. **Clues:** The producer is the algae which knocks out G and J. Bacteria are decomposers eliminating H.

MDE PT 3. # 8

The diagram below shows the gas exchange among different organisms.



Which carbon compound is represented by the X?

F Carbon dioxide, CO_2
G Glucose, $C_6H_{12}O_6$
H Carbonic acid, H_2CO_3
J Carbon monoxide, CO

Answer F. **Clues:** Turkey is giving X off and the plant is taking it in (gas exchange). Turkey do not give off G,H, or J and the plant cannot give off H or J.

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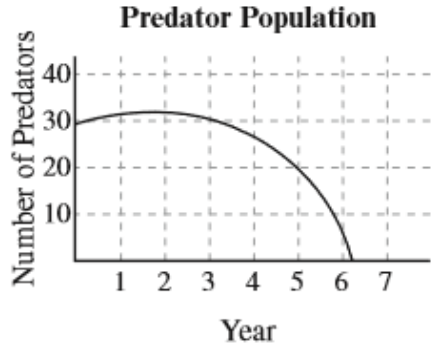
MDE PT 3. # 13

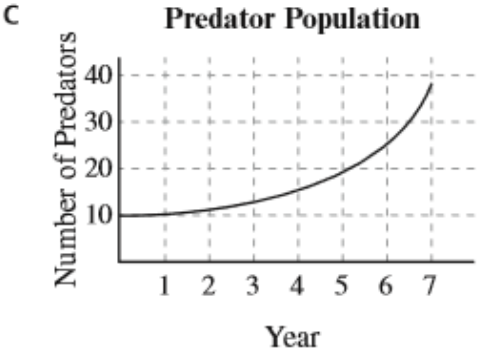
Researchers conducted a seven-year study of a rabbit population and its predators in an ecosystem. During the first two-and-a-half years of the study, the rabbit population rose steadily then declined to the lowest level in the fourth year. The rabbit population rose again during the last three years of the study.

Which of the following graphs shows how the population of rabbit predators would be expected to change during the same period in the ecosystem?

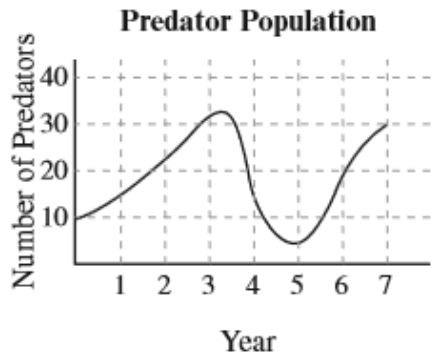
A



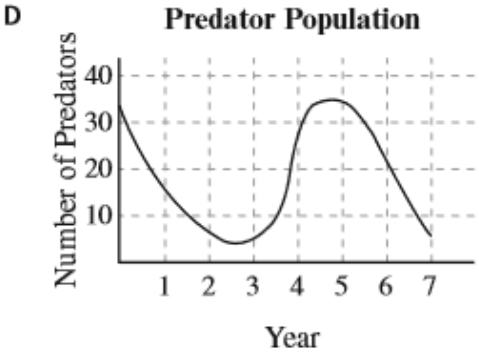
C



B



D



Answer B. **Clues:** "1st 2.5 years, rabbits increased and declined beginning in year 4, then rose again the last 3 years". B. is the only graph where there is an increase, decrease, and then an increase. A decline, D. starts off declining, and A is already up and doesn't increase.

MDE PT 3. # 51

Two food chains are shown below.

Algae → Zooplankton → Bluegill → Great Blue Heron
Grass → Rabbit → Fox

What role do the fox and the bluegill play in these communities?

A Producers

B Decomposers

C Primary consumers

D Secondary consumers

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Answer: D. **Clues:** Secondary consumers are the **third level from producers** of the energy flow within an ecosystem (food chain). Algae are the Producers, Zooplankton are the primary consumers. In the second food chain, grass is the producer, rabbit is the primary consumer and the **fox (third one away from producers)** is the secondary consumer.

MDE PT 3. # 64

Which of the following activities represents competition among organisms?

F A family of rabbits feeds on abundant pine seeds.

G A coyote pup learns to stalk both rabbits and hares.

H A wolf steals a rabbit killed by a coyote.

J A bobcat catches several rabbits as the rabbits eat pine seeds.

Answer: H **Clues:** steals (takes the advantage). F & J are both about Prey and predator. G is a learned behavior and is not in opposition.

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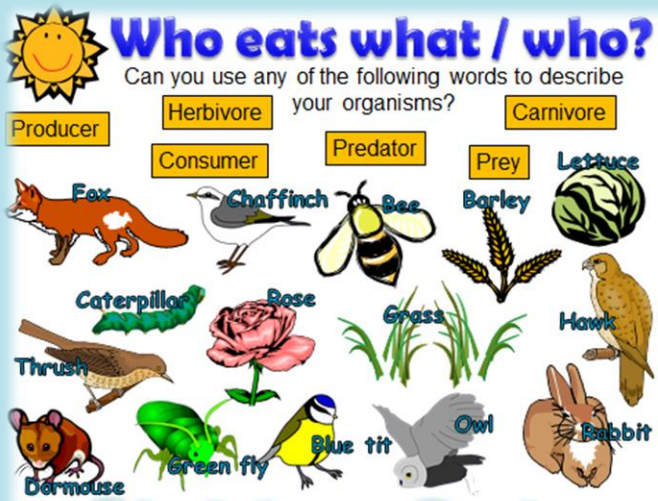
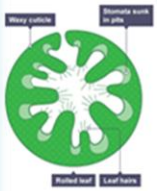
SECTION 6
ENVIRONMENT: INTEDEPENENCE

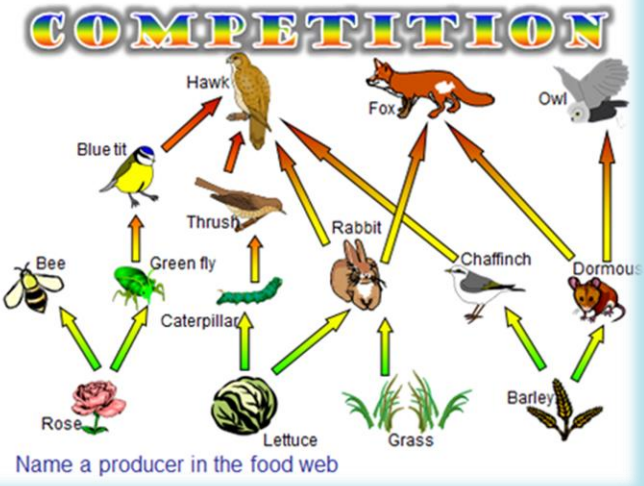


Adaptations in Plants



Marram grass grows on sand dunes. Its leaves have adaptations to reduce water loss in dry, windy conditions.

Adaptation	Explanation
Leaves reduced to spines	Impermeable to water, which stops evaporation
Reduced number of stomata	Reduces the transpiration rate
Waxy leaf cuticle	Traps moist air, which increases the humidity and reduces the diffusion of water vapour
Rolled leaves, leaf hairs, and stomata sunk in pits	Reduces the surface area for transpiration



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KEY CONCEPTS ENVIRONMENT: INTEDEPENENCE

MS-CCR Standard(s):
BIO. 5. Students will Investigate and evaluate the interdependence of living organisms and their environment.
BIO. 5. 5. Evaluate symbiotic relationships (e.g., mutualism, parasitism, and commensalism) and other coevolutionary (e.g., predator-prey, cooperation, competition, and mimicry) relationships within specific environments.
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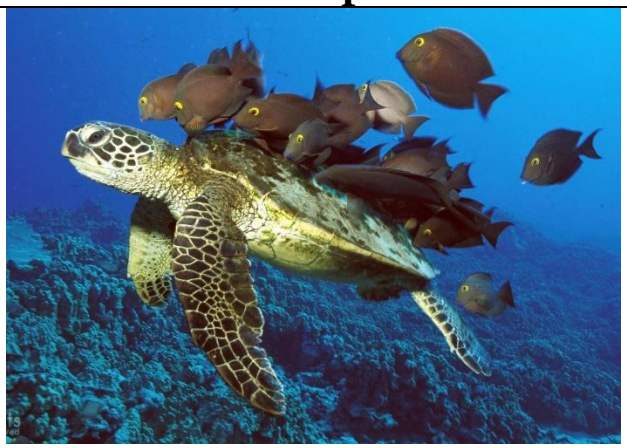
BIO. 5. 9. Enrichment: Use an engineering design process to investigate and model current technological uses of biomimicry to address solutions to real-world problems.

➡Interrelationships of Organisms

(Symbiotic Relationships) [Bio=life]==Relationships between living things

Types	Definition	Example
Cooperation	**one of the organisms benefits greatly and the other is not helped but is not harmed or damaged**	

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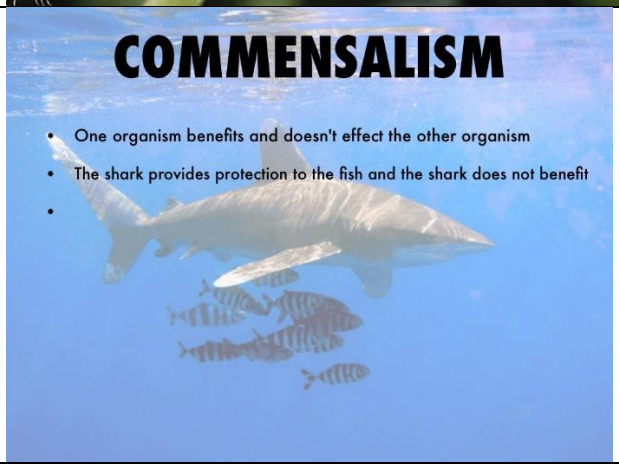
Predation	one organism acts as the "predator" and kills-and usually consumes-the other species, known as the "prey"	
Parasitism	**one** organism **benefits**, the **other** is **harmed**	
Commensalism	**one** organism **benefits**, the **other <u>is harmed, helped, or affected</u>**	

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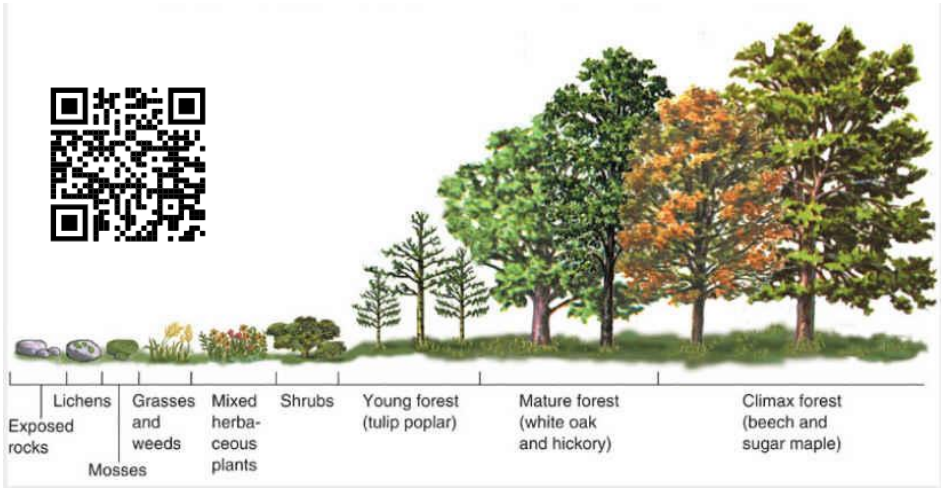
Mutualism	both organisms benefit	Mutualism • **Definition**: mutualism is the interaction between two living organisms that benefit both organisms. Nemo, the clown fish, is sheltered by the sea anemone. The sea anemone uses the clown fish as bait to attract its prey.

The following study videos help with understanding the relationships:

Natural Events/Human activities & ITS IMPACT on the ecosystem

A. Succession

- **Two types:** Primary Succession and Secondary Succession



Primary Succession: Over time a forests/fields grow over time.
----After a catastrophe or disaster secondary succession occurs----

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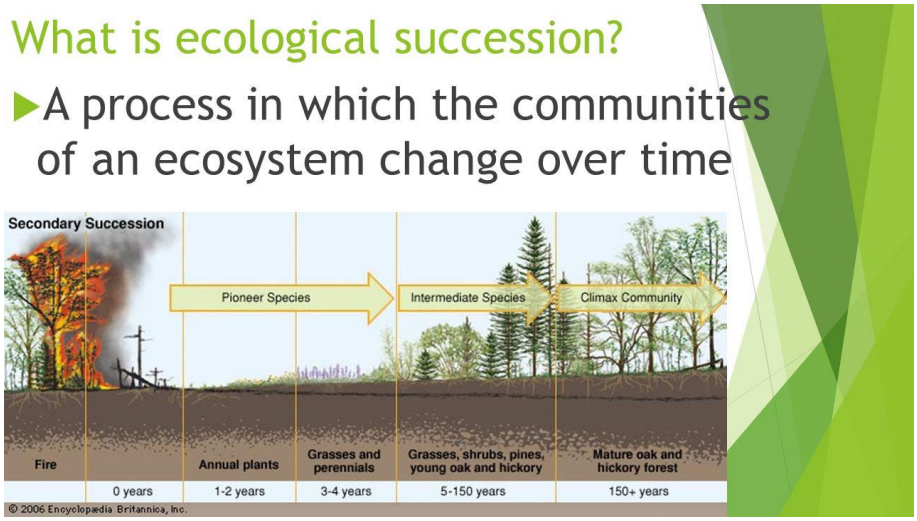
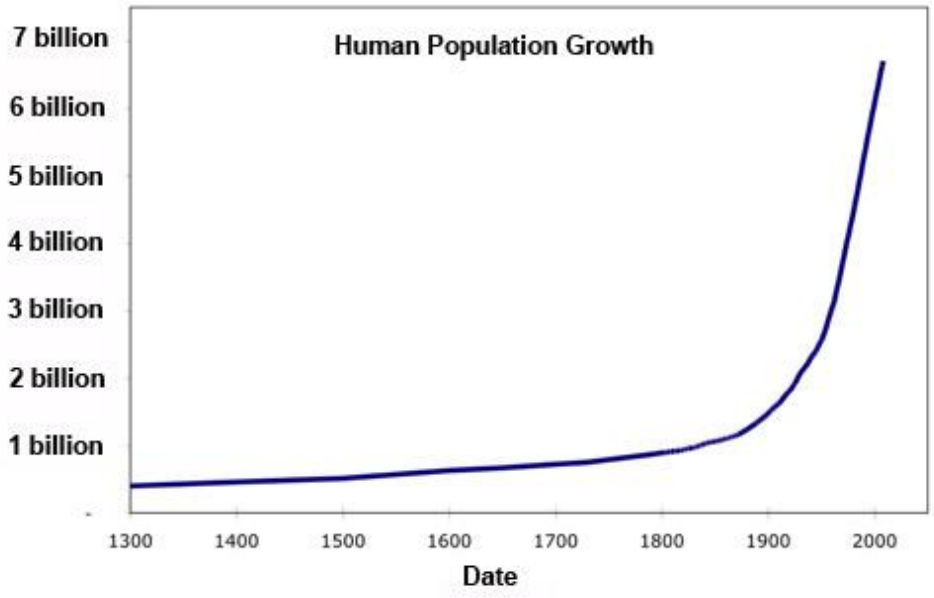


It takes about 100+ years for an ecosystem to completely grow back!!!

B. Population Growth



The rising **population** uses up much of the earth's natural resources and creates pollution. The **population** affects the **environment** in many ways.

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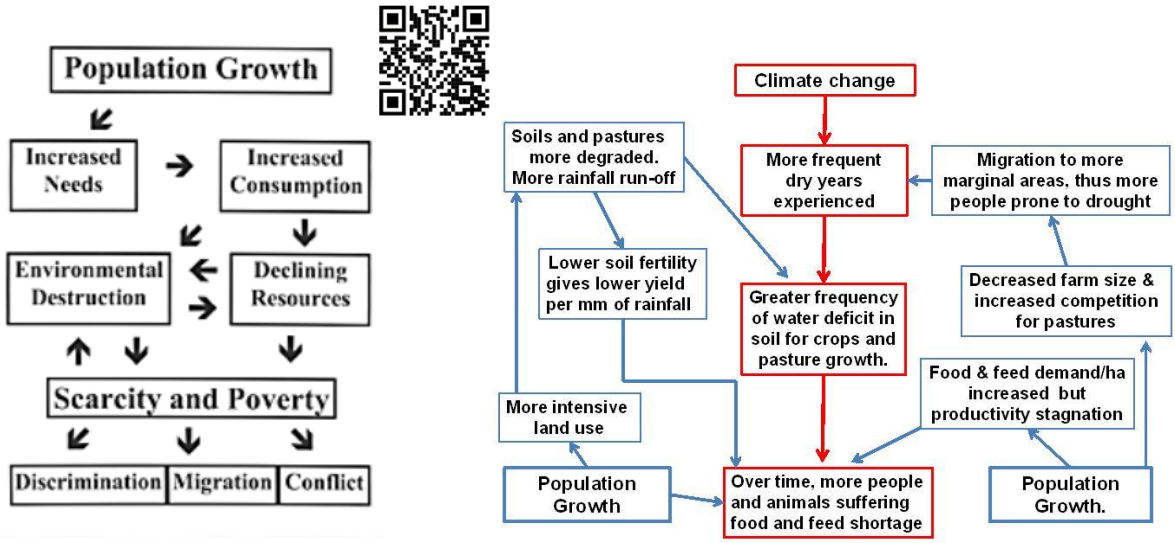

C. Technology

Impacts of Production Technology

POSITIVE IMPACTS	*NEGATIVE IMPACTS*
MANUFACTURING – New products help to make our life easier and increase leisure time	**MANUFACTURING –** Many industries use materials that can harm the environment
CONSTRUCTION – Provides shelter, improves roads, creates employment opportunities	**CONSTRUCTION –** Noise and debris, traffic problems, accidents and injuries

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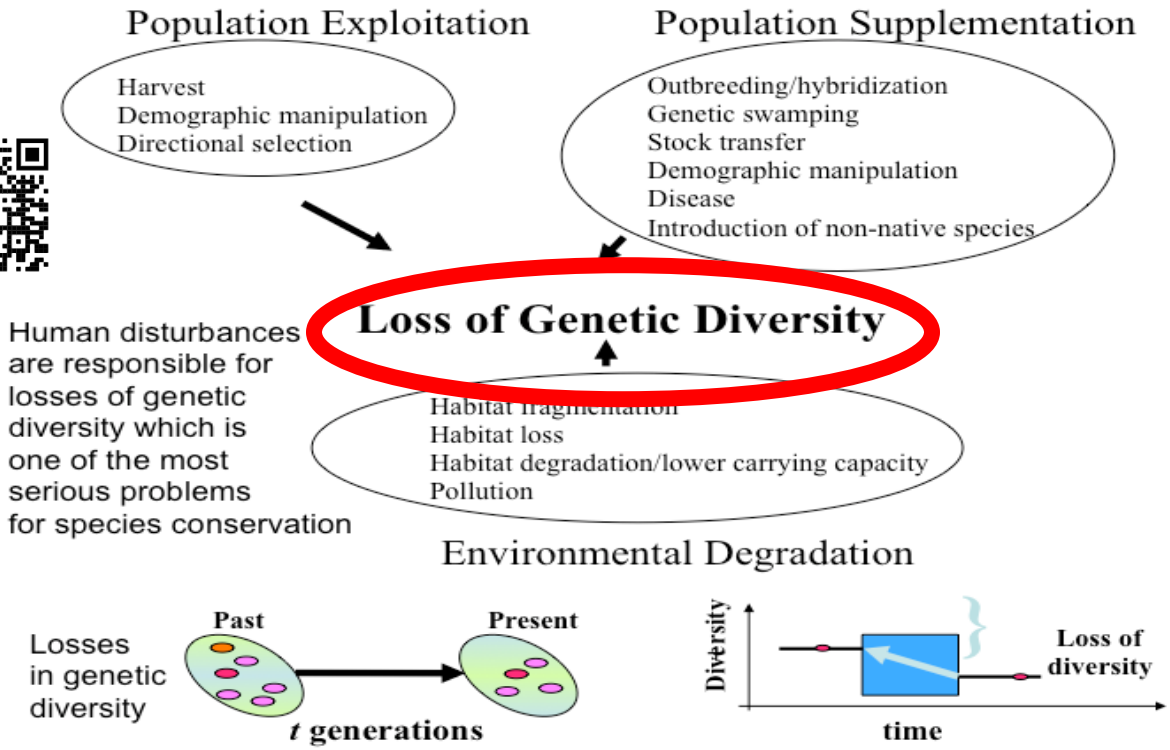
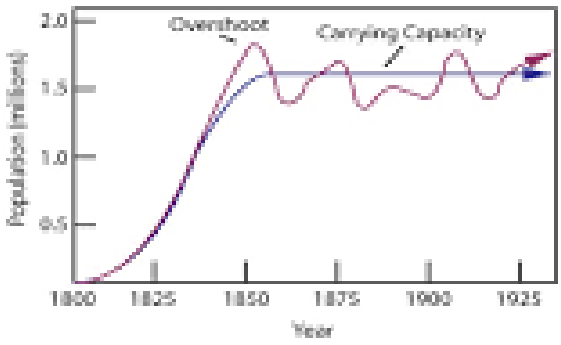
D. Loss of Genetic Diversity



E. Consumption of Resources "Carrying Capacity"

Carrying Capacity

- The number of people (organisms) that can be supported by a given ecosystem, based on their consumption of natural resources.
- Each species has requirements for survival and reproduction
  - water
  - food
  - space
  - shelter



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KEY VOCABULARY ENVIRONMENT: INTEDEPENENCE

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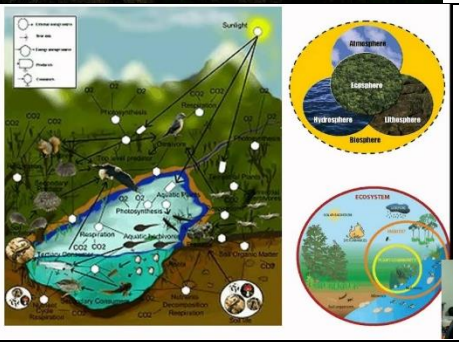
KEY TERM	KEY IMAGE	CLUES
Ecology		- is a branch of biology concerning interactions among organisms and their biophysical environment, which includes both biotic and abiotic components.
Interdependence		- All organisms in an ecosystem depend upon each other.

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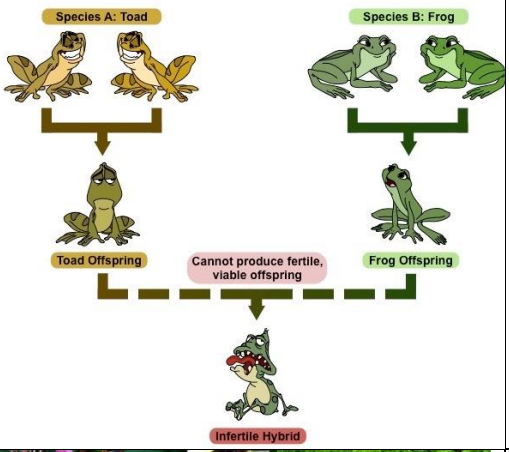
Habitat		- the natural home or environment of an animal, plant, or other organism.
Niche		- is the match of a species to a specific environmental condition. It describes how an organism or population responds to the distribution of resources and competitors and how it in turn alters those same factors.
Species		- a group of living organisms consisting of similar individuals capable of exchanging genes or interbreeding.
Biodiversity		- is the variety and variability of life on Earth. Biodiversity is typically a measure of variation at the genetic, species, and ecosystem level.

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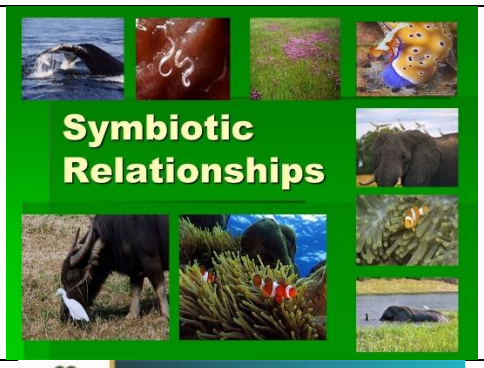
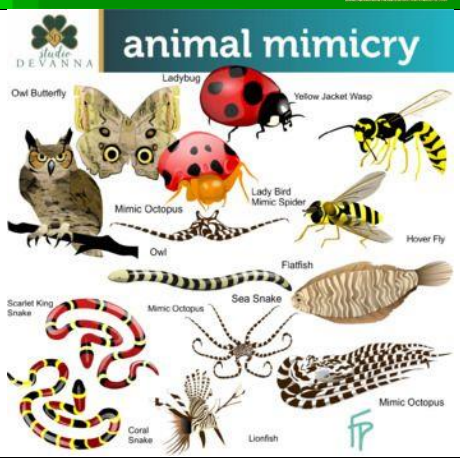
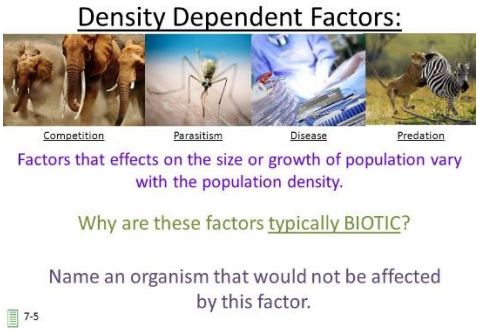
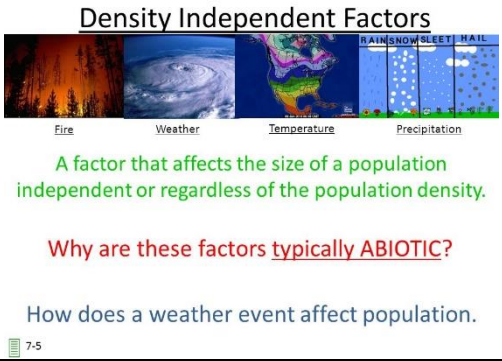
Symbiotic Relationship		- is a close relationship between two species in which at least one species benefits. For the other species, the relationship may be positive, negative, or neutral.
Mimicry		- is an evolved resemblance between an organism and another object, often an organism of another species. Mimicry may evolve between different species, or between individuals of the same species.
Density dependent factors		- are factors whose effects on the size or growth of the population vary with the population density. There are many types of density dependent limiting factors such as; availability of food, predation, disease, and migration. However, the main factor is the availability of food.
Density independent factors		- such as weather and climate, exert their influences on population size regardless of the population's density.

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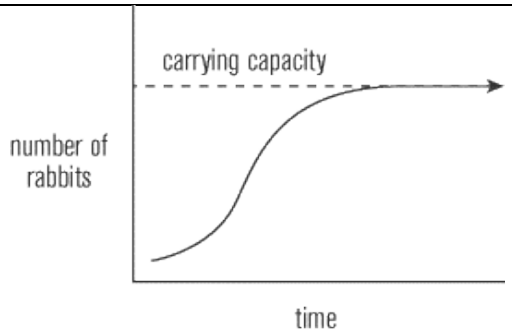
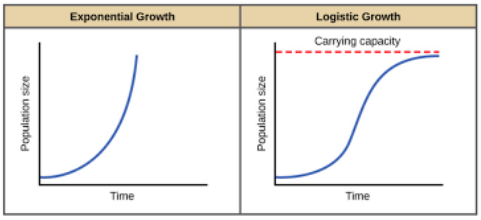
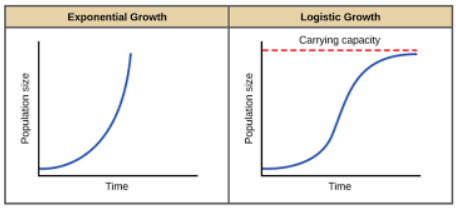
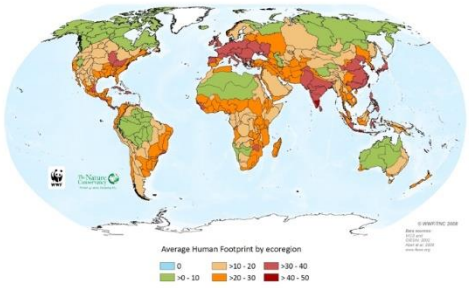
Carrying Capacity		- The carrying capacity of a biological species in an environment is the maximum population size of the species that the environment can sustain indefinitely, given the food, habitat, water, and other necessities available in the environment.
Exponential growth		- is a specific way that a quantity may increase over time. It occurs when the instantaneous rate of change of a quantity with respect to time is proportional to the quantity itself.
Limiting factors		- takes place when a population's per capita growth rate decreases as population size approaches a maximum imposed by limited resources, the carrying capacity (K).
Logistic growth		-
Population density		- is a measurement of population per unit area, or exceptionally unit volume; it is a quantity of type number density. It is frequently applied to living organisms, most of the time to humans.

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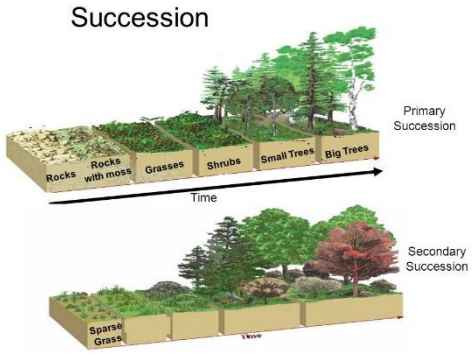
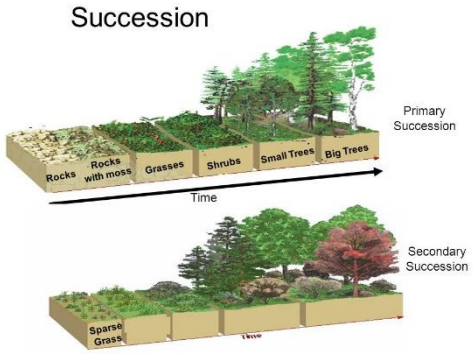
Ecological Succession		- is the process of change in the species structure of an ecological community over time. The time scale can be decades (for example, after a wildfire), or even millions of years after a mass extinction.
Primary Succession		- is one of two types of biological and ecological succession of plant life, occurring in an environment in which new substrate devoid of vegetation and other organisms usually lacking soil, such as a lava flow or area left from retreated glacier, is deposited.
Secondary Succession		- is one of the two types ecological succession of a plants life. As opposed to the first, primary succession, secondary succession is a process started by an event (e.g. forest fire, harvesting, hurricane, etc.) ... Seeds, roots and underground vegetative organs of plants may still survive in the soil.

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CONTENT REVIEW

1) _____ is the symbiotic relationship where both organisms benefit.

2) Given an example of mutualism
_____

3) _____ is the symbiotic relationship where one organism benefits and the other is neither hurt or harmed.

4) Given an example of commensalism_____

5) _____is the symbiotic relationship where one organism benefits from the harm of another without killing it immediately.

6) Given an example of parasitism
_____

7) _____succession occurs when a community is established in an area of bare rock or sand, where no topsoil is present.

8) _____succession occurs when a community is established in an area that previously contained life.

9) Place the five levels of ecological in order from smallest to largest:

_____

_____

_____

_____

_____

_____

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MAAP TEST PREP

1)

How are decomposers critical to the carbon cycle?

A	They return nitrogen gas back into the atmosphere.
B	They convert carbon dioxide into usable carbon.
C	They return carbon to the environment for reuse.
D	They store carbon compounds in fossils for later use.

a) Define the following terms from the question above:

Decomposer-

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

2)

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Which biotic limiting factor could be responsible for a decrease in a population of rabbits in an area?

A an increase in vegetation

B a decrease in rainfall

C an increase in the coyote population

D a decrease in the pH of their water

a) Define the following terms from the question above:

Biotic-

Limiting factor-

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

3)

A coral reef provides shelter and nutrients for unicellular algae, while the algae provides photosynthates used by the coral for growth. What term *best* describes this relationship?

A commensalism

B gradualism

C mutualism

D parasitism

a) Define the following terms from the question above:

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Commensalism-

Gradualism-

Mutualism-

Parasitism-

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

4)

Which is an example of a biotic factor that could affect a population of trout in a stream ecosystem?

A	average rainfall of the ecosystem
B	dissolved oxygen in the stream
C	predators in the ecosystem
D	types of minerals found in the stream

a) Define the following terms from the question above:

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Biotic-

Abiotic-

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

MDE PT.1 # 17

The northern elephant seal was almost hunted to extinction in the 1800s. By the late 1890s, approximately one hundred seals were left, reducing the gene pool of the population. What will be the consequence of this reduction?

A Competition within the population will increase.
B The surviving elephant seals will be better able to adapt.
C Inbreeding will be less frequent among the remaining population.
D The elephant seals will be more vulnerable to environmental change.

Answer: D. **Clues:** the question asked what will be the consequence on reduction (decrease in an amount) =**:** "More Vulnerable".

MDE PT. 1 # 26

A community is concerned about the water quality of a nearby lake. Increased sedimentation in the lake is endangering the native habitat. The increased sedimentation is caused by which of the following?

F Trees planted along the shore of the lake
G Construction of homes along the lake
H The amount of sunlight on the lake
J The amount of fish in the lake

Answer: G. **Clues**: "Sedimentation" = settling of dirt due to more construction. H & J have an increase of sunlight and fish. Neither deal with sediments. Although trees are in the ground, they would be a decrease due it being a community, so it would not impact the sedimentation.

MDE PT. # 31

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The common brushtail possum is a marsupial native to Australia. This possum was introduced to New Zealand where it had no natural predators and had an abundant food supply. Which of these likely occurred a few years after the introduction of this possum to New Zealand?

A The possums became extinct.
B The possums developed shorter life spans.
C The possum population grew to a large size.
D The possum population evolved into a different species.

Answer: C. **Clues**: "No predators". If there isn't anything eating it, the population will increase. A & B cannot be answer b/c the possums will not go extinct and their life spans are not in danger due to no predators. D isn't correct b/c nothing wasn't introduced into the environment for the possum to adapt.

MDE PT. 2 # 9

Footpaths and vehicles destroy the plant life on the top layer of permafrost in the tundra biome.

Which change is a result of losing this plant life?

A Increase in soil erosion
B Increase in precipitation
C Increase in frost formation
D Increase in wildlife habitats

Answer: A. **Clues:** "destroy play life" by "footprints and vehicles". Dirt leaving is only described in A. B & C deal with the climate of the tundra while D deals with the increase of habitats and not the decrease of what the plant needs to survive, soil.

MDE PT.2 # 29

A large tree in a forest falls down during a windstorm.

Which of the following is the result of this short-term change to the environment?

A An increase in canopy coverage due to decreased sunlight
B An increase in ground level vegetation due to increased sunlight
C A decrease in fungal growth due to increased moisture in the soil
D A decrease in predator activity due to the increased forest canopy

Answer B. **Clues:** large tree falls=more sunlight to ground.

MDE PT. 2# 38

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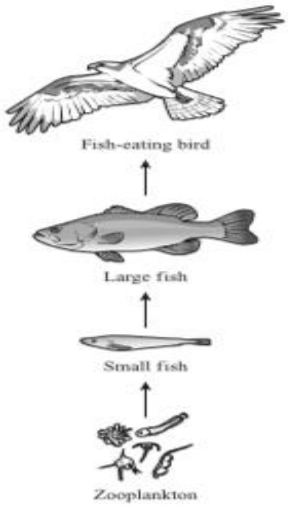
Mercury is introduced into the environment by many different industrial processes. Mercury that reaches the ocean is taken in by zooplankton. The picture shows a food chain containing zooplankton.



Which population is likely to become severely reduced due to mercury poisoning?

F Fish-eating bird
G Large fish
H Small fish
J Zooplankton

Answer: F. **Clues:** If the bottom is affected, the top will be most affected, why, there will not be any food for the other consumers.

MDE PT 3. # 25

Conservationists hope to restore populations of endangered black bears.

Which strategy will result in a long-term increase in bear populations?

A Bear feeding programs
B Tracking bear movements
C Restoration of bear habitats
D Increased hunting of bear predators

Answer: C. **Clues:** "Conservationists" (root word is conserve=meaning save) & "restore" = meaning rebuild.

MDE PT. 3 #33

The European starling is a bird that was introduced into the United States in the 1890s. It has been very successful due to its diverse diet and ability to nest in a variety of places.

What effect will a population of starlings have on a competing native species of birds?

A The native birds will raise fewer offspring.
B The native birds will share a nest with other birds.
C The native birds will develop into a new species.
D The native birds will reproduce with another species of birds.

Answer: A. **Clues**: "Competing"- the natives will have less to eat so less offspring. The other answer choices describe a possible impact.

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MDE PT. 3. # 43

The Japanese chestnut tree is related to, but does not normally cross-pollinate with, the American chestnut tree. The American chestnut tree was a dominant tree in the United States eastern forests until people imported the Japanese chestnut trees. Now there are a few remaining American chestnut trees in the United States eastern forests.

Which of the following is a possible explanation for the reduction in the number of American chestnut trees?

A Loss of genetic diversity of the American chestnut tree

B Interbreeding between Japanese and American chestnut trees

C Introduction of a disease carried by the Japanese chestnut tree

D Succession of the forests where American chestnut trees are found

Answer: C. **Clues:** "disease". The American chestnut was a dominant tree, so A cannot be the answer. Also, if B occurred, American chestnut would dominate. Finally, succession isn't being discussed in this question.

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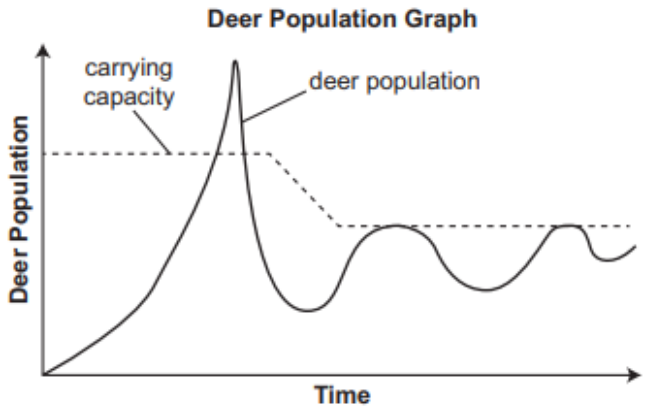
24. Deer are brought to an area lush with vegetation and no real predators. The deer population was monitored over time, and population data were recorded as shown in the graph.



Which set of statements **best** describes the data collected?

A. The deer population exceeded the carrying capacity, providing predators with a surplus of food. As the deer population decreased, so did the carrying capacity.

B. The deer population increased as the carrying capacity stabilized. As the carrying capacity decreased, the deer population decreased.

C. As the deer population reached a maximum, so did the carrying capacity. As the deer population decreased, so did the carrying capacity until the environment stabilized and the deer population could increase again.

D. The deer population increased rapidly, quickly exceeding the carrying capacity. As the deer population increased, there was less food available, reducing the carrying capacity.

Answer: D, Clues: Read graphs from left to right. You see that the Deer population quickly rises passed the ----lines then drops quickly. B, starts off correct, but then says wrong information about the carrying capacity.

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SECTION 7
ENVIRONMENT: DIVERSITY OF LIFE, ADAPTATION, AND EVOLUTION

Charles Darwin is the "Father of Evolution"
And wrote "Origin of Species"

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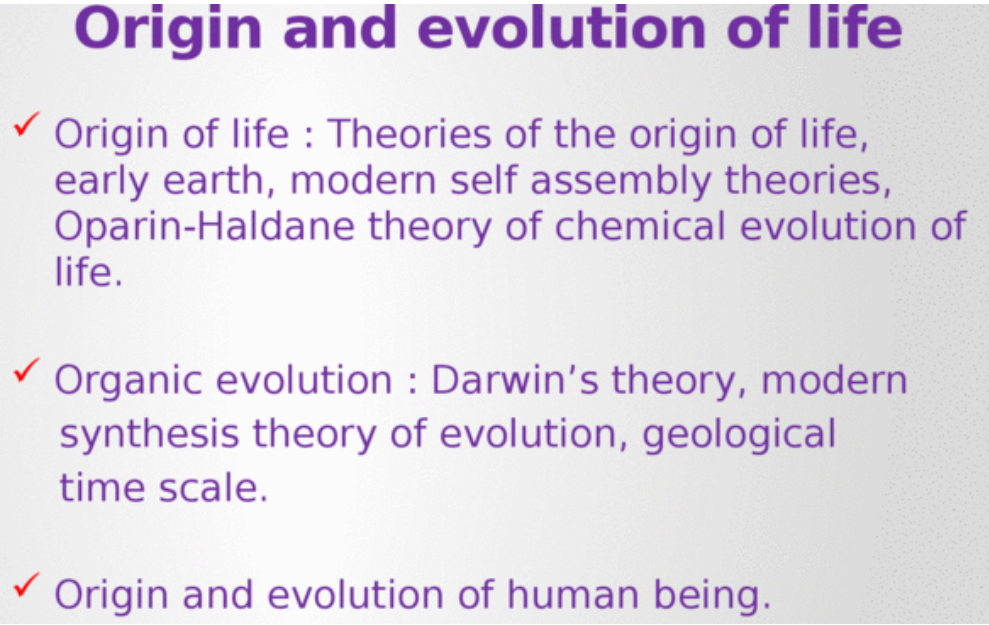
KEY CONCEPTS ENVIRONMENT: DIVERSITY OF LIFE, ADAPTATION, AND EVOLUTION

MS-CCR Standard(s):
BIO. 4. Students will analyze and interpret evidence to explain the unity and diversity of life.
BIO. 4. 1. Use models to differentiate between organic and chemical evolution, illustrating the steps leading to aerobic heterotrophs and photosynthetic autotrophs.
BIO. 4. 2. Evaluate empirical evidence of common ancestry and biological evolution, including comparative anatomy (e.g., homologous structures and embryological similarities), fossil record, molecular/biochemical similarities (e.g., gene and protein homology), and biogeographic distribution.
BIO. 4. 3. Construct cladograms/phylogenetic trees to illustrate relatedness between species.
BIO. 4. 4. Design models and use simulations to investigate the interaction between changing environments and genetic variation in natural selection leading to adaptations in populations and differential success of populations.
BIO. 4. 5. Use Darwin's Theory to explain how genetic variation, competition, overproduction, and unequal reproductive success acts as driving forces of natural selection and evolution.
BIO. 4. 6. Construct explanations for the mechanisms of speciation (e.g., geographic and reproductive isolation).
BIO. 4. 7. Enrichment: Construct explanations for how various disease agents (bacteria, viruses, chemicals) can influence natural selection.



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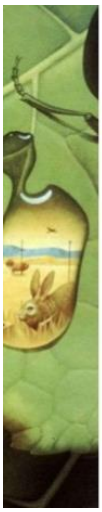


Unit 2 - Biodiversity

Organic Evolution

- Organic evolution can be studied at two different levels:
  - microevolution, which refers to small-scale genetic changes within populations
  - macroevolution, which refers to the large-scale results of genetic changes in populations, including the formation of new species and the evolution of large scale trends seen across species in what traits they have.

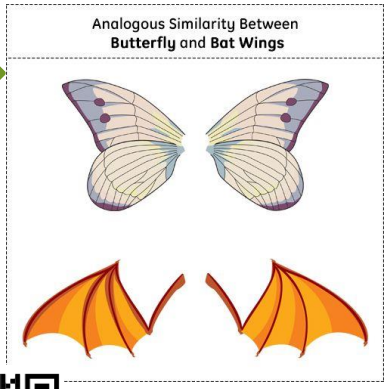
Evidence for organic evolution

Processes like growth, reproduction and metabolism are essentially the same in all organisms.

Analogous: Organs that are fundamentally unlike except in function

a) Tail fin of lobster and flukes of whale
b) Wings of fly and wings of a bird
c) Eyes of arthropods and vertebrates

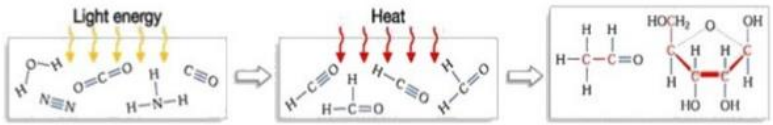
Analogous means= similar function of the adaptation but don't look the same.



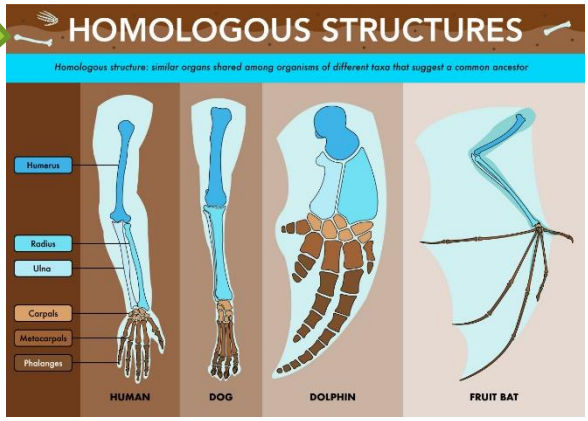
Chemical evolution

- **simple molecules** containing C, H, O and N react to form
- **reduced carbon-containing molecules**, which then react to form
- **organic compounds**.

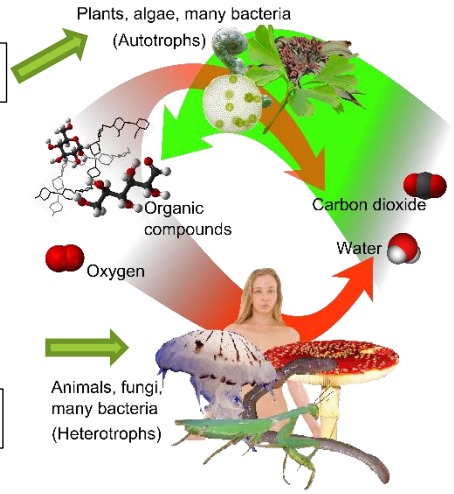
The process is triggered by an energy source such as **sunlight** or the **heat** released in a **volcanic eruption**.



Homologous means= similar organs shared among organisms with different taxa that suggest a common ancestor



Autotrophs



Heterotrophs

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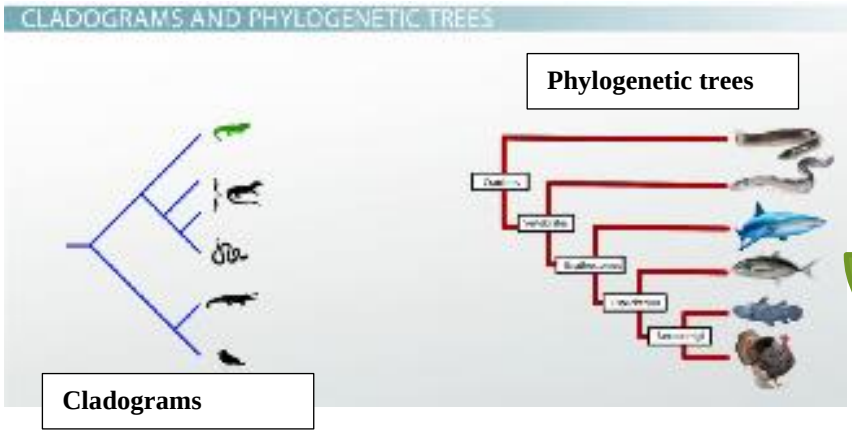
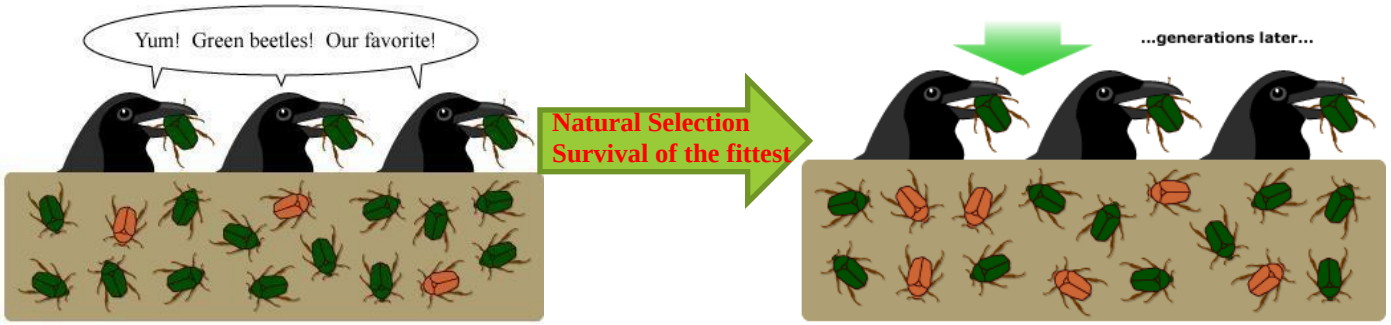


Natural selection, in a nutshell:



What is Natural Selection?

What is Charles Darwin's Theory of Evolution?

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KEY VOCABULARY ENVIRONMENT: DIVERSITY OF LIFE, ADAPTATION, AND EVOLUTION

MS-CCR Standard(s):

BIO. 4. Students will analyze and interpret evidence to explain the unity and diversity of life.

BIO. 4. 1. Use models to differentiate between organic and chemical evolution, illustrating the steps leading to aerobic heterotrophs and photosynthetic autotrophs.

BIO. 4. 2. Evaluate empirical evidence of common ancestry and biological evolution, including comparative anatomy (e.g., homologous structures and embryological similarities), fossil record, molecular/biochemical similarities (e.g., gene and protein homology), and biogeographic distribution.

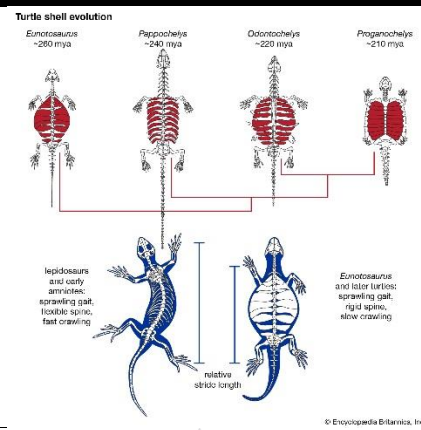
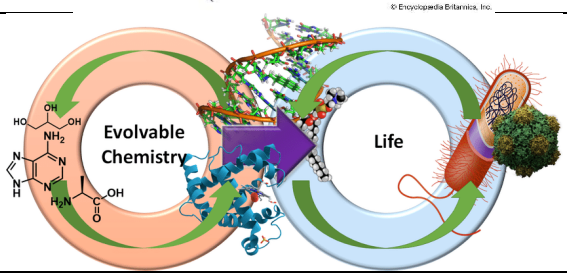
BIO. 4. 3. Construct cladograms/phylogenetic trees to illustrate relatedness between species.

BIO. 4. 4. Design models and use simulations to investigate the interaction between changing environments and genetic variation in natural selection leading to adaptations in populations and differential success of populations.

BIO. 4. 5. Use Darwin's Theory to explain how genetic variation, competition, overproduction, and unequal reproductive success acts as driving forces of natural selection and evolution.

BIO. 4. 6. Construct explanations for the mechanisms of speciation (e.g., geographic and reproductive isolation).

BIO. 4. 7. Enrichment: Construct explanations for how various disease agents (bacteria, viruses, chemicals) can influence natural selection.

KEY TERM	KEY IMAGE	CLUES
Evolution		- is the change in the characteristics of a species over several generations and relies on the process of natural selection.
Chemical Evolution		- The formation of complex organic molecules (see also organic molecule) from simpler inorganic molecules through chemical reactions in the oceans during the

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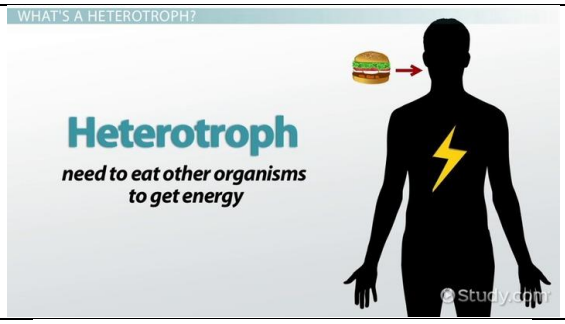
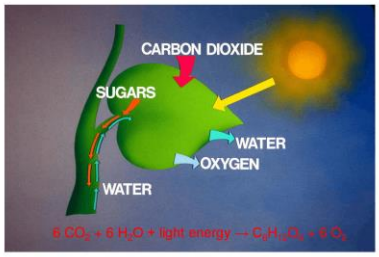
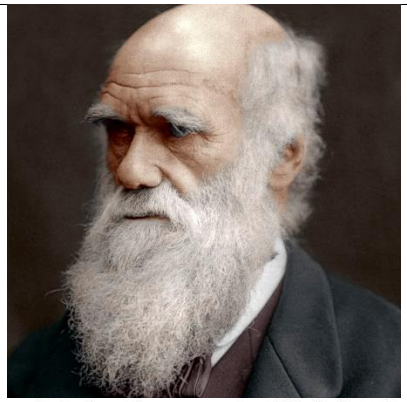
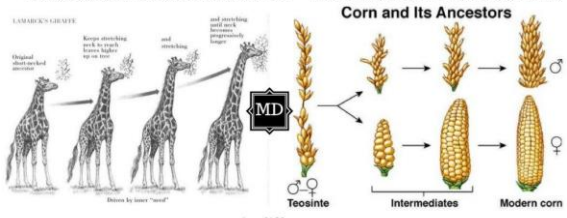
		early history of the Earth; the first step in the development of life on this planet.
Aerobic heterotrophs		- are simply organisms that cannot make their own food. They were creatures which ate some naturally occurring food and did not breathe oxygen.
Photosynthetic autotrophs	Light Energy Harvested by Plants & Other Photosynthetic Autotrophs  Docsity.com	- that they are able to produce their own food and do it through the process of photosynthesis**.**
Charles Darwin		- was an English naturalist, geologist and biologist, best known for his contributions to the science of evolution.
Natural Selection	Natural Selection vs Artificial Selection  www.majordifferences.com	- is the differential survival and reproduction of individuals due to differences in phenotype. It is a key mechanism of evolution, the change in the heritable traits characteristic of a population over generations.

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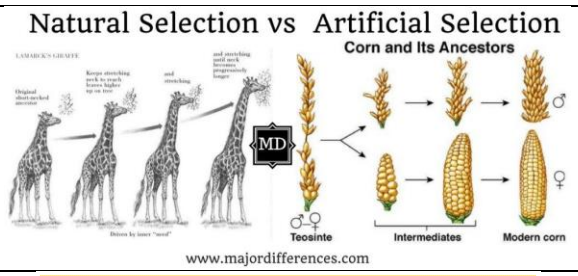
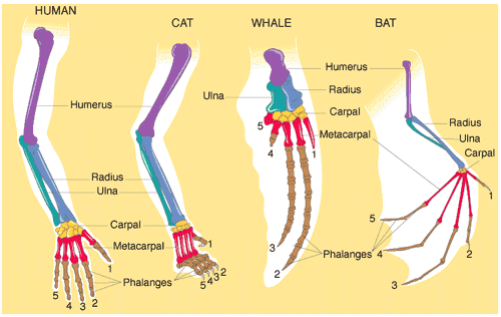
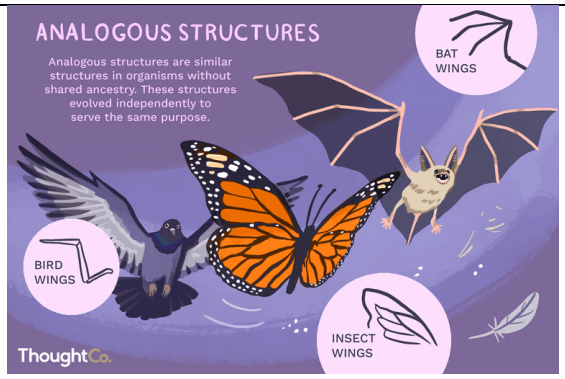
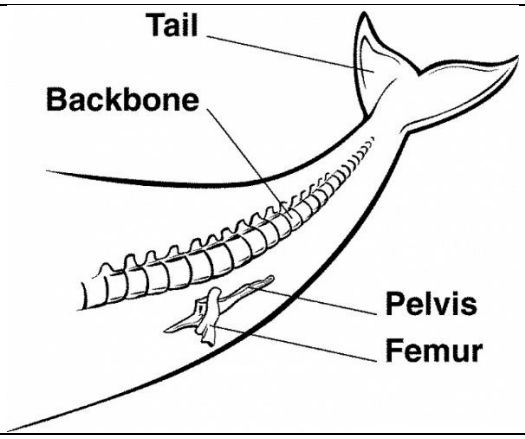
Artificial Selection		- is the identification by humans of desirable traits in plants and animals, and the steps taken to enhance and perpetuate those traits in future generations.
Homologous structures		- are organs or skeletal elements of animals and organisms that, by virtue of their similarity, suggest their connection to a common ancestor.
Analogous structures		- as biological structures having similar or corresponding function but not from the same evolutionary origin. In other words, species use these biological structures for the same purpose and yet these species are from unrelated evolutionary lines.
Vestigial structure		- is an anatomical feature or behavior that no longer seems to have a purpose in the current form of an organism of the given species. Often, these vestigial structures were organs that performed some important functions in the organism at one point in the past.

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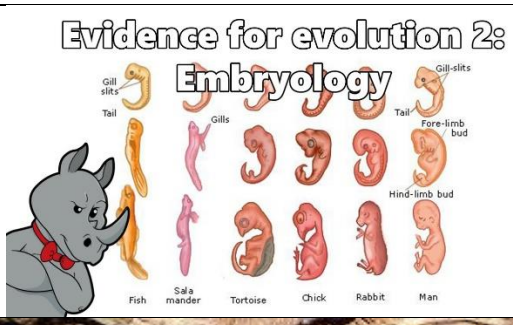
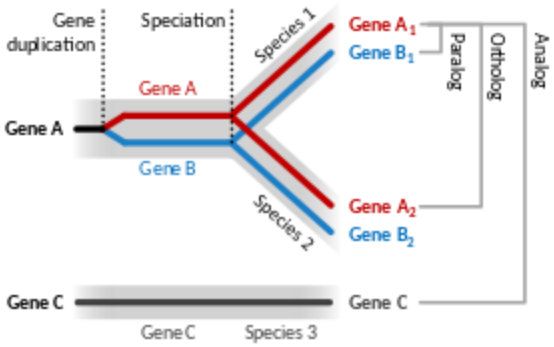
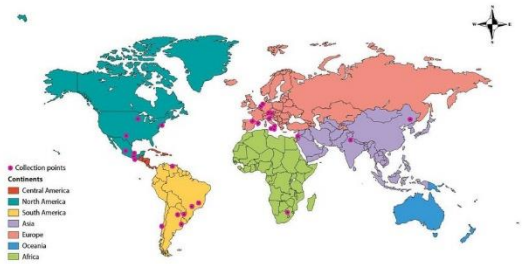
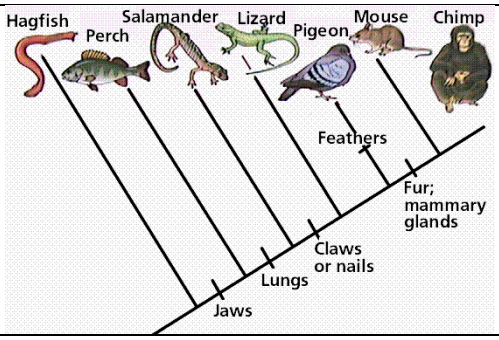
Embryological Similarities		- The study of one type of evidence of evolution is called embryology, the study of embryos. ... Many traits of one type of animal appear in the embryo of another type of animal.
Fossils		- the remains or traces of ancient life that have been preserved by natural processes, from spectacular skeletons to tiny seashells. Imprints, tracks and trails can also become fossilized, like dinosaur footprints or worm burrows. These are called trace fossils.
Gene homology		- is a gene inherited in two species by a common ancestor. ... If a gene is duplicated in a species, the resulting duplicated genes are paralogs of each other, even though over time they might become different in sequence composition and function.
Biogeographic distribution		- the natural arrangement and apportionment of the various forms of animals and plants in the different regions and localities of the earth.
Cladogram		- is a diagram used in cladistics to show relations among organisms.

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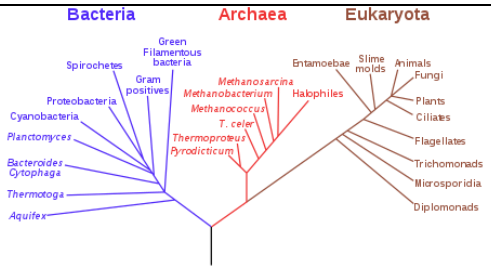
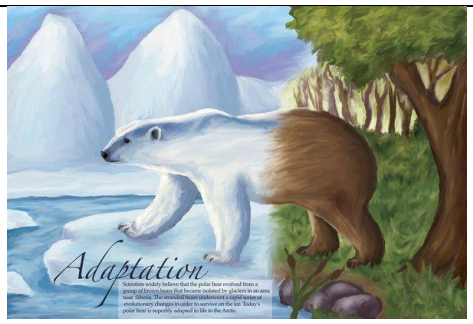
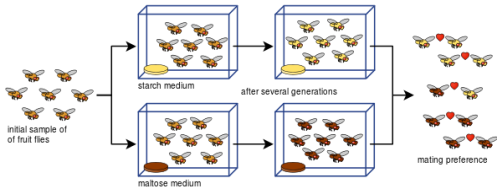
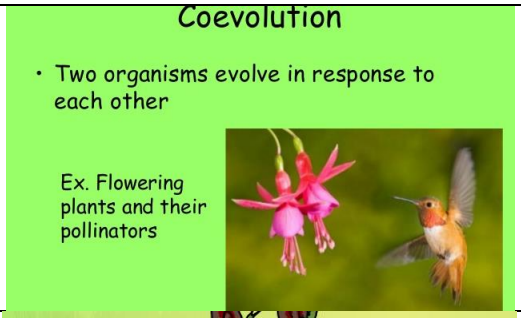
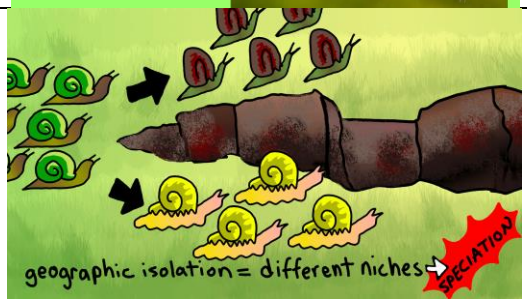
Phylogenetic Tree		- evolutionary tree is a branching diagram or "tree" showing the evolutionary relationships among various biological species or other entities—their phylogeny —based upon similarities and differences in their physical or genetic characteristics.
Adaptation		- any alteration in the structure or function of an organism or any of its parts that results from natural selection and by which the organism becomes better fitted to survive and multiply in its environment.
Speciation		- is the evolutionary process by which populations evolve to become distinct species.
Coevolution		- coevolution occurs when two or more species reciprocally affect each other's evolution through the process of natural selection.
Geographic Isolation		- is a term that refers to a population of animals, plants, or other organisms that are separated from exchanging genetic material with other organisms of the same species. Typically geographic isolation is the result of an accident or coincidence.

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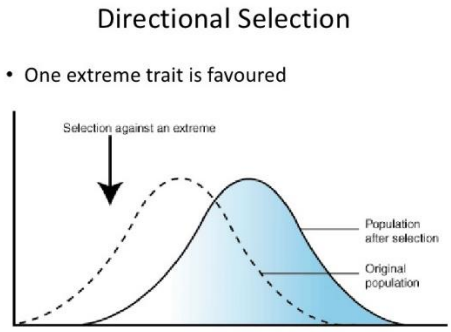
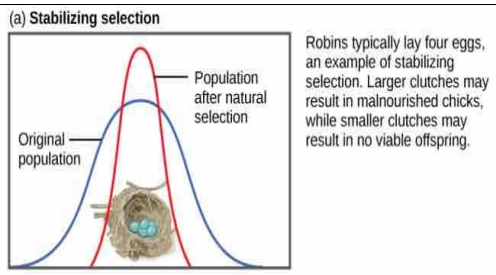
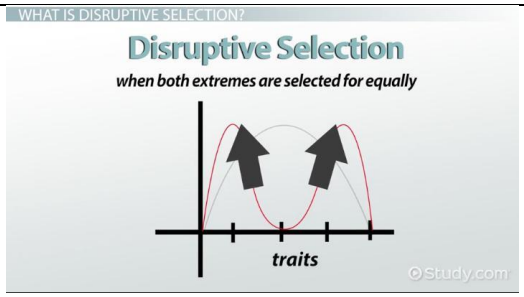
Reproductive Isolation		- is the reduction or cessation of reproduction between members of different species compared to that seen between individuals of the same species.
Directional selection		- positive selection is a mode of natural selection in which an extreme phenotype is favored over other phenotypes, causing the allele frequency to shift over time in the direction of that phenotype.
Stabilizing selection		- is a type of natural selection in which the population mean stabilizes on a particular non-extreme trait value. This is thought to be the most common mechanism of action for natural selection because most traits do not appear to change drastically over time.
Disruptive selection		- diversifying selection describes changes in population genetics in which extreme values for a trait are favored over intermediate values. In this case, the variance of the trait increases, and the population is divided into two distinct groups.

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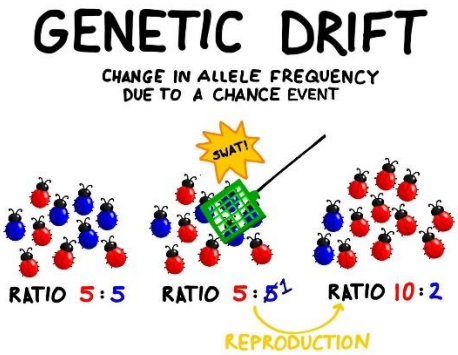
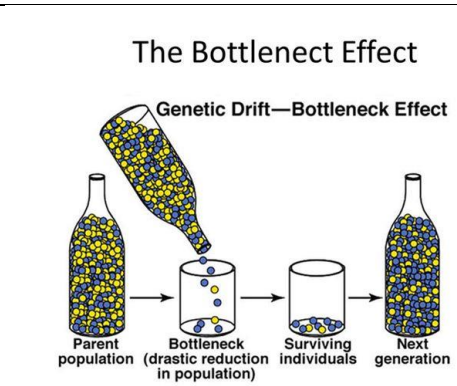
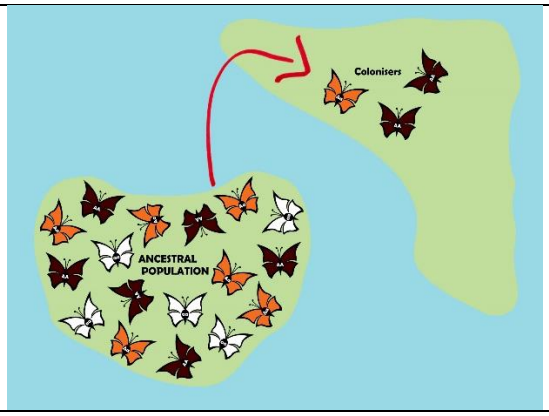
Genetic drift		- is the change in the frequency of an existing gene variant in a population due to random sampling of organisms. The alleles in the offspring are a sample of those in the parents, and chance has a role in determining whether a given individual survives and reproduces.
Bottleneck effect		- is a sharp reduction in the size of a population due to environmental events or human activities.
Founder effect		- is the loss of genetic variation that occurs when a new population is established by a very small number of individuals from a larger population.

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CONTENT REVIEW

1) _____ were the first types of cells on Earth

2) The first cells were (aerobic/ anaerobic) in nature

3) The "father" of evolution is _____ _____, who

   sailed abroad the HMS Beagle and studied the animals on _____ islands off

   the coast of South America.

4) Darwin's idea of evolution is called _____ _____ which is known as survival of the fittest.

5) A structure that shows a common ancestor is known as a _____ structure.

   Structure that does not show a common ancestor is known as an _____

   structure.

6) A bat wing, mouse forelimb, and human arm are examples of _____ structures.

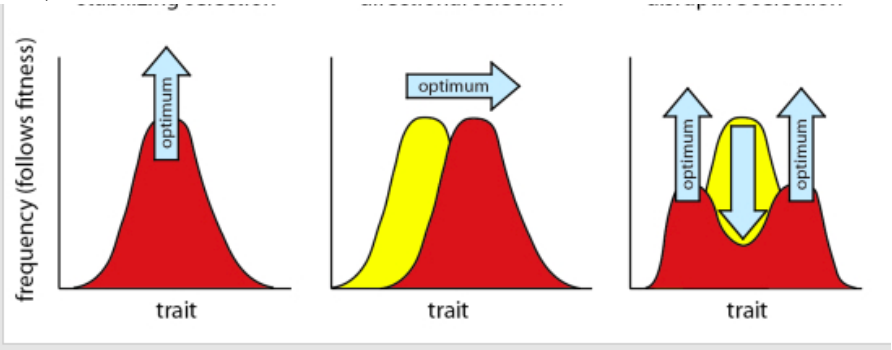
7) A bat wing and fly wing are examples _____ structures.

8) A structure that was once useful to a species, but no longer serves any function is called a _____ structure.

9) Identify the 3 types of graphs below and the situation that accurately describes them

   a) _____ b) _____

   c) _____



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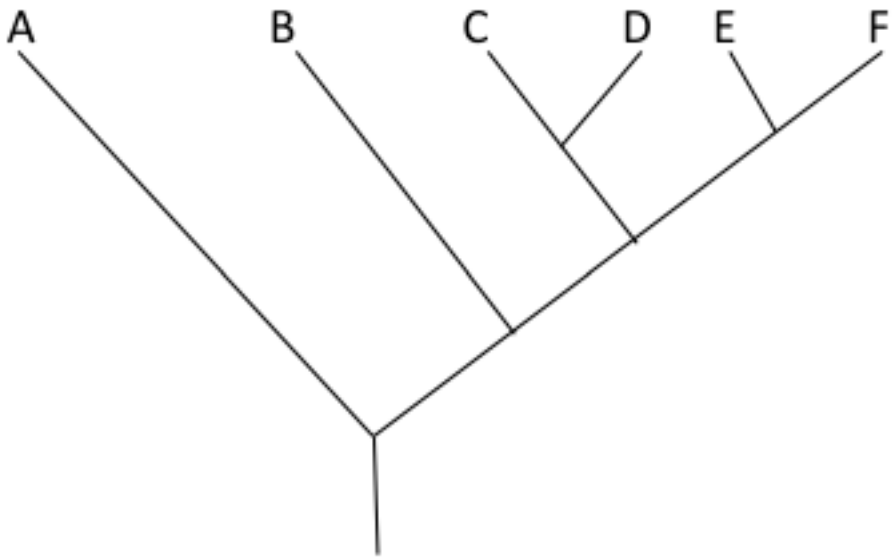
10) The diagram below is a _____ which shows evolutionary relationships between organisms.



A) Which two organisms are the most related? _____
B) How long ago did A & B spit? _____
C) Which organisms is most related to F? _____
D) Which 2 organisms are LEAST related? _____
E) Which 2 organisms are MORE related: D&E or E&F
F) Which 2 organisms are LESS related: B&C or D&C

11) There are two types of rabbits: those that strictly eat grass and those that strictly eat berries and flowers. A drought occurs one year, and the plants have difficulty producing any extras (flowers, berries, etc.).They can only try and keep themselves green. The rabbits have had babies all year long but many are eaten by foxes or hawks. Due to the drought, many have starved to death.

a. What rabbit will natural selection select AGAINST? _____ For?_____

b. What are the two variations in the rabbit population? _____

c. Which group willlikely produce more offspring? _____

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d. How will this change the population over time?
_____

12) Define the following terms

a). Geographic Isolation- _____

_____

_____

b). Reproductive Isolation-_____

_____

_____

MAAP TEST PREP

1)

Which organisms were the first to evolve on Earth?

A aerobic eukaryotes

B anaerobic eukaryotes

C aerobic prokaryotes

D anaerobic prokaryotes

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a) Define the following terms from the question above:

Anaerobic-

Aerobic-

Eukaryotes-

Prokaryotes-

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

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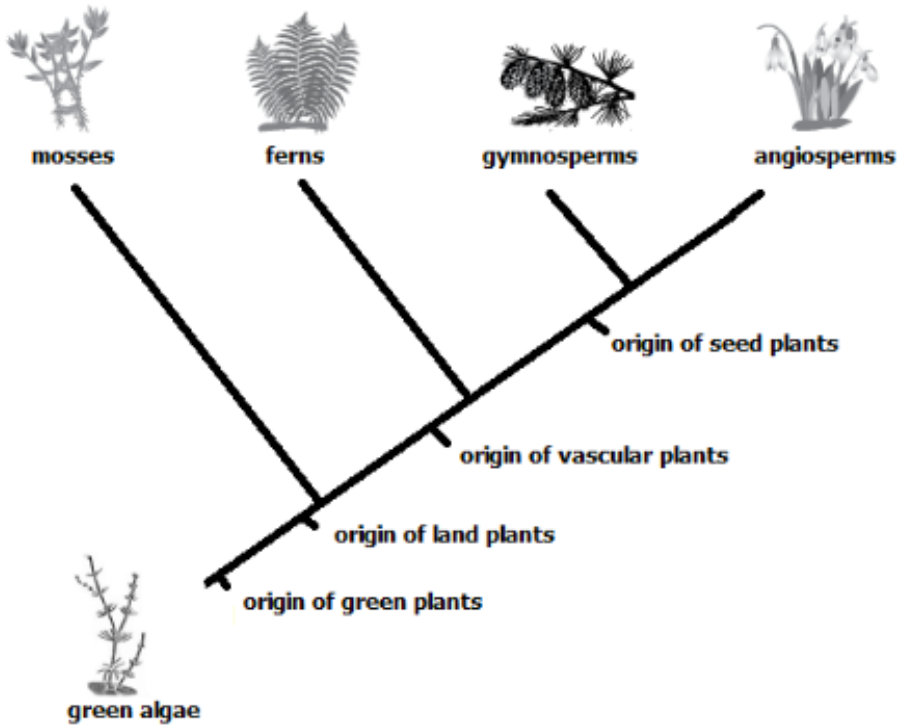
2)

The diagram shows a phylogenetic tree of plant evolution.



Which plant group was the *first* to diverge in the lineage?

A angiosperms

B ferns

C gymnosperms

D mosses

a) Define the following terms from the question above:

Diverge-

Lineage-

Angiosperm-

Gymnosperm-

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b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

3)

Snapdragon plants have unique bell-shaped flowers that only allow bumblebees to enter to collect nectar. The pollen sticks to bumblebees' bodies and is transferred between plants, leading to pollination. The flowers also release extra scents during the day to attract bumblebees.

Which evolutionary process explains the relationship between bumblebees and snapdragon plants?

A adaptive radiation

B coevolution

C convergent evolution

D gradualism

a) Define the following terms from the question above:

Adaptive radiation-

Coevolution-

Convergent evolution-

Gradualism

b) Rewrite the question in your own words. What are they really asking?

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c) What is the correct answer and WHY? (you will not get credit without an explanation)

4)

A NC town builds a hydroelectric dam, separating a population of fish. Years later the dam is demolished, allowing the fish to interact, but they can no longer mate together. What has occurred?

A behavioral isolation

B geographic isolation

C morphological isolation

D temporal isolation

a) Define the following terms from the question above:

Behavioral isolation-

Geographical isolation-

Morphological isolation-

Temporal isolation-

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

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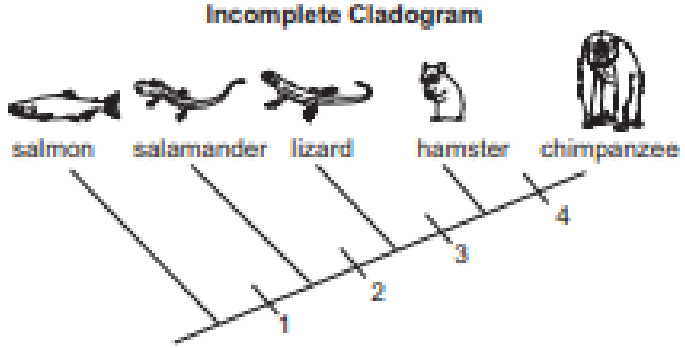
22. The chart below and the incomplete cladogram show the relatedness of five organisms.

Vertebrate Group	Basic Characteristics
Fish	obtain oxygen through gills; generally lay eggs; have scales and fins; live in water
Amphibians	develop in water with gills but breathe on land with lungs as adults; include frogs, toads, and salamanders; live in and around water
Reptiles	breathe with lungs; generally lay eggs, but some eggs hatch inside female; have scales or plates; include snakes, lizards, and turtles
Mammals	breathe with lungs; bear live offspring; have fur or hair; produce milk to feed young; may have opposable thumbs; include bats, dolphins, cats, dogs, possums, and primates

Incomplete Cladogram



Select the **two** statements that **best** describe the cladogram.

A. The trait that separates salmon from the other organisms (1) is the development of lungs.

B. The trait that separates hamsters from chimpanzees (4) is the presence of fur and mammary glands.

C. The trait that separates salamanders from lizards (2) is the presence of opposable thumbs.

D. The trait that separates lizards from hamsters (3) is the presence of fur and mammary glands.

E. The trait that separates salmon from salamanders (1) is the presence of opposable thumbs.

F. The trait that separates chimpanzees from the other organisms (4) is the development of lungs.

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23. Before the formation of the Grand Canyon, many years ago, a single species of squirrel lived in the area. As the canyon developed, the single species was separated into two habitats, one species on either side of the 10-mile-wide and 1-mile-deep canyon. Evidence also indicates that humans have inhabited the area in recent years.

Abert's squirrel

Kaibab squirrel

Which set of statements **most likely** describes how the formation of the Grand Canyon affected the single squirrel species that once populated the area?

A. **Process:** speciation
Explanation: Humans brought new organisms to the canyon, including a squirrel species that successfully competed with the native species in the area.

B. **Process:** genetic variation
Explanation: Humans brought new organisms to the canyon, including a squirrel species that successfully competed with the native species in the area.

C. **Process:** speciation
Explanation: The single species was split into two distinct groups by the canyon, with each group adapting to its unique environment.

D. **Process:** genetic variation
Explanation: The single species was split into two distinct groups by the canyon, with each group adapting to its unique environment.

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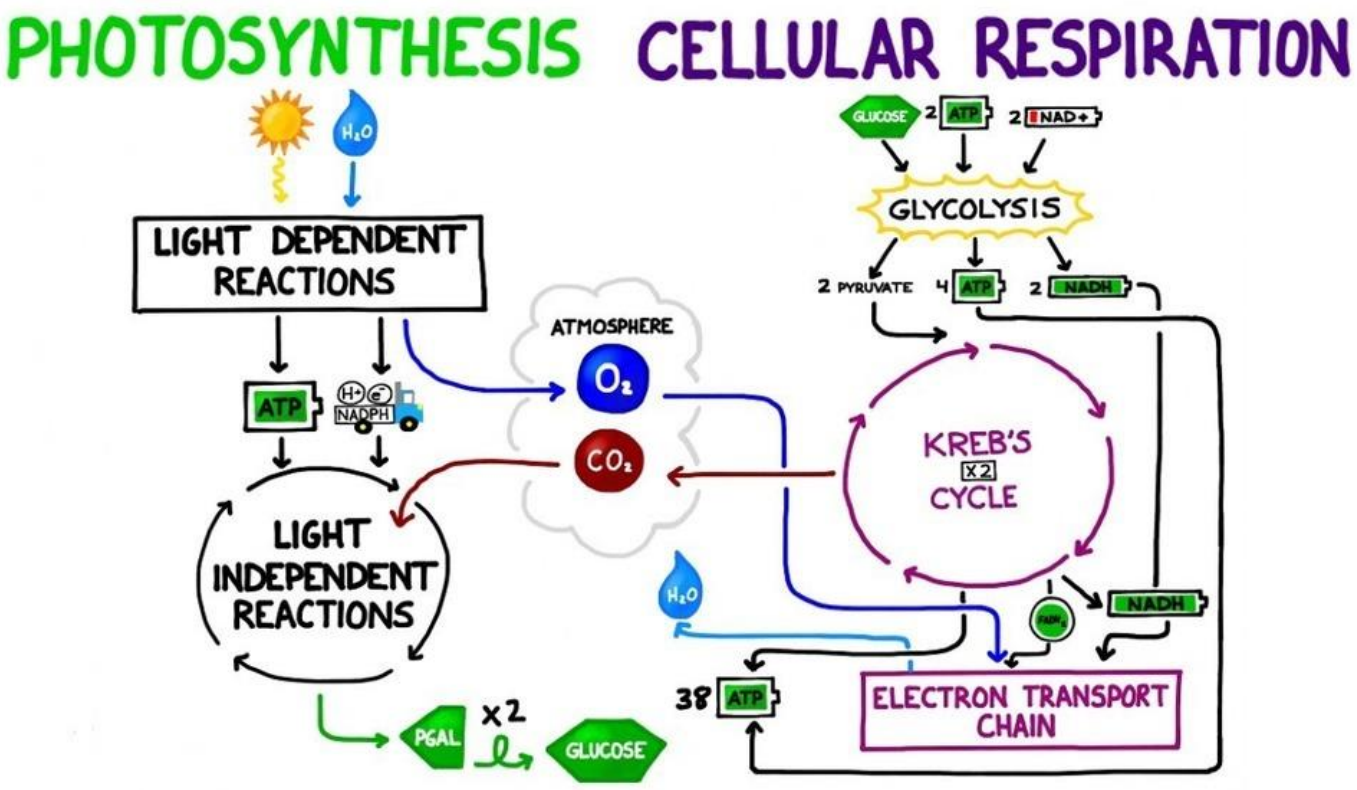
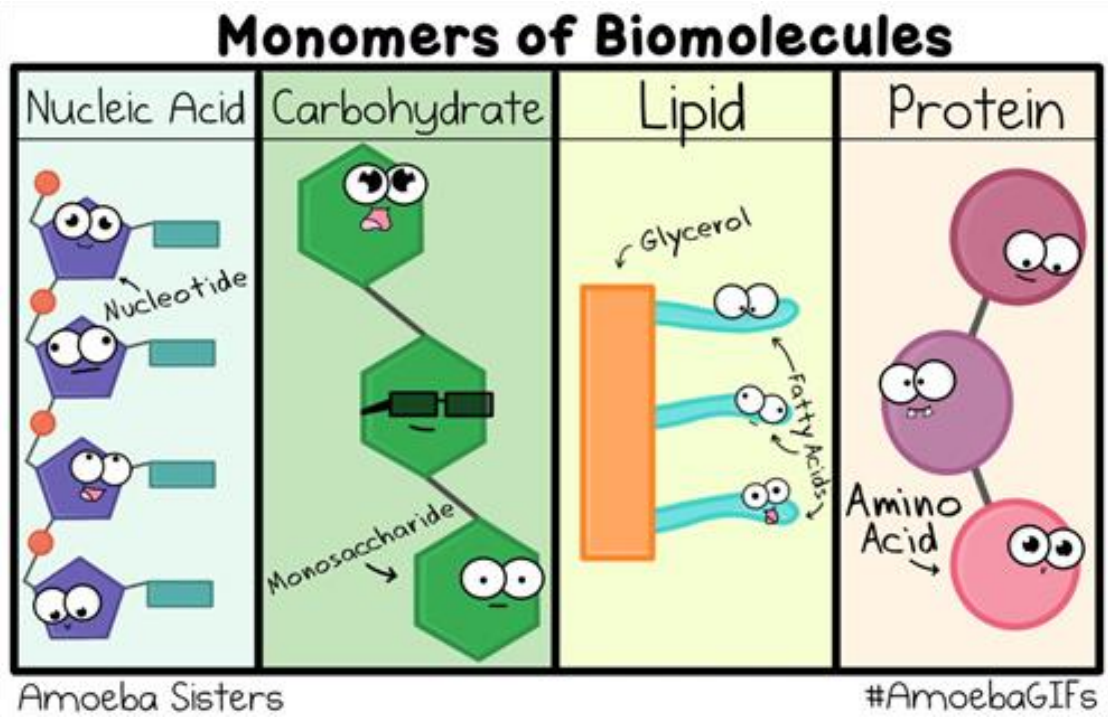
SECTION 8
CELLS: ENERGY FOR CELLULAR PROCESSES





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KEY CONCEPTS CELLS: ENERGY FOR PROCESSES

MS-CCR Standard(s):

BIO. 1B. Students will analyze the structure and function of the macromolecules that make up cells.

BIO. 1B. 1. Develop and use models to compare and contrast the structure and function of carbohydrates, lipids, proteins, and nucleic acids (DNA and RNA) in organisms.

BIO. 1B. 2. Design and conduct an experiment to determine how enzymes react given various environmental conditions (i.e., pH, temperature, and concentration). Analyze, interpret, graph, and present data to explain how those changing conditions affect the enzyme activity and the rate of the reactions that take place in biological organisms.

BIO. 1D. Students will describe the structure of the cell membrane and analyze how the structure is related to its primary function of regulating transport in and out of the cells to maintain homeostasis.

BIO. 1D. 1. Plan and conduct investigations to prove that the cell membrane is a semi-permeable, allowing it to maintain homeostasis with its environment through active and passive transport processes.

BIO. 1D. 2. Develop and use models to explain how the cell deals with imbalances of solute concentration across the cell membrane (i.e., hypertonic, hypotonic, and isotonic conditions, sodium/potassium pump).

BIO. 2. Students will explain that cells transform energy through the processes of photosynthesis and cellular respiration to drive cellular function.

BIO. 2. 1. Use models to demonstrate that ATP and ADP are cycled within a cell as a means to transfer energy.

BIO. 2. 2. Develop models of the major reactants and products of photosynthesis to demonstrate the transformation of light energy into stored chemical energy in cells. Emphasize the chemical processes in which bonds are broken and energy is released, and new bonds are formed, and energy is stored.

BIO. 2. 3. Develop models of the major reactants and products of cellular respiration (aerobic and anaerobic) to demonstrate the transformation of the chemical energy stored in food to the available energy of ATP. Emphasize the chemical processes in which bonds are broken and energy is released, and new bonds are formed, and energy is stored.

BIO. 2. 4. Conduct scientific investigations or computer simulations to compare aerobic and anaerobic cellular respiration in plants and animals, using real world examples.

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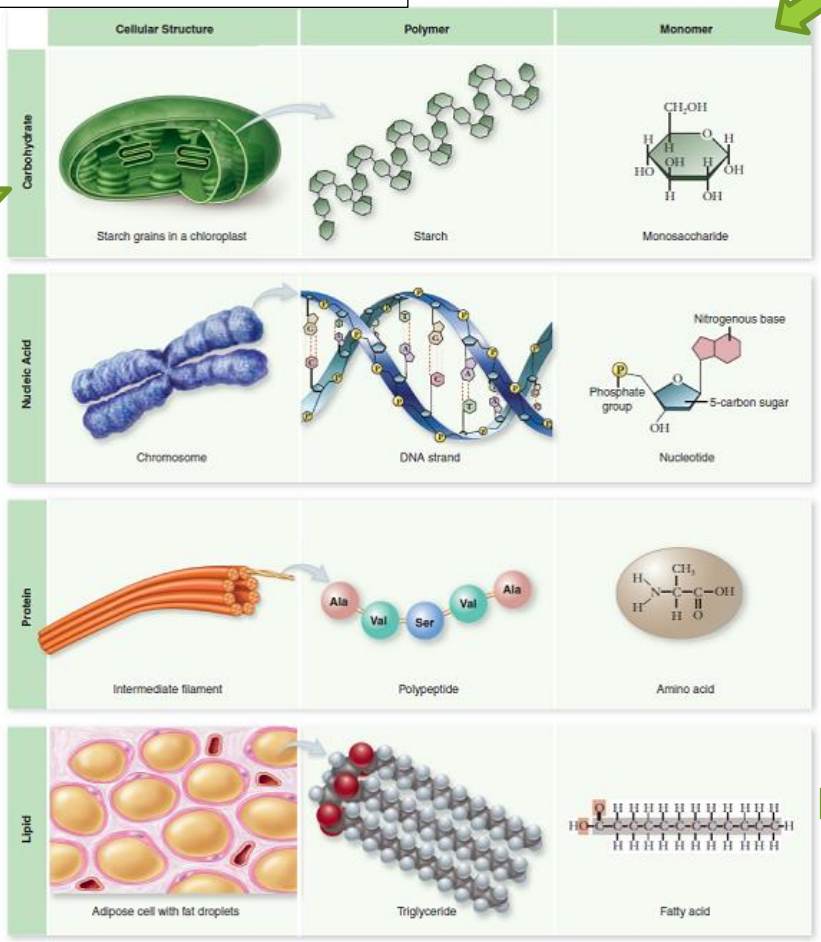
Polymer=is a large molecule, or macromolecule, composed of many repeated subunits.

Monomer=a molecule that can be bonded to other identical molecules to form a polymer.

Macromolecules

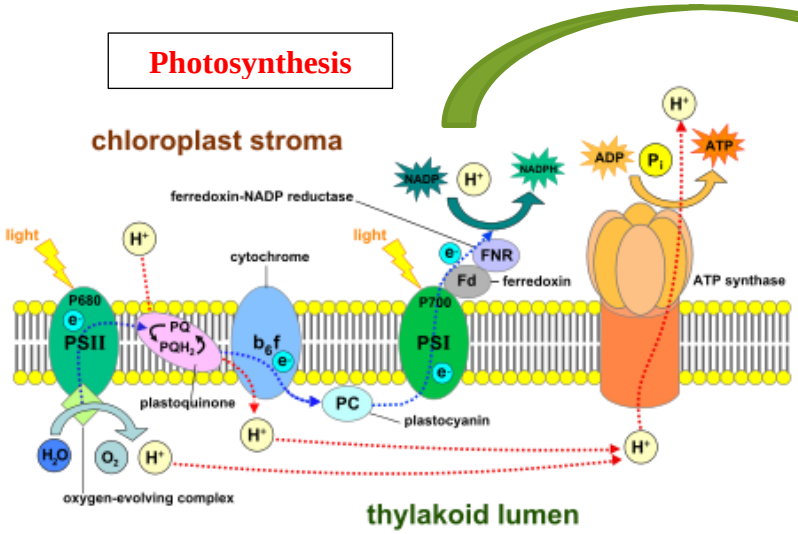


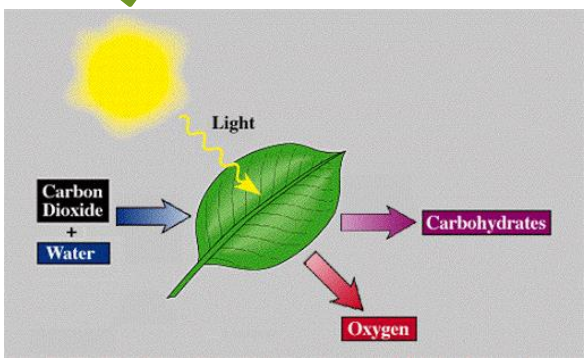
Key Important things to Remember about macromolecules:

Important cellular components and perform a wide array of functions necessary for the survival and growth of living organisms.

The four major classes of biological macromolecules are carbohydrates, lipids, proteins, and nucleic acids.

Photosynthesis





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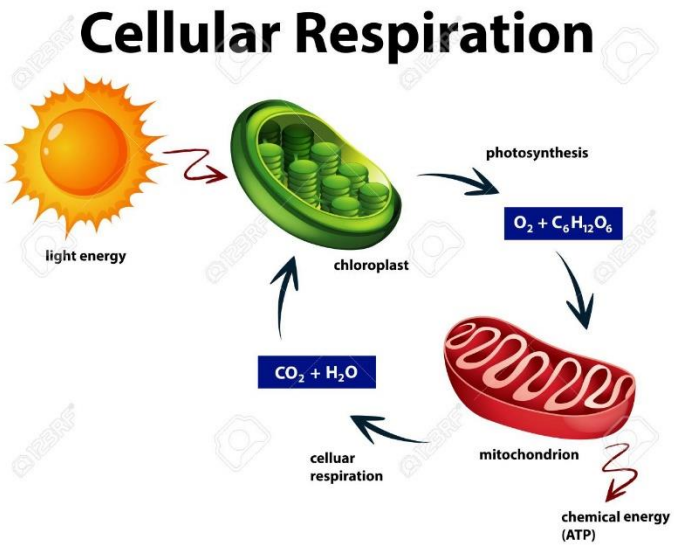

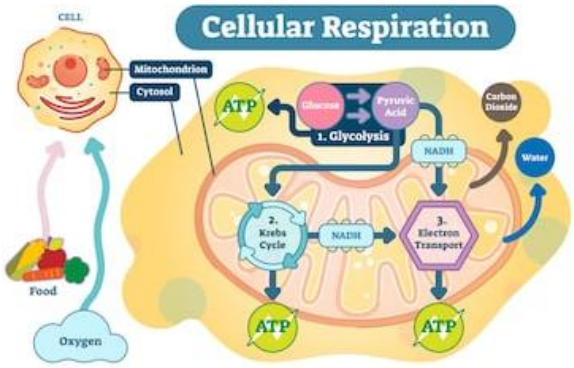

Photosynthesis and Cellular Respiration

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KEY VOCABUALRY CELLS: ENERGY FOR PROCESSES

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BIO. 2. 4. Conduct scientific investigations or computer simulations to compare aerobic and anaerobic cellular respiration in plants and animals, using real world examples.

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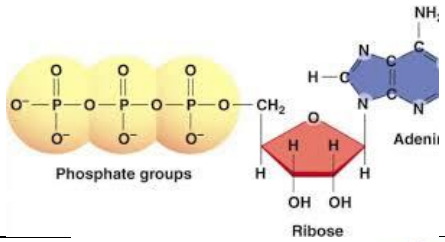
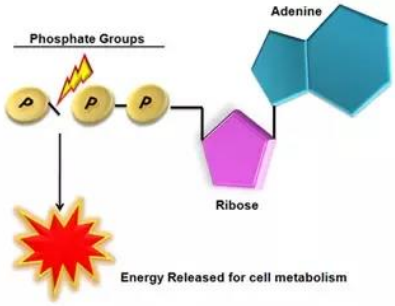
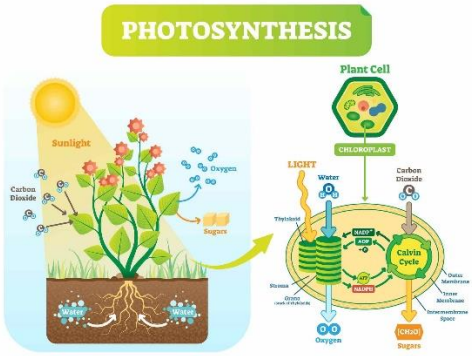
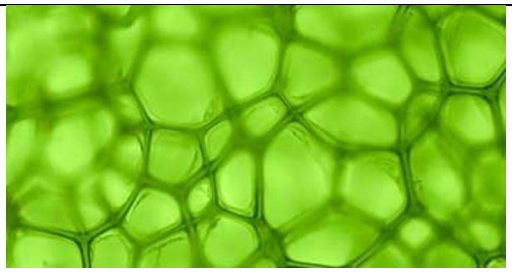
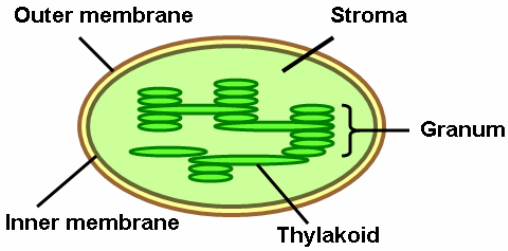
KEY TERMS	KEY IMAGE	CLUES
ATP		- is able to store and transport chemical energy within cells. ATP also plays an important role in the synthesis of nucleic acids.
ADP		- It can add and remove phosphate molecules to form different molecules.
Photosynthesis		- is a process used by plants and other organisms to convert light energy into chemical energy that can later be released to fuel the organisms' activities.
Chlorophyll		- is a green photosynthetic pigment found in plants, algae, and cyanobacteria. Chlorophyll ab sorbs mostly in the blue and to a lesser extent red portions of the electromagnetic spectrum, hence its intense green color.
Thylakoid		- are membrane-bound compartments inside chloroplasts and cyanobacteria. They are the site of the light-dependent reactions of photosynthesis. Thylakoids consist of a thylakoid membrane surrounding a thylakoid lumen. Chloroplast thylakoids

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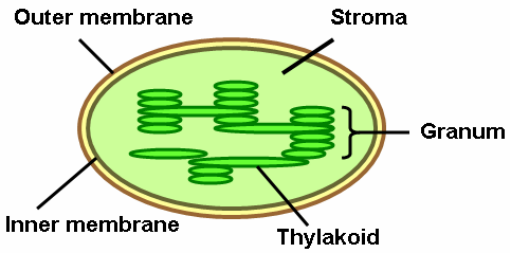
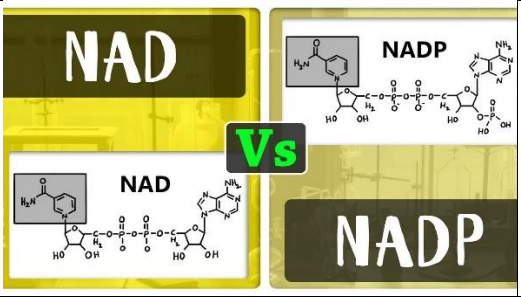
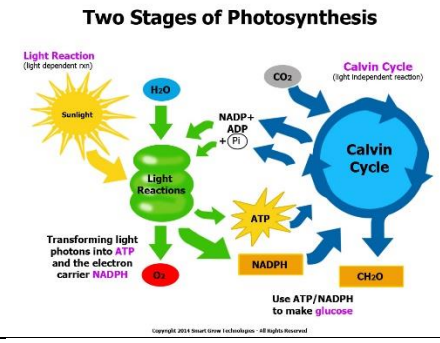
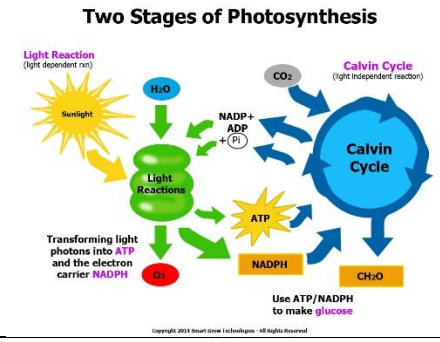
		frequently form stacks of disks referred to as grana.
Stroma		- refers to the colorless fluid surrounding the grana within the chloroplast. Within the stroma are grana, and the sub-organelles or daughter cells, where photosynthesis is commenced before the chemical changes are completed in the stroma.
NADP+		- is a cofactor used in anabolic reactions, such as the Calvin cycle and lipid and nucleic acid syntheses, which require NADPH as a reducing agent. It is used by all forms of cellular life.
Light-dependent reaction		- use light energy to make two molecules needed for the next stage of photosynthesis: the energy storage molecule ATP and the reduced electron carrier NADPH. In plants, the light reactions take place in the thylakoid membranes of organelles called chloroplasts.
Light-independent reaction		- take place in plant chloroplasts. In this process, sugars are made from carbon dioxide. The process, known as the Calvin cycle, uses products of the light-dependent reactions (ATP and NADPH) and various enzymes.

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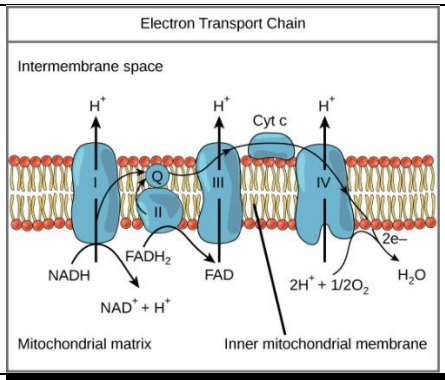
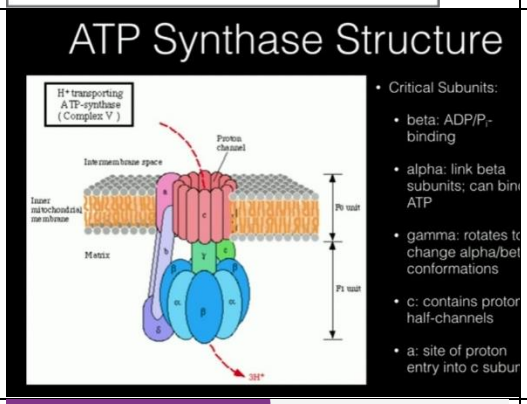
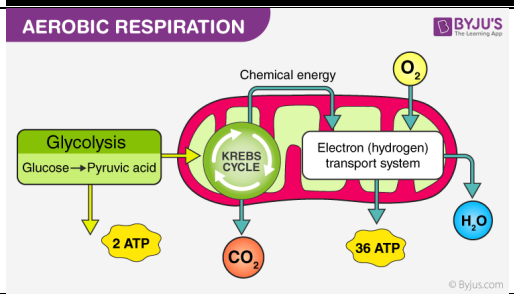
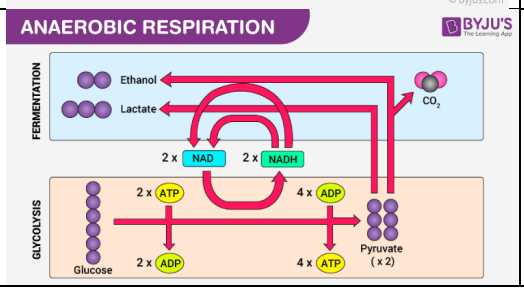
Electron-transport chain		- is a series of complexes that transfer electrons from electron donors to electron acceptors via redox reactions, and couples this electron transfer with the transfer of protons across a membrane.
ATP synthase		- is an enzyme that creates the energy storage molecule adenosine triphosphate. ATP is the most commonly used "energy currency" of cells for all organisms. It is formed from adenosine diphosphate and inorganic phosphate.
Aerobic		- is the process of producing cellular energy involving oxygen, Cells break down food in the mitochondria in a long, multistep process that produces roughly 36 ATP.
Anaerobic		- is respiration using electron acceptors other than molecular oxygen.

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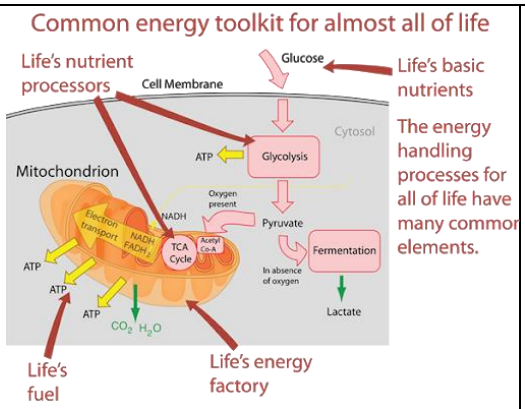
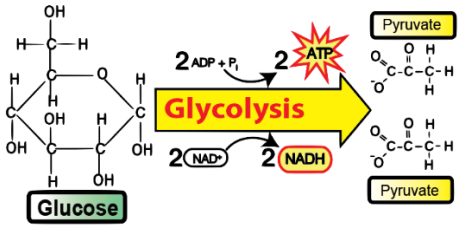
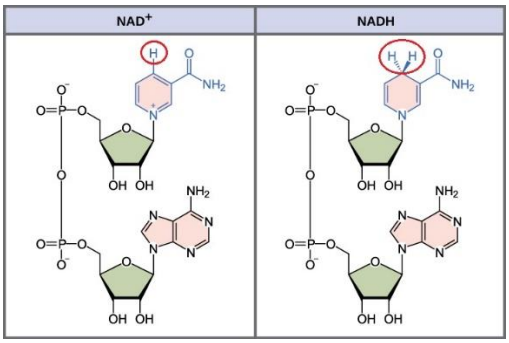
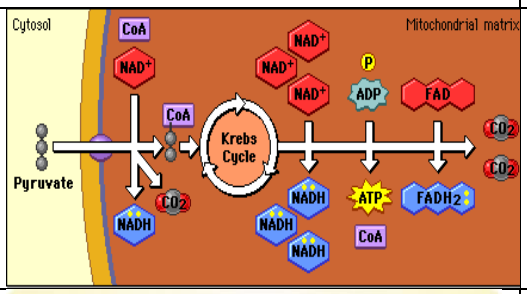
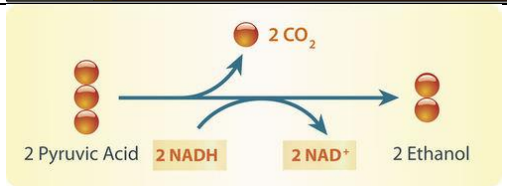
Cellular Respiration		- is a set of metabolic reactions and processes that take place in the cells of organisms to convert biochemical energy from nutrients into adenosine triphosphate (ATP), and then release waste products.
Glycolysis		- is the metabolic pathway that converts glucose $C_6H_{12}O_6$, into pyruvate, CH_3COCOO^-, and a hydrogen ion, H^+. The free energy released in this process is used to form the high-energy molecules ATP and NADH. Glycolysis is a sequence of ten enzyme-catalyzed reactions.
NAD+	- 	- Nicotinamide adenine dinucleotide is a cofactor that is central to metabolism. Found in all living cells, NAD is called a dinucleotide because it consists of two nucleotides joined through their phosphate groups. One nucleotide contains an adenine nucleobase and the other nicotinamide.
Krebs Cycle/Citric		- a series of chemical reactions used by all aerobic organisms to generate energy through the oxidation of acetate—derived from carbohydrates, fats, and proteins—into carbon dioxide.
Alcoholic Fermentation		- is a biological process which converts sugars such as glucose, fructose, and sucrose into cellular energy, producing ethanol and carbon dioxide as by-products.

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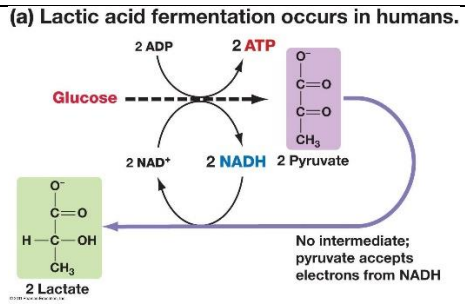
Lactic Acid Fermentation		- is a metabolic process by which glucose and other six-carbon sugars are converted into cellular energy and the metabolite lactate, which is lactic acid in solution. It is an anaerobic fermentation reaction that occurs in some bacteria and animal cells, such as muscle cells.

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CONTENT REVIEW

1) _____ processes break down larger molecules into smaller molecules.
2) _____ processes build large molecules from smaller molecules.
3) Photosynthesis is an _____ process
4) Cellular respiration is a _____ process
5) Write the equation for photosynthesis. Identify the reactants and the products.

6) The energy for photosynthesis comes from the _____.
7) Photosynthesis occurs in the _____
8) The 2 reactions for photosynthesis are : _____ and _____
9) _____ is a waste product of the light reactions (Calvin cycle).
10) The light reactions occur in the _____.
11) The dark reactions occur in the _____.
12) The electron carriers are _____ and _____.
13) _____is the splitting of water to gain electrons and hydrogen ions.
14) Write the equation for cellular respiration. Identify the products and the reactants.

15) The first step of cellular respiration is _____
16) Glycolysis occurs in the _____, is a(n) _____process, and nets ATP.
17) _____ process require oxygen, while _____ processes do not.

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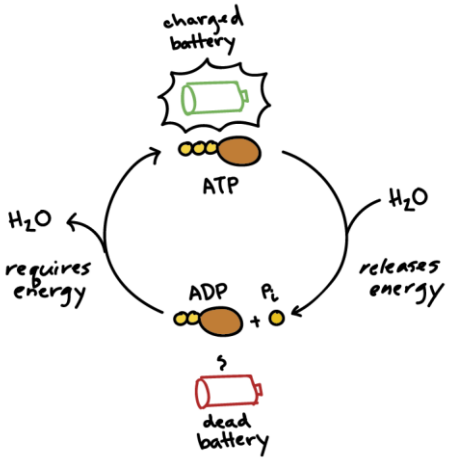
18) The follow aerobic respiration, the next step in the cycle or the _____ _____ cycle.

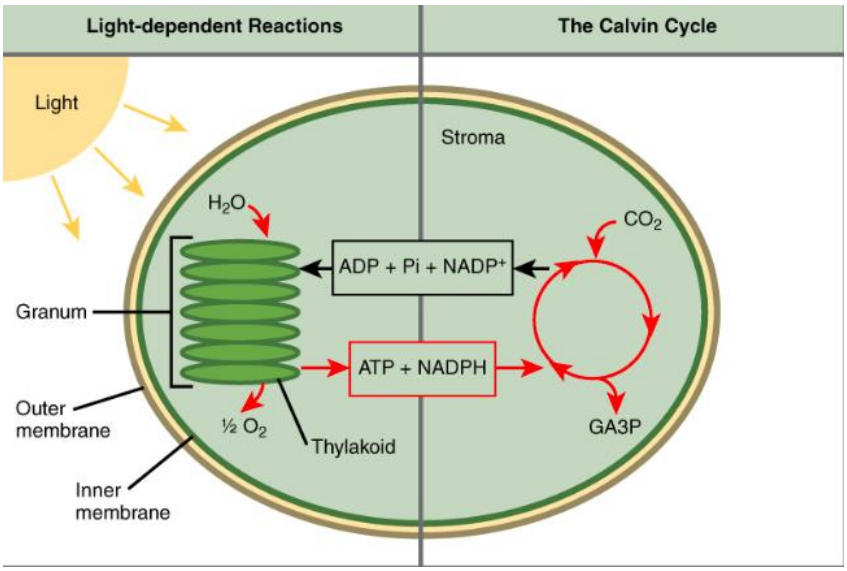
19) The Krebs cycle occurs in the _____ and nets _____ ATP, along with the electron carriers _____ and _____.

20) After the Krebs cycle, the electrons enter the _____ _____ _____.

21) The electron transport chain occurs in the _____ and nets _____ ATP.

22) The final electron acceptor is _____





MAAP TEST PREP

1)

Which chemical change releases the *most* energy for use by a plant cell?

A conversion of ATP to ADP

B conversion of ADP to ATP

C conversion of NADP to NADPH

D conversion of NADPH to NADP

a) Write the formula for the conversion of ADP to ATP?

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b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

2)

Which statement describes a difference between the dark (light-independent) reactions and the light-dependent reactions?

A	Light-independent reactions can only occur after sunset or during cloudy days, while light-dependent reactions only occur when it is sunny.
B	Light-independent reactions store energy as ATP and NADH, while light-dependent reactions store energy as glucose.
C	The light-dependent reactions occur in the leaves of plants, and the light-independent reactions occur in the limbs and trunks.
D	The products of the light-dependent reactions provide the energy to drive the light-independent reactions.

a) Define the following terms from the question above:

Light-dependent reactions

Light-independent reactions

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

3)

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Which statement *best* describes photosynthesis and respiration?

A	Autotrophs carry out photosynthesis, while autotrophs and heterotrophs carry out respiration.
B	Autotrophs and heterotrophs both carry out photosynthesis and then respiration.
C	In autotrophs, photosynthesis requires oxygen, and respiration requires carbon dioxide.
D	Only autotrophs carry out photosynthesis, while only heterotrophs carry out respiration.

a) Define the following terms from the question above:

Autotrophs

heterotrophs

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

4)

If a cell is producing lactic acid, what molecule is *most likely* unavailable to that cell?

A	carbon dioxide
B	glucose
C	oxygen
D	pyruvic acid

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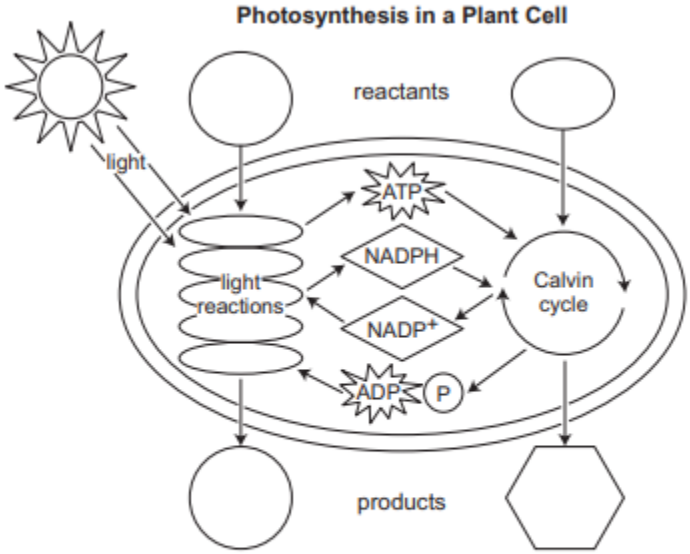
a) What are the two types of fermentation?

b) Rewrite the question in your own words. What are they really asking?

c) What is the correct answer and WHY? (you will not get credit without an explanation)

14. Write the labels in the shapes next to "reactants" and "products" in the diagram to show the major reactants and products of photosynthesis in a plant cell.



Labels:

O_2

CO_2

H_2O

glucose

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25. A student is developing a chart to compare aerobic respiration and anaerobic respiration in both plants and animals. The incomplete chart is shown.

Circle one word or phrase in each set of parentheses to complete the chart.

	Aerobic Respiration	**Anaerobic Respiration (plants)**	**Anaerobic Respiration (animals)**
Is oxygen required?	yes	(yes / no)	no
Is there glycolysis?	yes	(yes / no)	yes
What is the ATP yield?	36	2	2
Is glucose completely broken down?	yes	no	(yes / no)
What end products are produced?	carbon dioxide and water	ethanol and carbon dioxide	(carbon dioxide and water / lactic acid)

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Resources and References

Mississippi Department of Education

Parker Jackson with Ria Group (End of the Year Review for Biology)

Google and Bing Images

Mrs. Johnson's Biology Review

Information was gathered and complied from the resources above, former lesson plans, and test prep materials used to assist with the Biology I SATP that is now the MAAP EOC exam.

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