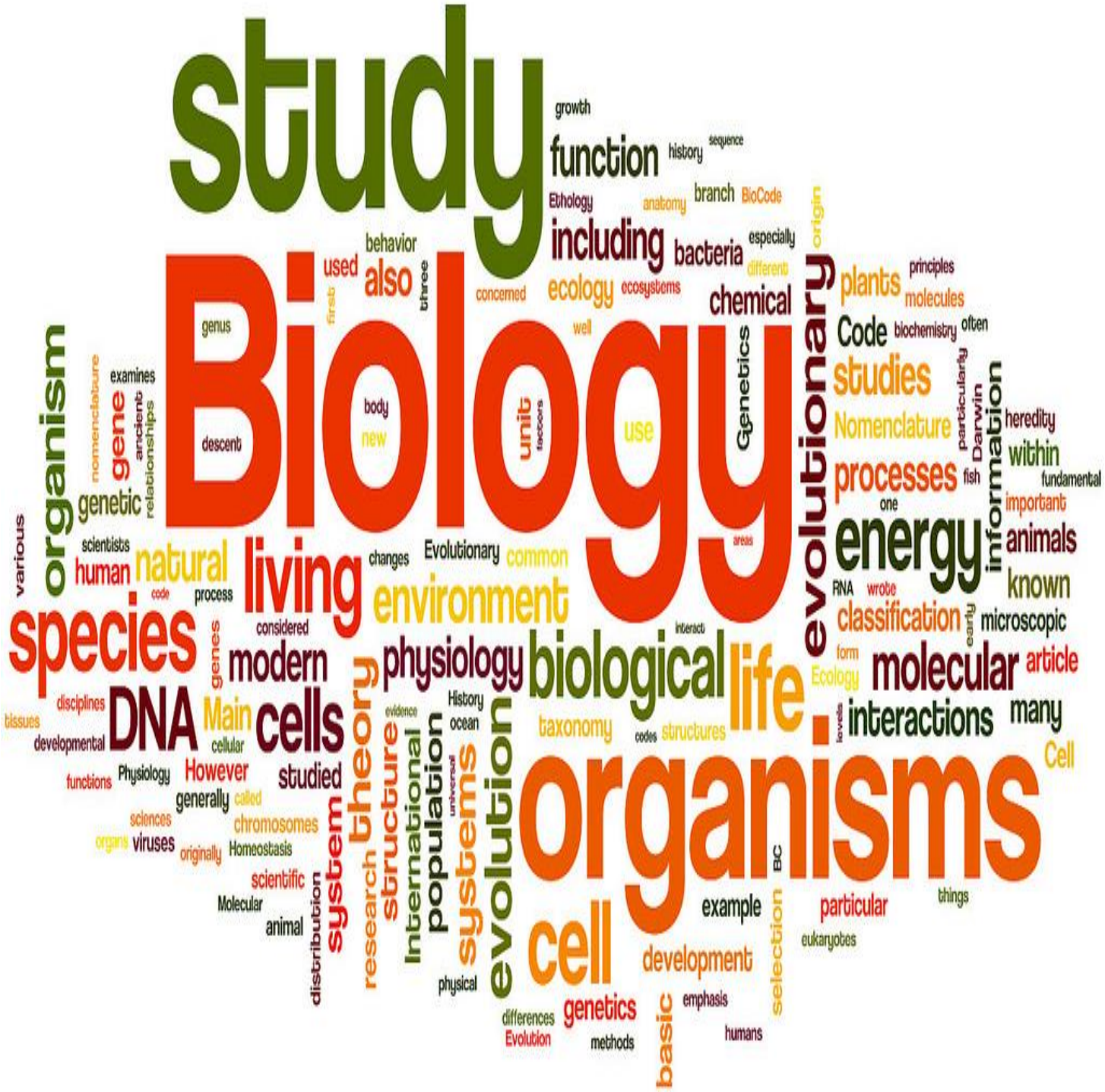
Biology EOC Review

Poinciana High School Science Department



Mr. Duran, M ed
Science Coach
Science Department

Name: _____ Teacher:_____

Period: _____ Date:_____

Poinciana High School Biology Progress Monitoring Sheet

Molecular and Cellular Biology – 35% of test

	Benchmark	Completed (Date & Initials) Grade	Retake Grade
	SC.912.L.14.1 – Cell Theory		
	SC.912.L.14.3 – Cell Structure Unit 3		
	SC.912.L.16.3 – DNA Replication Unit 7		
	SC.912.L.16.17 – Mitosis and Meiosis Unit 5		
	SC.912.L.18.1 – Macromolecules		
	SC.912.L.18.12 – Properties of Water		
	SC.912.L.18.9 – Photosynthesis and Cellular Respiration Unit 4		

Organisms, Populations and Ecosystems – 40% of test

	Benchmark	Completed (Date & Initials) Grade	Retake Grade
	SC.912.L.14.7 – Plant Structure		
	SC.912.L.14.26 – The Brain		
	SC.912.L.14.36 – Cardiovascular System		
	SC.912.L.14.52 – Immune System		
	SC.912.L.16.13 – Reproductive System		
	SC.912.L.17.5 – Population Size Unit 1		
	SC.912.L.17.9 – Food Webs and Energy Transfer		
	SC.912.L.16.10 – Biotechnology		
	SC.912.L.17.20 – Human Impact Unit 14		

Classification Heredity and Evolution – 25% of test

	Benchmark	Completed (Date & Initials) Grade	Retake Grade
	SC.912.L.15.1 – Evolution Unit 10		
	SC.912.L.15.8 – Origin of Life		
	SC.912.L.15.6 – Classification		
	SC.912.L.15.13 – Natural Selection Unit 10		
	SC.912.L.16.1 - Genetics		
	FLVS Practice Test		
	Questions 1-36 (then check answers)		
	Questions 37-72 (then check answers)		

Florida Website: http://www.floridastudents.org/	**Tests & PowerPoints:** http://biologyeocreview.weebly.com/
Videos & Questions: https://ecsd-fl.schoolloop.com/BiologyEOCReview	**Games:** http://biomanbio.com/index.html
Practice ePAT: http://tinyurl.com/4puzemb	**Videos:** https://www.youtube.com/user/AmoebaSisters **Bio EOC Review Edmodo:** jxe8jc

Biology EOC Review by Unit					
Unit	**Title**	**Standards**	**Reviewed in this Book? Y/N**	**MC Questions Score**	**Teacher Initials**
1	Populations & Ecosystems	SC.912.L.17.5		/15	
2	Energy Flow	SC.912.L.17.9		/8	
3	Environmental Impact	SC.912.L.17.20		/11	
4	Biochemistry	SC.912.L.18.1 & SC.912.L.18.12		/11	
5	Cellular Structure & Function	SC.912.L.14.1 & SC.912.L.14.3		/18	
6	Cellular Energy	SC.912.L.18.9		/20	
7	Cell Division	SC.912.L.16.17		/21	
8	Human Reproduction	SC.912.L.16.13		/10	
9	Genetics	SC.912.L.16.1		/11	
10	Protein Synthesis	SC.912.L.16.3		/8	
11	Biotechnology	SC.912.L.16.10		/5	
12	Body Systems	SC.912.L.14.52, SC.912.L.14.26 & SC.912.L.14.36		/13	
13	Plant Organization	SC.912.L.14.7		/15	
14	Evolution & Natural Selection	SC.912.L.15.1 & SC.912.L.15.13		/17	
15	History of Life	SC.912.L.15.8		/8	
16	Classification	SC.912.L.15.6		/7	

Additional Review Resources:In

Unit 1: Populations and Ecosystems/SC.912.L.17.5

Must Know….

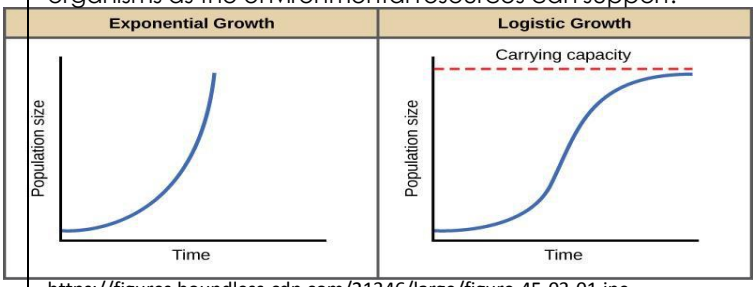
- How population size is determined by births, deaths, immigration, emigration and limiting factors.
- How to use data about population dynamics, abiotic factors, and biotic factors to explain a change in carrying capacity and population size in an ecosystem.
- The different types of organisms exist within aquatic systems due to chemistry, geography, light, depth, salinity, and/or temperature.
- The potential changes in an ecosystem resulting from seasonal variations, climate changes and/or succession.
- The positive or negative consequences that result from a reduction in biodiversity.

Population: all the individuals of a species that live together in an area.
Limiting factor- are biotic or abiotic factors that influence population density and growth, and cause them to fluctuate. These factors include the availability of food, predation, or availability of water and space, temperature.

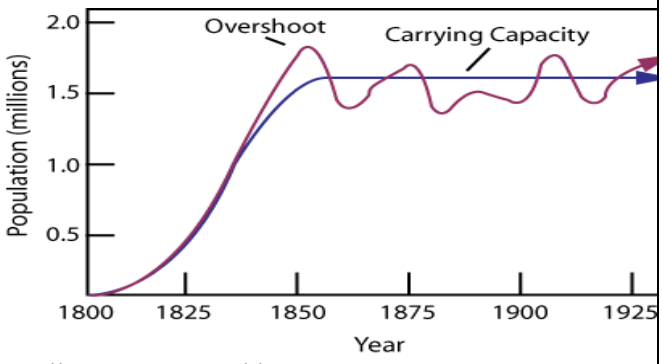
Factors that change population size/density-

- **Density-dependent factors- Biotic factors** in the environment that have an increasing effect as population size increases. Example: Disease, competition, parasites
- **Density-independent factors- Abiotic factors** in the environment that affect populations regardless of their density. Example: Temperature, storms, habitat destruction, drought
- Immigration- movement of individuals into a population
- Emigration- movement of individuals out of a population
- Death/mortality
- Birth/natality

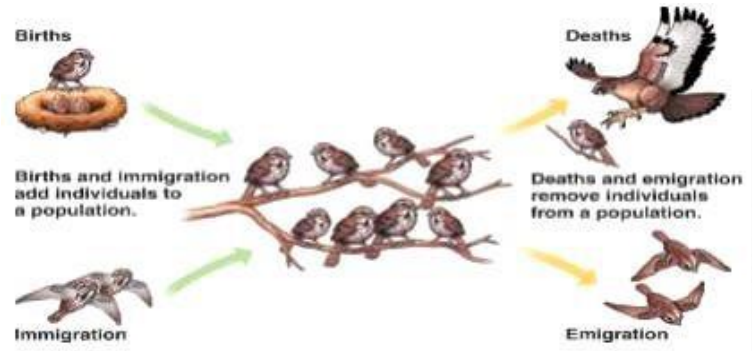
Carrying Capacity- the maximum population size that can be supported by the available resources, there can only is as many organisms as the environmental resources can support.



https://figures.boundless-cdn.com/21346/large/figure-45-03-01.jpe

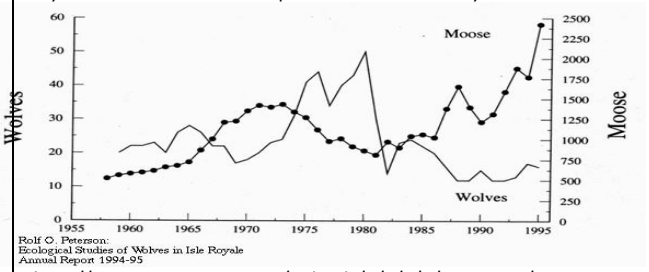


http://carrier.pbworks.com/f/carrying%20capacity.gif



http://bio1152.nicerweb.com/Locked/media/ch53/population.html

Population change- Moose is the primary food of the wolves/ predator-prey relationship. Population cycles of these two species are closely linked.



http://www.mrgscience.com/uploads/2/0/7/9/20796234/9703171_orig.gif

Potential Changes to an ecosystem

Seasonal changes/Climate changes

- ✓ For many species, the climate where they live or spend part of the year influences key stages of their annual life cycle, such as migration, blooming, and mating
- ✓ Climate is an important environmental influence on ecosystems. Climate changes and the impacts of climate change affect ecosystems in a variety of ways. For instance, warming could force species to migrate to higher latitudes or higher elevations where temperatures are more conducive to their survival. Similarly, as sea level rises, saltwater intrusion into a freshwater system may force some key species to relocate or die, thus removing predators or prey that were critical in the existing food chain.

Succession is the gradual process by which ecosystems change and develop over time. Nothing remains the same and habitats are constantly changing

- ✓ Primary succession is the series of community changes which occur on an entirely new habitat which has never been colonized before. Pioneer species (first species to inhabit a barren area) include: mosses
- ✓ Secondary succession is the series of community changes which take place on a previously colonized, but disturbed or damaged habitat. For example, land clearance or a fire.

Bare rock is exposed due to some type of **disturbance** like a retreating glacier or volcanic eruption. **No soil is present**.	**Pioneer species**, like lichens and mosses, establish themselves on the rock substrate.	Pioneer species die and decay, providing soil and nutrients for other plant species like shrubs and small trees.	Small and Large trees begin to grow, and the community reaches an **equilibrium** or balance. This results in a **climax community**.

Primary Succession: The establishment of new community where none existed before.

https://m7science.wikispaces.com/file/view/Primary_Succession.png/215427266/640x291/Primary_Succession.png

Organisms are driven away or killed by some type of **disturbance**, like a forest fire, leaving behind only the **soil**.	**Pioneer species**, like grasses and weeds, begin to grow from the soil. Roots and seeds left over may also begin to grow again.	Some pioneers species die and are replace or outcompeted by other species like shrubs and small trees.	Small and Large trees begin to grow, and the community reaches an **equilibrium** or balance. This results in a **climax community**.

Secondary Succession: The *reestablishment* of community following disturbance.

https://m7science.wikispaces.com/file/view/Secondary_Succession.png/2154272 66/640x291/Secondary_Succession.png

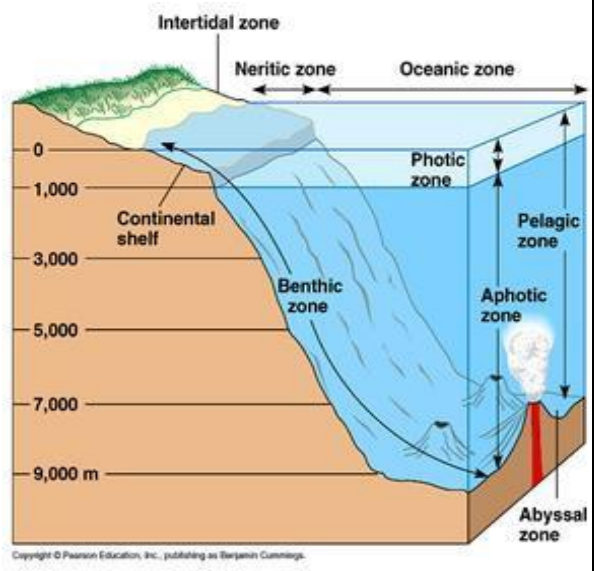
Aquatic Biomes

Factors affecting aquatic biomes: salinity, temperature, light and depth.

All aquatic ecosystems are affected by the same abiotic factors: sunlight, temperature, oxygen, and salt content.

- ✓ Sunlight is an especially important factor in aquatic ecosystems. Sunlight is necessary for photosynthesis in the water just as it is on land. However, because water absorbs sunlight, there is only enough light for photosynthesis near the surface or in shallow water. Most marine food chains begin with photosynthetic single-celled organisms which are affected by daily and seasonal changes in light intensity and duration. The most common producers in aquatic ecosystems are algae rather than plants.
- ✓ The metabolic rate of almost all the organisms thriving in this ecosystem is influenced by the water temperature. Some organisms such as the trout grow at relatively cool stream temperatures.
- ✓ Dissolved gases--gases dissolve more in cold water than in warm water. The two most important gases to marine organisms are: oxygen and carbon dioxide. Oxygen is essential for cellular respiration and carbon dioxide for photosynthesis.
- ✓ Salinity is a measure of the total dissolved solids in water (mostly salt). Ocean salinity confers an average pH of 8.1 which favors precipitation of calcium carbonate (used to make shells). It decreases the freezing point of water, so that in natural environments on Earth, it doesn't exactly freeze, it becomes more like slush. Salinity also affects water density; saltier water is denser.

https://upload.wikimedia.org/wikipedia/commons/3/33/Holzstaemme.JPG



https://cornellbiochem.wikispaces.com/file/view/Picture_1.png/1396 79067/301x313/Picture_1.png

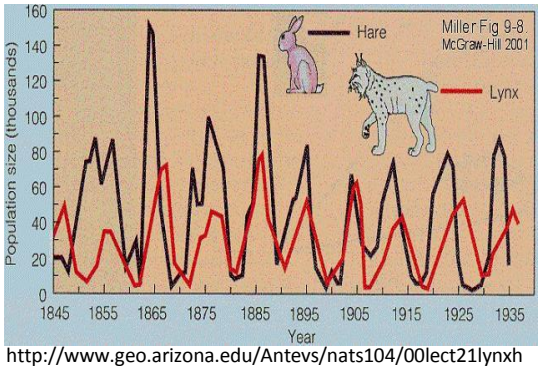
Consequences of Biodiversity Reduction-

Habitat loss and degradation, introduction of a non- native species, climate change, and pollution are some factors that can lead to the extinction of a species, which can then affect an entire ecosystem. The loss of biological diversity destabilizes ecosystems and makes them more vulnerable to shocks and disturbances such as hurricanes and floods, which may further reduce the ability of environments to provide for human well-being and other organisms.

Example of invasive species in Florida- pythons in the Everglades. The introduction of this species into the Everglades created an imbalance in that ecosystem, which caused a decrease in native species.

Habitat Loss- The rapidly growing human population is putting pressure on species habitats. Creating malls and new homes destroys homes of native species, which leads to decrease in population size or extinction. Deforestation!

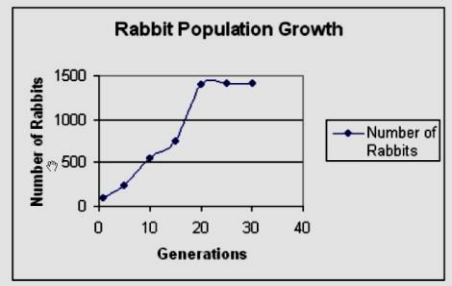
Multiple Choice Questions



http://www.geo.arizona.edu/Antevs/nats104/00lect21lynxhare.gif

1. The Iberian Lynx is a large cat that is native to Spain and Portugal. Over the last few decades, the lynxes' main food source, rabbits, have contracted a disease called myxomatosis. Myxomatosis causes death in rabbits.
How would this most likely affect the population of the lynx? (Use the graph on the left)
A. The lynx population would decrease since they won't have access to as much food.
B. The lynx population would remain the same because they would adapt to eating other food.
C. The lynx population would increase because they would produce more offspring to make up the difference.
D. The lynx population would decrease because they would also contract the disease.

2. A population of rabbits in an area of Northern Florida was monitored to learn more about the biotic and abiotic factors that affect the population size. The graph shows data collected about the rabbit population size for 30 generations. Based on the data on the right, what can be correctly stated about the rabbit population?
A. More rabbits have immigrated than have emigrated.
B. The number of deaths is greater than the number of births.
C. Overcrowding and a lack of food restrict on the population of rabbits.
D. At the twentieth generation a lethal virus kills a majority of the rabbits



3. Noxious weeds are weeds that invade ecosystems and grow very quickly and aggressively. In Colorado, more than 1 million acres are affected by noxious weeds. How do noxious weeds affect the biodiversity of an ecosystem?
A. The biodiversity increases slightly because they represent another species in the area.
B. They increase the biodiversity because they increase the total energy of the producers.
C. The biodiversity usually decreases greatly as the noxious weeds out-compete the local plants.
D. The biodiversity is not affected at all since the noxious weeds simply replace the dominant plant in the ecosystem.

4. Three hundred acres of pine forest in Florida were harvested for timber. A few trees were left at intervals in the harvested area as seed sources. What will be the likely progression of new growth on this land over the next few decades?
A. Pines will grow immediately from the seeds dispersed from the seed trees, and no other plants will be able to grow since the pines grow fastest.
B. Pines and oaks will start growing at the same time from seeds already in the soil, but the pines will grow taller than the oaks and shade them out.
C. Shrubby, fast-growing plants will sprout first, then pines will begin to grow over them and oaks will start growing in the shade below the pines.
D. Pines will grow tall very quickly from the seeds produced by the seed trees, and then shrubby plants will begin to grow in the shade underneath the pines.

5. Which of the following describes how an abiotic factor can impact the population dynamics in an ecosystem?
A. A parasite that invades a host can reproduce and cause a decline in the host species population.
B. Organisms that compete for the same resources will keep each other from overpopulating.
C. Predators will prevent herbivores from depleting the plants and other resources in an ecosystem.
D. Seasonal variations in temperature can cause some of the individuals in a population to die.

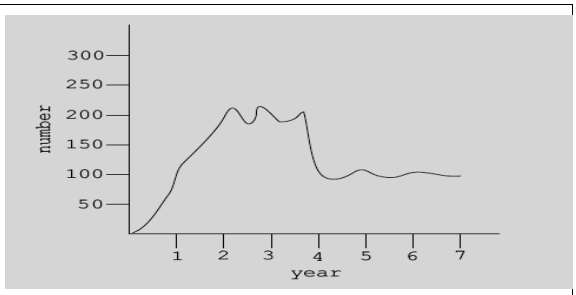
6. A biologist compares how different ecosystems undergo succession. She divides the series of events that happen during primary and secondary succession into three different stages. Which feature might be used to distinguish secondary succession from primary succession?
A. the lack of pioneer species in the second stage
B. the presence of soil and organic matter in the first stage
C. the presence of trees and large plants in the final stage
D. the presence of pioneer species in the final stage

7. Why are there so few aquatic plants and phytoplankton that live at the bottom zones in the ocean? (Use table on the right)
A. The ocean floor contains many decomposers.
B. Most sunlight is absorbed before reaching these levels.
C. Water is a limiting factor.
D. The temperature in these zones is extremely low.

Characteristics of Aquatic Zones **Intertidal** **Air, sun and water exposure; crashing waves**

Neritic	**Water depth less than 200 m; lots of sunlight; warm water**
Benthic	**Very deep water; no light; cold water except near thermal vents that emit heat and chemicals.**

8. The graph on the right shows the carrying capacity for a population of grass eating animals on the Great Plains of the United States. Which explanation below is the best reason why the carrying capacity dropped during years 4 to 7?
A. The animals began to migrate to another area in year 4
B. The animals began to have fewer offspring between years 3 and 4.
C. A group of carnivores moved into this area in beginning in year 3.
D. The area began to experience drought conditions in year 4.



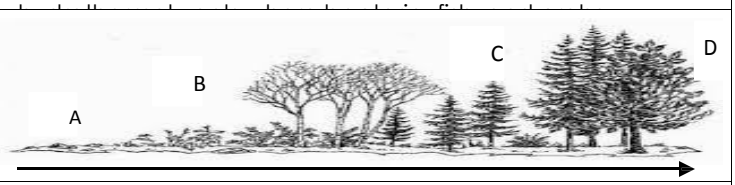
9. What does a decrease in salmon population due to an increase in river temperature indicate?
A. an abiotic factor affecting a biotic factor
B. change in population but not in abiotic factors
C. an effect of predation
D. an unchanging biological community

10. How could an asteroid impact cause a climate change and decrease biodiversity?
A. The impact could cause tsunamis and flood coastal areas.
B. The impact could cause a slight shift in Earth's axis, producing seasonal changes that lead to large migrations.
C. Dust and debris could reduce the amount of sunlight reaching Earth's surface, causing temperatures to drop and preventing plants from carrying out photosynthesis
D. The impact could lead to lava flows that could heat Earth's oceans, killing many organisms

11. The number of pythons found throughout Everglades National Park has increased in recent years. These huge snakes are not native to Florida and are believed to have been released into the wild by pet owners. Wildlife biologists have initiated attempts to capture and remove these pythons. Which statement best explains the biologists' reasons for removing these pythons from the Everglades?
A. The pythons could upset the territorial boundaries of native organisms.
B. The pythons could adapt to overcome diseases common to native snakes.
C. The pythons could prey on native organisms and cause native population to decline.
D. The pythons could begin to interbreed with native snakes and produce a more successful species.

12. Imagine you are listening to a series of student presentations in which the speakers hypothesize about the kinds of marine life they would expect to find in an abyssal marine zone. Which hypothesis do you find most compelling?
A. Autotrophic organisms like seaweed and plankton will be common, along with many larger organisms supported by these producers.
B. Coral reefs and high species diversity are expected, with many kinds of fish and invertebrates.
C. Large open-ocean fish will live there, like tuna, marlin, and sharks.
D. Low species diversity is predicted, except around

13. If a tornado moves through the area in the picture on the right, what will happen next?
A. a climax community will develop
B. the ecosystem will be at equilibrium
C. primary succession
D. secondary succession



14. Which of the following might be a limiting factor in an organism's survival?
A. Temperature B. Food availability
C. Abundance of predators D. All of the above

15. At which stage in the picture above are the most pioneer species found?
A. A B. B C. C D. D

Glossary

Abiotic factor (nonliving): An environmental factor not associated with or derived from living organisms.
Biodiversity: is the variety of different types of life found on earth. It is a measure of the variety of organisms present in different ecosystems.
Biotic factor (living): Factors in an environment relating to, caused by, or produced by living organisms.
Carrying capacity: 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.
Emigration: the movement of organisms away from a given area.
Immigration: the movement of organisms to a given area.
Invasive species: are plants, animals, or pathogens that are non-native to the ecosystem under consideration and whose introduction causes or is likely to cause harm to the native organisms.
Limiting factor: any environmental variable whose presence, absence, or abundance restricts the distribution, numbers, or condition of organisms in a population
Native species: organisms that originated in their location naturally, and without the involvement of human activity or intervention.
Pioneer species: one of the first species to colonize newly exposed land during primary or secondary succession.
Primary succession: an ecological succession that occurs following an opening of uninhabited, barren habitat or that occurs on an environment that usually lacking topsoil and no vegetation due to a volcanic eruption.
Secondary Succession: the ecological succession that occurs on a preexisting soil after there was a disturbance, such as a flood, that reduced the population of the initial inhabitants.
Succession: is the observed process of change in the species structure of an ecological community over time.

Unit 2: Energy Flow/ SC.912.L.17.9

Must Know….

- How to use a food web to identify producers, consumers, and decomposers.
- The pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.
- How matter and energy move through the water and carbon cycles.

ENERGY FLOW IN AN ECOSYSTEM

Sun ⟶ Grass ⟶ Zebra ⟶ Lion

Sunlight is the main energy source for living things. Energy flows through an ecosystem from the sun to organisms within the ecosystem in one direction. Two main groups of organisms in the ecosystem are the producers and consumers.

Producers – autotrophs, use sun's energy to make their own food, plants (grass)

Consumers – heterotrophs, cannot make their own food, eat other living things to get their energy (mice- primary consumers, zebra- secondary consumer and lion-tertiary computer)

FOOD CHAIN:

All living things need food to give them the energy to grow and move. A food chain shows how each living thing gets its food. It shows who is eating who. The arrow means "is eaten by"

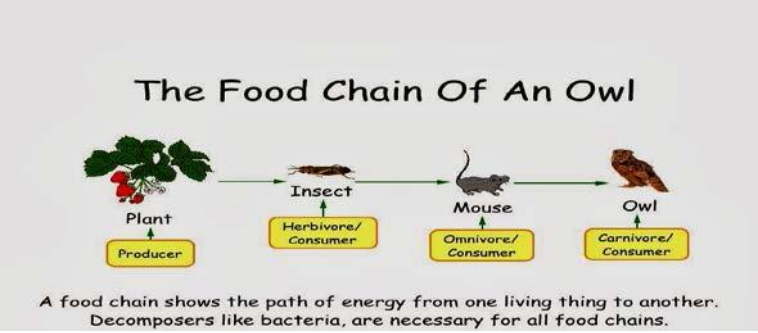
- Path of energy from producer to consumer
- Each level is called a trophic level (trophic = energy)
- Approximately 10% energy is transferred to next level
- 90% used for personal metabolism and development

FOOD WEB:

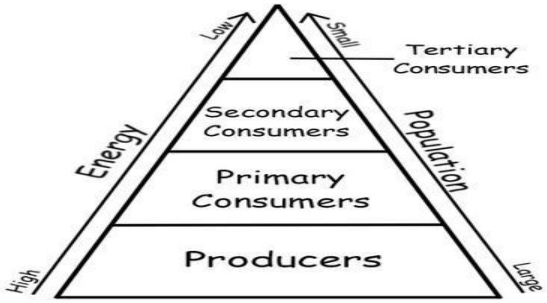
- Interconnected food chains; consists of many food chains and feeding relationships.
- Shows all possible feeding relationships at each trophic level in a community

ECOLOGICAL PYRAMID:

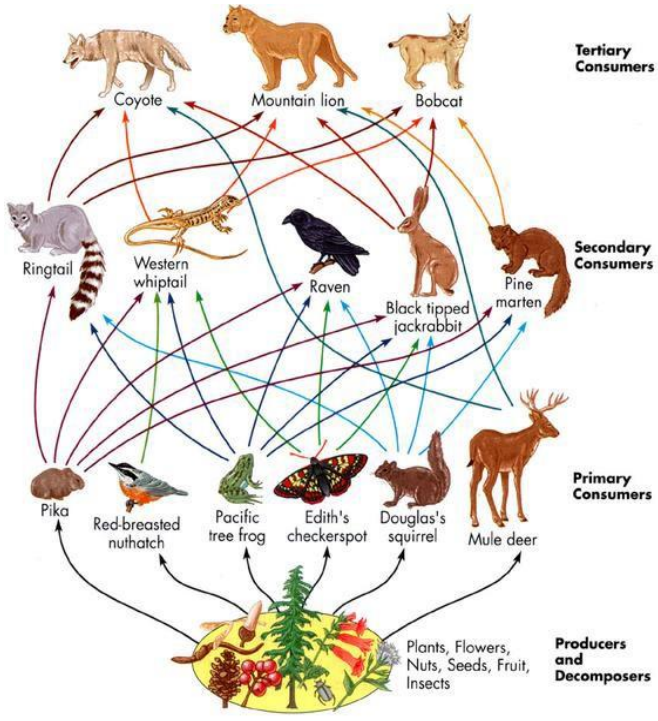
- Representation of energy transfer
- Pyramid of Energy – each level represents energy available at that level, 90% decline
- Pyramid of Biomass – each level represents amount level above needs to consume
- Pyramid of Numbers – each level represents number of organisms consumed by level above it



http://4.bp.blogspot.com/-5QNa2v7wLGs/UmekQ5pWzjI/AAAAAAAACKQ/Ir0x7_pU0MU/s1600/food+chain+b.jpg



http://harmonscience7.wikispaces.com/file/view/energy-pyramid ecosystem.jpg/322148016/480x345/energy-pyramid-ecosystem.jpg



https://y9-environmental-management-sg.wikispaces.com/file/view/Food%20web1%20%2B%20trophic%20levels.jpg/341537986/560x595/Food%20web1%20%2B%20trophic%20levels.jpg

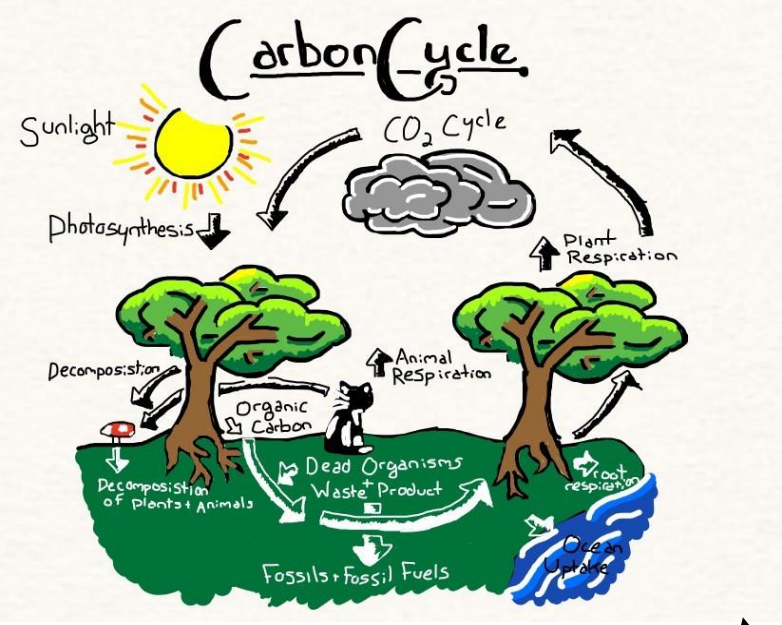
Energy Pyramid

Only 10% of the energy is passed on to the next trophic level; most is used up by the organism and some released as heat. Looking at the food chain above, if plant has 10,000 KJ of energy then only 1000KJ from the grass will be passed on to the insect and 100KJ from the insect will be passed on to the mouse…..(**10% only**)

Impact of changing one organism in a food web can alter the balance in an ecosystem-

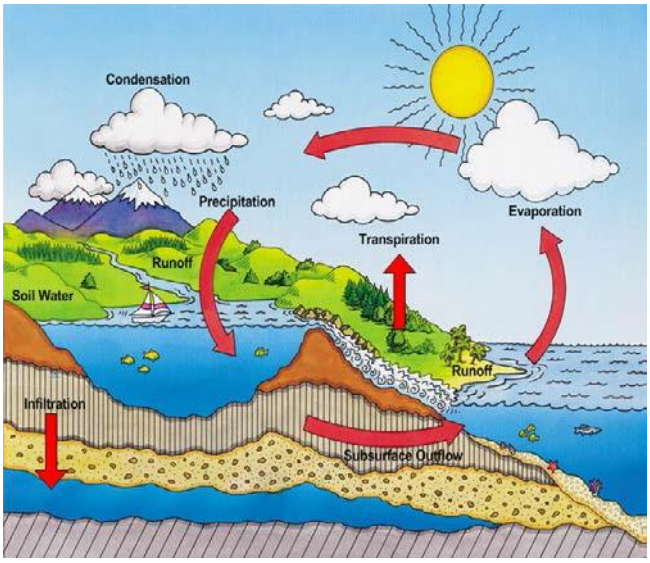
If for example, the producer is removed, the consequences could be dire. Producers capture sunlight directly and make chemical energy for consumers. If this is the only producer that a particular consumer eats, it may die as well. Pandas eat only bamboo. As bamboo is removed from the habitat, pandas will eventually diminish and possibly die off. If a secondary consumer or tertiary consumer were removed, for example, wolves, the primary consumers overpopulate. This is seen in places where wolves once roamed and no longer do. Deer are overpopulating out of control and they are exceeding the carrying capacity for their range. The deer population can experience an explosion and subsequent die off due to starvation. As you can see, no matter where the food web loses a member, the effects are great.

BIOGEOCHEMICAL CYCLES:
(Matter cannot be created nor destroyed, but can be converted/recycled to other forms)
Water Cycle – water is recycled through evaporation, condensation, precipitation, runoff, groundwater, aquifers, respiration, transpiration, excretion, decomposition
Carbon Cycle – carbon is recycled through respiration, photosynthesis, fuel combustion, decomposition; carbon can be atmospheric or dissolved, or can be found in organic compounds within the body



http://orig00.deviantart.net/57ec/f/2013/160/2/b/carbon_cycle_by_annanimus-d68fupz.jpg

Plants use carbon dioxide found in the atmosphere during photosynthesis to produce food (sugar). During cellular respiration, animals release carbon dioxide back into the atmosphere. Burning fossil fuel (cars, factories) also returns carbon into the atmosphere.
Carbon dioxide is a greenhouse gas and traps heat in the atmosphere. Without it and other greenhouse gases, Earth would be a frozen world. However, too much carbon dioxide in atmosphere can cause the Earth to become warmer and lead to the destruction of the Polar Regions.

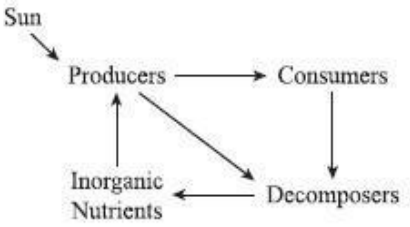


http://msttpagotech.pbworks.com/f/1340766419/water_cycle%20diagram.jpg

The Sun's heat provides energy to evaporate water from the Earth's surface (oceans, lakes, etc.). Plants also lose water to the air (this is called transpiration). The water vapor eventually condenses, forming tiny droplets in clouds. When the clouds meet cool air over land, precipitation (rain, sleet, or snow) is triggered, and water returns to the land (or sea). Some of the precipitation soaks into the ground. Some of the underground water is trapped between rock or clay layers; this is called groundwater. But most of the water flows downhill as runoff (above ground or underground), eventually returning to the seas as slightly salty water.

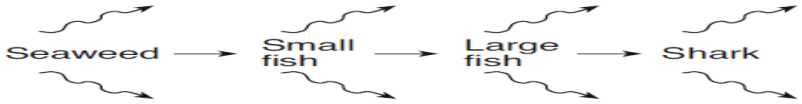
Multiple Choice Questions

1. The diagram below 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

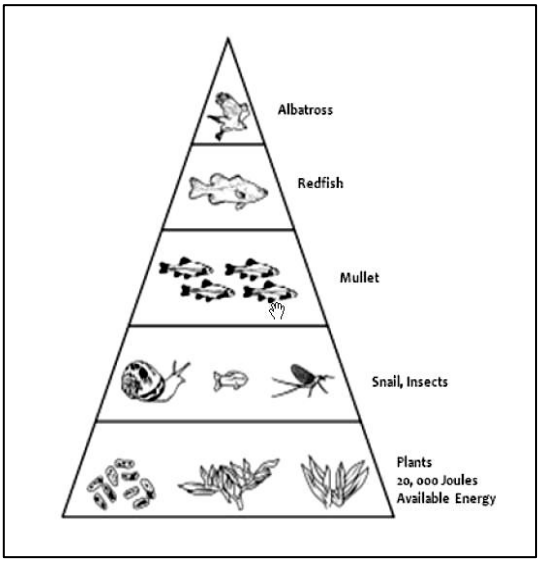
2. A food chain is illustrated below:



The arrows represented as  most likely indicate
A. Energy released from metabolism into the environment as heat.
B. Oxygen released from metabolism produced by cellular respiration.
C. The absorption of energy from the environment that has been created.
D. The transport of glucose away from the organism through photosynthesis.

3. A forest fire destroys the majority of the trees in a state park. What affect will this most likely have on secondary consumers in that ecosystem?
A. The amount of available energy will remain constant because secondary consumers are not reliant on primary consumers.
B. The amount of available energy will decrease because fewer primary consumers will survive the lack of vegetation.
C. The amount of available energy will increase because there will be less competition from producers.
D. The amount of available energy will increase because there will be fewer predators in the forest.

4. The amount of energy in an ecosystem can be represented in a model called an energy pyramid.



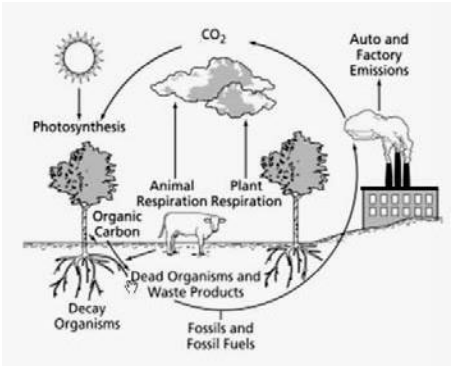
The producers at the bottom of the energy pyramid have 10,000 Joules of available energy. How much will be available for the mullet?

A. 10,000 Joules B. 1,000 Joules
C. 100 Joules D. 10 Joules

5. In a process called evaporation, water changes from a liquid to a gas/vapor. This excess water is then released into the atmosphere as part of the water cycle. Plants get rid of excess water through pores in the leaves called stomata. Which of the following terms best describes how plants release water into the atmosphere?

A. Condensation C. Precipitation
B. Transpiration D. Capillary action

6. A diagram of the carbon cycle is shown below.



Which of these could cause the amount of carbon dioxide in the atmosphere to decrease?

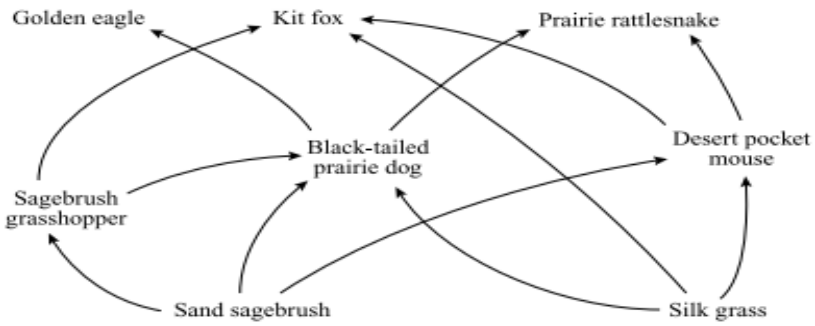
A. Increased burning of fossil fuels
B. Increased respiration in animals
C. Increased numbers of producers
D. Increased numbers of decomposers

7. In the carbon cycle, cellular respiration is the process responsible for the conversion of carbon-containing sugars into carbon dioxide gas, which can then become part of the atmosphere. What process can remove this gas from the atmosphere?

A. Fermentation B. glycolysis C. photosynthesis D. transpiration

8. Part of a desert food web is diagrammed on the right. Which of the following will **most likely** result if all of the primary consumers are removed from this ecosystem?

A. Prairie rattlesnakes will become herbivores.
B. Golden eagle and kit fox populations will decrease.
C. Sagebrush grasshoppers will consume soil bacteria.
D. Silk grass and sand sagebrush populations will decrease.



Glossary

Autotrophs/Producers: organisms that make their own food using sunlight or chemicals (plants, algae and bacteria)
Carbon Cycle: is a biogeochemical cycle by which carbon is recycled among the different spheres of the earth.
Cellular Respiration: is a process by which cells harvest the energy stored in food; organisms release carbon dioxide during this process.
Chemosynthesis: is the use of energy released by inorganic chemical reactions to produce food. Chemosynthesis is used by organisms living near or by deep ocean vents, sustaining life in absolute darkness, where sunlight does not penetrate.
Consumers/heterotrophs: organisms that rely on other organisms for their energy and food supply (animals, fungi, some bacteria)
Decomposers: organisms that break down organic matter (fungi and bacteria)
Energy Pyramid: is a model that uses a pyramid shape to show that the energy available for consumers decreases as it travels through a typical food chain or web. Most energy is located at the bottom of the pyramid-producers (plants).
Food Chain: is a linear network of links starting with producer organisms (such as grass or trees which use radiation from the sun to make their **food**) and ending at top predator species (like grizzly bears or killer whales), detrivores (like earthworms or woodlice), or decomposer species (such as fungi).
Food Web: is a diagram of the links among species in an ecosystem – essentially who eats what (several food chains).
Fossil Fuel: is a general term for buried combustible geologic deposits of organic materials, formed from decayed plants and animals that have been converted to crude oil, coal, natural gas, or heavy oils by exposure to heat and pressure in the earth's crust over hundreds of millions of years.
Photosynthesis: organisms (plants) use sunlight, water and carbon dioxide to create food/sugars.
Transpiration: is evaporation of water from plant leaves.
Trophic level: is the feeding position an organism occupies in a food chain (producers, primary consumers…)
Water Cycle: describes the continuous movement of water on, above and below the surface of the Earth.

Unit 3: Environmental Impact/SC.912.L.17.20

Must Know….

- How the actions of humans may impact environmental systems and affect sustainability?
- The costs and benefits of renewable and nonrenewable resources.
- That environmental policy decisions should be made after adequate monitoring of environmental parameters.

IMPACT OF HUMANS ON THE ENVIRONMENT:

- caused extinction of species through hunting, fishing, agriculture, industry, urban development
- Invasive species (pythons in Florida) vs. native species
- Growing population = greater demands on environment
- affected quality and quantity of land, air, water resources
- Pollution = pollutants
  - Air Pollution = smog, acid rain, dust, smoke, gases, fog, carbon dioxide
  - Water Pollution = sewers, industry, farms, homes, chemical waste, fertilizer, dirty dish water
  - Land Pollution = landfills, dumpsites, runoff, negligence, urban wastes

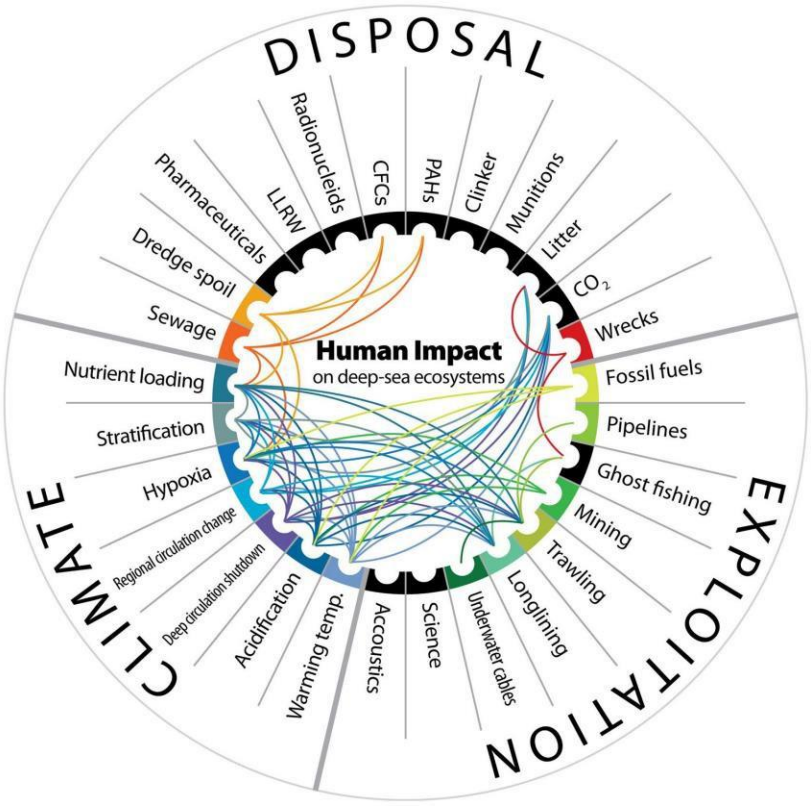
CONSERVATION EFFORTS

SUSTAINABILITY:

Sustainable Use- using resources at the rate at which they can be replaced or recycled while preserving the long term environmental health and biosphere REDUCE REUSE RECYCLE

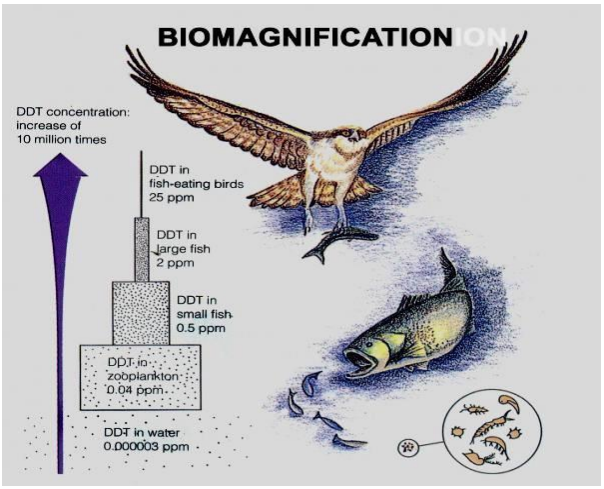
- conserve energy resources, develop and use renewable resources
- protect and conserve material resources
- control pollution (recapture wastes, carpooling, solid waste neutralization)
- Wildlife conservation protects animals from habitat loss, over-hunting, pollution; PROTECT BIODIVERSITY; stabilizing and restoring ecosystems
- reduce, reuse, and recycle programs
- Sanitation and waste disposal programs

-CREATE/ENACT LAWS that monitor and prevent the destruction habitats



http://2.bp.blogspot.com/-5g3PcaAq5ss/TjhaisDDrKI/AAAAAAAACm0/H_4nmAg6RNA/s1600/journal.pone.0022588.g007.jpg

DDT was once used extensively as an insecticide. DDT builds up in the fatty tissues of organisms. Organisms at lower trophic levels accumulate small amounts. Organisms at the next higher level eat many of these lower-level organisms and hence accumulate larger amounts. At the highest trophic levels, the increased concentrations in tissues may become toxic.



http://bwbearthenviro2011.wikispaces.com/file/view/48e0c2e877e27Biomagnification1copy_org.jpg/341273764/48e0c2e877e27Biomagnification1copy_org.jpg

Habitat Fragmentation-process by which habitat loss resulted from human activities (building roads, parking lots, homes…). It can reduce the population of various species, causing major changes in ecosystems.

http://www.blog.thesietch.org/wp-content/uploads/2007/10/amazon_deforestation.thumbnail.jpg

Laws and Policies

People are working together to protect the environment by considering how land usage and locations of power plants affect ecosystems. There is also great consideration on the usage on chemical pesticides and how they affect organisms. Pesticides are used to kill some organisms (harmful insects) but can cause to harm helpful insects.

NONRENEWABLE RESOURCES

Pros of nonrenewable sources of energy

1. Most nonrenewable sources of energy are easy to transport from one area to another. For example, petroleum oils which can be transported via pipes.
2. Cost of producing nonrenewable energy is low since they are naturally available. Furthermore, they are cheap to transform from one form of energy to another.
3. Most of this energy sources are abundantly available in different areas. Their availability is not affected by climatic condition.

Cons of nonrenewable sources of energy

1. Produce harmful green house gases which contribute global warming. Coal once burnt produces carbon dioxide harmful to the environment.
2. Once they are depleted they cannot be replaced making them expensive to obtain.

RENEWABLE RESOURCES

Pros of renewable sources of energy

1. Renewable sources of energy are renewable and easily regenerated. This is unlike fossil fuels which are perishable once used.
2. Renewable source of energy such as solar produce clean energy that does not pollute the environment. This is because no burning is required during usage of the energy.
3. Most importantly, renewable energy is available everywhere throughout the world thus there is no chance of the sources becoming depleted in future. For example, solar energy is everywhere as the sun will always be there every day.
4. Maintenance cost needed to install and use the renewable energy is relatively cheap. Solar energy can be trapped easily and used for domestic needs.
5. Renewable sources of energy boost economic growth and increase job opportunities. This includes electrical energy which is used to run many industries.

Cons of renewable sources of energy

Some of these limitations include

1. Difficult to produce the energy quantity that is equivalent to that produced by nonrenewable fuels
2. Technology required to trap renewable energy is costly. Setting of dams requires high initial capital to construct and maintain
3. Most renewable sources of energy are affected by weather thus reducing their reliability. For example, hydro generators need constant rainfall that will overflow the dams, wind turbines only rotate if there is wind of a given speed.

Multiple Choice Questions

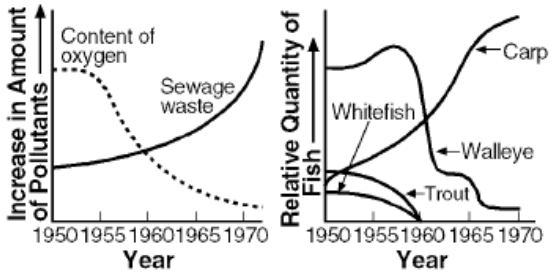
1. Some people see the benefit of wind energy as a clean alternative to fossil fuels for energy production. Others believe it is dangerous since the blades kill many migratory birds. These opinions best illustrate that decisions about alternate energy sources:
A. will usually favor older methods of energy production over newer methods
B. must be made by weighing the risks and costs against the benefits
C. must be made by taking into account the present needs of the citizens without looking toward the future
D. should be the responsibility of each individual

2. DDT and other pesticides used over 50 years ago are still affecting the environment today. Scientists have found these substances in recent glacier runoff. Glacier runoff occurs during the summer, when precipitation that has fallen on glaciers during the winter is released. Ice layers from existing glaciers have been analyzed. The results of this analysis show that the concentrations of DDT and other pesticides were highest about 10 years after the use of these substances was banned. This information shows that:
A. DDT and other pesticides cause glacier runoff during the summer.
B. it takes humans over 50 years to analyze a glacier.
C. precipitation helps to break down pesticides.
D. the decision of one human generation may have an impact on future

3. The activities that take place to meet human needs can often be harmful to ecosystem. By developing sustainable practices, however, we can help protect our environment. Which of the following changes would be most helpful in reaching sustainability?
A. Building more water treatment facilities
B. Planting trees to replace those that are cut down by logging
C. Tilling soil to improve soil fertility and increase crop production
D. Using natural gas for fuel instead of burning petroleum

4. Salt water is an abundant resource but unusable for irrigation and drinking. As demands on freshwater sources increase, the use of desalination processes to remove salt from ocean water is increasing. A concern of desalinating water is the large amounts of recovered salts that are returned to the ocean. Which of the following describes the most likely impact of desalination on the surrounding ocean environment?
A. Methane gas would pollute the ocean environment as shoreline organisms begin to die and decay.
B. Alteration in ocean salt levels would cause loss of species and unbalanced populations in marine food webs.
C. Nonrenewable resources in the ocean environment would become depleted and upset the ecosystem's balance.
D. Increased levels of salts and minerals in the ocean would result in overpopulation of marine bivalves due to strengthened shells.

5. The graphs below show data on some environmental factors acting in a large lake.



Which relationship can be correctly inferred from the data presented in the given graphs?
A. As sewage waste increases, walleye population increases.
B. As sewage waste increases, carp population increases.
C. As sewage waste increases, trout population increases.
D. As oxygen content decreases, carp population decreases.

6. Conservation is the wise use of natural resources. One way to practice conservation is the three R's -reduce, reuse, and recycle. When people practice conservation in these ways how do they affect the environment?
A. They do not affect the environment
B. They cause an increase in the amount of pollution in the environment.
C.They protect the environment by using fewer natural resources
D. They decrease the amount of natural resources in the environment

7. A power company wants to build a new electric power plant next
to a river and use water from the river for cooling. Which of the following should be studied before deciding whether to let the company build the plant?
A. The efficiency of the generators that the company plans to build
B. The power company's contributions to support local sports teams.
C. The effects of warmer water on the fish species that live in the river.
D. The price of the high-voltage wires used to transmit

8. The goal of scientists and interested citizen groups is to improve the quality of life for all. However, what is the major consideration for all efforts concerning the environment, economic needs, and practices?
A. Enact and enforce laws regarding the environment but without compromising the needs of future generations.
B. Mandate that all natural areas surrounding Florida peninsula become marine sanctuaries.
C. Remove regulations and monitoring efforts when they conflict with development.
D. Resettle areas where toxic dumps were found; natural bioremediation has removed all dangers to humans.

9. Public officials in Florida had to decide whether to build a new coal-fired electric power plant or invest in developing more solar energy. Which of the following sums up the arguments likely made by those who favored coal and those who favored solar energy?
A. Pro coal - invest in this relatively cheap and reliable energy source; Pro solar - invest in solar energy because coal supplies are running out faster than oil supplies
B. Pro coal - coal is relatively cheap and abundant energy source; Pro solar - Florida is ideal because it has abundant sunshine, and it produces no pollutants.
C. Pro coal - coal mines need more business; Pro solar - Florida is an ideal state for solar energy because of its abundant sunshine.
D. Pro coal - a coal-fired power plant gives off less pollution than any other type of power plant; Pro solar - investments in solar energy will help develop technologies for safer nuclear power plants.

10. Which of the following is the best reason for using wind farms to produce electrical power?
A. Wind farms have little environmental impact.
B. Wind farms are suitable for most locations.
C. The use of wind farms makes electricity less expensive.
D. The use of wind farms conserves nonrenewable fuels.

11. Which of the following is NOT true about energy?
A. Hydroelectric power plants produce electricity cheaply but may be environmentally expensive.
B. The formation of fossil fuels took millions of years, but they could be consumed in a few centuries.
C. Nuclear energy provides clean, cheap energy with few outside costs.
D. Biomass fuels are renewable but pollute the air and may not always be available.

Glossary

Biomagnification: the process by which the concentration of toxic substances increases in each successive link in the food chain.
Bioremediation: the use of biological agents, such as bacteria, fungi or green plants to remove or neutralize contaminants, as in polluted soil or water.
Deforestation: is the permanent destruction of forests in order to make the land available for other uses.
Eutrophication: the process by which a body of water acquires a high concentration of nutrients, especially phosphates and nitrates. These typically promote excessive growth of algae.
Habitat Fragmentation: is a landscape-scale process involving both habitat loss and the breaking apart of a large habitat into smaller parts.
Nonrenewable Resources: cannot be readily replaced by natural means on a level equal to its consumption. Most fossil fuels, such as oil, natural gas and coal are considered nonrenewable resources in that their use is not sustainable because their formation takes billions of years.
Renewable Resources: resources which are replaced naturally and can be used again. Examples are: wind, geothermal, water, solar energy, and biomass
Sustainability: the quality of not being harmful to the environment or depleting natural resources, and thereby supporting long-term ecological balance; development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Unit 4: Biochemistry/SC.912.L.18.1 & SC.912.L.18.12

Must Know….

- The basic molecular structure and primary functions of carbohydrates, proteins, lipids, and nucleic acids.
- The role of enzymes as catalysts that lower the activation energy of biochemical reactions.
- How factors such as pH and temperature affect enzyme activity.
- The specific properties of water that contribute to Earth's suitability as an environment for life. These include: cohesive behavior, ability to moderate temperature, expansion upon freezing, versatility as a solvent, hydrogen bonding and polarity

ORGANIC MOLECULES:

Organic compounds contain carbon and are found in all living things.

- Carbohydrates

- major source of short term energy and is also used in animal and plant structures (exoskeleton and cell wall); ex: sugars
- consists of carbon, hydrogen, and oxygen with a 2:1 ratio of hydrogen to oxygen; monomer/building block: monosaccharide(glucose)

- Proteins

- made up of chains of amino acids ; 20 different types of amino acids
- **enzymes**, hormones, antibodies, and structural components(muscles)

- Lipids

- water-insoluble (fats, waxes and oils)
- made up of carbon, hydrogen and oxygen; composed of glycerol and fatty acid
- provide insulation, long term energy, and cushion internal organs, found in cell membranes
- saturated (with hydrogen, single bonds) and unsaturated (double bonds)

- Nucleic Acids

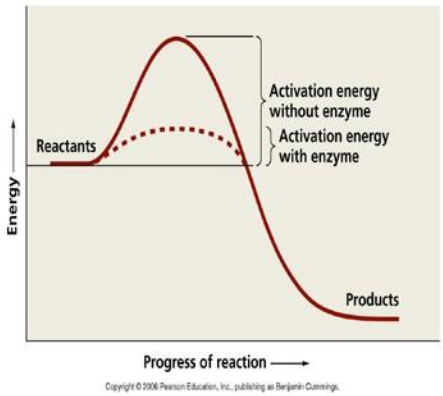
- instruction for protein synthesis
- store and transmit genetic information
- two types: DNA (deoxyribonucleic acid) and RNA (ribonucleic acid)
- composed of nucleotide (sugar, nitrogenous base and phosphate group)

ENZYMES:

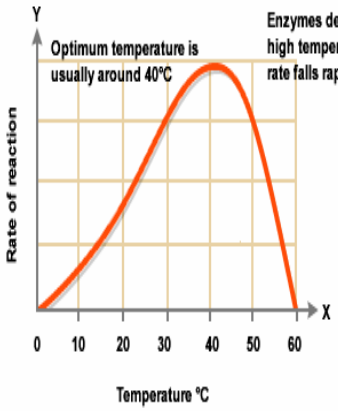
Enzymes are special proteins that regulate nearly every biochemical reaction in the cell. Different reactions require different enzymes. Enzymes function to:

- Aid in digestion
- Break down complex molecules ("substrate" = reactant)
- Catalysts (speed up chemical reactions without being used up or altered)
- Factors that affect enzymes: pH, temperature, and quantity
- Lower activation energy for chemical reactions.

- Enzymes are affected by changes in pH. The most favorable pH value - the point where the enzyme is most active - is known as the optimum pH.
- Like most chemical reactions, the rate of an enzyme-catalyzed reaction increases as the temperature is raised. Most animal enzymes rapidly become denatured at temperatures above 40°C, most enzyme determinations are carried out somewhat below that temperature.

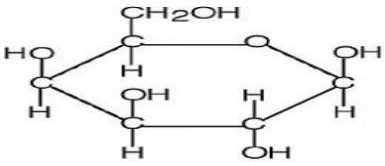


https://dr282zn36sxxg.cloudfront.net/datastreams/f-d%3Afe7c385d23106cb36c5a7b5be7fa9f0bb72ed3e087a054f1762267f9%2BIMAGE_THUMB_POSTCARD%2BIMAGE_THUMB_POSTCARD.1



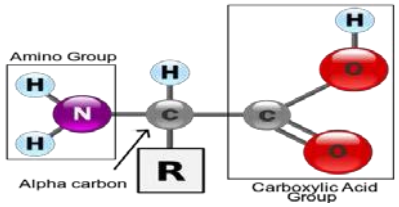
http://i.stack.imgur.com/Dj9Pe.gif

CARBOHYDRATE (monosaccharide – Glucose)



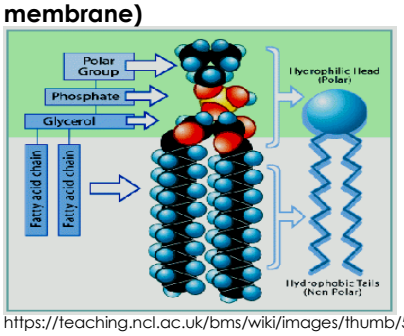
https://upload.wikimedia.org/wikipedia/commons/thumb/8/84/Alpha-D-glucose_Haworth.svg/1024px-Alpha-D-glucose_Haworth.svg.png

PROTEIN (One Amino Acid)



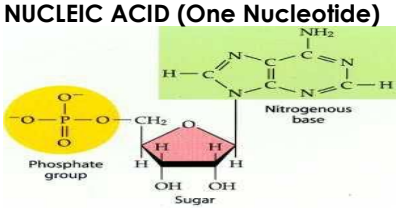
http://0.tqn.com/d/biology/1/5/6/b/amino_acid.png

LIPID (ex: phospholipid/cell membrane)

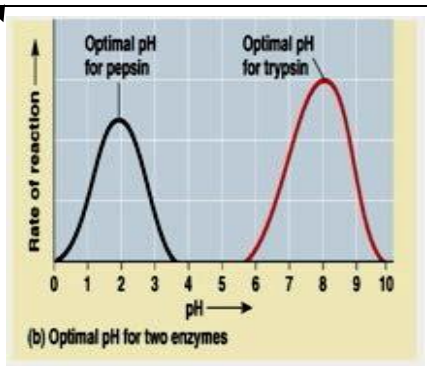


https://teaching.ncl.ac.uk/bms/wiki/images/thumb/5/5e/Phospholipid.gif/350px-Phospholipid.gif

NUCLEIC ACID (One Nucleotide)



http://2010g09r3bdnawiki.wikispaces.com/file/view/nucleotide.jpg/224706724/nucleotide.jpg



https://o.quizlet.com/i/-J-NUI-pjCYVYxNF1FLaxw_m.jpg

PROPERTIES OF WATER

Adhesion -water is attracted to other molecules; **Cohesion**-water is attracted to itself; ex: capillary action-water defies gravity and moves up a tree

High heat capacity- Holds heat to regulate temperature; homeostasis

High heat of vaporization -sweating to cool down

Less dense as a solid than a liquid (ice floats); ex: insulate lakes so that organisms can survive during the winter

Water is a **great solvent** (good at dissolving things); ex: dissolve nutrients

POLARITY

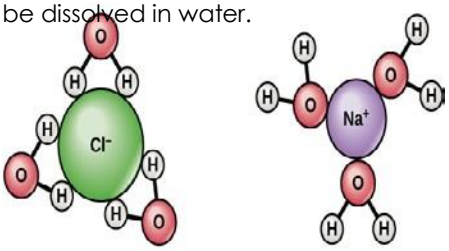
The uniqueness of water comes from its molecular structure.

Water is polar; it has a slight positive and slight negative charge on opposite ends.

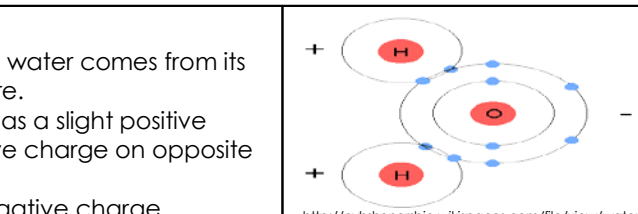
Oxygen- slight negative charge

Hydrogen- slight positive charge

The polarity of water is responsible for effectively dissolving other polar molecules. This is important to remember because for most biological reactions to occur, the reactants must be dissolved in water.



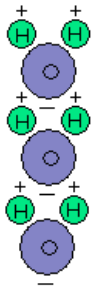
Water can **dissolve salt** because the positive part of **water** molecules attracts the negative chloride ions and the negative part of **water** molecules attracts the positive sodium ions.



http://cyhshonorsbio.wikispaces.com/file/view/water_molecule_2.gif/216975696/water_molecule_2.gif

Hydrogen is slightly positive and

oxygen is slightly negative



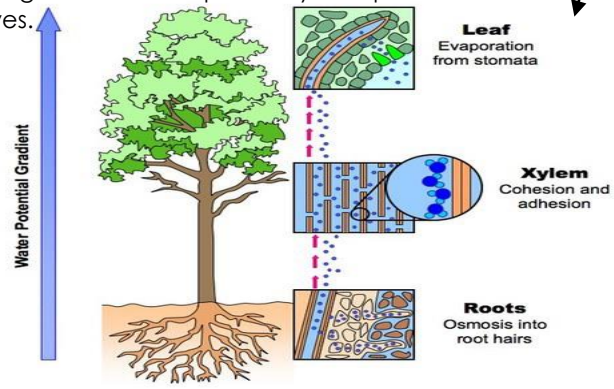
Cohesive property of water is due to the attraction between water molecules (positive end is attracted to the negative end)

http://broome.soil.ncsu.edu/ssc012/Graphics/watermol2.gif

Polarity and the Cohesive property of water in our body -It is the movement of water in and out of your cellular ~~structures that deposits vitamin, nutrients and vital blood~~ plasma.

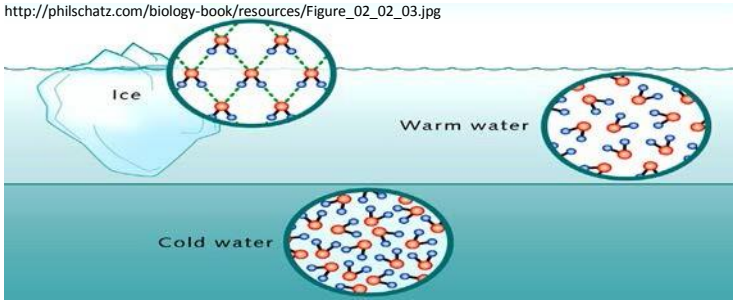
Driving force of Transpiration

Water moves from roots to leaves in the xylem. The upward movement is explained by the transpiration-cohesion hypothesis. The cohesive (water is attracted to itself) and adhesive (water is attracted to other molecules) property of water allows it to move upward. Water moves upward in a continuous column, linked by hydrogen bonds and pulled by transpiration from the leaves.



https://semoneapbiofinalexamreview.wikispaces.com/file/view/water_potential_up_a_tree.jpg/289691885/594x552/wate

http://philschatz.com/biology-book/resources/Figure_02_02_03.jpg



http://worldoceanreview.com/en/files/2010/11/k1_g_wasser-molekuele_e_en.jpg

Ice is less dense than liquid water and floats, which allows aquatic organisms to survive during winter.

When water freezes, water molecules form a crystalline structure maintained by hydrogen bonding.

Multiple Choice Questions

1. Many fish and aquatic plants can survive a cold winter because the layer of ice that forms at the top of the lake insulates the water below and prevents the lake from freezing solid. What unique property of water contributes to this effect?

A. Water absorbs heat when it evaporates and forms a gas

B. Water expands and becomes less dense when it freezes.

C. Water molecules completely separate into ions in solutions.

D. Water forms hydrogen bonds with ions and other polar substances.

2. Water is often called the "universal solvent" because many substances can be dissolved in water. What property of water allows it to be such a versatile solvent?

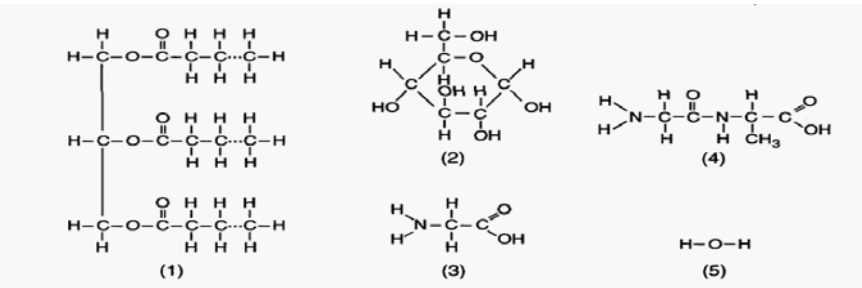
A. purity
B. polarity and cohesion
C. high heat capacity
D. expansion upon freezing

3. Water is essential for life. Its special properties make water the single most important molecule in plant life. Which of the following properties of water enable it to move from the roots to the leaves of plants?

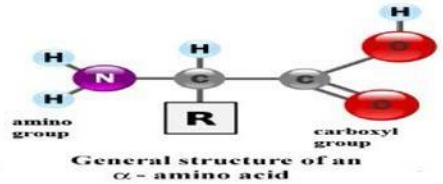
A. Water expands as it freezes.
B. Water is an excellent solvent.
C. Water exhibits cohesive behavior.
D. Water is able to moderate temperature

4. Resistance to antibiotics results from variations in the genetic code of *Streptococcus pneumoniae*. Which type of molecule encodes genetic information in *Streptococcus pneumoniae*?
A. carbohydrate B. fatty acid
C. nucleic acid D. protein.

5. Which of the following diagrams below is an example of a carbohydrate?
A. 5 B. 3 C. 2 D. 4 E. 1



6. The diagram below shows a monomer a macromolecule. Which type of molecule contains these monomers?
A. carbohydrates B. proteins
C. nucleic acid D. lipid

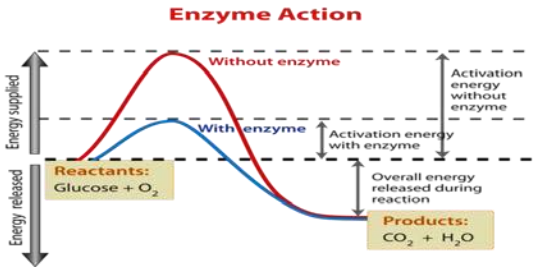


http://3.bp.blogspot.com/-jqyNe0M6Xqs/TZybsJFxWUI/AAAAAAAAALE/ZiDT3JVZtYY/s1600/702px-AminoAcidball.svg.png

7. Which of the following is <u>not</u> matched correctly?
A. Carbohydrates- provide short energy; structural part of cell walls
B. Lipids- provide long term energy; component of cell membranes
C. Proteins- provide energy needed for protein synthesis
D. Nucleic acids- stores genetic information; protein synthesis

8. Carbohydrates are a type of biological macromolecule required to carry out life functions. Which of the following is NOT true regarding carbohydrates?
A. Monomers of starch are sugars such as glucose.
B. Living things store extra sugars as complex carbohydrates.
C. They contain carbon, hydrogen and oxygen, usually in the ratio of 1:2:1.
D. Carbohydrates are the main substance that makes up cell membrane

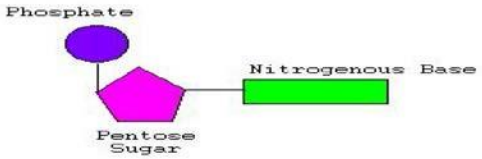
9. Many of the proteins in the human body are enzymes that catalyze chemical reactions. What is the relationship between enzymes and activation energy?



https://dr282zn36sxxg.cloudfront.net/d%3Afe7c385d23106cb36c5a7b5be7fa9f0bb72ed3e087a054f1762267f9%2BIMAGE_THUMB_POSTCARD%2BIMAGE_THUMB_POSTCARD.1

A. When an enzyme catalyzes a reaction, it increases the activation energy of the reaction and speeds it up.
B. When an enzyme catalyzes a reaction, it increases the activation energy of the product and speeds it up.
C. When an enzyme catalyzes a reaction, it decreases the activation energy of the reaction and speeds it up.
D. When an enzyme catalyzes a reaction, it does not affect the activation energy of the reaction.

10. What is the function of macromolecule subunit below?



http://www.ch.ic.ac.uk/local/projects/burgoine/nucleotide.jpg

A. energy
B. catalyst
C. stores genetic information
D. composes the majority of the cell membrane

11. Large bodies of water, such as lakes and oceans, do not quickly fluctuate in temperature. What is the reason for this phenomenon?
A. Water is an acid.
B. Water is a versatile solvent.
C. Water acts as a buffer.
D. Water has a high heat capacity.

Glossary

Activation energy: least amount of energy needed for a chemical reaction to take place.
Amino acid: building block or monomer of proteins
Carbohydrates: sugars; provide short term energy for cells.
Catalyst: enzymes; speeds up chemical reaction and lower activation energy
Cohesion: water is attracted to each other; sticky and clumps together into drops
Enzymes: act as catalysts and help complex reactions occur by speeding up reactions and lowering the activation energy.
Lipid: fats; long term energy; insulates the body
Macromolecule/Biomolecule: occurs naturally in organisms; ex: carbohydrates, lipids, proteins and nucleic acids
Monomer: is a molecule that may bind chemically to other molecules to form a polymer; ex: nucleotides are the monomers of nucleic acids
Nucleic Acid: DNA and RNA; stores genetic information; information to create proteins
Nucleotide: building block/monomer for DNA and RNA
Polarity: state of having two opposites sides; water has a positive end and a negative end
Protein: large biomolecule consisting of chains of amino acids; ex: enzymes, hormones
Universal Solvent: capable of dissolving a variety of different substances; water

Unit 5: Cellular Structure and Function/SC.912.L.14.1 & SC.912.L.14.3

Must know….

- The cell theory and how continuous investigations and/or new scientific information influenced the development of cell theory.
- How scientific claims are evaluated through scientific argumentation, critical and logical thinking and consideration of alternative explanations, in the context of cell theory.
- The difference between theories and laws and be able to explain how a theory is developed.
- The general structures of plant and animal cells and how plant and animal cells are alike and different
- The general structures of prokaryotic and eukaryotic cells and how they are alike and different
- How the structure relates to the function for the components of plant or animals cells. Structures you need to know are the cell wall, cell membrane, cytoplasm, plasmids, ribosomes, flagella, nucleus, nuclear envelope, nucleolus, chromatin, ribosomes, endoplasmic reticulum, microtubules, microfilaments, vacuoles, mitochondria, Golgi apparatus, chloroplasts, lysosomes, and cilia
- The role of the cell membrane as a highly selective barrier that carries out passive and active transport

LAW vs. THEORY

Law: Laws are simple and obvious statements about a phenomenon that never require a second guess, or an experiment to verify.

Theory: is a scientific explanation of an observed phenomenon. Unlike laws, theories actually explain why things are the way they are. Theories can never become laws or vice versa.

The Cell Theory was developed from three German scientist's discoveries. They are Matthias Schleiden, Theodor Schwann, and Rudolph Virchow.

- In 1838 the German Botanist Matthias Schleiden discovered that all plants were composed of cells.
- Then only a year later a German zoologist, Theodor Schwann, discovered that all animals were composed of cells.
- Later in 1855 a German physician named Rudolph Virchow was doing experiments with diseases when he found that all cells come from other existing cells.

Cells of course were discovered much earlier. The first person to see a cell was Robert Hooke. He used a very primitive microscope, but when he was looking at cork cells under the microscope he saw cells for the first time.

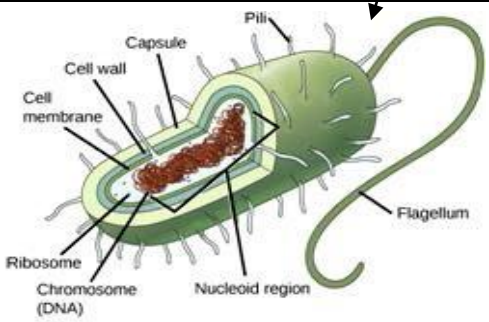
3 PARTS OF THE CELL THEORY:

- Cells are the basic units of structure and function in all living things.
- All organisms are composed of cells.
- All cells come from pre-existing cells.

PROKARYOTE: BACTERIA

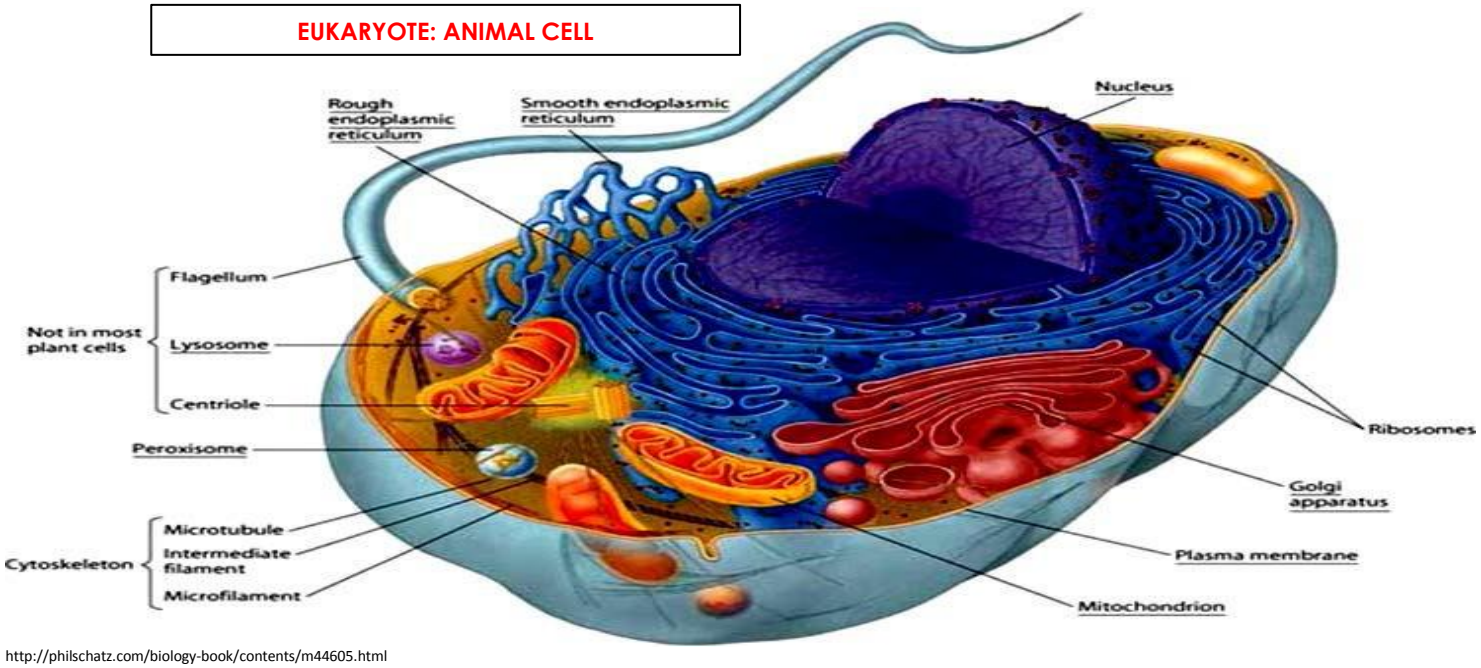
PROKARYOTIC CELLS vs. EUKARYOTIC CELLS

Features	Prokaryotic	Eukaryotic
Nucleus	NO	YES
Membrane-bound organelles	NO	YES
Size	small	large
Organisms	Bacteria, Archaea	Animals, Plants, Fungi, Protists
Ribosome and cell/plasma membrane	YES	YES
Cell wall	YES	Yes, except animals and some protists

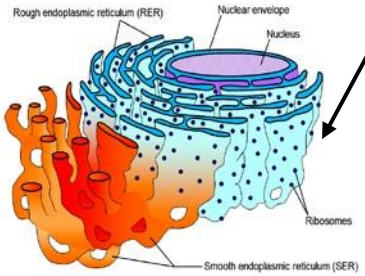


http://bio-120-exam2.wikispaces.com/

EUKARYOTE: ANIMAL CELL

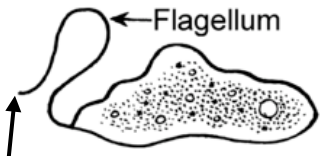


http://philschatz.com/biology-book/contents/m44605.html



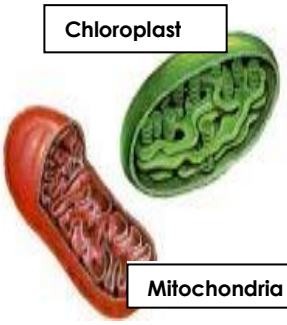
http://funny-pictures.picphotos.net/rough-endoplasmic-reticulum-function/pancreapedia.org*sites*pancreapedia.org*files*er_cartoon_1.png

Rough ER- contains ribosomes; protein synthesis



http://en.wiktionary.org/wiki/flagellum

Movement; found in both prokaryotes and eukaryotes.



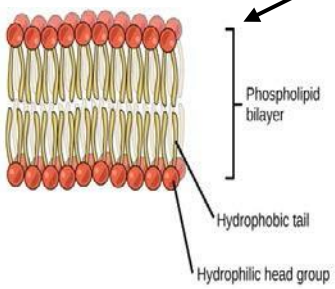
http://cellssixthgrade.wikispaces.com

Cellular Energy

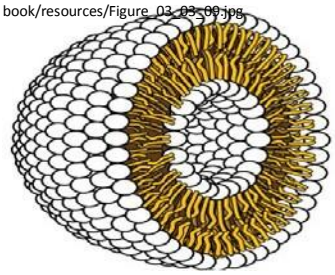
Mitochondria (plants/animals) are used to convert chemical energy into ATP for cellular activities. Chloroplast (plants) is used to capture light energy which is used for photosynthesis.

CELL/PLASMA MEMBRANE-

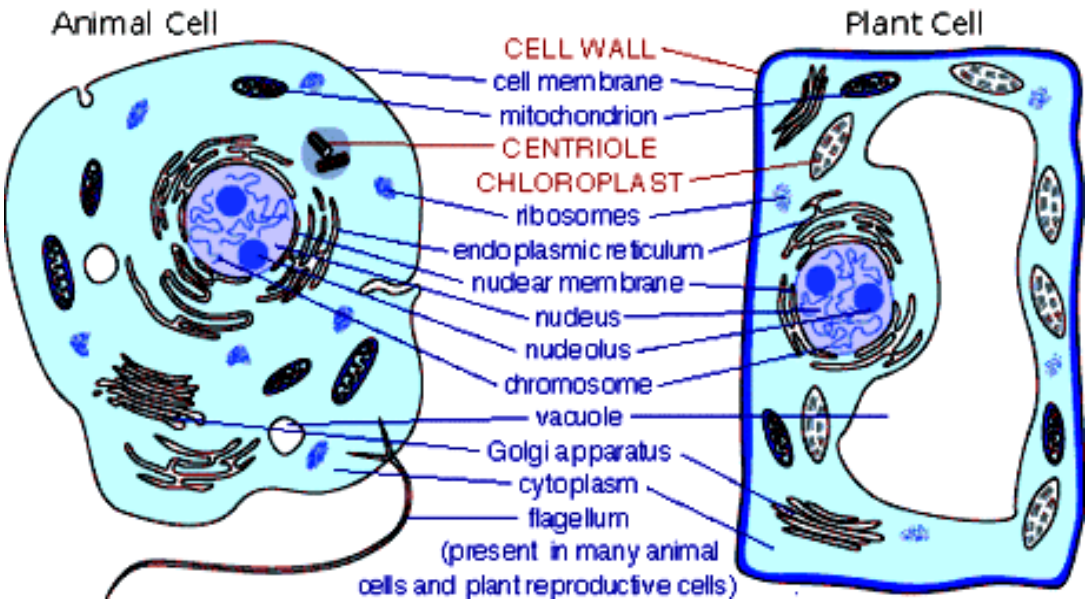
Phospholipid bilayer (glycerol head and two fatty acid tails)



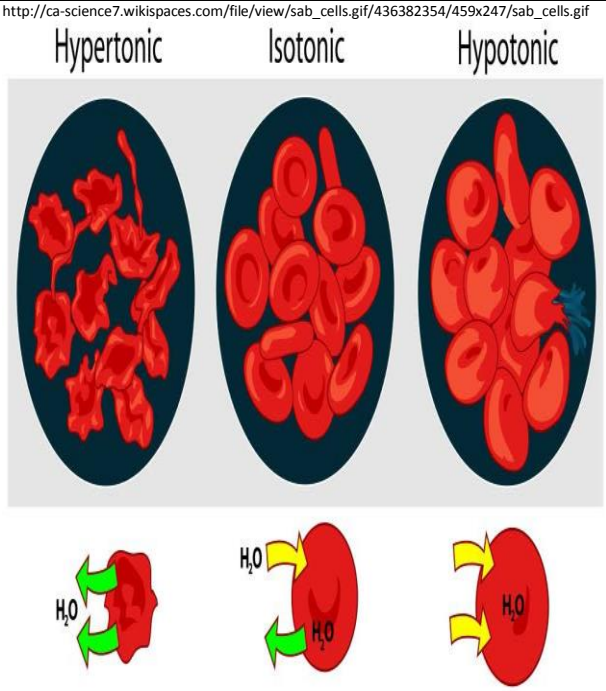
http://philschatz.com/biology-book/resources/Figure_03_03_09.jpg



http://figures.boundless-cdn.com/18618/full/figure-05-01-03.jpeg



http://ca-science7.wikispaces.com/file/view/sab_cells.gif/436382354/459x247/sab_cells.gif



https://upload.wikimedia.org/wikipedia/commons/thumb/7/76/Osmotic_pressure_on_blood_cells_diagram.svg/1000px-Osmotic_pressure_on_blood_cells_diagram.svg.png

CELL TRANSPORT:

- **Passive Transport** – movement of substances across the plasma membrane without the use of the cell's energy (with the concentration gradient; from high to low concentration)

1. DIFFUSION – movement of substances across the plasma membrane from an area of high concentration to an area of low concentration
2. OSMOSIS – diffusion of water across the plasma membrane from areas of high concentration to areas of lower concentration
   - HYPOTONIC – water moves in; cell bursts
   - HYPERTONIC – water moves out; cell shrivels
   - ISOTONIC – no net movement; cell maintains equilibrium
3. FACILITATED TRANSPORT – a carrier molecule embedded in the plasma membrane transports a substance across the plasma membrane following the high-to-low concentration gradient

- **Active Transport** – movement of substances across the plasma membrane that requires the use of the cell's energy and carrier molecules; substances are moving from an area of low concentration to an area of higher concentration (against the concentration gradient)
  - ENDOCYTOSIS – large particles are brought into the cell
  - EXOCYTOSIS – large particles leave the cell
- **HOMEOSTASIS** – internal equilibrium; the plasma membrane regulates what enters and leaves the cell; a selectively permeable membrane only allows certain substances to pass through.

Multiple Choice Questions

1. A specific type of cell is being studied by a scientist. She notices the cell contains a nucleus, mitochondria, a cell membrane

and cell wall. What is the correct classification of this cell?
A. A prokaryotic animal cell B. A prokaryotic plant cell C. A eukaryotic animal cell D. A eukaryotic plant cell

2. In the 1600s, advances in microscopy led to the development of cell theory. Which of the following statements is part of the cell theory?
A. All cells require water and oxygen to survive.
B. All living things are made of one or more cells.
C. All cells have organelles with specialized functions.
D. All living things rely on several different types of cells.

3. Cell theory is a result of the contributions of several different scientists, and applies to all living things. Which of the following explains why cell theory will not ever become the law of cells?
A. Cells of different organisms are so diverse that it is impossible to come up with a law that would apply to all of them.
B. Because cells undergo change as mutations occur within them, developing anything beyond a cell theory would be impractical.
C. Scientific theories are well-tested explanations, while laws are well-tested descriptions of natural phenomena; one cannot become the other.
D. Scientific theories can only become laws if all possible cases can be tested; it would be impossible to test all living things to see if they have cells.

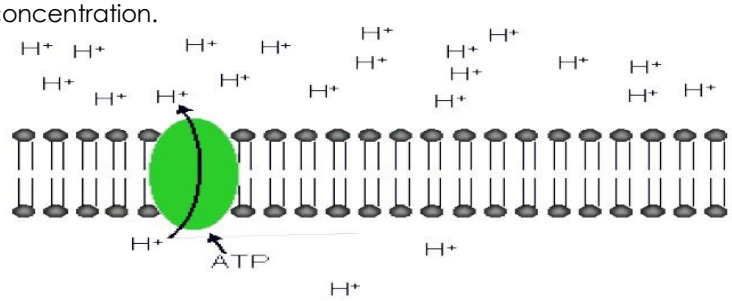
4. Joy took the notes shown below while learning about cells.
• Forms boundary between a cell and the outside environment
• Controls the movement of materials into and out of the cell
• Consists of double layer of phospholipids

She forgot to write the name of the cell structure that her class was studying that day. What structure is described in her notes?
A. endoplasmic reticulum
B. cell membrane
C. cell wall
D. nucleus

5. Which of the following contain complex, membrane-bound organelles?
1. Bacteria
2. Viruses
3. Eukaryotic
4. Prokaryotic
A. 1 and 2 B. 2 and 4 C. 3 only D. 4 only

6. The rough endoplasmic reticulum is a cell structure that consists of folded membranes that contain ribosomes. What is the advantage of the folded membranes?
A. increases surface area in order to produce more proteins
B. decreases surface area in order to produce more proteins
C. increases volume of the endoplasmic reticulum in order to produce more energy
D. decreases volume of the endoplasmic reticulum in order to make more energy

7. Look at the cross section of a cell membrane of a eukaryotic cell. H+ ions are being pumped from a low concentration to a high concentration.



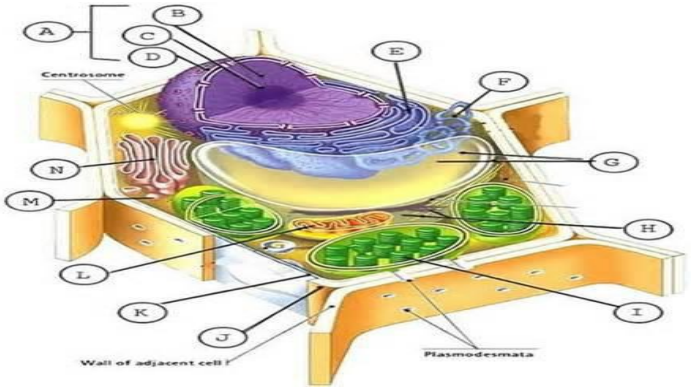
How do you describe this type of transport across the cell membrane?
A. active transport B. passive transport
C. facilitated diffusion D. co-transport

8. Plants play an important role in the carbon cycle by producing carbohydrates. Which of the following organelles enables plants to make carbohydrates from carbon dioxide and water?
A. nucleus C. central vacuole
B. chloroplast D. mitochondria

9. Some prokaryotes and eukaryotes, such as bacteria and sperm cells, have specialized structure that helps them move. What are these structures called?
A. pseudo-pods C. flagella
B. cilia D. vacuoles

10. Which of the following organelles is involved in the digestion of other worn-out organelles?
A. Lysosome
B. Endosome
C. Golgi apparatus
D. Rough endoplasmic reticulum

11. What is the function of letter J?



https://www.biologycorner.com/resources/cell_plant_label1.jpg

A. protein synthesis C. stores genetic information
B. provides protection and support D. storage

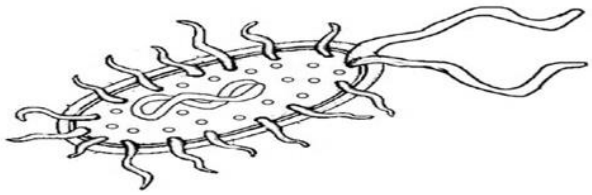
12. Looking at the cell on the right, the organelle labeled "L" is found in both animal and plant cells and is used to create ATP. What is the name of this organelle?

A. chloroplast
B. cell membrane
C. mitochondria
D. nucleus

13. After being formed by the ribosomes located on the endoplasmic reticulum, what is the next organelle to which a protein could be transported?
A. mitochondria C. chloroplast
B. golgi bodies D. lysosome

15. Looking at the animal cell on the right, what is the function of "z?"
A. controls what enters and leaves the cell
B. packages and transports proteins
C. site for protein synthesis
D. stores the information for creating proteins

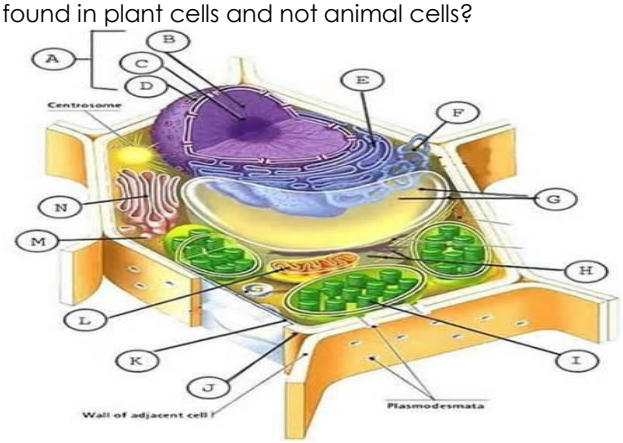
16. Looking at bacterium below, what is **most likely** the function of the long whip-like tail?



https://www.biologycorner.com/resources/prokaryote_color.png

A. capturing food C. movement
B. water storage D. reproduction

14. Looking at the cell below, what structures are only found in plant cells and not animal cells?

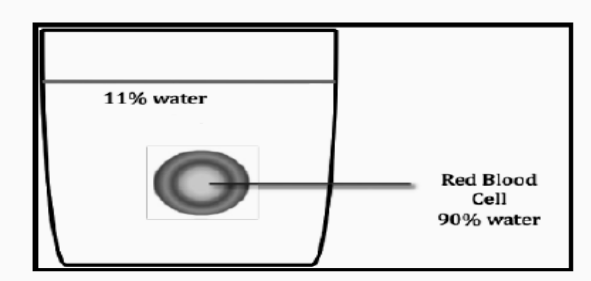


https://www.biologycorner.com/resources/cell_plant_label1.jpg

A. A, G, N C. L, J, I
B. I, J, G D. I, A, J

17. Which of the following does not correctly match an organelle with its function?
A. mitochondrion . . . energy/ATP
B. nucleus…lipid synthesis
C. ribosome…protein synthesis
D. central vacuole…storage

18. A red blood cell is 90% water. A red blood cell is suspended in an 11% water solution. A diagram is placed below.
What will most likely happen to the red blood cell?
A. The cell will burst.
B. The cell will shrink.
C. The cell will not be affected.
D. The cell will continually grow then shrink.



Glossary

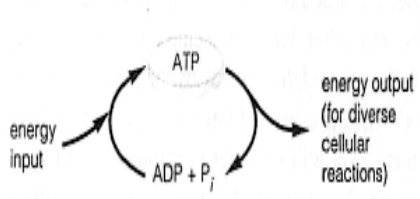
Prokaryote: single cell organism that lacks a nucleus and membrane-bound organelles
Eukaryote: organisms whose cells contain nucleus and membrane-bound organelles; single-cell or multicellular
Passive Transport: movement of molecules across the cell membrane without energy; high to low concentration
Active Transport: use of energy to move molecules through the cell membrane against the concentration gradient (from low to high)
Diffusion: the process by which molecules spread from areas of high concentration to areas of low concentration. When the molecules are even throughout a space - it is called **equilibrium**
Osmosis: the diffusion of water (across a membrane)
Law: describes a phenomenon that happens in nature.
Theory: scientific explanation about a phenomenon that is supported by multiple research/data
Ribosomes: an organelle that creates/synthesizes protein
Nucleus: an organelle found in eukaryotes that holds the genetic information
Mitochondria: organelles where cellular respiration and energy production occur
Chloroplast: organelle that uses sunlight to create food through a process called photosynthesis; found in plants
Cell Membrane: semipermeable membrane that surrounds the cytoplasm; controls what enters and leaves the cell
Central vacuole: stores water and enzymes for plants
Cell wall: a layer around the outside of the cell membrane in plants, fungi and some bacteria; provide rigidity, structural support, protection against mechanical stress and infection
Endoplasmic Reticulum: two types (rough and smooth); rough ER creates protein; smooth ER creates and stores lipids
Golgi apparatus: responsible for transporting, modifying, and packaging proteins and lipids into vesicles for delivery to targeted destinations.
Lysosome: digests things using enzymes
Selectively Permeable: membranes that allow some things through; the cell membrane is selectively permeable to water and oxygen because they move freely across the cell's membrane by diffusion

Unit 6: Cellular Energy/SC.912.L.18.9

Must Know….

- How photosynthesis and cellular respiration are related (that the products of one are the reactants of the other).
- The reactants, products and basic functions of photosynthesis, aerobic, and anaerobic respiration.
- How ATP is connected with energy transfers within the cell.
- That photosynthesis stores energy while cellular respiration releases energy.

BIOCHEMICAL REACTIONS: chemical bonds are formed and broken within living things creating chemical reactions that impact the ability to maintain life and carry out life functions.
ATP – ATP is a molecule that stores and releases the energy in its bonds when the cell needs it; removing a phosphate group (P) releases energy for chemical reactions to occur in the cell and ATP becomes ADP; when the cell has energy, the energy is stored in the bond when the phosphate group is added to the ADP
ATP ⟷ ADP + P + ENERGY



http://youngbloodbiology.wikispaces.com/file/view/atpcycling.png

-**PHOTOSYNTHESIS** – plant cells capture energy from the Sun and convert it into food (carbohydrates) and stored; plant cells then convert the carbohydrates into energy during cellular respiration; the ultimate source of energy for all living things is the Sun (in Chemosynthesis, organisms use sulfur or nitrogen as the main energy source)

$6CO_2$ + $6H_2O$ + ENERGY (light) → $C_6H_{12}O_6$ + $6O_2$

carbon dioxide + water + light → glucose + oxygen

REACTANTS → **PRODUCTS**

Interrelated nature of photosynthesis and cellular respiration- the reactants of photosynthesis are the products of cellular respiration and vice versa.

-CELLULAR RESPIRATION (aerobic) – stored energy (glucose) is released as ATP; there are three stages to cellular respiration; the first stage is called glycolysis and is anaerobic (no oxygen is required); and are aerobic (oxygen is required)

$C_6H_{12}O_6$ + $6O_2$ → $6CO_2$ + $6H_2O$ + ENERGY (~ 36 ATP)

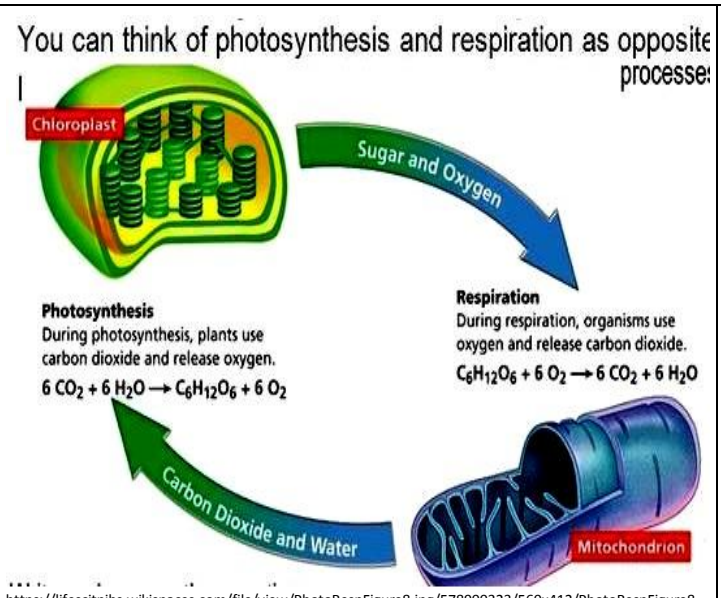
Glucose + oxygen → carbon dioxide + water + ~ 36 ATP

REACTANTS → **PRODUCTS**

-FERMENTATION (anaerobic) – bacteria and yeasts use this method to release energy. Also when cells are not provided with oxygen in a timely manner, this process occurs to continue producing ATP. There are two types of fermentation:

Lactic Acid Fermentation (muscle cells/fatigue, bacteria) — **Glucose → Lactic Acid + 2ATP**

Alcoholic Fermentation (yeasts, plant cells) — **Glucose → CO_2 + Alcohol + 2ATP**



https://lifescitpjhs.wikispaces.com/file/view/PhotoRespFigure8.jpg/578900323/560x412/PhotoRespFigure8.jpg

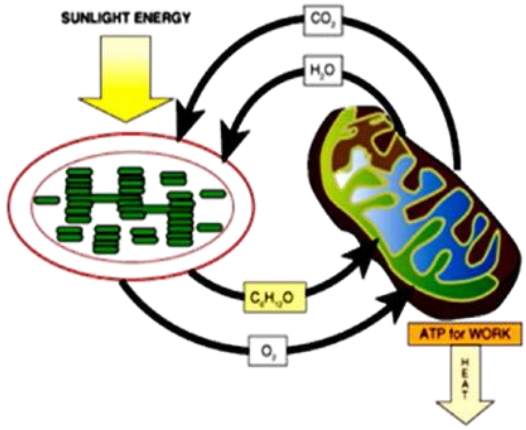
AEROBIC and ANAEROBIC RESPIRATION:
Aerobic Respiration/Cellular Respiration – 3 stages (glycolysis, Krebs cycle and Electron Transport chain)

- requires the **presence of oxygen**
- release of energy from the breakdown of glucose (or another organic compound) in the presence of oxygen to produce large amounts of energy.
- energy released is used to make ATP, which provides energy for bodily processes
- takes place in almost all living things

Anaerobic Respiration/Fermentation – 1 stage (glycolysis)

- occurs in the **absence of oxygen**
- breakdown of food substances in the absence of oxygen with the production of a small amount of energy
- produces less energy than aerobic respiration
- often called fermentation: lactic and alcoholic
- seen as an adaptation for organisms that live in environments that lack oxygen

Multiple Choice Questions

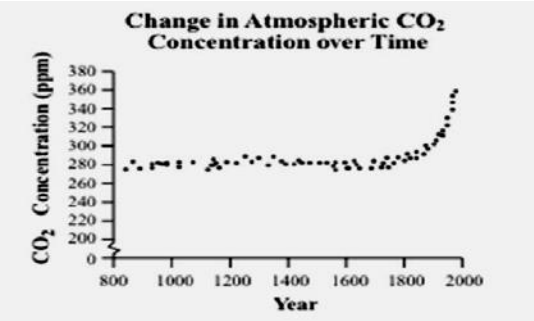


http://opencurriculum.org/articles/science/biology/?q=powering-the-cell-cellular-respiration-and-glycolysis

1. The diagram on the left shows the relationship between photosynthesis and cellular respiration and the organelles in which they occur.
Which statement describes how photosynthesis and cellular respiration are interrelated?
A. Oxygen is produced during cellular respiration and stored during photosynthesis.
B. Carbon dioxide and water released by cellular respiration are used in photosynthesis.
C. Photosynthesis releases the energy that is stored during the process of cellular respiration.
D. Glucose is used during cellular respiration to produce food that is broken down during photosynthesis.

2. In the absence of oxygen, yeast cells undergo fermentation to produce —

A. lactic acid. B. oxygen. C. glucose. D. ethyl alcohol.



3. Scientists have been investigating the change in atmospheric carbon dioxide concentration since about 800 AD. A graph of atmospheric carbon dioxide concentration over time is shown on the left.
If the trend on the above graph continues, which of the following animals would benefit?
A. The decrease in atmospheric CO_2 would benefit the anaerobic cellular respiration of humans.
B. The increase in atmospheric CO_2 would benefit the aerobic cellular respiration of cows.
C. The increase in atmospheric CO_2 would benefit the photosynthesis of phytoplankton.
D. The decrease in atmospheric CO_2 would benefit the reproduction of grasshoppers.

4. Which equation best describes a method of anaerobic respiration?
A. Glucose yields energy and lactic acid.
B. Glucose and oxygen yield lactic acid and water.
C. Glucose and lactic acid yield energy and carbon dioxide.
D. Glucose and oxygen yield energy, carbon dioxide, and water.

5. Which statement accurately describes the way that adenosine triphosphate (ATP) transfers energy within a cell?
A. ATP molecules break up sugars such as glucose into energy-rich compounds like lactose.
B. ATP molecules split carbon dioxide molecules, and the carbon is used as fuel by the cell.
C. ATP molecules ionize oxygen molecules, which give up electrons that can then be used for energy.
D. An ATP molecule reacts with water and loses a phosphate group, breaking a bond and releasing energy.

6. Two different species of bacteria are examined. Scientists find that species X always produces CO_2 and H_2O during cellular respiration. Species Y always produces ethyl alcohol and CO_2. Which conclusion can be made from these observations?
A. Only species Y is aerobic.
B. Only species Y is anaerobic.
C. Both species X and Y are aerobic.
D. Both species X and Y are anaerobic.

7. Which of the following correctly compares the products of aerobic and anaerobic respiration?
A. Aerobic respiration produces more than 30 ATP per glucose molecule and either ethyl alcohol or lactic acid, while anaerobic respiration produces only 2 ATP per glucose molecule.
B. Aerobic respiration produces more than 30 ATP per glucose molecule, while anaerobic respiration produces only 2 ATP per glucose molecule and either ethyl alcohol or lactic acid.
C. Anaerobic respiration produces more than 30 ATP per glucose molecule, while aerobic respiration produces only 2 ATP per glucose molecule and either ethyl alcohol or lactic acid.
D. Anaerobic respiration produces more than 30 ATP per glucose molecule and either ethyl alcohol or lactic acid, while aerobic respiration produces only 2 ATP per glucose molecule.

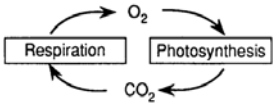
8. In which way are photosynthesis and cellular respiration different?
A. Cellular respiration stores ATP, while photosynthesis releases ATP.
B. Cellular respiration produces oxygen, while photosynthesis uses oxygen.
C. Photosynthesis and cellular respiration uses carbon dioxide.
D. Photosynthesis stores energy, while cellular respiration releases energy.

9. What are the products of alcoholic fermentation?
A. Lactic acid
B. Ethanol and carbon dioxide
C. Glucose and oxygen
D. Glucose

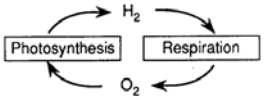
10. The overall equation for the aerobic cellular respiration is
A. $C_6H_{12}O_6 + O_2 \rightarrow CO_2 + H_2O + ATP$
B. $CO_2 + H_2O \rightarrow C_6H_{12}O_6 + O_2 + ATP$
C. $C_6H_{12}O_6 \rightarrow$ Lactic acid + ATP
D. $C_6H_{12}O_6 \rightarrow CO_2$ + Ethyl alcohol + ATP

11. Which of the following diagrams represents the correct cycling of gases during photosynthesis and cellular respiration?

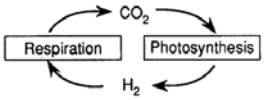
A.



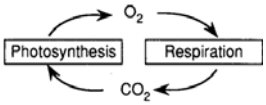
C.



B.



D.



12. A student athlete on the track and field team told his friends that he experienced oxygen debt near the end of his longest run in the last competition. How is oxygen debt explained in metabolic terms?
A. Without enough oxygen, muscle cells utilize aerobic respiration to synthesize sugar to provide energy.
B. Without enough oxygen, muscle cells will utilize lactic acid fermentation to synthesize 2 ATP molecules.
C. Without enough oxygen, muscle cells will utilize anaerobic respiration to convert lactic acid to oxygen.
D. Without enough oxygen, muscle cells utilize aerobic respiration to synthesize 36 ATP molecules.

13. ATP and ADP both play a role in cellular reactions involving energy.
How are these two molecules related?
A. ADP breaks down to produce ATP and a phosphate group, releasing energy.
B. ATP breaks down to produce ADP and a phosphate group, releasing energy.
C. Adding a phosphate group to ATP produces ADP and releases energy.
D. Adding a phosphate group to ADP produces ATP and releases energy.

14. The summary equation for photosynthesis is
A. $CO_2 + H_2O \rightarrow C_6H_{12}O_6 + O_2 + ATP$
B. $CO_2 + H_2O$ + light $\rightarrow C_6H_{12}O_6 + O_2$
C. $C_6H_{12}O_6 + O_2$ + light $\rightarrow CO_2 + H_2O + ATP$
D. $C_6H_{12}O_6 \rightarrow CO_2$ + Ethyl alcohol + ATP

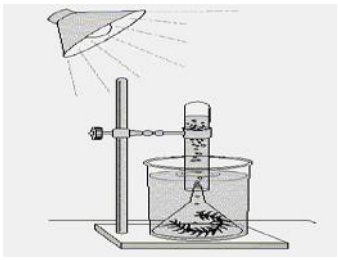
15. What occur during photosynthesis?
A. Chemical energy is converted into light energy.
B. Glucose is broken down to release energy.
C. Light energy is converted into chemical energy.
D. Carbon dioxide and energy are released into the atmosphere.

16. Which statement best describes the way that an adenosine diphosphate (ADP) molecule becomes an adenosine triphosphate (ATP) molecule in the human body?
A. Protein causes phosphate molecules to bind to sugars and form ATP.
B. Food energy is used to attach a phosphate molecule to an ADP molecule.
C. Ionized oxygen in cells causes sugars and phosphate molecules to form ATP.
D. Water breaks down ADP molecules which form into ATP molecules over time.

17. Which of the following shows the correct sequence during cellular respiration?
A. Electron transport chain → glycolysis → Krebs cycle
B. Glycolysis → Electron transport chain → Krebs cycle
C. Krebs cycle → Electron transport chain → glycolysis
D. Glycolysis → Krebs cycle → Electron transport chain

18. The two main types of fermentation are called
A. alcoholic and aerobic.
B. aerobic and anaerobic.
C. alcoholic and lactic acid.
D. lactic acid and anaerobic

19. The apparatus shown on the right was used to collect the oxygen that was produced by Elodea. Which factor was most responsible for the production of oxygen by Elodea?



A. The liquid contained enough oxygen for the plant to absorb.
B. Sugar was present in the liquid.
C. The presence of light stimulated photosynthesis.
D. The plant contained a large number of mitochondria.

20. The products of photosynthesis are the
A. products of cellular respiration.
B. reactants of cellular respiration.
C. products of glycolysis.
D. reactants of fermentation.

Glossary

Adenosine Triphosphate (ATP): an energy molecule found in cells; the energy in ATP is obtained from the breakdown of foods (glucose).
Aerobic Cellular Respiration: uses oxygen to break down glucose and release ATP
Alcoholic Fermentation: breaks down glucose without oxygen into ATP and alcohol (ethanol); type of anaerobic respiration
Anaerobic Respiration/Fermentation: releases ATP by breaking down glucose without oxygen
Glucose: chemical energy that is converted into usable cellular energy (ATP)
Lactic Acid Fermentation: breaks down glucose without oxygen into ATP and lactate; type of anaerobic respiration; used by yogurt bacteria and muscle cells
Photosynthesis: process used by plants and other organisms to convert light energy, normally from the Sun, into chemical energy that can be later released to fuel the organisms' activities.

Unit 7: Cell Division/ SC.912.L.16.17

Must know….

- The differences and similarities in the processes of mitosis and meiosis and relate these to the processes of sexual and asexual reproduction.
- How meiosis lead to genetic variation.
- The relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer.
- The cell cycle, including the process of mitosis and be able to explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during sexual reproduction.

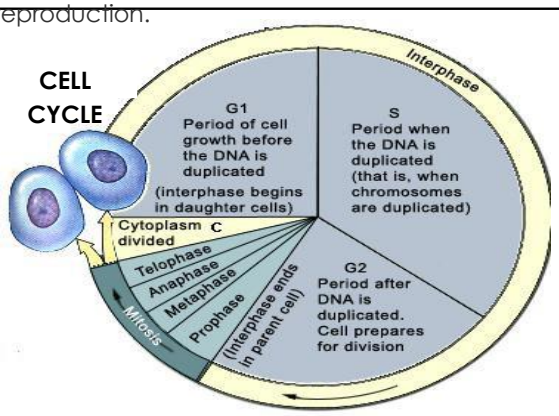
Asexual and Sexual Reproduction

Asexual Reproduction – a single parent produces one or more identical offspring by dividing into two cells - **mitosis** (protists, arthropods, bacteria by binary fission, fungi, plants); produces large numbers of offspring

- **offspring are clones of parents (genetically identical) which occurs during the process of mitosis**
- common in unicellular organisms, good for stable environments
- budding, binary fission, conjugation
- quick process (low energy requirement) – produces high number of offspring

Sexual Reproduction – pattern of reproduction that involves the production and fusion of haploid sex cells; haploid sperm from father fertilizes haploid egg from mother to make a diploid zygote that develops into a multicellular organism through mitosis

- **results in genetic variation (diversity) due to the formation of genetically different gametes during MEIOSIS**
- common in multicellular organisms (external or internal fertilization); good for changing environments

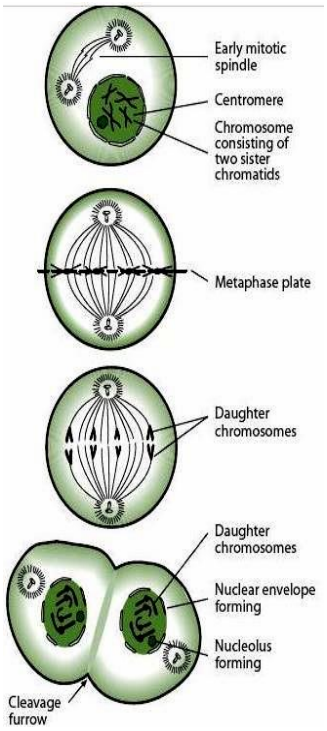


http://yr10biolsem12011.wikispaces.com/Genetics+Revision+Topics

Cancers are diseases in which there is a defect in the regulation of the cell cycle; uncontrolled cell division.

CELL DIVISION:

- process of copying and dividing the entire cell
- the cell grows, prepares for division, and then divides to form new daughter cells
- allows unicellular organisms to duplicate in a process called asexual reproduction
- allows multicellular organisms to grow, develop from a single cell into a multicellular organism, make other cells to repair and replace worn out cells
- three types: binary fission (bacteria and fungi), **mitosis, and meiosis**

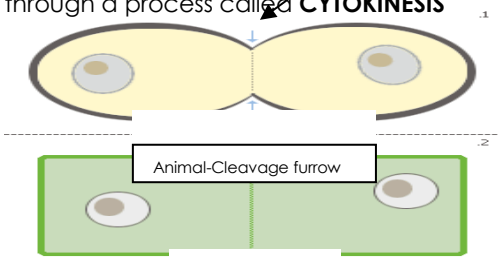


http://biology4ib.wikispaces.com/file/view/mitosis_stages.jpg/97417644/mitosis_stages.jpg

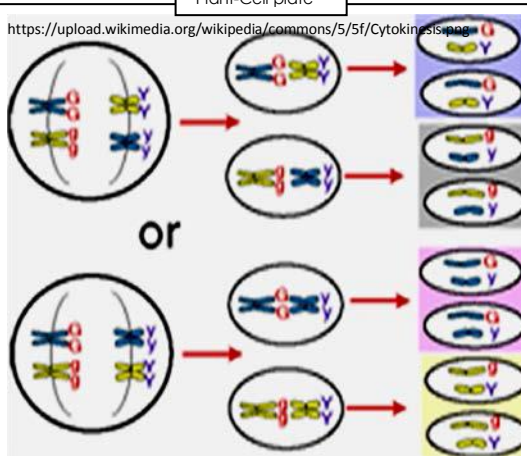
MITOSIS PMAT BODY CELLS

Prophase- chromosome visible
Metaphase- chromosome line up in the middle
Anaphase- chromosome pulled apart
Telophase- two nuclei

After Mitosis the cell finally becomes two through a process called **CYTOKINESIS**

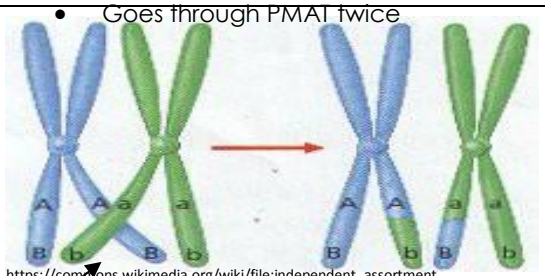


https://upload.wikimedia.org/wikipedia/commons/5/5f/Cytokinesis.png



MEIOSIS PMAT (1) PMAT (2) GAMETES

- Cell division responsible for genetic diversity through crossing over and independent assortment
- Creates sperm and egg
- Goes through PMAT twice



https://commons.wikimedia.org/wiki/file:independent_assortment

Independent Assortment/Meiosis: Metaphase I

-Random arrangement of pairs of chromosomes which leads to genetic diversity in gametes.

http://silverfalls.k12.or.us/staff/read_shari/mysite/modcrossingover.jpg

Crossing-over is the process that can give rise to genetic recombination. The duplicated homologous chromosomes pair, and crossing- over (the physical exchange of chromosome parts) occurs during **Prophase I/Meiosis**.

Property	Mitosis	Meiosis
DNA Replication	During interphase before mitosis	During interphase before Meiosis I only
# of divisions	One	Two
Synapsis of homologous chromosomes	Do not pair.	Pair during Prophase I, with crossing over between non-sister chromatids
# of daughter cells and genetic composition	Two diploid (2n) daughter cells that are genetically identical to the parent cell	Four haploid (n) daughter cells, contain half the # of chromosomes as parents, daughter cells are genetically different from parent cells and each other
Role in animal body	Produces somatic cells for growth and repair	Produce gametes and assure genetic diversity in sexual reproduction

Multiple Choice Questions

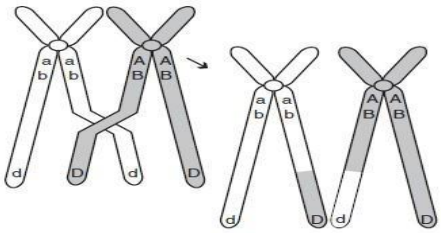
1. Which row in the chart below indicates the correct process for each event indicated?

Row	Formation of Egg	Formation of Sperm	Growth of Embryo
(1)	mitosis	mitosis	meiosis
(2)	mitosis	meiosis	mitosis
(3)	meiosis	mitosis	meiosis
(4)	meiosis	meiosis	mitosis

A. row 1 B. row 2 C. row 3 D. row 4

2. Which of the following phrases best describes cancer?
A. absence of cyclins in the DNA
B. multiple gene mutations on a chromosome of DNA
C. uncontrolled cell growth caused by mutations in genes that control the cell cycle
D. presence of genetic defects caused by hereditary disorders

3. The diagram below shows homologous chromosomes during prophase I of meiosis.



Which of the following correctly describes the process being illustrated?

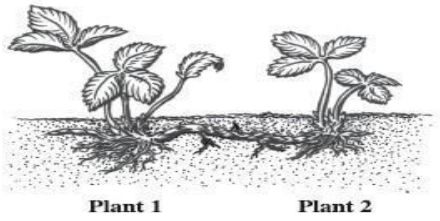
A. mutation in which the DNA content of the gene is altered

B. segregation of sister chromatids

C. condensation and segregation of alleles

D. crossing-over in which alleles are exchanged

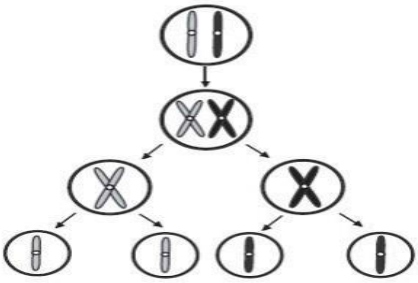
4. The diagram below shows two strawberry plants.



Plant 2 is produced asexually from Plant 1. If the leaf cells of Plant 1 have 56 chromosomes, how many chromosomes will be found in the leaf cells of Plant 2?

A. 14 B. 28 C. 56 D. 112

5. The diagram below shows a cellular process that occurs in organisms.



What is the name of this process?

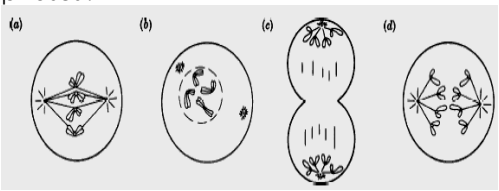
A. meiosis

B. mitosis

C. endocytosis

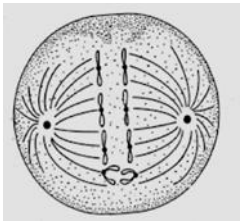
D. phagocytosis

6. In the cell cycle diagram, which of the following represents the correct order of the phases?



A. a, d, b, c C. c, d, b, a
B. b, a, d, c D. d, a, b, c

7. Describe the actions of the cell's chromosome shown in the picture, a stage of mitosis.



A. Metaphase- they line up in the middle of the cell.
B. Anaphase- they move towards the poles of the cell.
C. Telophase- they duplicate.
D. Prophase- they become visible as chromatin condenses.

8. During which phase of the meiotic cell cycle does DNA replication occur?
A. interphase B. prophase I C. metaphase II D. anaphase I

9. Which 2 cells would be more genetically similar to each other?
A. Two gametes produced by the same person
B. Two somatic cells produced by the same person
C. Two eggs produced by the same woman
D. Two sperm produced by the same man

10. Which of the following statements concerning cell division is NOT correct?
A. Gametes contain half the number of chromosomes found in somatic cells.
B. Somatic cells have the haploid number of chromosomes.
C. The haploid number of chromosomes in humans is 23.
D. The diploid number of chromosomes in humans is 23 pairs.

11. Meiosis and mitosis are both processes involved in reproduction. Which statement does NOT describe the process of meiosis?

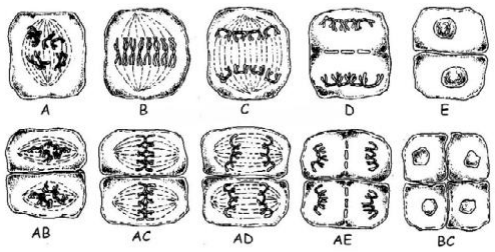
A. Meiosis allows gametes to have a haploid number of chromosomes.
B. During meiosis, the number of chromosomes per cell is reduced by half.
C. During meiosis II, chromosomes replicate and crossing over allows genetic variation within the species.
D. Prior to meiosis I, each chromosome is replicated, and by the end of meiosis II, the number of chromosomes is reduced.

12. Mitosis and meiosis are both processes involved in reproduction. Which statement correctly compares mitosis and meiosis?

A. Mitosis and meiosis both produce genetic variation within their daughter cells.
B. Mitosis results in the production of two genetically identical diploid cells and meiosis produces four haploid cells.
C. Mitosis and meiosis are both divided into only four distinct phases: prophase, metaphase, anaphase, and interphase.
D. Mitosis results in the production of two genetically identical diploid cells and meiosis produces four genetically identical haploid cells.

13. What is the purpose of mitosis?

A. Guarantees that each daughter cell has half the amount of DNA of parent cells
B. It ensures that new nuclei have the correct amount of DNA.
C. It ensures the reproduction of mitochondria and chloroplasts.
D. It prevents the occurrence of cancer cells.



14. What process is occurring on the left?

A. Mitosis C. Budding
B. Meiosis D. Fertilization

15. During which stage of the cell cycle does the cell duplicate its DNA?

A. M stage B. G1 stage
C. S stage D. G2 stage

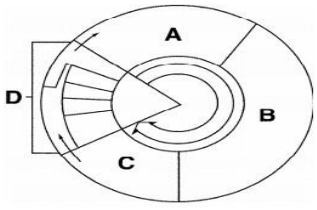


Figure 10-1

16. Cell division is represented in Figure 10-1 by the letter

a. A. b. B. c. C. d. D.

17. A cell with 10 chromosomes undergoes meiosis. How many daughter cells are created?___Each daughter cell has___chromosomes.

A. 4, 5 B. 2, 10 C. 2, 5 D. 4, 10

18. Random orientation of homologous chromosomes that increases genetic diversity occurs in_____of meiosis.

A. Anaphase I B. Metaphase I C. Prophase II D. Telophase II

19. Which of the following shows the correct sequence of the cell cycle?

A. C→M→ G_1→S→G_2 C. S → G_1 → G_2→ M → C
B. G_1→ S→G_2→ M→C D. none of the above

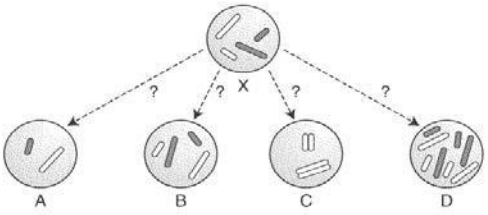


Figure 10-9

20. Consider the cell labeled X in Figure 10-9 containing 4 chromosomes. Which of the four cells below it represents a healthy gamete that could be produced from this cell?

a. A b. B c. C d. D

20. Which occurs in metaphase?

A. Centrioles move to opposite poles.
B. Chromosomes line up along the equator of the dividing cell.
C. Chromosomes move to opposite poles.
D. The nuclear envelope disappears.

21. The numbers in Figure 10-1 represent the chromosome number found in each of the dog cells shown. The processes that are occurring at A and B are.

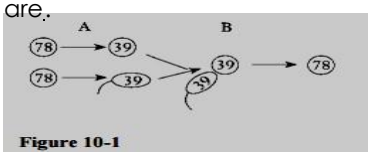


Figure 10-1

A. mitosis and fertilization
B. mitosis and pollination
C. meiosis and fertilization
D. meiosis and pollination

Glossary

Asexual reproduction: a single organism or cell makes a copy of itself; clones or genetically identical to parent cell
Crossing over: is the exchange of genes between two chromosomes, resulting in non-identical chromatids that comprise the genetic material of gametes (sperm and eggs)
Genetic variation: differences in genes within and among populations; increases genetic diversity
Independent assortment: formation of random combinations of chromosomes in meiosis and of genes on different pairs of homologous chromosomes
Meiosis: process by which the nucleus divides in all sexually reproducing organisms during the production of spores or gametes.
Mitosis: process where a single cell divides resulting in generally two identical cells, each containing the same number of chromosomes and genetic content as that of the original cell.
Sexual reproduction: union of male and female gametes (sperm and egg) to form genetically different offspring

Unit 8: Human Reproduction/SC.912.L.16.13

Must Know….

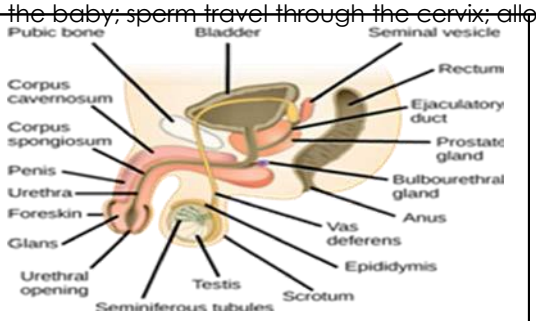
- The basic anatomy and physiology of the human reproductive system.
- The process of human development from zygote to birth.
- The male reproductive system, you will need to know the seminal vesicle, prostate gland, vas deferens, urethra, epididymis, scrotum, penis, and testes.
- The female reproductive system, you will need to know the ovaries, oviduct (fallopian tube), uterus, cervix, and vagina.

Male Structures

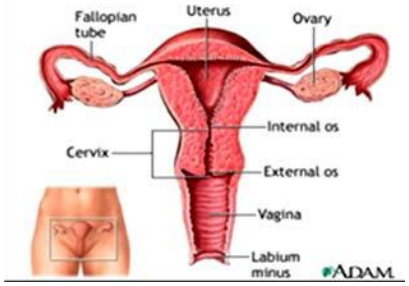
• **Vas deferens:** during sexual stimulation, the sperm travels through this long duct.
• **Testes:** sperm production
• **Penis:** male organ for sexual intercourse; contains a number of sensitive nerve endings.
• **Urethra:** carries urine from the bladder to outside the body; expels semen during orgasm
• **Scrotum:** pouch that encloses the testes
• **Epididymis:** immature sperm leaves the testes and mature in this duct; remain here until expelled or reabsorbed
• **Prostate gland:** walnut shape; controls urination and produce minerals and sugars that make up semen.
• **Seminal vesicle:** a pair of tube that produces fluid that becomes a large percentage of semen.

Female Structures

• **Ovaries:** oval-shaped, on both sides of the uterus, egg cells and hormones production
• **Oviduct/Fallopian tubes:** narrow tube, allows the egg to travel from ovary to lower part of the uterus; conception usually occurs there.
• **Vagina:** canal that joins the cervix to the outside of the body.
• **Uterus/womb:** hollow and pear-shaped organ that is the home to the developing fetus. 2 parts: cervix that leads to vagina and the upper part or corpus which expands to hold a developing baby.
• **Cervix:** lower part of the uterus; dilates during childbirth to allow the passage of ~~the baby; sperm travel through the cervix; allows the passage of menstrual fluid.~~



https://opentextbc.ca/biology/chapter/24-3-human-reproductive-anatomy-and-gametogenesis/

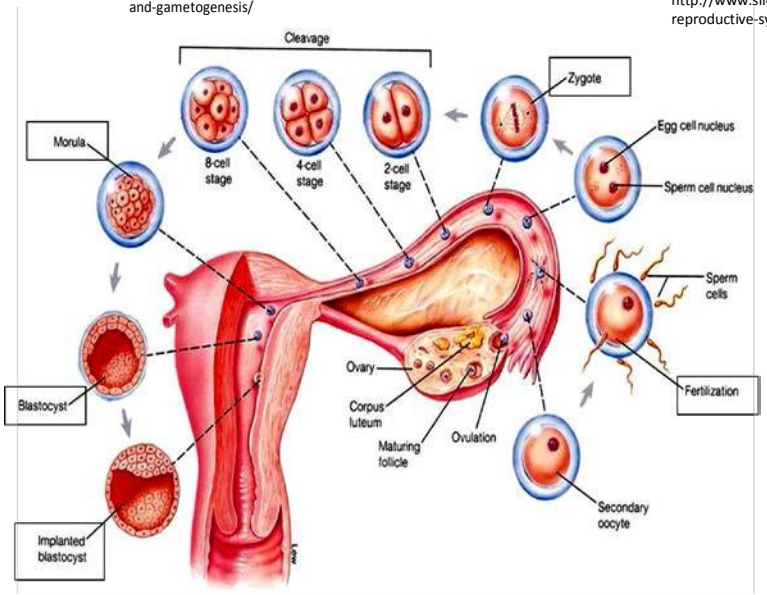


http://www.slideshare.net/sandeshkamdi/female-reproductive-system-12211932

Fetus Life Support

• **Placenta:** organ attached to the lining of the uterus; keeps baby and mother's blood separate; provides a link between mother and baby.
• **Amniotic Sac:** membrane which contains the fetus and the amniotic fluid. This is the place where the fetus develops.
• **Amniotic Fluid:** liquid that cushions the baby and helps prevent injuries.
• **Umbilical cord:** connects the placenta to the developing baby. It removes waste products and carbon dioxide from the baby and brings oxygenated blood

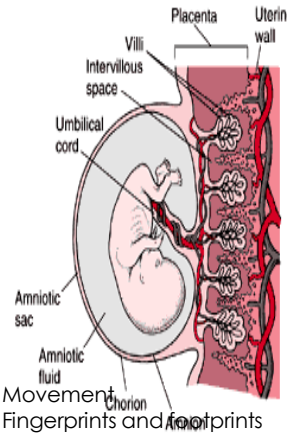
and nutrients from the ~~mother through the placenta~~ to the baby.



http://humanphysiology2011.wikispaces.com/15.%20Reproductive%20Physiology

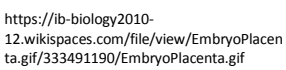
Embryogenesis: zygote to embryo to fetus
1. Morula (zygote-16 cells)
2. Blastula (zygote-100 cells)
3. Gastrulation-development of 3 layers that are responsible for the development of tissues and organs.
4. Neurulation-development of the nervous system.

Blastocyst implants in the uterus where it grows into a fetus; uterus has the space to support the growth!



1st Trimester	2nd Trimester	3rd Trimester
Implantation of blastocyst Neural tube closes Rapid growth Brain, spinal cord, heart and other organs begin to form Basic facial features begin to appear	Eye lenses begin to form	Urine forms Sex becomes apparent Bones develop Begins to hear Hair grows Movement Fingerprints and footprints form

Eyes open and close; respond to light
Bones are fully developed Rapid weight gain
Lots of movements Organs are ready to function on their own



https://ib-biology2010-12.wikispaces.com/file/view/EmbryoPlacenta.gif/333491190/EmbryoPlacenta.gif

Multiple Choice Questions

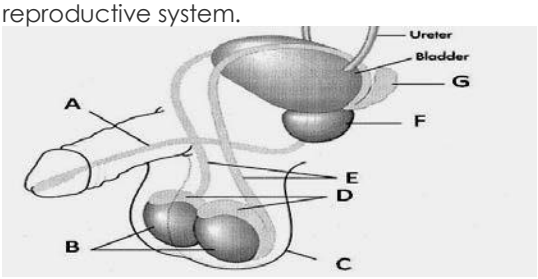
1. In the female human reproductive system, eggs are created in an ovary, and implanted in the uterus. In order for the embryo to grow, it must receive nutrients and oxygen. This problem is solved through an organ called the

A. amniotic sac B. placenta
C. uterus D. umbilical cord

2. The main function of the male reproductive system is to produce and deliver sperm for fertilization. Which of the following gives the path of sperm cells through the male reproductive system?

A. testicle, epididymis, vas deferens, urethra
B. testicle, vas deferens, epididymis, urethra
C. epididymis, testicle, urethra, vas deferens
D. testicle, epididymis, urethra, vas deferens

3. Below is a diagram of the male reproductive system.



What is the function of structure is represented by the letter D?

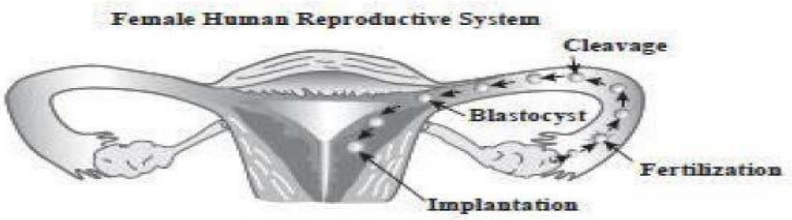
A. sperm production
B. takes urine from the bladder to the outside
C. holds the developing fetus
D. brings sperm to maturity

4. In the male reproductive system, gametes are produced in the testicles. Which of the following structures of the female reproductive system has the same function as the testicles?

A. uterus B. Cervix C. Ovaries D. Fallopian tubes

5. A fertilized egg undergoes several stages before it is successfully implanted. The diagram below shows these stages as the fertilized egg travels through the female reproductive system.

In which of the following structures of the female human reproductive system is the blastocyst implanted during normal human development?



A. ovary B. uterus C. vagina D. amniotic sac

6. The drinking of alcoholic beverages by a pregnant woman is harmful to the development of her fetus. This is most damaging early in the first trimesters of pregnancy because during this time

A. the lungs of the fetus become functional.
B. alcohol can easily enter the mouth of the fetus.
C. many of the essential organs of the fetus are forming.
D. the fetus cannot excrete wastes.

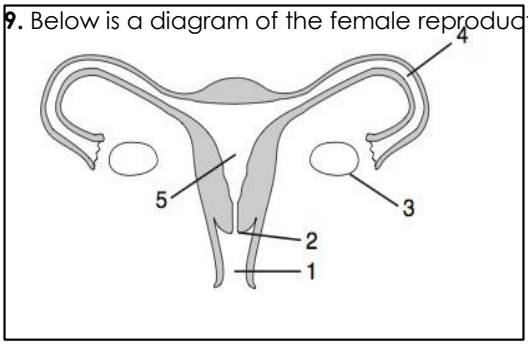
7. Using the diagram above, where in the female reproductive system does fertilization occurs?

A. ovary B. fallopian tube C. vagina D. uterus

8. What is the human embryo called after the eighth week of development?

A. infant C. fetus
B. embryo D. zygote

9. Below is a diagram of the female reproductive system.



What is the function of the structure represented by number 3?

A. Egg production
B. Embryo implantation and growth
C. Fertilization occurs here
D. Provides nourishment for fetus

10. Sexual reproduction is vital to the propagation of the human race. Which of the following sequences represents the correct order of events in the formation of a human fetus?

A. Zygote → Blastocyst → Embryo → Fertilization
B. Fertilization → Zygote → Blastocyst → Embryo
C. Blastocyst → Embryo → Differentiation → Zygote
D. Fertilization → Growth → Differentiation → Zygote

Glossary

Embryo: the first stage of development of a baby from the moment of fertilization until the end of the eighth week of gestation.
Fertilization: the fusion of an egg and a sperm to form a zygote
Fetus: later stage of development of a baby from the end of the eighth week to the moment of birth
Implantation: the attachment of the fertilized egg or blastocyst to the wall of the uterus at the start of pregnancy, often delayed in some mammals by several months.
Ovulation: process that the egg travels down the fallopian tube where it may be met by a sperm and become fertilized
Zygote: fertilized egg; union of two gametes (sperm and egg)

Unit 9: Genetics/ SC.912.L.16.1

Must know…

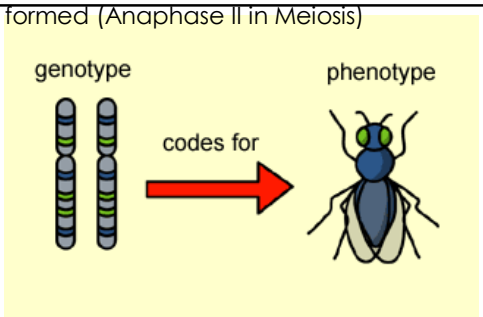
- How to use Mendel's laws of segregation and independent assortment to analyze patterns of inheritance.
- How dominant, recessive, codominant, sex-linked, polygenic, and multiple allele modes of inheritance cause observed inheritance patterns.

MENDELS LAWS OF HEREDITY:

1. Law of Dominance
- the dominant allele will prevent the recessive allele from being expressed
- recessive allele will appear when it is paired with another recessive allele in the offspring

2. Law of Segregation
- gene pairs separate when gametes (sex cells) are formed
- each gamete has only one allele of each gene pair

3. Law of Independent Assortment
- different pairs of genes separate independently of each other (metaphase I) when gametes are formed (Anaphase II in Meiosis)



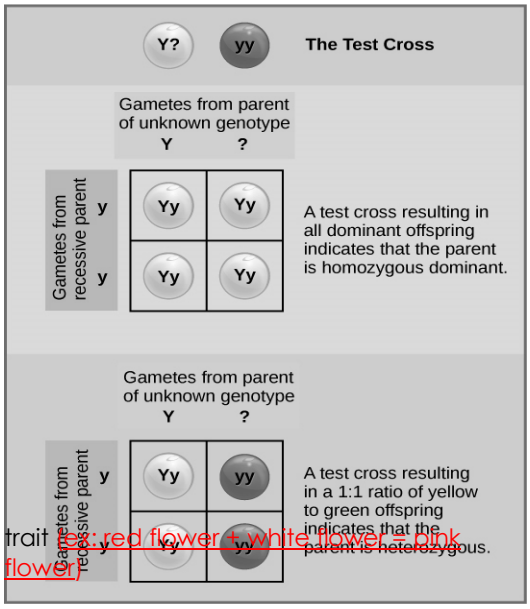
Creative Commons: http://seniorapbiologyreview.wikispaces.com/file/view/bigenopheno.gif/82042665/bigenopheno.gif

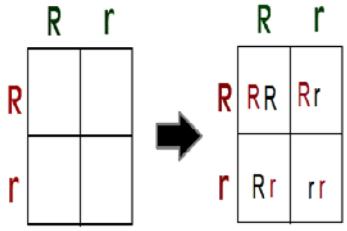
Gregor Mendel experimented with sweet pea plants in 1800s

Mendel's experiment

Crossing true-breeding tall plants (homozygous TT) with true-breeding dwarf plants (homozygous tt) produced all tall plants (heterozygous Tt).

Crossing hybrid/heterozygous tall plants (Tt) produced 75% tall plants (1homozygous tall plant and 2 heterozygous tall plants) and 25% dwarf plants.





Creative Commons: https://tse2.mm.bing.net/th?id=OIP.M5124fe37fe4a98cdc7c841b4181487o0&pid=15.1.gif

Genotype:
RR = 1 1/4 25%
Rr = 2 1/2 50%
rr = 1 1/4 25%

Phenotype:
Red = 3 3/4 75%
White = 1 1/4 25%

trait (ex: red flower + white flower = pink flower)

PATTERNS OF INHERITANCE:

Sex-Linked Traits
- traits associated with particular sexes
- 23rd pair of chromosomes; Males = XY; Females = XX
- X-Linked Traits inherited on X chromosome (ex: colorblindness, baldness, hemophilia)

Multiple Alleles
- presence of more than two alleles for a trait (ex: eye color)

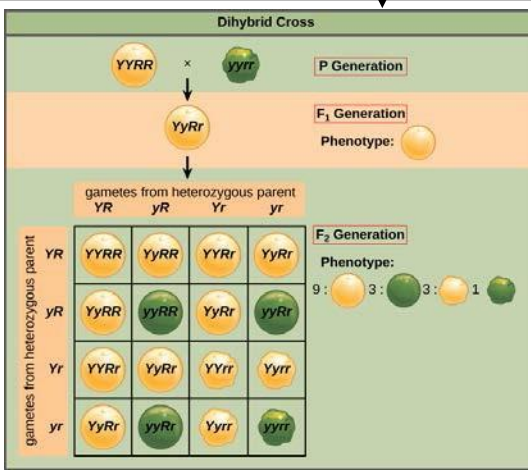
Polygenic Inheritance
- one trait controlled by many genes (ex: hair color, skin color); genes may be on the same or different chromosomes

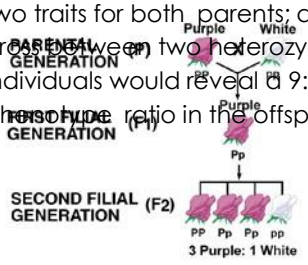
Codominance
- phenotypes of both homozygous parents are produced in heterozygous offspring so that **both alleles are equally expressed/dominant** (ex: black chicken + white chicken = checkered chickens), (ex: sickle cell anemia)

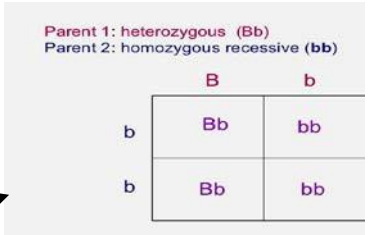
Incomplete Dominance
- phenotype of a heterozygote is intermediate between the two homozygous parents; **neither allele is dominant**, but combine to display a new

Creative Commons: https://figures.boundless-cdn.com/20328/large/e-20of-20a-20test-20cross.jpe

A **dihybrid** cross contains sixteen boxes; a dihybrid cross reveals two traits for both parents; a cross between two heterozygous individuals would reveal a 9:3:3:1 phenotypic ratio in the offspring.







Creative Commons: http://philschatz.com/biology-concepts-

book/resources/Figure_08_02_06.png

Brown-B Blue-b
Genotype- Bb 50% 2:4, bb 50% 2:4
Phenotype- Brown 50%, blue 50%

Creative Commons: http://1.bp.blogspot.com/-aBZUuikGTds/UrB3eeKfS_I/AAAAAAAAC6k/Hc4e1jvY5iQ/s1600/punnett+square.png

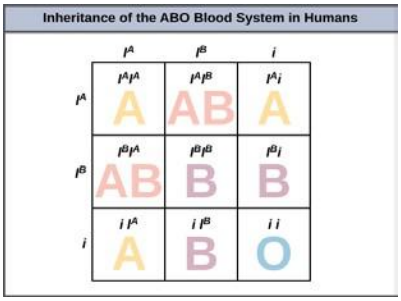
A **monohybrid** cross contains four boxes; a cross between two heterozygous individuals would reveal a 1:2:1 genotype ration and a 3:1 phenotype ratio in the offspring; the probability that the offspring will show a dominant phenotype is ¾, or 75%

Creative Commons: http://www.desktopclass.com/wp-content/uploads/2011/02/Offspring-of- monohybrid-cross-in-ratio.jpg

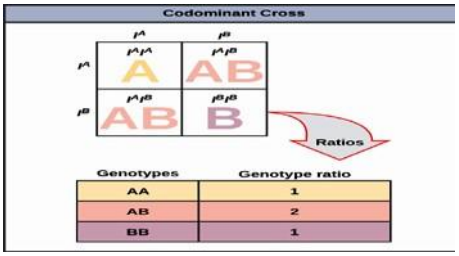
Blood type- Multiple Alleles and Codominant

A number of human traits are the result of more than 2 types of alleles (multiple alleles). There are 3 different alleles for blood type (A, B, & O).

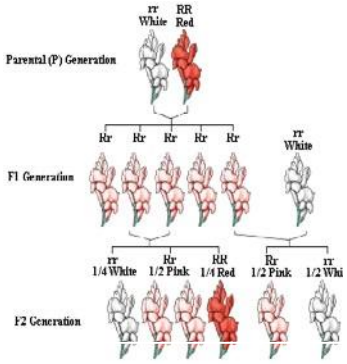
Blood type A is dominant to O. B is also dominant to O. A and B are both codominant.



Creative Commons: http://opentextbc.ca/biology/wp-content/uploads/sites/96/



Creative Commons: http://opentextbc.ca/biology/wp-content/uploads/sites/96/2015/02/Figure_08_03_02.jpg

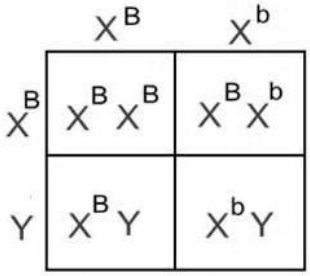


Incomplete Dominance

RR- Red

YY-White

RY- Pink



1/2 of the females will be carriers
1/2 of the females will be normal

1/2 of the males will be normal
1/2 of the males will be colorblind

Sex-linked

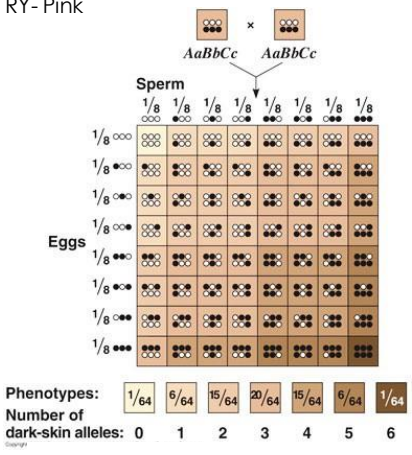
Creative Commons: Incomplete Dominance: http://www.biologycorner.com/resources/snapdragon.gif

Sex Linked: https://tse2.mm.bing.net/th?id=OIP.M4037ce595a8ab9ec6e40d8f78ae5f450o0&pid=15.1

Codominance: https://tse2.mm.bing.net/th?id=OIP.M4037ce595a8ab9ec6e40d8f78ae5f450o0&pid=15.1

Codominance

-when crossed, red hair and white hair cows (RR x WW) will produce roan cows (RW= red and white).



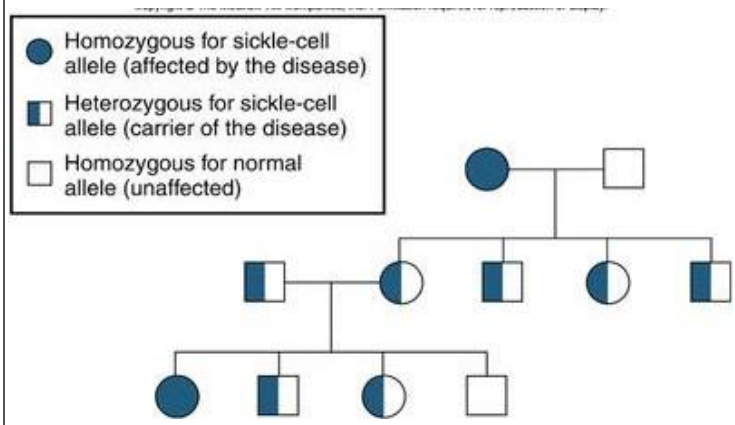
Polygenic-skin color

Creative Commons: Polygenic: http://buffonescience9.wikispaces.com/file/view/main-qimg-918dfaf31f950477d62ffcc5f2b6ce5c.jpg/313413316/441x485/main-qimg-918dfaf31f950477d62ffcc5f2b6ce5c.jpg

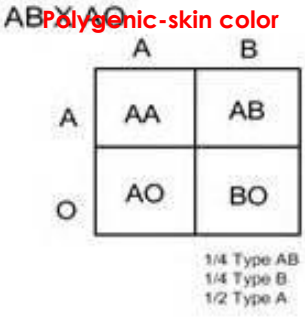
Pedigree: http://tvhsdawgsbio2pd1.wikispaces.com/file/view/Sickle%20Cell%20Pedigree.jpg/496178972/400x232/Sickle%20Cell%20Pedigree.jpg

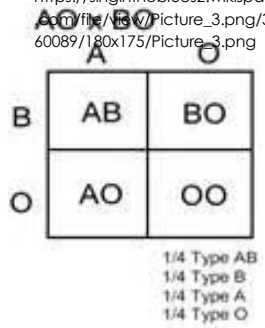
Blood type: https://tse1.mm.bing.net/th?id=OIP.M5271fb3ddccb01eb7663933abe662614o0&pid=15.1

Widow's Peak: https://singintheblues2.wikispaces.com/file/view/Picture_3.png/32260089/180x175/Picture_3.png



Recessive disorder pedigree





Codominant human trait – A, B, O blood type

Dominant human trait – widow's peak

MULTIPLE CHOICE QUESTIONS

1. Hemophilia is a sex-linked, recessive trait. Which of the following describes the probability of hemophilia in the offspring of

a man who does not have hemophilia and a woman whose father is a hemophiliac?

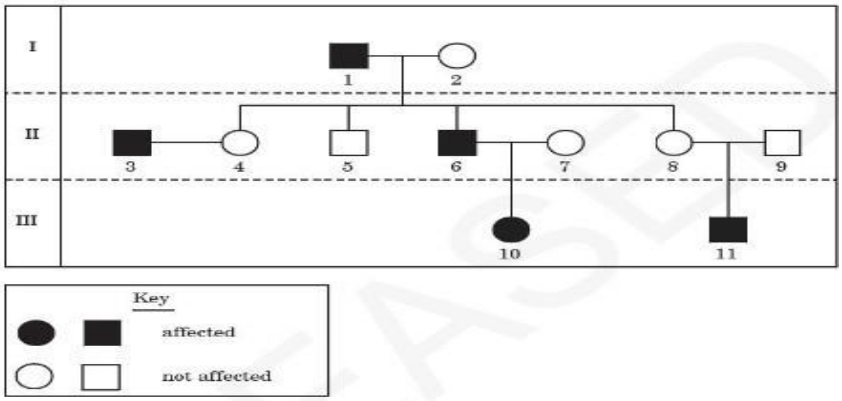
A. Each of their sons will have hemophilia.

B. None of their daughters will have hemophilia.

C. There is a 50% chance that their daughters will have hemophilia.

D. Their sons have a 25% chance of having hemophilia.

2. This diagram shows a pedigree for a recessive genetic disorder.



What is the genotype of individual 6?
A. X^HX^H B. X^HX^h C. X^HY D. X^hY

3. The table lists the trials 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%

4. If you made a Punnett square showing Gregor Mendel's cross between true-breeding tall plants and true-breeding short plants, the square would show that the offspring had
A. the genotype of one of the parents.
B. a phenotype that was different from that of both parents.
C. the genotype of both parents.
D. a genotype that was different from that of both parents.

5. In horses a roan coat (RW) is the result of Codominance between a red (RR) and a white coat (WW). What is the chance of 2 roan horses will produce a white horse?
A. 25% B. 50%
C. 75% D. 100%

6. In certain breeds of dogs, deafness is due to a recessive allele (d) of a particular gene, and normal hearing is due to its dominant allele (D). What percentage of the offspring of a normal heterozygous dog and a deaf dog would be expected to have normal hearing?
A. 25% B. 50% C. 75% D. 100%

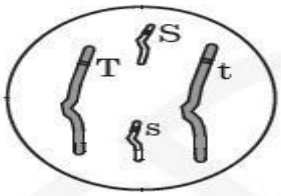
7. A species of mice can have gray or black fur and long or short tails. A cross between black-furred, long-tailed mice and gray-furred, short-tailed mice produce all black-furred, long-tailed offspring. Using the gene symbols G for black, g for gray, S for long and s for short, what would be the genotype of a gray-furred, short-tailed mouse?
A. GGSS B. ggSS C. ggss D. GgSs E. Ggss

8. In which kind of cross would you expect to find a ratio of 9:3:3:1 among the F2 offspring?
A. Monohybrid cross B. Dihybrid cross
C. Polygenic cross D. Multiple allele cross

9. Starting with a P generation with the following genotypes (AABB x aabb). Based on classical Mendelian inheritance, what is the expected phenotypic ratio observed among the F2 progeny?
A. 9:3:3:1 B. 1:2:1 C. 3:1 D. 1:1 E. 1:1:1:1

10. Mendel hypothesized that reproductive cells have only one factor for each inherited trait. This hypothesis is supported by which observation?
A. Haploid cells are produced by mitosis.
B. Diploid cells are produced by mitosis.
C. Haploid cells are produced by meiosis.
D. Diploid cells are produced by meiosis.

11. This diagram shows a diploid cell with two pairs of homologous chromosomes.



Due to independent assortment, what is the possible genetic make-up of gametes produced by this organism?
A. SsTt B. Ss, Tt
C. S, s, T, t D. ST, St, sT, st

Glossary

Dihybrid – cross involving two traits
Dominant – controlling allele; designated with a capital letter (RR, Rr)
Gene – carries instructions responsible for expression of traits; a pair of inherited genes controls a trait; one member of the pair comes from each parent; often called **alleles**
Genotype – genetic makeup of an organism (represented by the letters)
Heterozygous – two alleles of a pair are different (Bb); often called "hybrid"
Homozygous – two alleles of a pair are identical (BB or bb
Monohybrid – cross involving one trait
Pedigree – graphic organizer to map genetic traits between generations
Phenotype – physical appearance of an organism (description of the letters)
Punnett Square – graphic organizer used to show the probable results of a genetic cross
Recessive – hidden allele; designated with lower-case letters (rr)
Test Cross – mating of an individual of unknown genotype with an individual of known genotype; can help to
Trait – characteristic an individual receives from its parents determine the unknown genotype of the parent

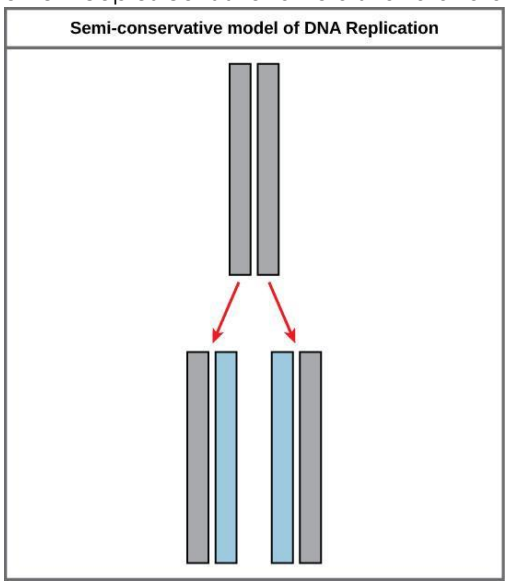
Unit 10: Protein Synthesis/ SC.912.L.16.3

Must know…

- The basic process of DNA replication and how it relates to the transmission and conservation of genetic information.
- How mutations in the DNA sequence may or may not result in phenotypic change and mutations in gametes may result in phenotypic changes in offspring.
- You need to know the basic processes of transcription and translation and how they result in gene expression. You will also need to know that the basic processes of DNA are universal in organisms.
- The similarities in the genetic codes of organisms are due to common ancestry and the process of inheritance.

DNA & RNA:
- Nucleic acids composed of nucleotides
- Nucleotides composed of: Phosphate group, Sugar Nitrogenous base

DNA Replication:
Helicase unravels the DNA molecule and each strand serves as a template to make new exact copies (so that when mitosis takes place, each cell has the exact copy of DNA). DNA polymerase is used to add the nitrogenous bases to create the new strands.
Semiconservative model- the two new copies consist of an old strand and a new strand.



Creative Commons: Replication: https://opentextbc.ca/biology/wp-content/uploads/sites/96/2015/08/Figure_09_02_02.jpg

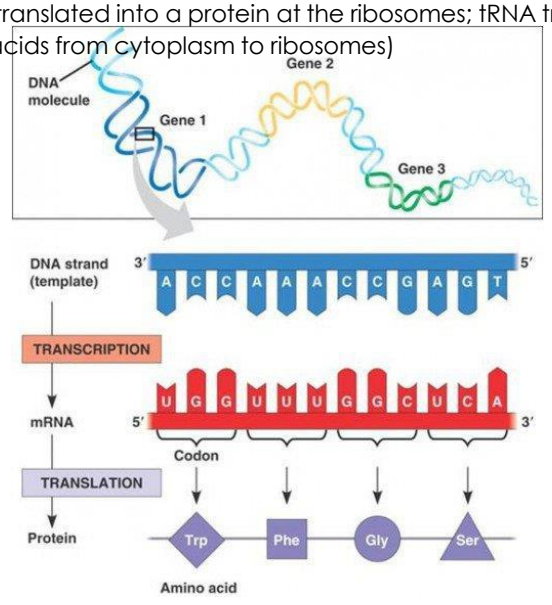
Protein Synthesis: http://s2.hubimg.com/u/6092429_f520.jpg

Codon Chart: https://youngbloodbiology.wikispaces.com/file/view/codonchart.gif/119841281/codonchart.gif

Deoxyribonucleic acid
- Double-stranded, twisted helix
- Never leaves the nucleus
- Nitrogenous bases: adenine, thymine, guanine, cytosine(Guanine w/Cytosine, Adenine w/Thymine)- held together by weak hydrogen bonds (A-T, T-A or C-G, G-C)
- Sugar: deoxyribose
- Controls production of all proteins
- DNA coiled into chromosomes in nucleus
- Tiny sections of DNA are called genes
- Sequence of bases determines sequence of amino acids in proteins

Ribonucleic acid
- Single-stranded
- Leaves the nucleus
- Nitrogenous bases: adenine, uracil, guanine, cytosine (A-U, T-A or C-G, G-C)
- Sugar: ribose
- Three major types of RNA (Ribosomal – rRNA; Messenger – mRNA; Transfer – tRNA)
- Leaves the nucleus to carry out functions in cytoplasm

Protein Synthesis- Central Dogma
Transcription: takes place in the nucleus; DNA to mRNA (mRNA is made from one strand of DNA, carries message to ribosomes)
Translation: takes place in the cytoplasm; mRNA to protein (mRNA translated into a protein at the ribosomes; tRNA transfers amino acids from cytoplasm to ribosomes)

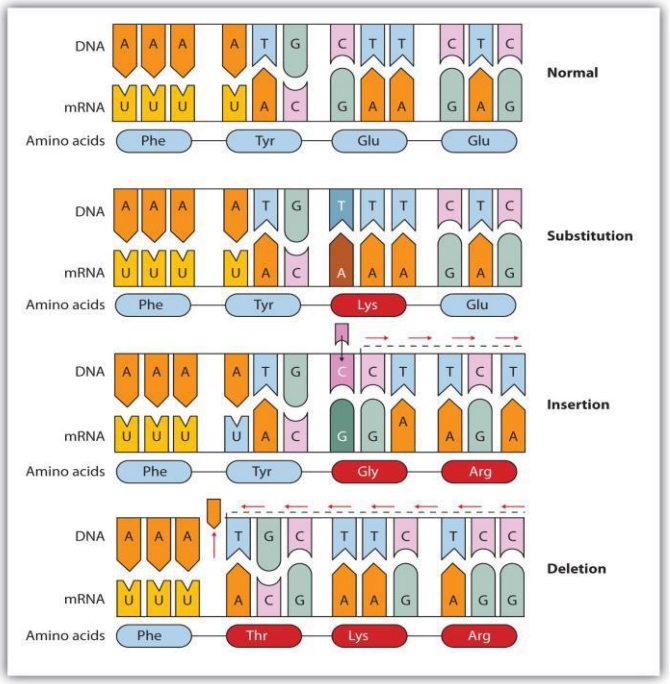


The **genetic code is universal** to ALL life and tells us that everything is related. All life regenerates itself by producing offspring and passing on the genetic code. The genetic code is used to produce amino acids, which are the building blocks for proteins (build and construct practically everything in your body). Variations in the genetic code caused by mutations may alter the protein sequence, which can lead to variation in species.

First Letter	Second Letter: U	C	A	G	Third Letter
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

MUTATIONS:
-change in genetic code
- passed from one cell to new cells
- transmitted to offspring if occurs in sex cells
- most have no effect
- Gene Mutation – change in a single gene; point/substitution or insertion and deletion; occurs during DNA replication.
- Chromosome Mutation – change in many genes; occurs during cell division.
- Can be spontaneous or caused by environmental **mutagens** (radiation, chemicals, etc.)

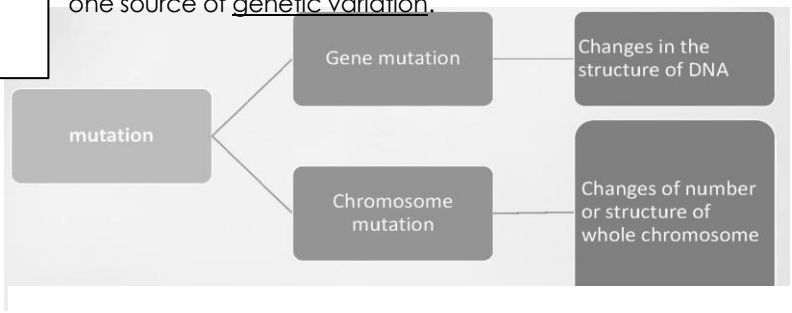
Creative Commons: http://www.ask4biology.com/wp-content/uploads/2013/02/Gene-Mutation.jpg



Creative Commons: http://2012books.lardbucket.org/books/introduction-to-chemistry-general-organic-and-

The actual effect of a single gene mutation depends on many factors:
-A substitution on the third base of a codon may have no effect because the third base is less important.
-If a single amino acid is changed to a similar one, then the protein structure and function may be unchanged, but if an amino acid is changed to a very different one, then the structure and function of the protein will be very different.
-Additions and Deletions are Frameshift mutations and are far more serious than substitutions because more of the protein is altered.
-Some proteins are simply more important than others. For instance non-functioning receptor proteins in the tongue may lead to a lack of taste but is not life threatening, whereas non-functioning hemoglobin is fatal.
-Some cells are more important than others. Mutations in somatic cells (i.e. non-reproductive body cells) will only affect cells that derive from that cell, so will probably have a small local effect like a birthmark (although they can cause widespread effects like diabetes or cancer). Mutations in germ cells (i.e. reproductive cells) will affect every single cell of the resulting organism as well as its offspring. These mutations are one source of genetic variation.

As a result of a gene mutation there are three possible phenotypic effects:
-Most mutations have no phenotypic effect. These are called silent mutations, and we all have a few of these.
-Of the mutations that have a phenotypic effect, most will have a negative effect. Most of the proteins in cells are enzymes, and most changes in enzymes will stop them working. When an enzyme stops working, a metabolic block can occur, when a reaction in cell doesn't happen, so the cell's function is changed. An example of this is the genetic disease phenylketonuria (PKU)
-Very rarely a mutation can have a beneficial phenotypic effect, such as making an enzyme work faster, or a structural protein stronger, or a receptor protein more sensitive. Although rare beneficial mutations are important as they drive evolution.



Creative Commons: http://2012books.lardbucket.org/books/introduction-to-chemistry-general-organic-and-biological/section_22/4b82e479bd31db665696203cea437b72.jpg

Mutations in chromosomes are different from gene mutations, modification results in more marked phenotypic effects. Mutations in chromosomes occur during the formation of zygote where there are changes in the number of chromosomes; this may result in fission or fusion of chromosomes. Changes in the structure of chromosome can occur in many ways including inversion, duplication, deletion or translocation.

Multiple Choice Questions

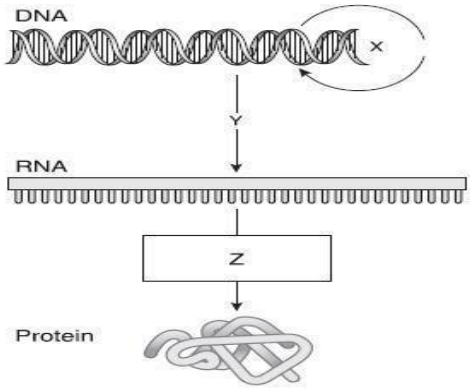
1. The sequence of DNA below is part of a gene. How many amino acids are coded for by this segment?

5' ATCAGCGCTGGC 3'

A. 4 B. 8 C. 12 D. 20

2. At what point in the cell cycle does DNA replication occur and why?
A. before a cell divides, to provide each of the two resulting cells with a complete set of DNA instructions
B. before a cell divides, to ensure that the DNA will fit into the resulting cells
C. during cell division, to ensure that the DNA will fit into the resulting cells
D. after a cell divides, to provide each of the two resulting cells with a complete set of DNA instructions

3. A diagram of a cellular process is shown below.



Which of the following identifies the process shown at point Z?
A. Translation
B. Translocation
C. Replication
D. Transcription

4. Errors sometimes happen during DNA replication. If a DNA nucleotide that contains guanine is accidently substituted for a DNA nucleotide that contains thymine, which of the following will always happen because of the error in DNA replication?
A. The cell will become a rapidly dividing cancer cell.
B. The cell will have a better chance of surviving under different conditions.
C. The cell will die when it divides.
D. The cell will produce mRNA with a mutated nucleotide sequence.

5. Which of the following statements describes processes that occur during DNA replication?
A. A DNA sequence is read by RNA polymerase, which produces another RNA strand complementary to the first strand.
B. Two free-floating single strands of DNA are joined by polymerase. The polymerase finds the point at which the two strands will match up into a double strand.
C. Messenger RNA are decoded by a ribosome to produce an amino acid chain. In the cell's cytoplasm, transfer RNA joins the messenger RNA, forming a polypeptide.
D. A double-stranded DNA molecule is unwound into single strands. Polymerase matches the right nucleotides to the single strand so that each forms a double strand of DNA.

6. The table below gives the codons found in messenger RNA (mRNA).

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

Based on the table above, determine the sequence of amino acids produced by this DNA sequence: 5' GCAGTTTTC 3'?
A. Arg - Gln - Lys
B. Cys - Gln - Lys
C. Ser - Phe - Phe
D. Ala - Val - Phe

7. Cancer is a disease caused by mutations. Yet in most instances, if a parent tragically dies from cancer, this does not put their child at greater risk than a person whose parents do not develop cancer. How can cancer be caused by mutations and yet not be heritable?
A. Most cancers arise from mutations in germ line cells.
B. Mutations that cause cancer occur in specific cells, such as sex cells.
C. Mutations caused by environmental agents, such as tobacco smoke, occur in somatic cells.
D. Mutations that cause cancer are specific and cannot be passed on regardless of the type of cell they occur in.

8. Which of the following indicates that all organisms can be traced back to a common ancestry?
A.The genetic code consists of nucleotides in triplet codes.
B.Almost all genes in microorganisms, plants, and animals have the same codons.
C.Microorganisms contain codons and anticodons.
D.There are a few organisms that respond differently to the start and stop signals in the genetic code.

Glossary

Chromosomal Mutation: result in changes in the number of chromosomes in a cell or changes in the structure of a chromosome.
DNA: carries the genetic instructions used in the development, functioning and reproduction of living organisms
DNA Replication: the process by which a double-stranded DNA molecule is copied to produce two identical DNA molecules.
DNA Transcription: particular segment of DNA is copied into RNA (mRNA) in the nucleus.
DNA Translation: takes place in the cytoplasm; mRNA gets translated/converted into protein
Genetic Code: the nucleotide triplets of DNA and RNA molecules that carry genetic information in living cells
Gene Mutation: alters a single gene or larger segment of DNA on a chromosome
Mutation: change in the DNA sequence or chromosome
Protein Synthesis: DNA gets transcribed into mRNA and mRNA gets translated into Protein
RNA: act as a messenger carrying instructions from DNA for controlling the synthesis of proteins, although in some viruses RNA rather than DNA carries the genetic information.
Semiconservative model: DNA replication in which each double-stranded molecule is composed of one parental strand and one newly polymerized strand.

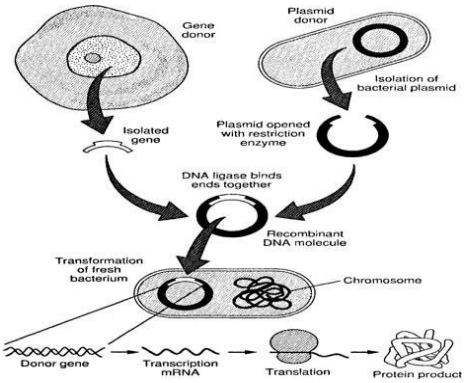
Unit 11: Biotechnology/ SC.912.L.16.10

Must know…

- How biotechnology impacts individuals, society, and/or the environment. You will be given scenarios with specific examples and asked to determine the impact.

Biotechnology is the manipulation of organisms or their parts to produce useful products to improve human health and food production.

Genetic Engineering is the process of manually adding new DNA to an organism. Examples of genetically engineered (transgenic) organisms currently on the market include plants with resistance to some insects, plants that can tolerate herbicides, and crops with modified oil content.



GENETIC ENGINEERING

Recombinant DNA- insert human gene for insulin production into bacteria to produce insulin for human

Creative Commons: https://tse1.mm.bing.net/th?&id=OIP.M54690439adff2e0614c29bcbe644acc2o0&w=221&h=300&c=0&pid=1.9&rs=0&p=0&r=0

IMPACT OF BIOTECHNOLOGY ON-

Environment:

- For the most part, crops developed with biotechnology will have many positive impacts on the environment.
- Benefits include reduced pesticide use, improved water and soil conservation and greater safety for workers and the ecosystem.
- Biotechnology has aided in the removal of pollution from our soils, water, and air.
- Also, it has helped us find ways to use our garbage to create new needed products.
- Concerns have been raised that a herbicide tolerant plant could pass that gene responsible for the tolerance on to a weed species, thus conferring herbicide tolerance.

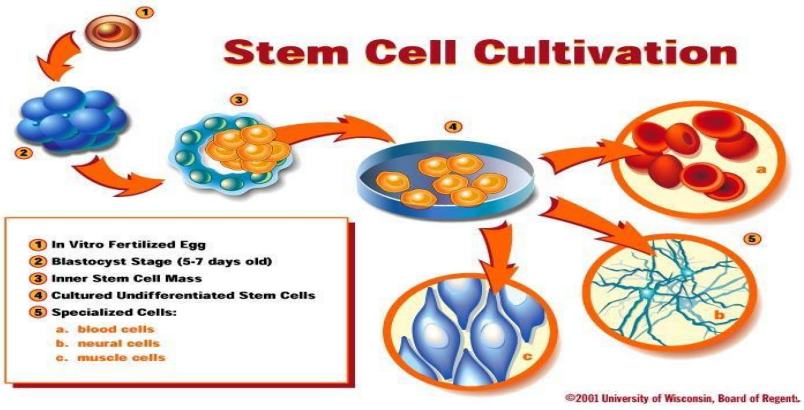
Society:

- For developing countries, biotechnology can increase crop yields, thereby helping to address food shortages and hunger.
- In time, biotechnology may produce biodegradable packaging, alternatives to chemical pharmaceuticals, and more healthful food products (e.g. vegetables with increased quantities of antioxidants to reduce the risk of cancer.); as well as foods, when consumed, will deliver vaccines that can currently only be given by injection.
- Also, it is used to solve crimes with DNA and forensic testing.
- Concerns: Accidental immunity of pests, weeds, viruses, and bacteria; biological warfare.

Individual:

- It provides medicine, and can detect and treat diseases: Diabetes, sickle-cell anemia, antibiotics, etc.

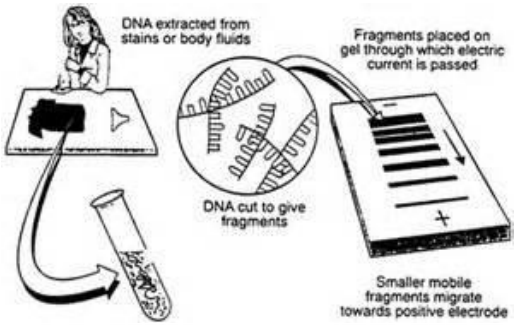
Usage	Concerns
• GMOs- genetically modified plants to be pest/disease resistance; to use less water and fertilizers. • Genetically modified bacteria to clean up toxic waste/oil spill. • Biofertilizers- increase fertility of soil. • Gene cloning- specific DNA sequence is isolated and reproduced for medical research, production of insulin and vaccines. • Gene therapy-a nonfunctioning gene in human cells are replaced with a functioning one. • DNA fingerprinting- fragments of DNA are used to identify criminals or to reveal paternity.	• Reduce genetic diversity • Safety of genetic modified foods • Discrimination by DNA • Interference with nature



Biotechnology is used to create stem for medical purposes.

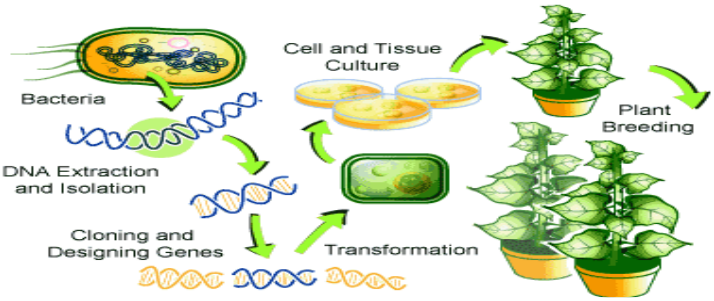
Stem cells are used to treat diseases of the blood, a therapy that has saved the lives of thousands of children with leukemia; and can be used for tissue grafts to treat diseases or injury to the bone, skin and surface of the eye.

Creative Commons: http://whyfiles.org/127stem_cell/images/cultivation.jpg



DNA fingerprinting can be used to identify criminals and also to establish maternity

Creative Commons: http://whyfiles.org/127stem_cell/images/cultivation.jpg



Genetic engineering- Isolating a bacterial gene that produces pest-killing protein and inserting it into plant DNA so that the genetically modified plants can be pest-resistant.

Creative Commons: http://ib-bioplans.wikispaces.com/file/view/transgeniccrop.gif/86292493/transgeniccrop.gif

Multiple Choice Questions

1. Genetic engineering has both positive and negative outcomes. One of the most common areas where genetic engineering is used is in agriculture. If farmers plant more genetically modified crops, which of the following negative outcomes could occur?
A. An increase in the use of pesticides
B. A decrease in genetic diversity of the crops
C. An increase in the contamination of the water supply
D. A decrease in crop productivity

2. Rice, the most popular food crop in the world, can be successfully grown only in certain places. If trends in climate change continue, the areas in which rice currently grows will be significantly reduced. Which of the following is the best way that biotechnology can keep the harvest of rice from decreasing?
A. Identifying new areas with soil fertile enough for rice production.
B. Developing clean energy sources to reduce carbon dioxide production worldwide.
C. Seeing clouds with dry ice to produce more rainfall where it is needed.
D. Genetically engineering rice crops that are tolerant to change in the environment.

3. In October of 1990, the US Department of Energy's Office of Science and the US National Institute of Health began the process of mapping the human genome. This process was referred to as The Human Genome Project and was intended to identify the 20,000 – 25,000 genes of the human genome. A working draft of the genome was announced in 2000 and a complete one in 2003. Which of the following describes the main benefit of completing The Human Genome Project?
A. Cloning humans
B. Designing new human genes
C. Patenting specific human genes
D. Identifying genetically-based diseases

4. Insulin is a natural human product that is deficient in people with diabetes. The human gene for insulin has been inserted into E. coli DNA to produce synthetic insulin for diabetes treatment. Why can the E. coli bacteria accept a human gene and then produce a human protein?
A. Bacteria cells are identical in structure to human cells.
B. The basic components of DNA are the same in bacteria and humans.
C. DNA replication occurs in the exact same way in both bacteria cells and human cells.
D. Chromosomes are identical in bacteria cells and human cells.

5. Genetic screening is a procedure where a person's DNA is analyzed to identify a genetic predisposition to lethal diseases. One advantage of genetic screening is that it allows doctors to prevent and treat diseases before patients have symptoms. Which of the following is a **disadvantage** of genetic screening?
A. Genetic screening results could be used to determine inheritance patterns in families.
B. The likelihood of a child contracting an inheritable disease could be predicted by genetic screening.
C. A doctor could combine a patient's current symptoms with genetic screening results to diagnose and treat the patient.
D. Insurance companies could drop a patient's medical coverage based on potential medical issues projected by genetic screening.

Glossary

Biotechnology: use of biotechnical methods to modify the genetic material of living cells so they will produce new substances or perform new functions; ex: genetic engineering
Genetic engineering: a group of applied techniques of genetics and biotechnology used to cut up and join together genetic material and especially DNA from one or more species of organism and to introduce the result into an organism in order to change one or more of its characteristics
Recombinant DNA: DNA that has been formed artificially by combining constituents from different organisms
DNA fingerprinting: the analysis of DNA from samples of body tissues or fluids in order to identify individuals
GMO (genetically modified organism): are organisms whose genetic material has been artificially manipulated in a

laboratory through genetic engineering

Unit 12: Body Systems/ SC.912.L.14.52, SC.912.L.14.26 & SC.912.L.14.36

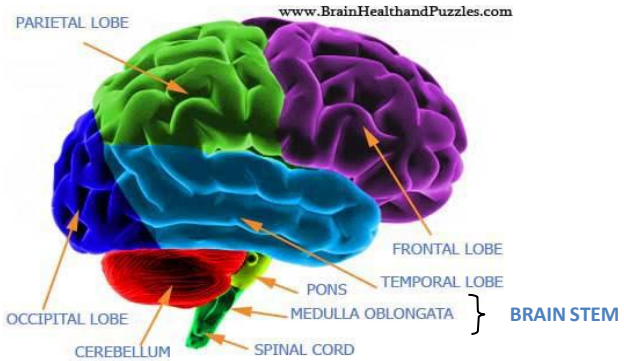
Must know…

- The major parts of the brain on a diagram. Items are limited to the following: cerebrum, cerebellum, pons, medulla oblongata, brain stem, frontal lobe, parietal lobe, occipital lobe, temporal lobe
- The factors that affect blood flow through the cardiovascular system: blood pressure, blood volume, resistance, disease and exercise.
- How these factors affect blood flow.
- The basic functions of the human immune system.
- Specific and non-specific immune responses.
- How the human immune system responds to vaccines and/or antibiotics.
- How genetic factors, environmental factors, and pathogenic agents affect both individual and public health.

THE BRAIN

The Cerebrum: The cerebrum or cortex is the largest part of the human brain, associated with higher brain function such as thought and action. The cerebral cortex is divided into four sections, called "lobes": the frontal lobe, parietal lobe, occipital lobe, and temporal lobe.

- **Frontal Lobe**- associated with reasoning, planning, parts of speech, movement, emotions, and problem solving
- **Parietal Lobe**- associated with movement, orientation, recognition, perception of stimuli
- **Occipital Lobe**- associated with visual processing
- **Temporal Lobe**- associated with perception and recognition of auditory stimuli, memory, and speech



http://www.brainhealthandpuzzles.com/images/labeled_diagram_human_brain.jpg

BLOOD FLOW

• Blood flow: Amount of blood that flows through any tissue in a given period of time (mL/min)
• Total blood flow: Volume of blood that circulates through the systemic and pulmonary blood vessels each minute

Cardiac Output (CO)
Distribution of CO into different body tissues:
1. Pressure difference of different parts of the body
Pressure ↑ → Blood Flow ↑
2. Resistance of specific blood vessels to blood flow
Resistance ↑ → Blood Flow ↓
Size of the lumen of a blood vessel ↓ → Resistance to blood flow ↑

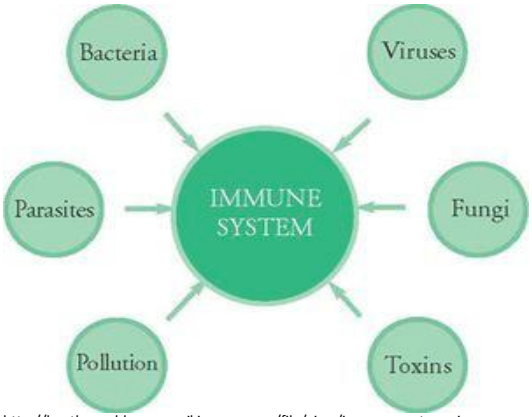
*Diabetes is one of the many medical conditions that slow down blood flow. In diabetes, there is an elevated level of sugar in the blood. This increase in glucose causes the blood to be viscous or thicker causing the flow to decrease.
*Blood flow is also altered when the pathway for blood flow in the blood vessels is blocked
*Factors affecting blood flow not only slows down the flow but also, some factors can cause an increase in the blood flow. An example is the use of marijuana. Because of this increased blood flow to the brain, marijuana users find it difficult to think or remember recent events because their brain is functioning too fast.
***Blood flow can be affected by the composition of the blood itself (i.e. concentration of solutes), the diameter of blood vessels, and presence of chemical substances that can alter blood flow

IMMUNE SYSTEM

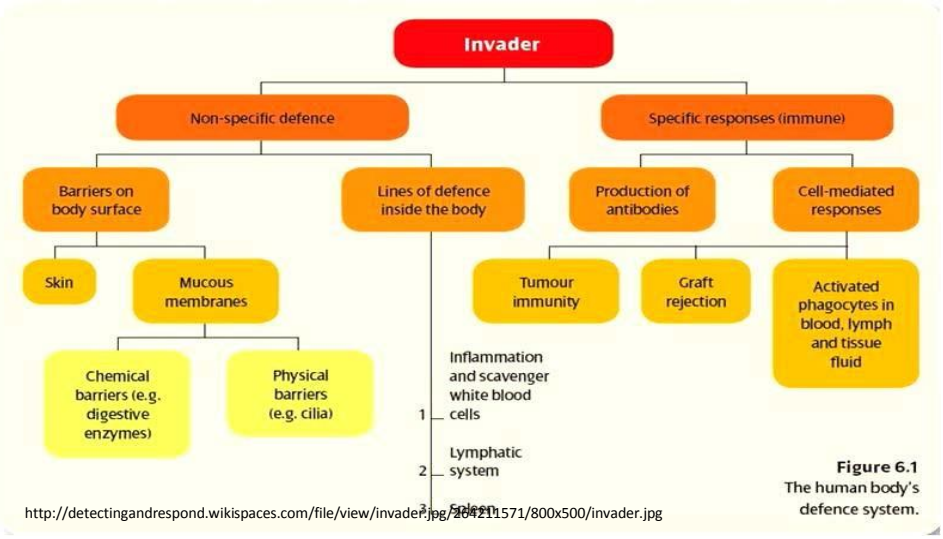
-The body's defense against disease causing organisms, malfunctioning cells, and foreign particles
Antibody: a protein produced by the human immune system to tag and destroy invasive microbes.
Antigen: any protein that our immune system uses to recognize "self" vs. "not self."

Nonspecific Immune Response is our first line of defense (skin, mucous) against invading organisms. It is not tailored to any specific pathogen and treats all equally.

Specific Immune Response is effective against specific pathogens and is based on memory (memory cells- Tcells/Bcells). Antigen based…identifies a specific pathogen and creates antibodies for it. This involves various white blood cells called lymphocytes or leukocytes.



http://heatherreddemann.wikispaces.com/file/view/immune-system-viruses-parasites.jpg/211154276/300x276/immune-system-viruses-parasites.jpg



http://detectingandrespond.wikispaces.com/file/view/invader.jpg/204211571/800x500/invader.jpg

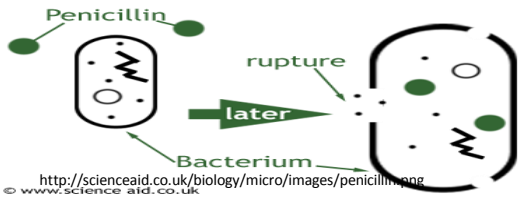
Figure 6.1 The human body's defence system.

Vaccines vs. Antibiotics

- Vaccine kills virus while antibiotics kill bacteria.
- Vaccine is taken once and has permanent effect whereas antibiotics work during the time of disease.
- Antibiotics are available in different forms like tablets, capsules, drops or ointments. Vaccines can be given orally or through injection.
- Vaccines are preventive method that is taken before getting infected. Antibiotics are taken after getting infected.

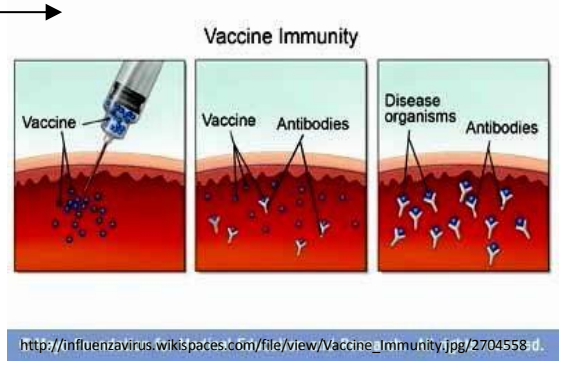
Antibiotics help destroy bacteria (but not viruses). Antibiotics work in one of several ways:

- Slowing bacteria reproduction.
- Interfering with bacterial cell wall formation.



http://scienceaid.co.uk/biology/micro/images/penicillin.png
© www.science aid.co.uk

How vaccines work?
The proteins are recognized as antigens by our immune systems. This causes a mild immune response. Memory T-cells and B-cells remain ready to fight off the illness if it is encountered again.

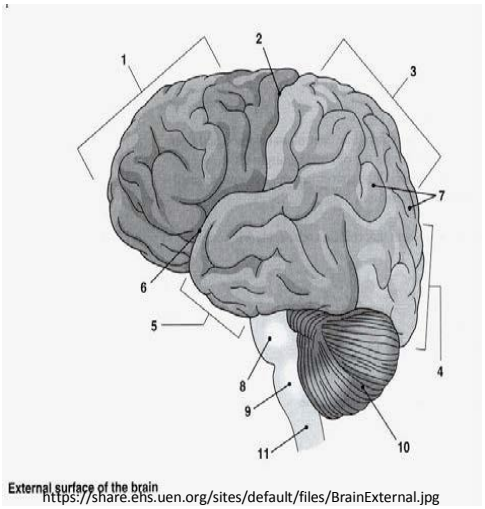


http://influenzavirus.wikispaces.com/file/view/Vaccine_Immunity.jpg/2704558

Genetic factors, pathogenic agents and environmental factors can negatively affect individual health by causing illnesses or diseases…

- Genetic mutations occur when DNA changes, altering the genetic instructions. This may result in a genetic disorder or a change in characteristics.
  Mutations can be caused by exposure to specific chemicals or radiation. For example, cigarette smoke is full of chemicals that attack and damage DNA. This causes mutations in lung cell genes, including the ones that control growth.
  Other genetic illnesses caused by genetic factors: heart disease, diabetes, asthma
- Environmental factors relate to pollution of air, water, and air caused by emissions, chemical fertilizers, pesticides, and other chemicals that are released from factories can cause severe health problems.
- Pathogenic agents are the bacteria, viruses, fungi, and protozoan that cause diseases.

Multiple Choice Questions



External surface of the brain
https://share.ens.uen.org/sites/default/files/BrainExternal.jpg

1. In the diagram on the left, which area of the brain is indicated by both letters 8 and 9?
A. brain stem
B. cerebellum
C. cerebrum
D. parietal lobe

2. In the diagram on the left, which area of the brain is indicated by letter 8?
A. pons
B. cerebellum
C. cerebrum
D. medulla oblongata

3. In the diagram on the left, which area represents the occipital lobe?
A. Region 1
B. Region 3
C. Region 4
D. Region 5

4. The frontal lobe is a large section of the brain that controls functions like reasoning, speech and movement. Where is the frontal lobe located on the diagram on the left?

A. Region 1
B. Region 3
C. Region 4
D. Region 5

5. Which of the following statements best describes blood flow in the human body?
A. As blood pressure increases, the rate of blood flow decreases.
B. As the length of a vein decreases, the resistance to blood flow decreases.
C. As the viscosity of the blood decreases, the rate of blood flow increases.
D. As the diameter of a blood vessel decreases, the rate of blood flow increases.

6. If a person has coronary heart disease, some of the vessels that supply blood to the heart can become narrowed.
Which of the following would you also expect to find in a patient with coronary heart disease?
A. low heart rate
B. high blood pH
C. low blood volume
D. high blood pressure

7. Marie transitions from a resting state to exercise. Which of the following correctly describes what happens to Marie's body during exercise?
A. heart rate decreases
B. blood volume increases
C. blood pressure increases
D. resistance to blood flow increases

8. How do human diseases caused by bacteria and diseases caused by viruses react to antibiotics?
A. Neither responds to antibiotics.
B. Both respond to antibiotics.
C. Viral diseases respond to antibiotics; bacterial diseases do not.
D. Bacterial diseases respond to antibiotics; viral diseases do not.

9. Which of the following best describes a difference between the nonspecific and specific immune responses?
A. The nonspecific response provides an immediate response that targets all pathogens, while the specific response involves a delay between exposure and response because it targets specific pathogens.
B. The nonspecific response is based only on physical barriers, while the specific response includes both physical and chemical barriers.
C. The nonspecific response provides a lasting immunity from previously encountered pathogens, while the specific response does not.
D. The nonspecific response relies on the recognition of pathogens to combat infections, while the specific response relies on inflammation

10. Although vaccines cannot be used to treat a person who is sick, they can help to prevent infections. Vaccinations tell the body to create "memory cells", which will function later to create antibodies against certain pathogens. When a person is vaccinated, what are they injected with?
A. antibodies to a disease bacterium
B. blood from a person who has had the disease
C. live, inactive virus
D. weakened viruses or antigens from the virus

11. Huntington's disease is a genetic disorder that affects muscle coordination and cognitive ability. Which of the following pieces of information would be most helpful in the diagnosis of this disorder?
A. The patient has a family history of the disease.
B. The patient has a history of exposure to radiation.
C. The patient is sedentary and has a history of smoking.
D. The patient has a poor diet and a history of high cholesterol.

12. Cardiovascular disease runs in Jim's mother's family. Jim is only 17 but knows that his mom and grandparents all have high blood pressure. Which of the following best describes the connection between cardiovascular disease and age?
A. As people age, their blood vessels become more elastic leading to less cardiovascular disease.
B. As people age, the heart becomes more efficient with each pump, increasing cardiac output.
C. As people age, blood pressure decreases leading to more cardiovascular disease.
D. As people age, plaque builds up in the arteries increasing vessel resistance, which leads to disease.

13. Vaccines are weakened forms of disease causing microorganisms, which are given to patients to prevent disease. After the vaccine is administered, what response to the vaccine is triggered in the body?
A. Secretion of antigens by lymphocytes.
B. Absorption of histamines throughout the body.
C. Production of temporary resistance to the disease.
D. Production of antibodies providing active immunity.

Glossary

Antibiotics: used in the treatment and prevention of bacterial infection.
Antigens: a toxin or other foreign substance that induces an immune response in the body, especially the production of antibodies.
Blood pressure: force exerted by the blood against the vessel wall. Blood pressure is highest in arteries and gradually decreases as it passes through arterioles, capillaries, and veins.
Nonspecific Immune Response: generalized responses to pathogen infection - they do not target a specific cell type
Pathogens: a bacterium, virus, or other microorganism that can cause disease.
Specific Immune Response: immunity against a specific antigen or disease; B cells and T cells (memory cells)
Vaccines: a substance used to stimulate the production of antibodies and provide immunity against one or several diseases
Virus: small infectious agent that replicates only inside the living cells of other organisms. Viruses can infect all types of life forms, from animals and plants to microorganisms

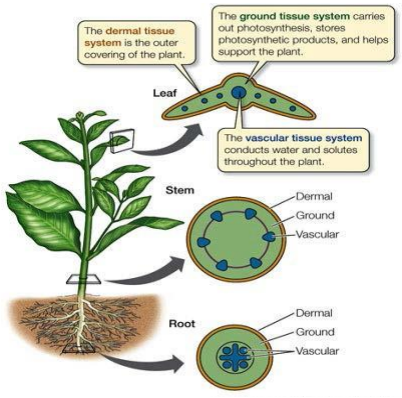
UNIT 13: PLANT ORGANIZATION/ SC.912.L.14.7

Must Know…

- How the structures of plant tissues and organs are directly related to their roles in physiological processes.
  - Plant organs are limited to roots, stems, leaves, flowers, fruit and cones.
  - Physiological processes are limited to photosynthesis, cellular respiration, transpiration, and reproduction.
  - Plant tissues are limited to meristematic, ground, dermal and vascular tissues.
  - Plant structures are limited to cambium, guard cells, phloem, seed, stomata and xylem.

PLANT ORGANS

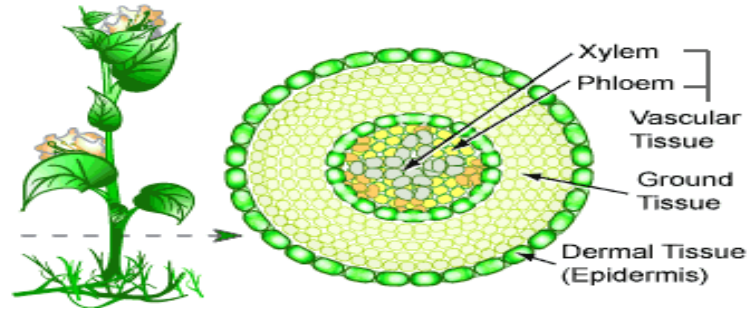
Roots- Underground (usually), anchor the plant in the soil, absorb water and nutrients, conduct water and nutrients, and food storage.
Leaves-manufacture food material in the presence of sunlight and green pigment-chlorophyll present in the leaf (photosynthesis).
Stems-move water and minerals to the leaves; transport food (sap) downward from the leaves to the roots
The stem increases in thickness as it grows older. In the vascular bundle of a young stem the xylem and phloem are separated by cambium.
Flowers- enable angiosperm/flowering plants to reproduce, and their colors and shapes facilitate pollination, seed growth and seed dispersal. The sexual reproductive organs of the flower are the pistil, or female parts, and the stamen, or male parts.
Fruits- are ripened ovaries and protect seeds.
Cones-are the reproductive organs for gymnosperms (fruitless and flowerless)

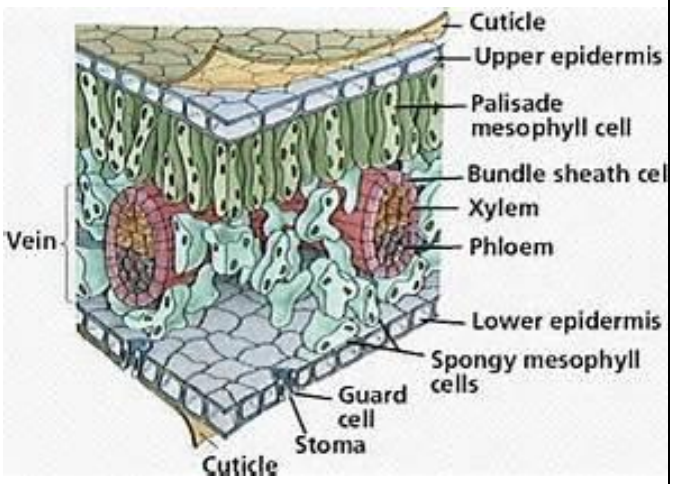


Creative Commons: http://www.vi.cl/gepe/f34006.jpg

PLANT TISSUES

Dermal- protection and prevention of water loss; epidermis
Meristematic-growth tissue and the location of most cell division. It is known as *undifferentiated tissue* because cells in the meristematic tissue will eventually become vascular, ground, or dermal tissue
Ground- photosynthesis, food storage, regeneration, support and protection; Parenchyma tissue, Collenchyma tissue, Sclerenchyma tissue
Vascular-transport of water/minerals **(xylem)** and transport of food **(phloem)**





Above: Creative Commons: http://ap-bio-chs-plants.wikispaces.com/file/view/leaf.gif/140623741/leaf.gif

Left: Creative Commons: http://www.scq.ubc.ca/wp-content/uploads/2006/08/plantcrossection.gif

PLANT PROCESSES

Photosynthesis-In plants and other photosynthetic organisms, photosynthesis takes place inside the chloroplasts. Plants change carbon dioxide and water into carbohydrates and give off oxygen (Photosynthesis uses the energy of sunlight to convert water and carbon dioxide into high-energy sugars and oxygen). Xylem: brings water to the leaf, Stomata: brings in carbon dioxide and remove oxygen, Chloroplast: pigment (chlorophyll) absorbs sunlight, Phloem: transportation of food and nutrients such as sugar and amino acids from leaves to storage organs and growing parts of plant.

Photosynthesis Equation							
Carbon dioxide	+	Water	SUNLIGHT →	Sugar	+	Oxygen	
$6CO_2$		$6H_2O$		$C_6H_{12}O_6$		$6O_2$	

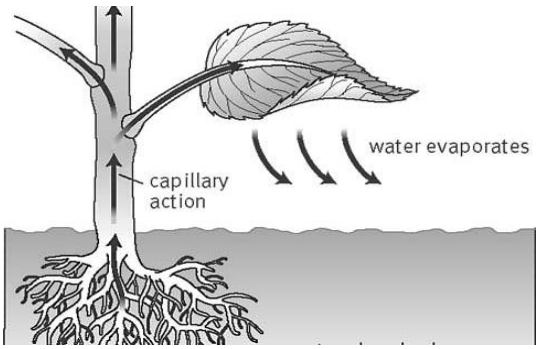
Creative Commons: https://figures.boundless.com/18850/full/figure-08-01-04.jpeg

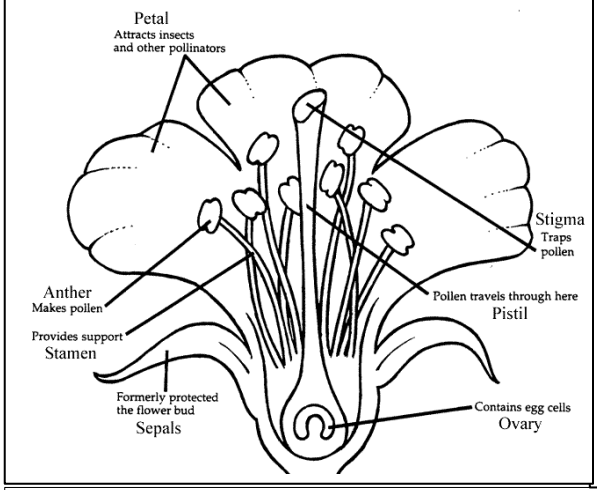
Cellular Respiration- Cells take the carbohydrates into their cytoplasm, and through a complex series of metabolic processes, they break down the carbohydrates and release the energy (ATP). This process takes place mainly in the mitochondria.

PLANT PROCESSES

Transpiration-Transpiration is the evaporation of water into the atmosphere from the leaves and stems of plants. Plants pump the water up from the soil through the xylem to deliver nutrients to the leaves. This pumping is driven by the evaporation of water through small pores (stomata).

Reproduction- Flowers are the plant's reproductive structures. Angiosperms are types of plants that bear fruits and flowers. Flowers are usually both male and female, and are brightly colored to attract insects to help them carry pollen used for sexual reproduction. Gymnosperms are types of plants that reproduce with cones. They do not bear fruits.

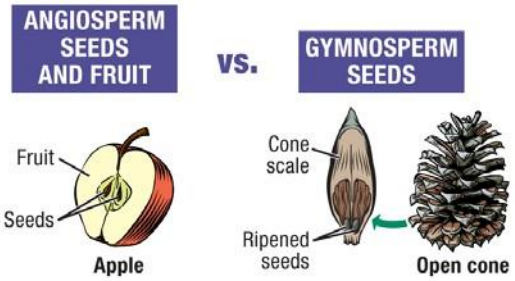




Above Right: Creative commons: http://images.yourdictionary.com/images/science/ASTransp.jpg

Left: Creative Commons: http://dbscience2.wikispaces.com/file/view/flower_parts.gif/73089621/flower_parts.gif

Right: Creative Commons: http://2.bp.blogspot.com/-QRPK8EGe4vs/UOU9uJ6o8ZI/AAAAAAAABhI/ZKOW1uZVVZw/s1600/Angiosperms%20and%20Gymnospserms%20Differences.gif



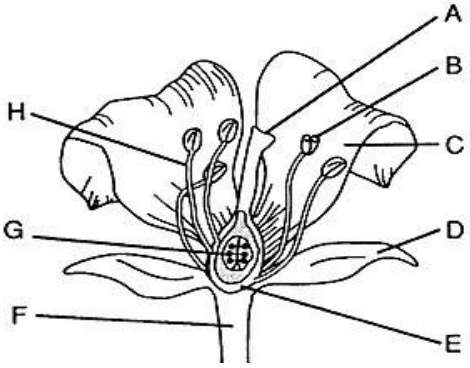
Multiple Choice Questions

1. Which of the following is responsible for the exchange of gases between the plant and the atmosphere during photosynthesis?
A. primary and secondary meristems
B. xylem and phloem
C. guard cells and stomata
D. cambium and epidermis

2. What is the main function of leaves?
A. Leaves provide support for growth and a place to store food.
B. Leaves provide a place for photosynthesis to occur.
C. Leaves absorb water and minerals and transport nutrients to the stem.
D. Leaves create a barrier that prevents water in the plant's tissues from evaporating

3. The cambium is a section of cells in a plant that can become either part of the xylem or phloem, depending on the growth and needs of the plant. If the cambium of a particular plant was damaged, what would be the most likely effect on the plant?
A. The plant would lose its ability to carry out photosynthesis.
B. the plant would have uncontrolled growth.
C. The plant would not experience any change in physiology.
D. The plant would not be able to transport nutrients and water.

4. The diagram below represents a flower, the reproductive structure of some plants. Most flowers have both male and female structures for fertilization and reproduction.

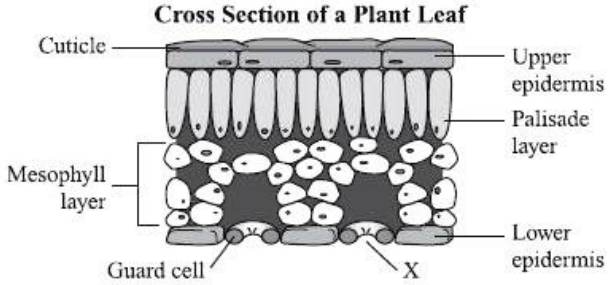


Which structure is represented by the letter A in the diagram above?
A. the stamen, a male structure which produces pollen
B. the pistol, a female structure which collects pollen and passes it to the ovary
C. the sepal, a modified leaf used for protection of the flower
D. the petals, decorative structures which attract pollinators

5. What is the main purpose of seeds in plants that have them?
A. To protect and distribute the zygote.
B. To entice animals to eat the plant.
C. To be fertilized by other plants.
D. To store water for the mother plant.

6. Plant cells that are specialized for cell division are most likely found in what part of the plant?
A. root tips
B. leaf epidermis
C. stem epidermis
D. vascular tissue

7. The diagram below shows a cross section of a plant leaf.

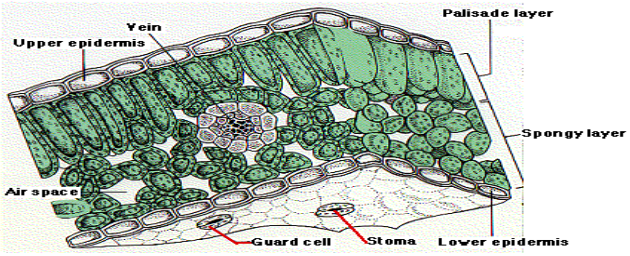


How does the structure marked X contribute to the survival of the plant?
A. It allows the intake of gases necessary for photosynthesis.
B. It allows the intake of minerals necessary for plant growth.
C. It allows the intake of sunlight necessary for ATP production.
D. It allows the intake of sugars necessary for plant reproduction.

9. Which is **not** a function of plant roots?
A. anchor the plant
B. store the products of photosynthesis
C. absorb water and minerals
D. produce sugars and carbohydrate

10. Photosynthesis occurs in plants in specialized organelles called_____.
A. Mitochondria C. Golgi bodies
B. Chloroplast D. Nucleus

12. Below is a diagram of a leaf's anatomy.



The palisade mesophyll layer located below the upper epidermis contains chloroplasts. What is the function of this layer?
A. Transportation C. Reproduction
B. Photosynthesis D. Transpiration

8. Jake conducted an experiment with four bean plants. They were placed next to one another on a sunny windowsill. He gave each plant equal amounts of a different type of water. The plants were given tap water, distilled water, flavored water, or carbonated water. He made the following observations after three weeks.

PLANT EXPERIMENT OBSERVATIONS

Plant	Type of Water Given Daily	Final Observations
A	Tap	All leaves have turned brown and fallen off. No change in height recorded. Plant appears dead.
B	Distilled	Plant is 3 centimeters taller at the end of experiment. Leaves are green. Plant appears healthy.
C	Flavored	New green leaves have appeared. No change in height recorded. Plant appears healthy.
D	carbonated	Leaves appear yellow. Many leaves have fallen, others are drooping. Plant does not appear healthy.

Based on his results, Jake concluded that tap water is not good for plants. How can Jake change his experimental design to improve the validity of his results?
A. carry out multiple trials, and increase the number of plants that are given each type of water
B. establish a control group that includes different types of plants
C. establish another dependent variable to generate more data
D. carry out multiple trials that include fewer plants, and increase the types of water given to the plants

11. When stomata are open, water vapor diffuses out of a leaf in a process called____.
A. Germination C. Osmosis
B. Transpiration D. Photosynthesis

13. Mosses and ferns produce fertilized eggs that form _____. These are simplified seeds that have a limited food supply and no seed coat.
A. Pistil B. Cones C. Spores D. Seeds

15. Which of the following tissue forms the outer protective covering of the plant and helps with transpiration and photosynthesis?
A. meristem B. ground tissue
C. dermal tissue D. vascular tissue

Glossary

Angiosperm/Flowering plants: a plant that has flowers and produces seeds enclosed within a fruit
Cellular respiration: break down of glucose to create ATP
Cones: reproductive structures of gymnosperm
Flowers: reproductive structures of angiosperm
Gymnosperm: a plant that has seeds unprotected by an ovary or fruit.
Leaves: organ in plants where photosynthesis occurs
Phloem: the vascular tissue in plants that transports sugars and other metabolic products downward from the leaves
Photosynthesis: process plants use to create food (glucose)
Pollination: transfer of pollen from the anthers of a flower to the stigma of the same flower or of another flower; before fertilization
Roots: absorbs water and nutrients for plants; anchor plants
Seed: an embryonic plant enclosed in a protective outer covering
Transpiration: process where plants absorb water through the roots and then give off water vapor through the stomata
Xylem: conducts water and dissolved nutrients upward from the root

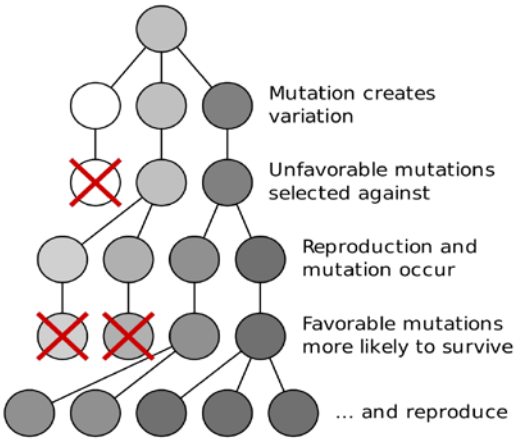
Unit 14: Evolution and Natural Selection/ SC.912.L.15.1 & SC.912.L.15.13

Must know…

- How the theory of evolution is supported by evidence from the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.
- Trends in hominid evolution from early ancestors to modern humans including brain size, jaw size, language and manufacture of tools.
- How to draw scientific conclusions based on the evidence or scenario given.
- The differences between a theory and a law and know how a theory is developed over time.
- How specific scientists (Darwin, Lyell, Malthus, Mendel, Wallace) contributed to the theory of evolution.
- The conditions required for natural selection to occur. These include: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.
- Genetic drift and gene flow.
- How mutation and genetic recombination increase genetic variation.

THEORY OF EVOLUTION:

- proposed by Charles Darwin
- process by which organisms that are best suited to environment survive and pass genetic traits on to offspring
- **Adaptation** – organisms with the most suited traits will survive
- **Evolution** – change in a species over time (not a single individual, but the group)



Left: Creative Commons: http://upload.wikimedia.org/wikipedia/commons/thumb/f/f3/Mutation_and_selection_diagram.svg/1130px-Mutation_and_selection_diagram.svg.png

The traits that help an organism survive in a particular environment are "selected" in **natural selection.** Overtime, natural selection results in changes in the inherited characteristics of a population. These changes increase species fitness (survival rate).

Conditions required for natural selection:

There is variation in traits.

For example, some beetles are green and some are brown.

There is differential reproduction.

Since the environment can't support unlimited population growth, not all individuals get to reproduce to their full potential. In this example, green beetles tend to get eaten by birds and survive to reproduce less often than brown (camouflage with the bark of trees) beetles do.

There is heredity.

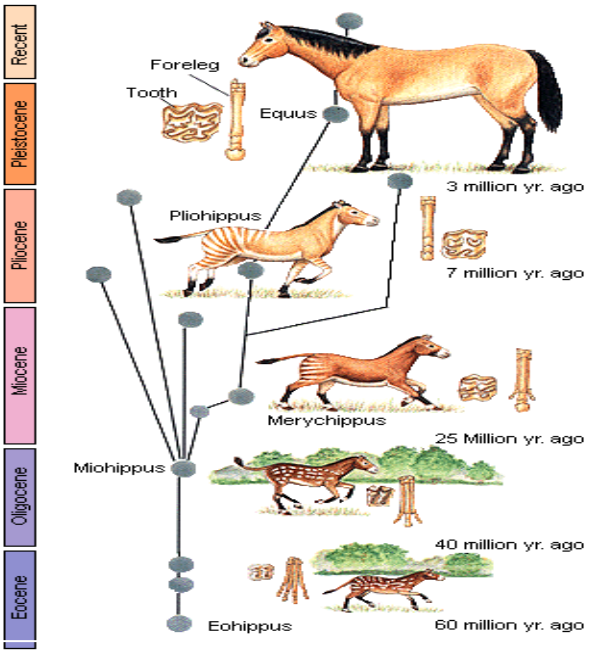
The surviving brown beetles have brown baby beetles because this trait has a genetic basis.

End result

The advantageous trait, brown coloration, which allows the beetle to have more offspring, becomes more common in the population. Eventually, all individuals in the population will be brown.

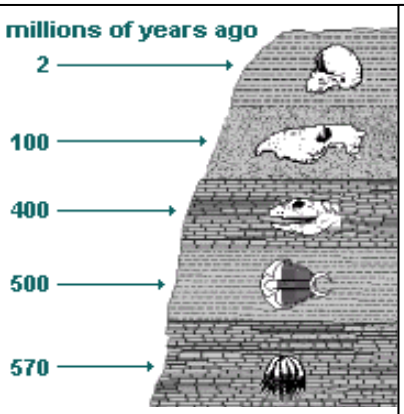
EVIDENCE OF EVOLUTION:

- **Fossils-** may appear in rocks, ice, and amber; when fossils are arranged in order of their age, the fossil record provides a series of changes that occurred over time; comparison of anatomical characteristics reveals shared ancestry/common ancestry
- **Molecular Biology-** comparing DNA/gene or protein sequences from organisms (closely-related organisms will have similar DNA, RNA, and protein (amino acid) sequences). This also gives evidence of a common ancestor
- **Embryology-** embryos of different vertebrates look alike in their early stages, giving the superficial appearance of a relationship
- **Comparative anatomy-**Homologous structures - structures (body parts/anatomy) which are similar in different species because the species have common descent. They may or may not perform the same function. An example is the forelimb structure shared by cats and whales. Vestigial structures are anatomical features that are still present in an organism (although often reduced in size) even though they no longer serve a function. Whales, which evolved from land mammals, have vestigial hind leg bones in their bodies.
- **Biogeography-** patterns of past evolution are found in the natural geographic distribution of related species, similarity of endemic island species to nearby mainland species.



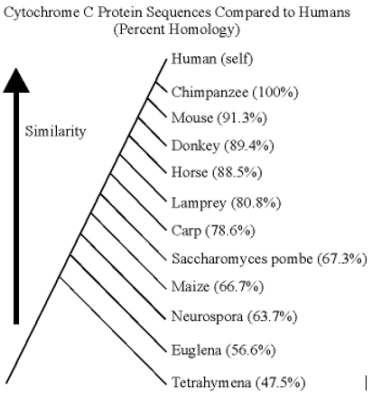
Fossil Evidence - Horse

Creative Commons: http://scepticon.files.wordpress.com/2009/02/horseevolution.gif%3Fw%3D510Evolu



Fossil Evidence- newer on top

Creative Commons: http://tse1.mm.bing.net/th?&id=OIP.M82cca208c049f7



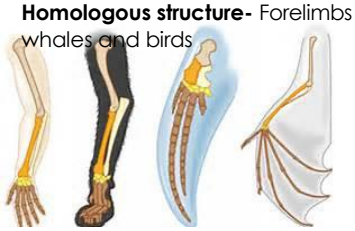
Molecular Evidence- DNA, RNA, & amino acids similar for recent common ancestors

Creative Commons: http://ideonexus.com/wp-content/uploads/2012/02/022.gif

Comparative Anatomy Evidence

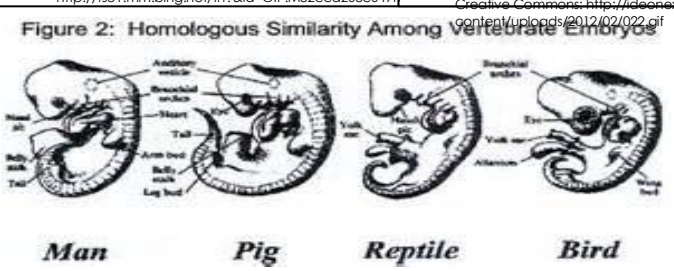
Vestigial Structures- pelvis and femur bones in whales

Homologous structure- Forelimbs in humans, dogs, whales and birds



Top: Creative Commons: http://tse1.mm.bing.net/th?&id=OIP.M9457a60da77c46d08c2926a00b083abeH0&w=301&h=173&c=0&pid=1.9&rs=0&p=0&r=0&url=http%3A%2F%2Fjoneslabsafety.wikispaces.com%2Fchapter%2B10%2Bresources

Left: Creative Commons: http://tse3.mm.bing.net/th?id=OIP.M605453b907f2328e596b3224b445fd67H0&pid=15.1



Embryo Evidence

Creative Commons: http://tse4.mm.bing.net/th?id=OIP.Ma02dcf11ec4d6e3da9e64ee2cb9195e4o0&pi

Biogeographic Evidence

Creative Commons: http://jfk-science-wiki.wikispaces.com/file/view/g-d_of_living_species.jpg/221470108/705x264/g-d_of_living_species.jpg

humans.

TRENDS IN HOMINID EVOLUTION:

- Bipedalism (walk on two legs)
- Increase in brain size
- Smaller teeth and jaw
- Tool usage
- Language development

Human Evolution

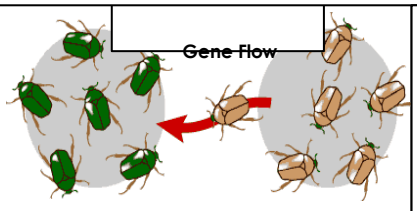
Creative Commons: http://zepfanman.com/wp-content/uploads/2013/02/family-tree.jpg

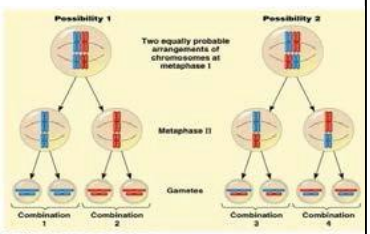
MECHANISMS OF EVOLUTIONARY CHANGE

Mutation is the change in DNA. Since all cells in our body contain DNA, there are lots of places for mutations to occur; however, not all mutations matter for evolution. Somatic mutations occur in non- reproductive cells and won't be passed onto offspring only those in germ cells/gametes.

Gene Flow/Migration is any movement of genes from one population to another. It includes different kinds of events, like pollen blowing to a new destination or people moving. If genes are carried to a population where those genes previously did not exist, gene flow can be an important source of genetic variation which could lead to evolution in that population.

Genetic drift along with natural selection, mutation, and migration is a basic mechanisms of evolution. In each generation, some individuals may, **by chance**, leave more descendants (and genes, of course!) than others. Genes in the next generation will be those of the "lucky" ones, not necessarily the healthier or "better" ones



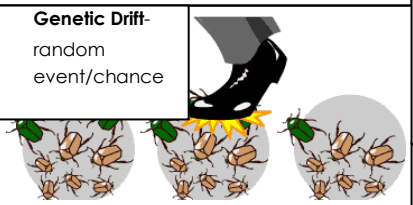


Creative Commons: http://sharonap-cellrepro-p3.wikispaces.com/file/view/indep_assor.jpg/309267540/500x323/indep_assor.jpg

Nonrandom Mating is mating that has not occurred due to chance (arranged marriages or animal breeding).

Note - Regardless of the mechanism, **individuals do not evolve, populations do**. Specifically, evolution is the change in allele frequencies in populations over time. Creative Commons: Gene Flowhttp://2.bp.blogspot.com/_N0Ds7OY_MuQ/S5M334PdMjI/AAAAAAAAAAk/QCW-tvvFYIE/S700/fig+3+gene+flow.JPG Genetic Drift: http://evolution.berkeley.edu/evolibrary/images/evo/beetles_mech3.gif

Genetic Drift- random event/chance



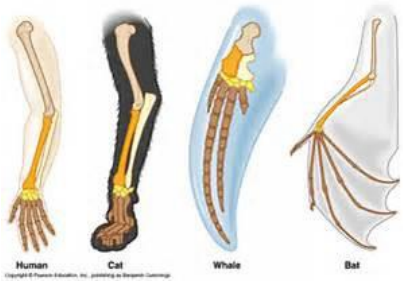
Meiosis- Independent Assortment of chromosomes during **Metaphase I and II increases genetic variations.**

Multiple Choice Questions

1. During biology class, a student asks his teacher, "Once scientists gather enough data and evidence supporting the scientific theory of evolution, will it become the *scientific law of evolution*?"Which is the best response to this student's question?
A. Yes, once scientists collect enough evidence, scientific theories can become scientific laws.
B. No, scientific theories are more widely accepted than scientific laws, so changing a theory to a law is like going backwards.
C. Yes, laws are more reliable than theories, and it is important to keep collecting data so that all scientific theories will eventually become scientific laws.
D. No, scientific theories explain how something might happen and scientific laws describe relationships; they are different and one does not become the other.

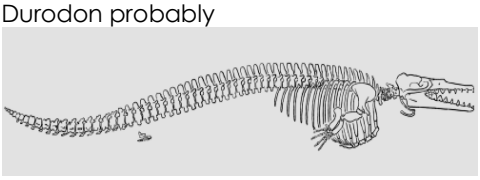
2. Why do scientists use fossil evidence to help support the scientific theory of evolution?
A. Fossils help show which organisms have lived over the last 100 years.
B. Fossils are exact replicas of animals from the past.
C. There are fossils from every species of animal that has ever lived.
D. Fossils can show patterns of change that happened over millions of years.

3. The images below each represent a limb from four different organisms. How could scientists use images like these to support the scientific theory of evolution?



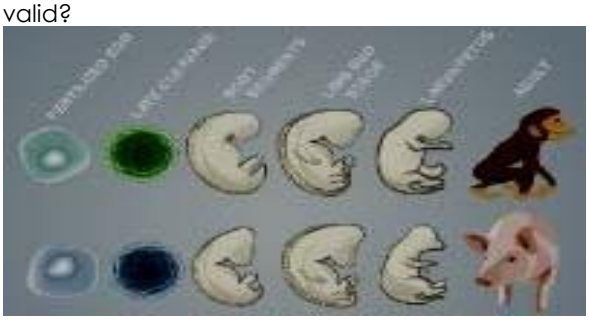
A. The limbs have similar structures, so the organisms may have a common ancestor.
B. The limbs look alike, so they are likely from the same genus but represent different species of animals.
C. Because the limbs look alike, all animals with limbs must have a humerus, radius, and ulna.
D. Because the limbs look alike, all limbs with similar structures serve the same function.

4. Fossils of the Durodon, an aquatic mammal that lived over 40 million years ago, provide scientists with evidence for the ancestry of the modern whale. These fossils contained vestigial, or small, underdeveloped hind limbs. This feature helps scientists conclude that the Durodon probably



A. was a mix of many different types of animals.
B. descended from animals that could walk on land.
C. was the apex predator of the ancient aquatic food chain.
D. needed strong back limbs to propel them through the water.

5. The table below shows five developmental stages of two different organisms and what they look like when mature. After viewing the table, four students developed arguments about how the data in the chart related to the scientific theory of evolution. Which argument is the most valid?



A. These organisms are very different and, therefore, are not related.
B. These organisms are likely to have a common ancestor because of the similarities in their developmental patterns.
C. Because of the similarities in the development of these organisms, they would likely only differ at the genus level when classified.
D. These organisms may look similar during development, but because they take different amounts of time to develop, they do not share a common ancestor.

6. A species of mockingbird lives in the Apalachicola National Forest. One year, a few of the mockingbirds were born with very long beaks. Over the next several years, the area experienced particularly cold winters. The weather forced the insects in the area to burrow deeper into the ground. Surveys of the mockingbird population showed that the number of long-beaked mockingbirds had increased. What would account for this increase in the number of long-beaked mockingbirds?
A. Short-beaked mockingbirds migrated to warmer climates.
B. Short-beaked mockingbirds became food for other animals.
C. Long-beaked mockingbirds were able to reach food and survived.
D. Long-beaked mockingbirds were able to stay warmer during the cold winters.

7. In a population, mutations can be either beneficial or harmful. What positive effect can mutation have on a population?
A. It increases the genetic variation within the population.
B. It eliminates the genetically weak members of a population.
C. It decreases competition for resources between the population's different species.
D. It ensures that a population will not produce more offspring than the habitat can support.

8. Under some conditions, such as a lack of natural predators, a species may experience an increase in reproductive success and produce a very large number of offspring. Which of the following is the most likely consequence?
A. The species will experience a decrease in its physical capability to reproduce in future generations.
B. Some of the individuals will breed with closely related species, increasing the genetic diversity within the population.
C. Individuals who are better able to compete for resources will survive and pass on the traits that enabled survival to their offspring.
D. The species will be better equipped to defend its territory against other species, and its population will increase even more.

9. Natural selection is the process by which a characteristic becomes more or less prevalent in a population, and is the mechanism by which evolution occurs. Which of the following will mostly likely help natural selection to take place?
A. a lack of natural predators
B. underproduction of offspring
C. mutation in an organism's DNA
D. an abundance of natural resources

10. Genetic drift results in a change in the gene pool of a population, and can be described as a mechanism of evolution. How does genetic drift change a population's gene pool?
A. Individuals develop adaptations and pass them on to their offspring.
B. It causes random changes in allele frequencies in small populations.
C. Individuals at one end of a population growth curve have higher fitness.
D. It causes mutations in the DNA, which lead to a difference in the survival ability of organisms.

11. Which of the following correctly describes the general trend in hominid evolution?
A. larger body size, broad forehead, smaller brains
B. increase in brain capacity, bipedalism, use of tools
C. thickening of the skull, protruding teeth, organized hunting
D. large canine teeth, small skulls, diet of coarse plant material

12. In a small group of people living in a remote area of Kentucky, there is a high incidence of "blue skin", a condition that results from a variation in the structure of hemoglobin. All of the "blue-skinned" residents can trace their ancestry to one couple, who were among the original settlers of this region. The unusually high frequency of "blue skin" in the area is an example of
A. Mutation
B. Natural selection
C. Genetic drift
D. Sexual selection

13. A subspecies is a different group within a species that is able to interbreed but is usually prevented from doing so by geographical isolation. The Florida Panther is a subspecies of the American Cougar, and there are very few (less than 100) remaining in its population. When populations get this small, inbreeding results in low genetic diversity. The result is fewer beneficial adaptations that might help the animals survive environmental change, as well as an increase in the occurrence of genetic abnormalities. How can this subspecies of cougar be saved from extinction?
A. Keep the existing population in a controlled environment until their population increases.
B. Increase the genetic diversity by introducing other subspecies of cougar to the population.
C. Relocate remaining Florida Panthers to the larger populations of cougar subspecies in Texas and California.
D. Remove all the panthers with genetic abnormalities from the environment and leave only the healthy ones.

14. In order for a new species to arise, inherited variations must make organisms more fit to survive in their environment. Which two processes within a population can lead to inherited variation?
A. genetic drift and gene flow
B. natural selection and evolution
C. stabilizing and disruptive selection
D. mutation and genetic recombination through sexual reproduction

15. Natural selection is a process that results in change within a species over time. Which of the following is NOT a condition required for natural selection to result in speciation?
A. overpopulation of the species
B. genetic equilibrium of the species
C. genetic variation within the species
D. competition for survival within the species

16. Which of these would have the least effect on natural selection in a subspecies of giraffes that is geographically isolated from other subspecies of giraffes?
A. available niches
B. existing predators
C. chromosome number
D. available food resources

17. Humans and chimpanzees have almost identical DNA and many similarities in anatomy. Which statement about the evolutionary relationship between modern humans and chimpanzees is supported by these facts?
A. Humans and chimpanzees are unrelated.
B. Humans descended directly from chimpanzees.
C. Humans are a more evolved version of chimpanzees.
D. Humans and chimpanzees share a common ancestor.

Glossary

Adaptation: is a feature that is common in a population because it provides some improved function; process by which an organism becomes fitted to its environment; it is the result of natural selection's acting upon heritable variation.
Evolution: the process by which different kinds of living organisms are thought to have developed and diversified from earlier forms during the history of the earth; change in the gene pool of a population from generation to generation by such processes as mutation, genetic drift, and natural selection
Gene flow: the movement and exchange of genes between interbreeding populations
Genetic drift: random changes in the frequency of alleles in a gene pool, usually of small populations.
Inherited variation: difference in a characteristic that is a result of genetic inheritance from the parents

Unit 15: History of life/ SC.912.L.15.8

Must know…

- The scientific explanations of the origin of life on Earth

Conditions contributing to the origin of life on Earth:

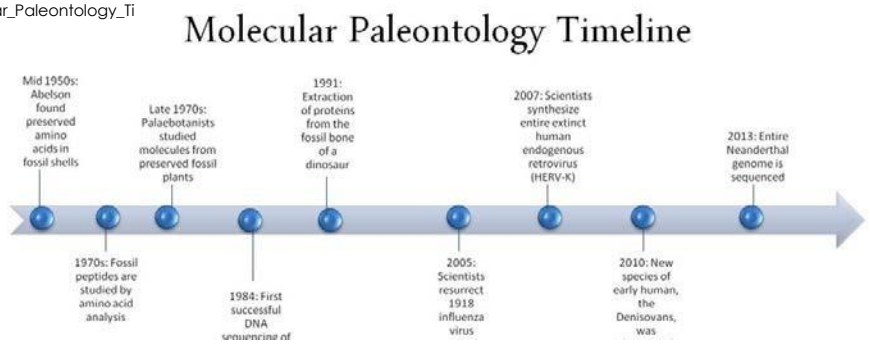
- Presence of liquid water
- Moderate temperature
- Free oxygen
- Sunlight
- Formation of the ozone layer using oxygen
- Absence of toxin from the atmosphere
- Absence of radiation

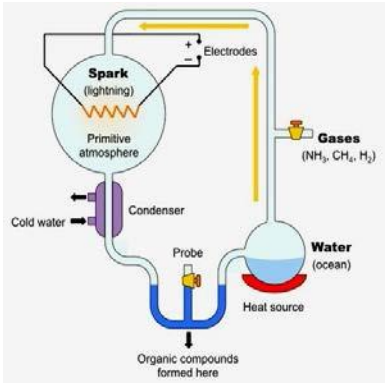
Origin of Life on Earth
Chemical Evolution- inorganic molecules formed complex organic molecules (building blocks of life)
Biological Evolution- prokaryotes engulfed each other to form eukaryotes.

Scientific Explanation of the Origin of Life

1. Simple organic molecules (monomers to polymers)) were formed (primordial soup)
2. Replicating molecules evolved and began to undergo natural selection.
3. Replicating molecules became enclosed within a cell membrane
4. Formation of prokaryotes. Some cells began to evolve modern metabolic processes and out-competed those with older forms of metabolism(Endosymbiotic theory)
5. Multicellularity evolved.

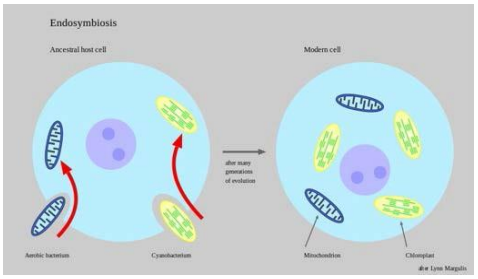
Creative Commons: https://upload.wikimedia.org/wikipedia/en/5/5c/Molecular_Paleontology_Timeline.jpg





Creative Commons: https://upload.wikimedia.org/wikipedia/commons/thumb/5/54/Miller-Urey_experiment-en.svg/2000px-Miller-Urey_experiment-en.svg.png

Miller/Urey Experiment showed that amino acids (organic molecules) could be formed from matter present on early Earth (inorganic molecules:



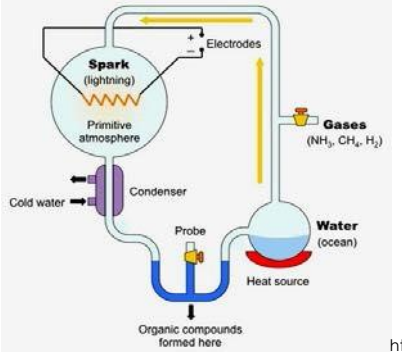
Creative Commons: https://upload.wikimedia.org/wikipedia/commons/thumb/d/dc/Endosymbiosis.svg/800px-Endosymbiosis.svg.png

Endosymbiotic Theory states that several key organelles of eukaryotes originated as symbiosis between separate single-celled prokaryotic organisms.

Remember…
A Theory is a scientific explanation with extensive research and data to support it. The WHY
A Law is a description of what happens in nature. The HOW

Multiple Choice Questions

1. In the 1950s, scientists Miller and Urey conducted a classic experiment in which water, methane, ammonia, and hydrogen were sealed in a flask containing a pair of electrodes. An electric spark was fired between the electrodes, and after a week's time, they found that amino acids were present in the flask. Which of the following best explains the significance of this experiment in explaining the origin of life on Earth?



A. It showed that any raw materials could produce the compounds necessary for life to exist on Earth.
B. It showed that amino acids were the basic building blocks of DNA, which is necessary for life to exist.
C. It showed how biological molecules can be formed from the very simple molecules that were most likely available early in Earth's history.
D. It showed how lightning can cause organic matter to decompose into amino acids, which were thought to be present on Earth long before other biological molecules.

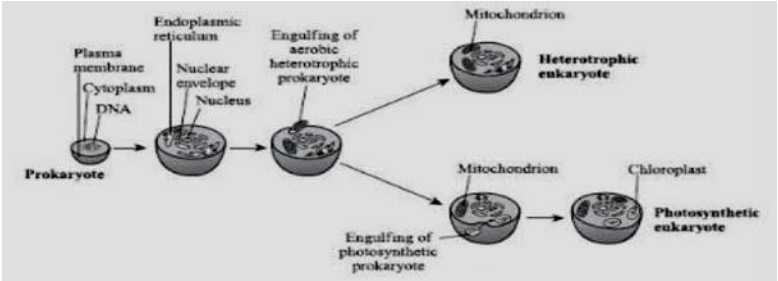
https://upload.wikimedia.org/wikipedia/commons/thumb/5/54/Miller-Urey_experiment-en.svg/2000px-Miller-Urey_experiment-en.svg.png

2. In order for the development of life on Earth, a very important transition had to occur. Which of the following would have been an important early step in the evolutionary history of organisms on Earth?
A. Unicellular organisms had to evolve into multicellular organisms.
B. Unicellular organisms had to become extinct.
C. Multicellular organisms had to evolve into less complex unicellular organisms.
D. Multicellular organisms had to become extinct.

3. There are many different explanations that attempt to describe the origin of life on Earth, some of which are more scientifically sound than others. In any scientific explanation, which of the following needed to happen before life could exist on Earth?
A. Organisms needed to be able to undergo photosynthesis using sunlight as an energy source.
B. An atmosphere with an abundance of oxygen needed to form.
C. Organisms needed to find a way to reproduce both sexually and asexually.
D. Simple compounds needed to combine to form the building blocks of biological molecules.

4. Which of the following was most likely the first type of biological molecule that was formed from the conditions present on Earth before life came into being?
A. amino acid B. DNA
C. prokaryote D. water

5. The diagram below shows a proposed theory of the origin of eukaryotic cells, called endosymbiosis. Which of the following explains why cells that contained mitochondria-like organelles had an evolutionary advantage?

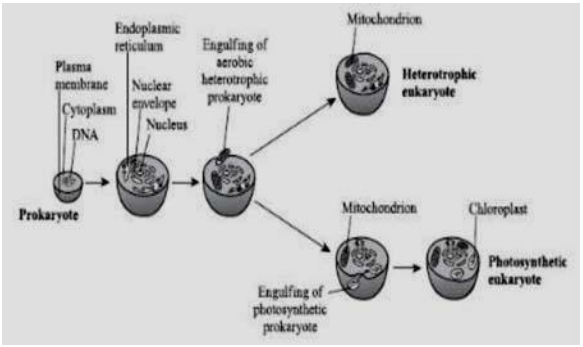


A. They were able to photosynthesize
B. They had more DNA
C. They were able to make more use of available energy
D. They were immune to bacterial invasion.

6. Scientific explanations like theories of the origin of life on Earth help to explain how the first organisms on Earth came about. In order for explanations like these to be considered scientific, they must have certain characteristics. Which set of characteristics below best describes scientific explanations?
A. Scientific explanations are based on popular opinion within the science community and are only supported by recently collected data and evidence.
B. Scientific explanations must be agreed on by all scientists and have at least some supporting evidence.
C. Scientific explanations explain why things happen based on the best guess scientists can make.
D. Scientific explanations are the ones best supported by all the available data and evidence to help understand how something happens.

7. Which types of organisms developed first due to the early environmental conditions on Earth?
A. prokaryotic and aerobic
B. prokaryotic and anaerobic
C. eukaryotic and aerobic
D. eukaryotic and anaerobic

8. The Endosymbiotic theory proposes that eukaryotic cells arose from living communities formed by the merging of prokaryotic organisms and their hosts. Which of the following is the best evidence to support the Endosymbiotic theory?
A. Mitochondria and chloroplasts contain DNA similar to bacterial DNA.
B. Both prokaryotic and eukaryotic organisms require oxygen in order to use energy.
C. Bacteria, mitochondria, and chloroplasts all divide by mitosis, while the cells containing them divide by binary fission.
D. Bacteria and mitochondria contain many features that are similar to each other but different from those of chloroplasts.



Glossary

Biogenesis: living thing can only come from another living thing, and no cellular life has ever been observed to arise from non-living matter. For example, a spider lays eggs that will develop into spiders.
Endosymbiotic: symbiosis in which one of the symbiotic organisms lives inside the other; eukaryotes came from prokaryotes
Inorganic molecule: are not usually found in living things but abound in nature or Earth. Some molecules, though, contain carbon and are still inorganic.
Organic molecule: a molecule that is normally found in or produced by living systems; consists of carbon atoms
Primordial soup: a solution rich in organic compounds in the primitive oceans of the earth, from which life is hypothesized to have originated
Probiont: a collection of abiotically produced organic molecules surrounded by a membrane or a membrane-like structure; considered to have possibly been the precursor to prokaryotic cells
Reducing atmosphere: lacks free oxygen, and may contain such reactive gases as hydrogen and/or carbon monoxide; early Earth's atmosphere
Spontaneous Generation: production of living organisms from nonliving matter

Unit 16: Classification/SC.912.L.15.6

Must know…

- The distinguishing characteristics of the domains and kingdoms of living organisms.
- How organisms are classified based on evolutionary relationships.
- The reasons for changes in how organisms are classified.

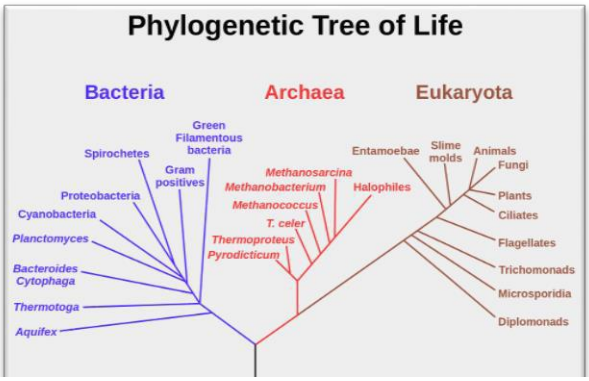
CLASSIFICATION:

- process in understanding how organisms are related and how they are different
- It also follows the evolutionary trends
- **taxonomy** – branch of biology that studies grouping and naming of organisms

History of classification systems-

- early 1700s, Carolus Linnaeus developed a system based on physical characteristics; two kingdoms (plants and animals)
- developed "genus" and "species"
- designed system of naming called **binomial nomenclature** ("two names") which gave each organism two names, a genus and a species, Genus always capitalized, both should be underlined or italicized

One of the new reasons why species are being re-evaluated is because of DNA analysis. Basic genetic analysis information can change our ideas of how closely two species are related and so their classification can change.

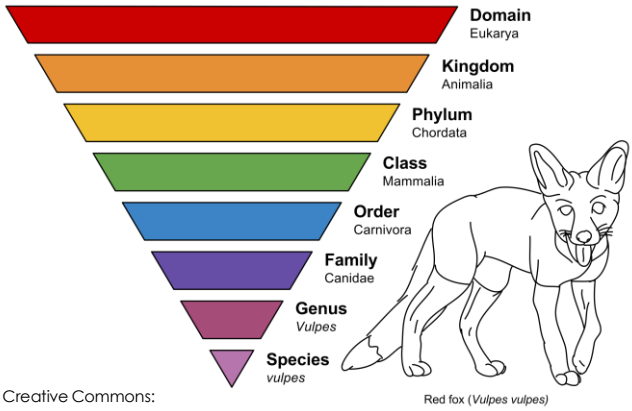


Creative Commons: https://upload.wikimedia.org/wikipedia/commons/thumb/7/70/Phylogenetic_tree.svg/2000px-Phylogenetic_tree.svg.png

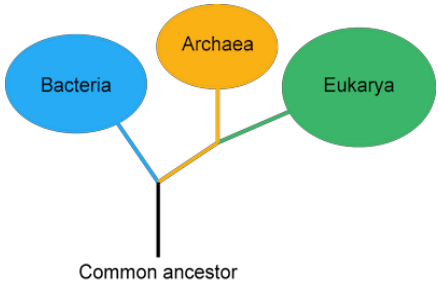
Organisms are classified into three Domains and into one of six Kingdoms of life. Organisms are placed into these categories based on similarities or common characteristics. Some of the characteristics that are used to determine placement are cell type, metabolism, and reproduction.

Domain: Archaea, Bacteria and Eukarya

Six kingdoms: Archaea/Archaeabacteria, Bacteria/Eubacteria, Protista, Fungi, Plantae, and Animalia



Creative Commons: https://upload.wikimedia.org/wikipedia/commons/thumb/7/71/Taxonomic_Rank_Graph.svg/2000px-Taxonomic_Rank_Graph.svg.png



Creative Commons: http://media1.shmoop.com/images/biology/biobook_mechevolution_graphik_15.png

A **phylogenetic tree** is another way of representing evolutionary relationships.

Branches represent real lineages that occurred in the evolutionary past.

It includes information about ancestors, duration of evolutionary lineages, amounts of evolutionary change that has occurred.

Domain Eukarya

	Domains Bacteria & Archaea	Kingdom ?Protista?	Kingdom Plantae	Kingdom Fungi	Kingdom Animalia
Cells Type	Prokaryotic	Eukaryotic	Eukaryotic	Eukaryotic	Eukaryotic
Number of Cells	Unicellular or Colonial	Unicellular or Colonial	Multicellular	Multicellular	Multicellular
Type of Nutrition	Autotrophic or Heterotrophic	Autotrophic or Heterotrophic	Autotrophic	Heterotrophic (Saprophytic)	Heterotrophic (ingestion)
Cell Wall	Cell Wall	Cell Wall or No Cell Wall	Cell Wall (Cellulose)	Cell Wall (Chitin)	No Cell Wall
Examples	Bacteria & Blue-Green Bacteria (algae)	Protozoa & some algae	Seaweeds, some algae, mosses, vascular plants	Mushrooms, molds	Humans, fish, insects

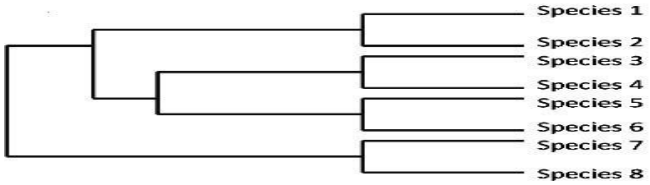
Creative Commons: http://media1.shmoop.com/images/biology/biobook_mechevolution_graphik_15.png

LEVELS OF CLASSIFICATION:
- Kingdom
- Phylum
- Class
- Order
- Family
- Genus
- Species

CLASSIFICATION OF HUMANS:
Kingdom: *Animalia* (multicellular organisms that eat food)
Phylum: *Chordata* (dorsal hollow nerve cord, notochord, pharyngeal slits)
Class: *Mammalia* (hair, mammary glands, endothermic, and four-chambered heart)
Order: *Primates* (nails, clavicle, orbits encircled with bone, enlarged cerebrum, and opposable digits)
Family: *Homidae* (bipedal – walk erect on two feet, advanced tool use)
Genus: *Homo* ("human" like)

Multiple Choice Questions

1. Scientists are studying the evolutionary history of a group of plants in the United States, and they developed an evolutionary tree, as shown below.



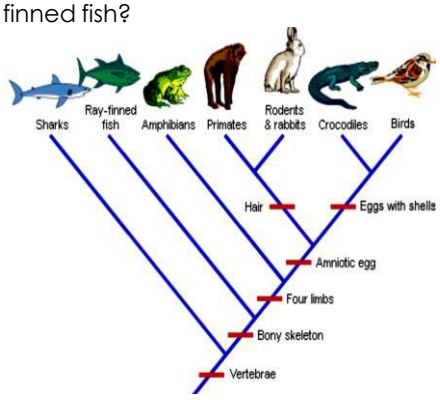
What information about organisms' best helps the scientists to determine the evolutionary relationships among them?
A. DNA sequences B. Anatomical features
C. Habitat types D. Reproductive Strategies

2. Many protists are single-celled organisms, as are bacteria. However, protists and bacteria are in different biological kingdoms. Which of the following comparisons of protists and bacteria is NOT true?
A. Both protists and bacteria can be motile.
B. Both protists and bacteria are microorganisms.
C. Protists are eukaryotes, while bacteria are prokaryotes.
D. Protists may be photosynthetic, but bacteria cannot be photosynthetic.

3. All prokaryotes reproduce asexually, while many eukaryotes can reproduce sexually. Given this information, which statement best explains why the Eukarya domain includes more complex living things than the Archaea or Bacteria domains?
A. All prokaryotes are unicellular, and all eukaryotes are multicellular.
B. Prokaryotes can live in more extreme conditions than eukaryotes.
C. Eukaryotes have a greater variety of genetic material than prokaryotes.
D. There are more eukaryotic organisms than prokaryotic organisms in the world.

4. In 1990, Carl Woese introduced the three domain system for classifying living things, after the advancement of DNA analysis allowed for a comparison of species genetic code. Which of the following is the best explanation for why domains were added to the previous system of classification?
A. The old system of classification was wrong and needed to be corrected.
B. New species are evolving too quickly to keep up with the old system of classification.
C. Domains have always been included, they were just made official recently.
D. Some organisms, which were previously characterized together, were determined to be genetically very different.

5. Based upon the information shown in the cladogram below, which trait would most likely be observed in ray-finned fish?



A. amniotic egg
B. bony skeleton
C. four limbs
D. hair

6. Some organisms are multicellular, sessile (non-moving), and able to create their own food. What biological kingdom do these organisms belong to?
A. animal B. bacteria C. fungi D. plant

7. The Florida Panther was once considered to be a subspecies of cougars and given a special trinomial taxonomy of *Puma concolor coryi*. Current scientists however, have studied the Florida Panther and removed the subspecies classification to only *Puma concolor.* Which of the following would **most likely** explain why the classification of the Florida Panther changed?
A. New genetic evidence suggests a much closer relationship between the Florida Panther and other cougars.
B. Shared features between the Florida Panther and other cougars were also found in newly discovered organisms in the world.
C. Advanced technologies have shown a large difference in cell structure between the Florida Panther and other cougars.
D. Trinomial naming conventions are no longer used by longer used by scientists because only the genus and species are important in taxonomy.

Glossary

Cladogram: diagram that shows the evolutionary relationships among a group of organisms
Common ancestor: all life descended from a universal ancestor; different species arise from speciation
Domains: most inclusive taxonomic category; larger than a kingdom; there are three- bacteria, archaea and eukarya
Kingdoms: second largest taxonomic group; there are six - animalia, plantae, protista, bacteria, archaea and fungi

NGSSS Benchmark	PHS Biology EOC CONTENT FOCUS 2012-2016	NUMBER OF POSSIBLE POINTS
	1st Quarter	
Unit 1: Populations and Ecosystems		
SC.912.L.17.5	**Interdependence** ○ Carrying Capacity ○ Life in Aquatic System: depth, temperature ○ Consequences to Biodiversity: human activity ○ Changes in Ecosystems: seasonal variations, succession, climate change ○ Limiting Factors	4-7
Unit 2: Energy Flow		
SC.912.L.17.9	**Food Webs & Energy Transfer** ○ Energy Pathways: Food Web, Energy Pyramid, ○ Water Cycle ○ Carbon Cycle	1-2
Unit 3: Environmental Impact		
SC.912.L.17.20	**Effects of Human Impact to the Environment & Sustainability** ○ Monitoring Environmental Parameters ○ Using Renewable Resources ○ Cost & Benefits: Renewable Resources ○ Effects of Human Impact on the Environment	4-6
Unit 4: Biochemistry		
SC.912.L.18.12	**Properties of Water** ○ Properties of Water: cohesive behavior, solvent, moderating temperature, freezing	1-2
SC.912.L.18.1	**Macromolecules** ○ Biochemical Reactions and Enzymes ○ Primary function: lipids, carbohydrates, nucleic acids ○ Effect of Environmental Factors on Enzyme Activity ○ Molecular Structure: proteins	2-3
	2nd Quarter	
Unit 5: The Cell		
SC.912.L.14.3	**Cellular Structure & Function** ○ Comparing Prokaryote and Eukaryote ○ Cell Wall ○ General Structures: eukaryotic cell, plant cells, animal cells ○ Comparing Animal & Plant cells: cell wall, common structures, chloroplast ○ Cell Membrane	2-4
SC.912.L14.1	**Cell Theory** ○ Cell Theory and Advances in Science ○ Evaluating Scientific Claims ○ Identifying What is Science: cell theory ○ Cell Theory	1-2
Unit 6: Bioenergetics		
SC.912.L.18.9	**Cellular Energy** ○ Cellular Respiration: anaerobic ○ Photosynthesis: reactants and products ○ Photosynthesis and Cellular Respiration Relationship ○ Role of ATP ○ Photosynthesis	1-3
Unit 7: Cell Reproduction		
SC.912.L.16.17	**Cell Division** ○ Mitosis: anaphase, telophase, prophase ○ Role of Meiosis: sexual reproduction ○ Role of Mitosis: asexual reproduction ○ Cell Cycle: M phase ○ Comparing Mitosis and Meiosis ○ Uncontrolled Cell Growth ○ Meiosis I & II: anaphase, prophase	2-5

3rd Quarter		
Unit 8:Reproductive System		
SC.912.L.16.13	**Human Reproduction:** ○ Human Development: fertilization to birth, first trimester, ○ Female Reproductive Organs ○ Male Reproductive Organs	1
Unit 9: Genetics		
SC.912.L.16.1	**Mendel's Law of Segregation & Independent Assortment** ○ Codominance ○ Multiple Alleles ○ Analyzing Patterns of Inheritance ○ Determine Genotypes ○ Polygenic Inheritance ○ Sex-linked inheritance ○ Incomplete Dominance	2-4
Unit 10: DNA		
SC.912.L.16.3	**Protein Synthesis** ○ DNA Replication ○ Gene Mutation ○ Similarities in Genetic Codes ○ Translation ○ Transcription ○ Chromosomal Mutation	2-4
4th Quarter		
Unit 11: Biotechnology		
SC.912.L.16.10	**Use of Biotechnology:** ○ Impact of Biotechnology: in individuals, society, environment	1-2
Unit 12: Body Systems		
SC.912.L.14.52	**Immune Response** ○ Significance of: Genetic Factors, Pathogenic Agents, Environmental Factors ○ Immune System: non-specific response, specific response ○ Vaccines	1-3
SC.912.L.14.26	**The Brain** ○ Brain stem ○ Frontal Lobe ○ Cerebrum ○ Occipital Lobe	1
SC.912.L.14.36	**Cardiovascular System**: ○ Blood Pressure ○ Disease ○ Blood Viscosity ○ Resistance ○ Exercise	1
Unit 13: Plants		
SC.912.L.14.7	**Plant Physiology** ○ Plant Structures: photosynthesis, vascular tissue, reproduction ○ Plants: stem, roots, leaves, cones	1-2
Unit 14: Evolution & Natural Selection		
SC.912.L.15.1	**Support of Scientific Theory of Evolution** ○ Evaluating Scientific Claims: evolution ○ Evidence for Evolution: molecular biology, fossil record, comparative embryology, biogeography, observable changes, comparative anatomy ○ Identifying what is science: evolution ○ Trends in hominid evolution: brain size, skull shape	2-4

SC.912.L.15.13	**Conditions Required for Evolution** ○ Gene Flow ○ Increasing Genetic Variation ○ Inherited Variations ○ Overproduction of Offspring ○ Nonrandom Mating ○ Genetic Drift	2-4
Unit:15: Origin of Life		
SC.912.L.15.8	**Scientific Explanation for Life on Earth** ○ Evaluating sources of Info: origins of life ○ Evaluating Scientific Claims: origins of life ○ Scientific Explanations for Life on Earth ○ Conditions Required for Life	1-2
Unit 16: Classification		
SC.912.L.15.6	**Characteristics of Domains & Kingdoms** ○ Changes in Organism Classification ○ Distinguish Characteristics: Plantae, Archaea, Fungi, Animalia ○ Understanding Classification	2-3
Tested in All Units!!!!		
SC.912.N.1.1	**Scientific Processes and Reasoning:** ○ Defending Conclusions ○ Designing Scientific Investigations ○ Evaluating Scientific Investigations ○ Analyzing Data ○ Making Inferences ○ Comparing Microscopes: structures	5-9