

Name: _____

Organic Molecules: Vocabulary

Subunits:

- Proteins** 1) Made up of Amino Acids
- Nucleic acids** 2) Made up of Nucleotides
- Lipids** 3) Made up of 1 Glycerol and 3 Fatty Acids
- Carbohydrates** 4) Made up of Simple Sugars

Functions:

- Proteins** 1) Used to transport materials through cell membranes, transport oxygen in blood, speed up chemical reactions, regulate cell metabolism, etc.
- Nucleic acid** 2) Used to encode genetic (hereditary) information.
- Carbs** 3) Used as a short-term energy source.
- Lipids** 4) Used as a long-term energy source, waterproofing.

Examples:

- 1) Carbohydrate Examples
 - a. Monomer Example (Monosaccharides): Sugar
 - b. Polymer Examples (Polysaccharides):
 - i. amylose : energy storage for plants
 - ii. cellulose : found in cell walls of plants & used for structural support
 - iii. glycogen : energy storage for animals

2) Protein Examples

- a. Hemoglobin : used to transport oxygen through the blood
- b. Insulin : used to regulate amount of glucose in blood
- c. Enzyme : used as a catalyst to speed up chemical reactions; can be denatured (preventing it from working) if there are changes in temp or pH
 - Examples are lactase which breaks down lactose and pepsin which is found in the stomach & works best at pH = 2.

3) Nucleic Acid Examples

- a. DNA : Found in the nucleus; contains instructions for organism; replicates when cells divide; passed on from one generation to the next.
- b. mRNA : Makes copies of parts of DNA; travels out of nucleus and to ribosomes where proteins are made; carries amino acids to ribosomes.

4) Lipid Examples: FATS and oils (waxes)

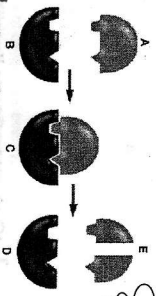
Organic Molecules: Diagrams

1) Identify the following in the diagram (can be used more than once): enzyme, substrate, product

- A) SUBSTRATE
- B) ENZYME
- C) ENZYME
- D) ENZYME
- E) PRODUCT

2) Interpret the Graphs:

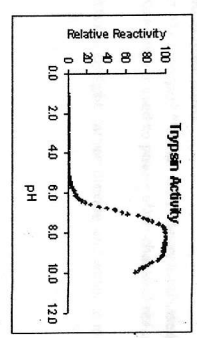
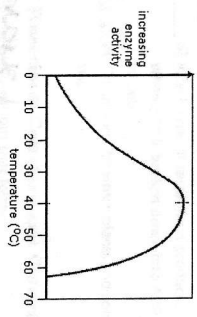
- a. At what pH range will enzyme activity be optimal? 7-9
- b. At what temperature will the speed of the reaction be greatest? 40°



Remember, enzymes are reusable and specific to their substrate!

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c. At a temperature of 30°C, will the reaction rate be faster or slower than the rate at 20°C? Faster



3) Label the pH Scale with: neutral, strong acid, strong base, weak acid, weak base

Strong Acid	Weak acid	Neutral	Weak base	Strong base										
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Battery acid	HCl	lemon juice	acid vinegar	rain	coffee	orange juice	pure water	sea water	baking soda	ammonia solution	soapy water	bleach	Drain cleaner	

- a. High pH (big number) means that it is a strong (acid or base)? Base
- b. Low pH (small number) means that it is a strong (acid or base)? Acid
- c. A Buffer is used to maintain a constant pH in the internal environment of a cell so that enzymes in the cell will function well and chemical reactions will take place at normal rates. This is an example of the need for maintaining homeostasis.

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Living Cells: Vocabulary

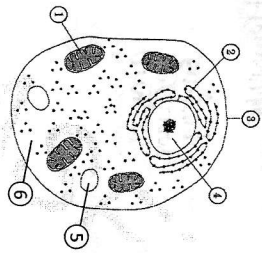
- 1) Prokaryotic cells do NOT contain any membrane-bound organelles. These very simple cells typically contain only 4 parts (Remember NONE of these are membrane-bound organelles!): (1) DNA, (2) Wall, (3) Membrane, (4) Cytoplasm Ribosomes
- 2) Bacteria are the only organisms that have prokaryotic cells.
- 3) Eukaryotic cells contain membrane-bound organelles. Both Plant and Animal have these types of cells.
- 4) The Endosymbiont theory explains how eukaryotic cells arose. This theory explains the origin of these 2 organelles: Mitochondria and Chloroplasts. We think that these 2 organelles were once separate prokaryotes because they contain their own DNA. All cells within an organism contain same DNA, yet some cells have specialized functions. Cells gain their specialization when genes are turned on or off during differentiation.

Organelle Functions:

- Plasma Mem. 1) Regulates what enters and leaves cell
- Cell Wall 2) Provides structural support in plant cells
- Vacuole 3) Store water; are especially large in plants
- Chloroplasts 4) Where photosynthesis takes place
- Chloroplasts 5) Contains chlorophyll (responsible for trapping light energy; green in color)
- Chloroplasts 6) Where sugar is made from light energy, carbon dioxide, and water
- Mitochondria 7) Where aerobic respiration takes place
- Mitochondria 8) Where sugar is broken down and energy is stored as ATP
- Nucleus 9) Contains the instructions for the cell's functioning (contains DNA)
- Nucleus 10) Where DNA replication takes place
- Nucleus 11) Where DNA is transcribed into mRNA
- Ribosomes 12) Where proteins are made (protein synthesis)
- Ribosomes 13) Hold organelles; where anaerobic respiration begins
- Cytoskeleton 14) Hairlike structures used for movement; found along respiratory system and in some protists
- Cilia 15) Whiplike structure used for movement; found on sperm and some protists
- Flagella

Living Cells: Diagrams

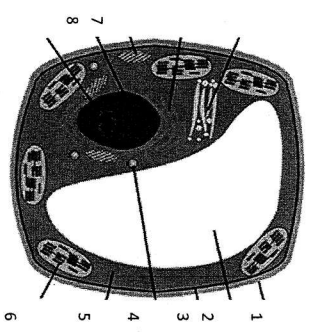
World Bank for all 3 diagrams: cell wall, chloroplast, cytoplasm, mitochondria, nucleus, plasma membrane, ribosome, vacuole, DNA



- 1) Mitochondria
- 2) Ribosomes
- 3) Plasma membrane
- 4) Nucleus
- 5) Vacuole
- 6) Cytoplasm

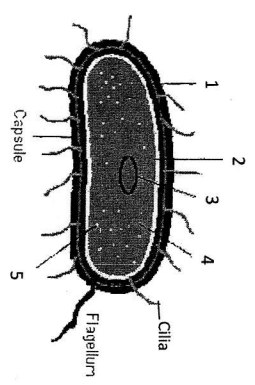
DIAGRAM #1

Name: _____



- 1) Cell wall
- 2) Vacuole
- 3) Cell membrane
- 4) Ribosome
- 5) Cytoplasm
- 6) Chloroplast
- 7) Nucleus
- 8) Chromatin

DIAGRAM #2



- 1) Cell wall
- 2) Cell membrane
- 3) DNA (ring-shaped plasmid)
- 4) Cytoplasm
- 5) Ribosome
- 6) Prokaryotic cells are [larger or smaller?] than eukaryotic cells.

DIAGRAM #3

Identify the type of cell in the 3 diagrams above:

- 1) Which diagram is a prokaryotic cell? 3
- 2) Which diagram is a plant cell? 1
- 3) Which diagram is an animal cell? 2

What does a plant cell have that an animal cell does NOT?:

- 1) Cell wall
- 2) Chloroplasts
- 3) lg. vacuole

What does an animal cell have that a plant cell does NOT?:

Living Cells: Skills

- 1) What would the magnification of a cell be if the microscope's eyepiece lens was 10x and the objective lens was 30x? 300
- 2) Muscle cells require a lot of energy, therefore they must have many of which organelle? Mitochondria
- 3) Palisade mesophyll cells in leaves are responsible for photosynthesis. They have a lot of which organelle? Chloroplasts
- 4) nerve cells (neurons) transmit signals throughout the body and have a long, slender shape.

Semi-Permeable Plasma Membrane: Vocabulary

Transport Across the Plasma Membrane:
 1) In Passive transport, energy is NOT required. In this type of transport, materials can only move WITH the concentration gradient - from [high or low?] concentration to [high or low?] concentration.

- a. Types:
- Diffusion: when materials move from high to low concentration through the membrane.
 - Facilitated Diffusion (Passive Transport): when materials move from high to low concentration through the membrane, but require a channel protein to help them move through.
 - Osmosis: when water moves from high to low concentration through the membrane.

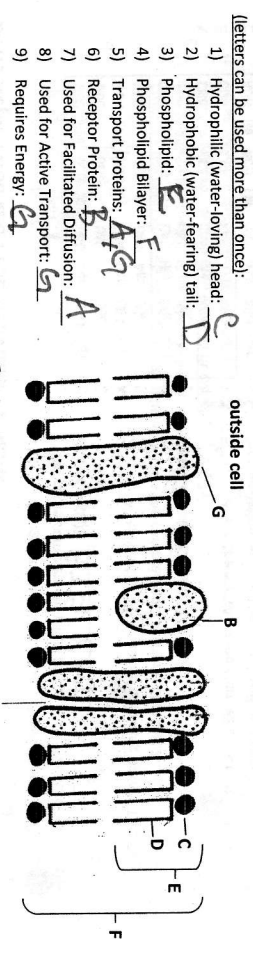
2) In Active transport, energy IS required. In this type of transport, materials can be moved AGAINST the concentration gradient - from [high or low?] concentration to [high or low?] concentration. Pump proteins are used to force materials to move from low concentration to high concentration. Energy in the form of ATP is needed.

Osmosis Examples:

- Does water move out or move in?
 a. When you soak in a bathtub, water moves into or out of your fingers making them look swollen.
 b. If your finger is swollen and you put it into salt water, water moves into or out of your finger.
 c. When you put wilted parsley in water, water moves into or out of the parsley.
- Does the cell shrink or expand?
 a. When a red blood cell is placed in distilled water: Expand
 b. When a red blood cell is placed in salt water: Shrink

Semi-Permeable Plasma Membrane: Diagrams

Write the appropriate letter:



- Water can go through this by osmosis: F
- Materials can go through this by simple diffusion: A

Cell Energy Reactions: Vocabulary

Respiration The process of breaking down sugar in the presence of oxygen for energy.
Anaerobic Respiration The process of breaking down sugar for energy without oxygen.
Alcoholic Fermentation out oxygen, carbon dioxide and ethanol are produced.

Lactic Acid This type of anaerobic respiration that occurs when your muscles run out of oxygen and results in an aching sensation.
Fermentation This type of anaerobic respiration that is used to make bread.
ATP 6) Which type of respiration produces the most ATP (energy)? *Remember, energy is released when ATP is broken down into ADP + P. This energy is used to power other chemical reactions in cells.
Photosynthesis The process by which plants and some protists use sunlight, carbon dioxide, and water to make sugar.

Cell Energy Reactions: Compare and Contrast

Complete the table and the questions that follow.

	Reactant #1	Reactant #2	Reactant #3	Product #1	Product #2	Product #3
Photosynthesis	<u>CO₂</u>	<u>H₂O</u>	<u>light</u>	<u>Glucose</u>	<u>O₂</u>	
Aerobic Respiration	<u>Glucose</u>	<u>O₂</u>		<u>CO₂</u>	<u>H₂O</u>	<u>ATP (36)</u>
Anaerobic Respiration:						
Lactic Acid Fermentation	<u>Glucose</u>			<u>Lactic Acid</u>	<u>ATP</u>	
Alcoholic Fermentation	<u>Glucose</u>			<u>Alcohol</u>	<u>ATP</u>	<u>CO₂</u>

- The goal of photosynthesis is to produce: SUGAR (Glucose)
- The goal of respiration is break down SUGAR to obtain Energy in the form of ATP.
- What gas is produced by photosynthesis that is needed for aerobic respiration? O₂
- What gas is taken out of the atmosphere by photosynthesis but is released into the atmosphere by aerobic respiration? CO₂
- What gas is thought to cause the greenhouse effect (and global warming)? Carbon dioxide
- Do all organisms use photosynthesis? Yes or No?
- Do all organisms use respiration? Yes or No?
- If an organism does not use photosynthesis to make sugar, how does it get the sugar it needs for respiration?
Consumes others

DNA Replication and Protein Synthesis: Vocabulary

- The process of copying DNA to create 2 identical daughter DNA molecules is called replication.
 - Helicase unravels the DNA and unzips the hydrogen bonds that connect the nitrogenous bases together.
 - When DNA polymerase makes a mistake while copying DNA, this is called a mutation.
 - Mistakes in DNA can cause a cell to divide rapidly without a limit which can result in cancer.
 - Copying DNA occurs during which phase of cell division: interphase (G₁, S, G₂), prophase, metaphase, anaphase, telophase, or cytokinesis? S phase of interphase
- The process of making proteins is called protein synthesis. There are two steps in this process:
 - In the first step, a segment of DNA is unraveled and mRNA makes a copy of a DNA segment. This is called transcription.
 - In the second step, the mRNA travels out of the nucleus to a ribosome where tRNA brings amino acids and connects them with peptide bonds to form a protein. This process is called translation.

DNA Replication and Protein Synthesis: Skills

1) A segment of DNA has the following bases: TAC GCA. What is the complementary strand of DNA (the other side of the double helix)? ATG CGT

2) A segment of DNA has the following bases: TAC GCA. What is the complementary strand of mRNA? AUG CGU

3) When the mRNA strand from #2 goes to the ribosome for translation, what is the amino acid sequence? MET ARG

4) What is the amino acid sequence from this DNA strand TAC CGT TCA: MET ARG SER

5) If the DNA strand is TAC CAA CCA, what are the complementary mRNA codons? AUG GUU GGU

First base	A	C	G	U
U	Phe	UCU	Ser	UAU
U	UCU	UCC	Tyr	UGU
U	UUC	UAC	Cys	UGC
U	UUA	Leu	UCA	UUA
U	UUG	Leu	UGA	Der
U	UUG	Leu	UGA	UGA
C	Leu	CCU	Pro	CAU
C	CUU	CCC	His	CGU
C	CUA	CCA	Gln	CGA
C	CUU	CCG	Arg	CGC
C	CUA	CCA	Gln	CGA
C	CUU	CCG	Arg	CGC
A	Ile	ACU	Thr	AUU
A	ACC	ACC	Arg	AUG
A	ACA	AAA	Lys	AGA
A	AUA	Met	ACG	AAG
A	AUA	Met	ACG	AAG
G	Val	GUU	Ala	GAU
G	GUC	GCC	Asp	GGU
G	GUA	GCA	Glu	GGA
G	GUG	GCU	Gly	GGU

Cell Division – Mitosis and Meiosis: Vocabulary

- The division of the cell which produces two identical daughter cells with the same number of chromosomes as the original cell. Mitosis
- Starts with a diploid cell and ends with 2 diploid cells. Mitosis
- Starts with a diploid cell and ends with 4 haploid cells. Mitosis
- Cells with a set of chromosomes from each parent. Diploid
- Cells with half the normal number of chromosomes. Haploid

Meiosis 6) The division of a cell that produces four gametes – each with its own random assortment of alleles.

Cell Division – Mitosis and Meiosis: Diagrams

Mitosis: Number the pictures so they are in order.

1) How many cell divisions in mitosis: 1 or 2?

2) Is mitosis a part of Asexual or Sexual Reproduction? Asexual

3) What type of cells are produced in mitosis (haploid or diploid)? diploid

Meiosis: Use the pictures to remind you of the process. Answer the questions that follow.

1) How many cell divisions in meiosis: 1 or 2? 2

2) Is meiosis a part of Asexual or Sexual Reproduction? Sexual

3) What types of cells are produced in meiosis (haploid or diploid)? haploid

4) In both Mitosis and Meiosis, DNA must first undergo Replication

Sources of Genetic Variation during Mitosis & Meiosis: Vocabulary

- Genetic variation is important because the more variation there is within a species, the more likely the species will be able to survive environmental changes (evolve and adapt)!
- Independent Assortment** 1) When homologous chromosomes pair up during Metaphase I, the position of the maternal (mom) and paternal (dad) chromosomes are random.
- Crossing over** 2) When homologous chromosomes (one from mom, one from dad) pair up during Metaphase I, segments of homologous chromosomes can break off and switch places. [See picture to the right.]
- Mutations** 3) During DNA Replication (in interphase) mistakes can be made that change the sequence of amino acids in proteins (which can result in new adaptations!).
- Randomization** 4) When homologous chromosomes do not separate during Anaphase I.
- Fertilization** 5) When a random sperm meets a random egg (recombination of alleles).
- Genetics: Vocabulary**
- Complete dominant** 1) Recessive trait is completely hidden when a dominant allele is present (ex. Tt → tall plant)
- Incomplete dominant** 2) Results in the blending of traits (ex. pink flowers, medium height).
- Co-dominant** 3) Results in the expression of both traits. Ex. sickle cell anemia (AS → half are normal and half are sickled).
- Polyallelism** Ex. AB blood type (blood cells have both A and B antigens); Ex. roan cattle (brown and white)
- Recessive** 4) Gene has multiple (more than 2) alleles for a trait. Ex. Blood type – I^A, I^B, i
- Polygenic** 5) Traits that are controlled by more than one gene, resulting in lots of variation. Ex. Human skin & hair color
-

- 6) Traits that are found on the X chromosome, which results in a high % of males expressing the trait
 7) Used to determine the genotype of an individual expressing a dominant trait (is it AA or Aa?)
 8) Disease that is sex-linked; individuals' blood cannot clot
 9) Disease that is dominant; brain degeneration occurs
 10) Disease that is recessive; individuals cannot process phenylalanine and brain damage can occur

Genetics: Diagrams

- 1) Look at the diagram of the diploid cell with 2 pairs of homologous chromosomes to the right. What are the 4 possible gametes that can be created from this diploid cell (because of independent assortment)?

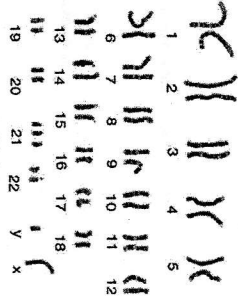


Draw the Four Possible Gametes:



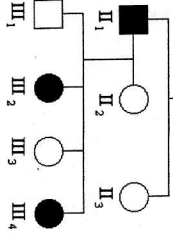
Use the **karotype** to answer the questions:

- 3) Is this person male or female? MALE
 4) This person suffers from Down Syndrome, a nondisjunction disease. What is the mistake in the number of chromosomes? 3



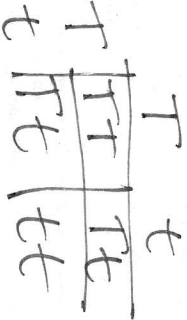
Use the **pedigrees** below to answer the questions:

- 1) Males are represented with squares or circles? Squares
 2) Females are represented with squares or circles? Circles
 3) The pedigree to the right is for the sex-linked recessive trait colorblindness (X^b). What are the genotypes for the individuals below?



Genetics: Skills

- 1) Two heterozygous tall plants are crossed.
 a. Punnett Square:
 b. What is the genotypic ratio? 1 TT: 2 Tt: 1 tt
 c. What is the phenotypic ratio? 3 tall: 1 short
 d. If T was incompletely dominant over t, what would the phenotype ratio be? 1 tall: 2 medium: 1 short



- 2) Huntington's disease (H) is a dominant autosomal (not sex-linked) disease. A heterozygous man with Huntington's disease marries a homozygous normal woman. Draw a Punnett Square to show their possible offspring.
 a. Punnett Square:
 b. What percentage of their offspring are likely to have Huntington's Disease? 50%

- 3) Normal wings (N) is dominant to vestigial wings (n). A male fruit fly with normal wings mates with a female that has vestigial wings. What are the genotypes of the parents if the offspring ALL have normal wings?
 a. Punnett Square (you may need to try more than one):
 b. Genotypes of Parents: Female: nn Male: Nn

- 4) Colorblindness is a sex-linked recessive trait (X^b). A normal male marries a female who is a carrier for colorblindness.
 a. Punnett Square:
 b. What percentage of all of their children are expected to be colorblind? 25%
 i. What percentage of the males will be colorblind? 0%
 ii. What percentage of the females will be colorblind? 0%

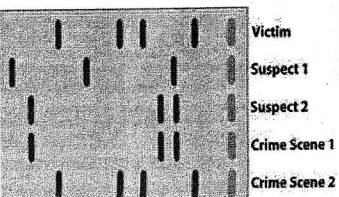
- 5) What are the possible blood types of the children of a mother with AB blood type and a father with heterozygous B blood type? (Hint: Use I^A, I^B, i)
 a. Punnett Square:
 b. Phenotypic ratio for the children: 1 Type A: 2 Type B: 1 Type AB: 0 Type O

DNA Technology: Vocabulary

- Electrophoresis** Separates DNA fragments by moving them through a gel with electricity.
Restriction Enzymes Used to cut DNA into small fragments.
Transformation An organism that contains DNA from a different organism - ex. a bacteria can be made to produce human insulin when a human gene is inserted in its plasmid DNA.
Genetically Modified Organism (GMO) An organism whose genes have been changed so it is now resistant to insects, cold, mosaic viruses, rotting, etc. - ex. Flavr Savr tomatoes
Human Genome Project Was developed to determine which genes are found on which chromosomes in humans.
DNA Fingerprinting Used to determine paternity and solve crimes.
Stem Cell Cells that have the potential to become any type of cell
Cloning An identical organism is created from the DNA of a parent organism.

DNA Technology: Skills

- DNA fingerprinting uses gel electrophoresis (separation of DNA fragments by moving them through a gel with electricity) to identify criminals. Who did the crime: Suspect 1 or Suspect 2?
2 Which suspect has the shortest fragments of DNA? 1



Behavior & Ecology: Vocabulary

Classify as "innate", "learned", or "social" Behavior:

- innate 1) Suckling
- learned 2) Habituation – Ex. Tapping on a table will initially cause a snail to pull back into its shell. Eventually, if nothing bad happens, the snail will habituate to the tapping and will stay out of its shell.
- innate 3) Positive phototactic response – Ex. Moths moving towards light
- social 4) Bees doing a waggle dance when they find food; Ants leaving trails of pheromones
- social 5) Territorial behavior – Ex. Male dogs urinating
- social 6) Male birds dancing to attract females (courtship)
- innate 7) Migration to warmer climates for feeding and reproduction during the winter.
- innate 8) Estivation – slowing of body processes in hot, dry climates.
- innate 9) Imprinting – Ex. baby geese attaching to their mother during a critical period.
- learned 10) Classical Conditioning – Ex. Pavlov's dogs associating a bell with the arrival of food.
- innate 11) Hibernation – slowing of body processes in cold climates.
- innate 12) Fight-or-Flight response
- learned 13) Mice finding food in a maze

Ecology Vocabulary

Identify the Type of Symbiotic Relationship: "Commensalism", "Mutualism", or "Parasitism"?

Type of Interaction	Effect on Organism X	Effect on Organism Y
A	Harms	Harms
B	Benefits	Harms
C	Benefits	No effects
D	Benefits	Benefits

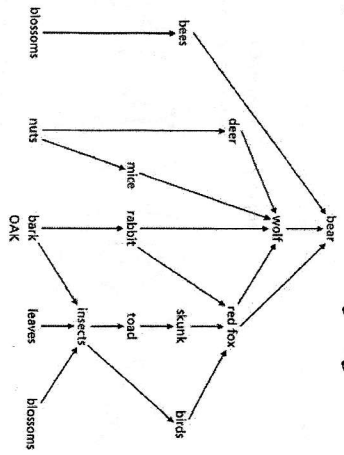
- B) PARASITISM
- C) COMMENSALISM
- D) MUTUALISM

Word Bank: abiotic, biotic, carnivores, consumers, decomposers, herbivores, producers

- abiotic 1) Nonliving factors that affect an organism – ex. weather, temperature, rain, soil composition
- biotic 2) Living factors that affect an organism – ex. other animals, plants, bacteria
- producers 3) Organisms that can make their own food
- consumers 4) Organisms that cannot make their own food
- decomposers 5) Organisms that break down dead organisms and return nutrients to the soil for plants to use.
- herbivore 6) Animals that eat plants.
- carnivore 7) Animals that eat other animals.

1) Put in order from smallest to largest: Community, Ecosystem, Organism, Population: Organism, Population, Community, Ecosystem

a. Which of these includes both biotic and abiotic factors? ecosystem



9) Which would have the greatest impact on this ecosystem: removal of mice or removal of insects?

10) List the five producers in the food web: blossoms, nuts, oak, leaves, blossoms

11) The bear is a tertiary consumer.

12) Which population in the food web would have the least amount of available energy? oak

13) Which populations in the food web would have the greatest amount of available energy? producers

14) There are usually no more than a few trophic levels in an ecosystem because energy transfer efficiency is only 10 %.

15) A population will reach carrying capacity when it is limited by limiting factors.

16) Carbon is a gas emitted when burning fossil fuels.

17) One result of rising CO2 levels is an increase in global warming.

18) Rising temperatures lead to Ocean Acidification.

Evolution & Classification: Vocabulary

Theory of Evolution, Natural Selection, and the Formation of New Species: The first living organisms were anaerobic bacteria because the early atmosphere did not have oxygen. These bacteria were very simple prokaryotic, i.e. they did not contain a nucleus or any other membrane-bound organelles. They reproduced asexually, which means that reproduction occurred when one bacteria divided into two identical daughter bacteria. There were not male and female bacteria. Therefore, the only variation between individual bacteria was due to mistakes during DNA replication. These mistakes are called mutations. Variation is very important in evolution because natural selection acts on the variation between individuals. The evolution of sexual reproduction resulted in more variation among individuals – due to crossing-over, random assortment of chromosomes, the meeting of a random sperm and egg during fertilization, etc. Natural selection selects for organisms that have the most adaptive traits and therefore can survive and produce more offspring to populate the next generation. This is why natural selection is also called survival of the fittest. New species arise when populations get separated from each other by geographical isolation (ex. a mountain range, a river, an island). In different environments (ex. east of the river vs. west of the river), different traits will be selected for and organisms with these adaptive traits will become more common in the population. Eventually, the two populations will be so different that individuals from each population will no longer be able to mate together and produce viable offspring (or hybrids). At this point, the two populations have achieved reproductive isolation and they are considered two separate species.

Organize these from largest taxon (most inclusive) to smallest (most specific) taxon:

Taxon Bank: Class, Domain, Family, Genus, Kingdom, Order, Phylum, Species

LARGEST Domain Kingdom Phylum Class Order Family Genus Species **SMALLEST**
 Classification: Linnaeus originally categorized all living things into 2 taxa: plants and animals.
 Today, there are 3 domains (Archaea, Bacteria, Eukarya) and 6 kingdoms (see table below).
 Fill in the Table:

	Archaea	Bacteria	Protists	Fungi	Plants	Animals
Prokaryotic or Eukaryotic?	Prokaryotic	Prokaryotic	Eukaryotic	Eukaryotic	Eukaryotic	Eukaryotic
Unicellular or Multicellular?	unicellular	unicellular	unicellular	multicellular	multicellular	multicellular
Autotroph or Heterotroph?				heterotrophic	autotrophic	heterotrophic
Mainly Sexual or Asexual Reproduction?	Asexual	Asexual	Asexual	Sexual	Sexual	Sexual

Organism Matching:

1. Unicellular photosynthetic eukaryotic organisms
2. Multicellular photosynthetic organisms whose cells have cell walls made of cellulose.
3. Multicellular heterotrophs (cannot make their own food) whose cells have cell walls made of chitin.
4. Multicellular heterotrophs that use external fertilization (ex. female frogs laying eggs and male frogs release their sperm over the eggs).

A) Amphibians
B) Bacteria
C) Fungi
D) Mammals
E) Plants
F) Protists
G) Viruses

5. Multicellular heterotrophs that can regulate their body temperature (endothermic) give birth to live offspring, produce milk with mammary glands, and have internal fertilization.
6. Prokaryotic unicellular organisms that sometimes cause diseases; Examples are streptococcus & staphylococcus.
7. Nonliving; Examples are HIV, influenza, smallpox

Random Reminders:

- Early mammal development: zygote → embryo → fetus
- Folds in the stomach lining and small intestine & villi (finger-like projections) in the small intestine increase the surface area to allow greater absorption of nutrients. Animals that breathe or absorb nutrients through their skin tend to have folds in skin to allow for greater surface area and greater absorption.

Genetics & Environment:

- 1) Sickle cell allele provides humans resistance to malaria which is caused by the protist parasite, Plasmodium.
- 2) Tobacco use can cause cancer.
- 3) Sunlight can cause skin cancer, but also causes your body to make much-needed vitamin D.
- 4) Smoking while pregnant can cause problems in the development of the fetus.
- 5) Diabetes is caused when the body cannot regulate the amount of glucose in the blood.
 - a. Glucose enters the blood stream when food is broken down in the digestive system.
 - b. Insulin is needed to remove glucose from the blood and transfer it to other body cells that use glucose for energy. The amount of insulin is determined by the endocrine system, the body system that regulates hormones.
- 6) People with PKU (phenylketonuria) cannot break down the amino acid phenylalanine; if this amino acid builds up in the body, it can cause brain damage.
- 7) Two environmental toxins that affect humans are mercury (found in fish like tuna) and lead (found in paint).

Immune System Matching:

1. Destroy infected cells
2. Produce antibodies and "remember" specific antigens so they can respond more quickly when infected by the same bacteria next time.
3. Produced by B-cells to prevent bacteria from being able to invade body cells.
4. A part of an infecting bacterium that is recognized by B-cells as foreign.
5. When antibodies are produced by the person that has been infected by bacteria
6. When antibodies are given to a person from a different source (ex. to a fetus from the mother).
7. Attenuated (heat-killed) bacteria/viruses given to a person to train their immune system

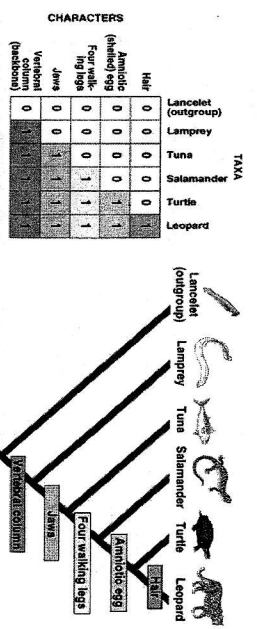
A) Active Immunity
B) Antibodies
C) Antigen
D) B-cells
E) Passive Immunity
F) T-cells
G) Vaccines

Evolution & Classification: Diagrams

Phylogenetic trees / Cladograms:

- 1) Which 2 species are most closely related? Turtles and leopards
- 2) Which organism was the first to evolve? Jawless fish
- 3) Which evolved first in evolutionary history: laws or hair? Jaws
- 4) Tuna and leopards have what characteristic in common? Jaws

Name: _____

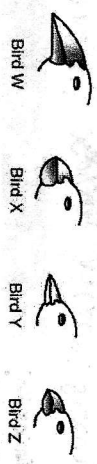


(a) Character table

(b) Cladogram

Dichotomous Keys:

- 1) What is the genus of Bird W? Geospiza
- 2) What is the genus of Bird X? Pipilo
- 3) What is the genus of Bird Y? Cathartes
- 4) What is the genus of Bird Z? Campephilus
- 5) What two genera probably have the closest evolutionary relationship? X and Z



Dichotomous Key to Representative Birds

1. a. The beak is relatively long and slender.....Cathartes
- b. The beak is relatively stout and heavy.....go to 2
2. a. The bottom surface of the lower beak is flat and straight.....Geospiza
- b. The bottom surface of the lower beak is curved.....go to 3
3. a. The lower edge of the upper beak has a distinct band.....Campephilus
- b. The lower edge of the upper beak is mostly flat.....Pipilo