Biology EOC Review Booklet

You will have a total of 11 questions from this concept.

REPORTING CATEGORY 1
CELL STRUCTURE & FUNCTION.

Need to know the function & type of cell

- DNA:
  - Deoxyribonucleic acid, contains genetic information (blueprint for proteins); found in all cells.
- Nucleus:
  - Membrane bound organelle, contains DNA; only found in eukaryotes
- Cell Membrane
  - Lipid bilayer (two layers), surrounds the cell and separate the cell from the rest of the world; found in all cells.

Need to know the function & type of cell

- Cell Wall:
  - Surrounds cell membrane, extra barrier for cell; found in plants cells, fungal cells, and bacterial cells
- Flagella:
  - Whip like tail used to move; found in some bacterial cells, sperm cells, some protists
- Ribosome:
  - Site of protein synthesis, made primarily of rRNA; found in all cells

Need to know the function & type of cell

- Mitochondria:
  - Site of cellular respiration, makes energy (ATP); found in eukaryotic cells
- Chloroplasts:
  - Site of photosynthesis; found in some bacterial cells, plant cells, some protists
- ER (endoplasmic reticulum):
  - Internal membrane system in cells in which lipid components of the cell membrane are assembled and some proteins are modified; found in eukaryotic cells

Need to know the function & type of cell

- Gogli Body/Apparatus:
  - Stack of membranes in the cell that modifies, sorts, and packages proteins from the ER; found in eukaryotic cells
- Lysosome:
  - Cell organelle filled with enzymes needed to break down certain materials in the cell; found in eukaryotes
- Prokaryote:
  - Cell with no nucleus or other membrane bound organelles; eubacteria and archaebacteria
- Eukaryote:
  - Cell with nucleus and organelles; includes plants, animals, fungi, and protists

Cell Structure & Function

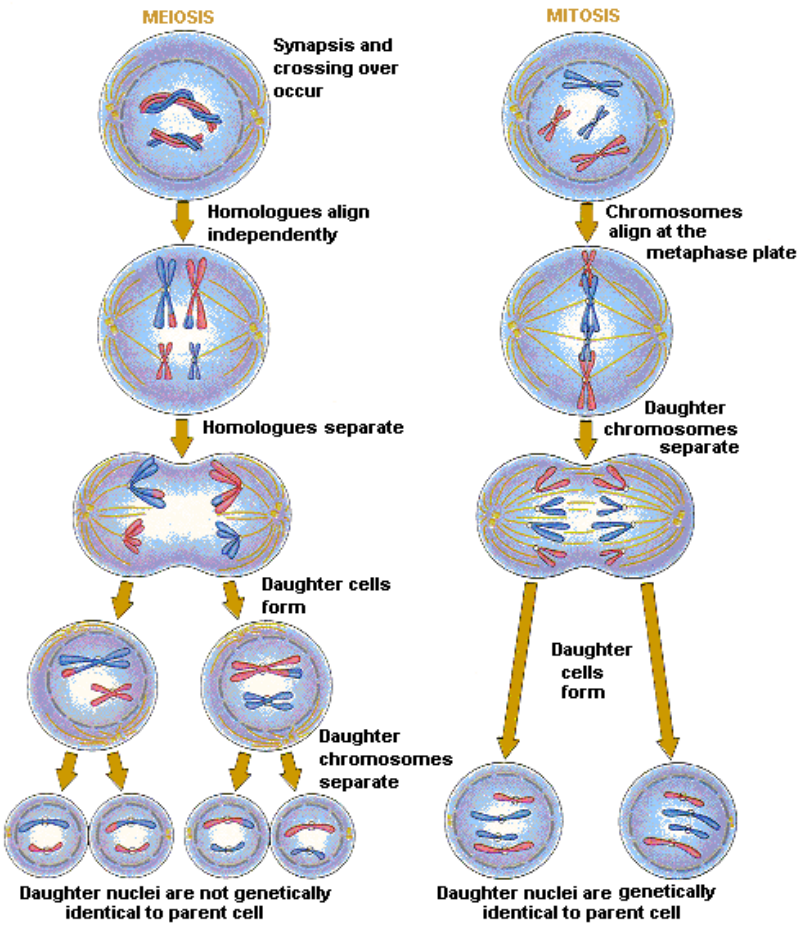
- Passive Transport:
  - movement of materials without using energy
- Osmosis:
  - Diffusion of water through a selectively permeable membrane (like across a cell membrane)
- Diffusion:
  - Process by which molecules tend to move from an area where they are more concentrated to an area where they are less concentrated.
- Facilitated Diffusion:
  - Movement of specific molecules across cell membranes through protein channels

Cell Structure & Function

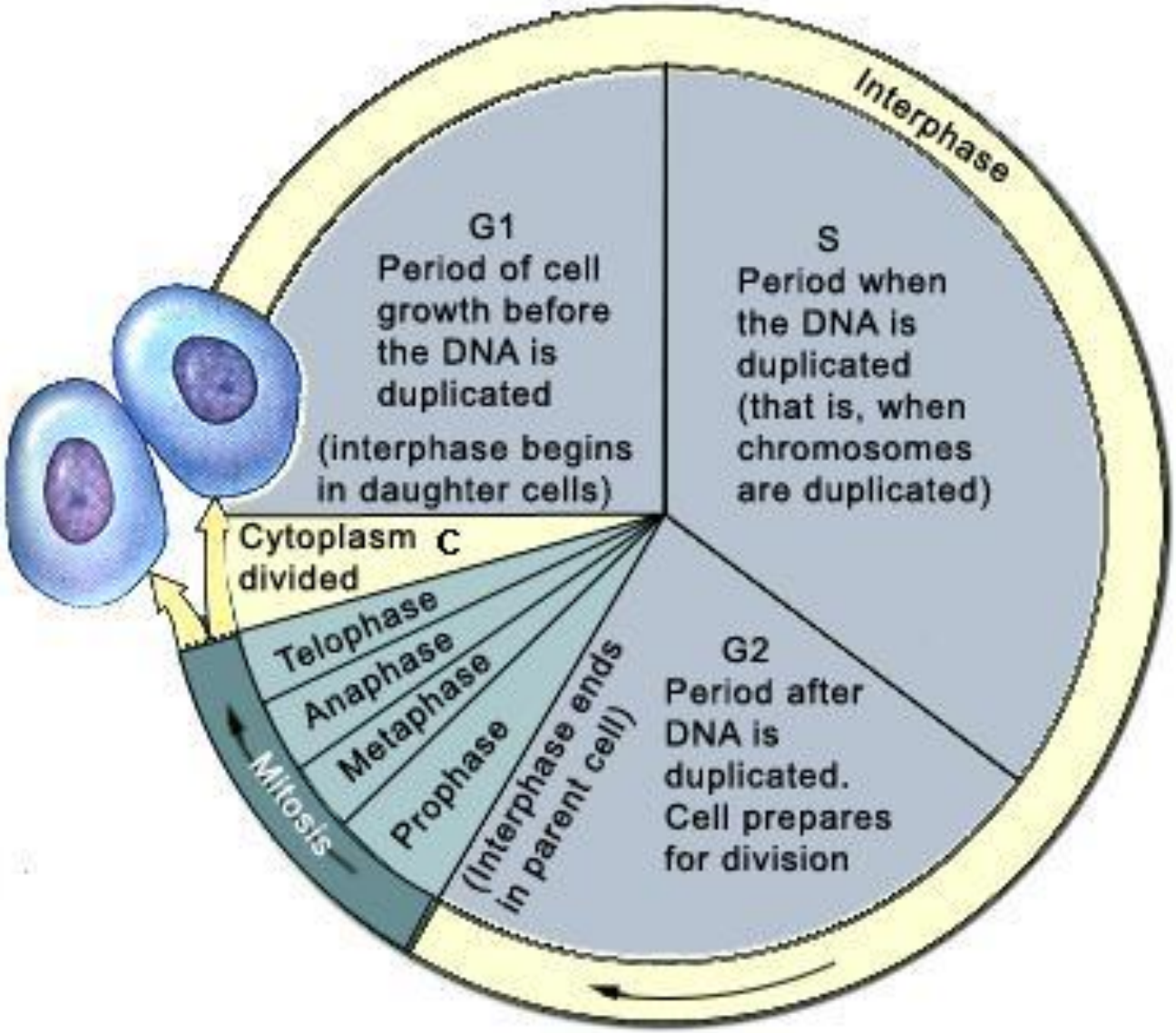
- Active Transport:
  - Energy-requiring process that moves materials across a cell membrane against a concentration difference. Includes phagocytosis and pinocytosis.

Cell Structure & Function

	Mitosis	Meiosis
What is the function? When does this happen?	To divide the nucleus Before the cell divides	To create sex cells Before cell division during interphase
How many cells are made?	2	4
Describe the cells (different or identical; haploid or diploid)	Identical & Diploid (2N) Somatic (body cells)	Different & haploid (N) Gametes (sex cells)



Label the Cell Cycle



Cell Structure & Function

- What is the cell cycle?
  - Series of events that cells go through as they grow and divide. Cancer is the result of an uncontrolled cell cycle.
- What happens if there is an error in the cell cycle?
  - The daughter cells will not have the correct information. A mutation has occurred.
- When is DNA replicated?
  - During S period (synthesis) of interphase
- What is cell differentiation?
  - When cells specialize in functions. Ex. Stem cells become bone cells, muscle cells and neurons

Plant Specialized Cells

- Leaves:
  - Collect sunlight for photosynthesis, gas (O_2/CO_2) exchange through the stomata.
- Stems:
  - Hold up leaves and flowers, contains vascular tissue (xylem & phloem)
- Xylem vs. Phloem:
  - Xylem – carries water up from the roots to the rest of the plant
  - Phloem – carries sugar from the leaves and nutrients from roots to the rest of the plant
- Roots:
  - Attach/anchor plant to the ground, absorb water and nutrients from the soil
- Flowers:
  - Seed-bearing structures, will sometimes produce fruit, attract pollinators (bees & butterflies) to the plant.

Cell Structure & Function

Viruses

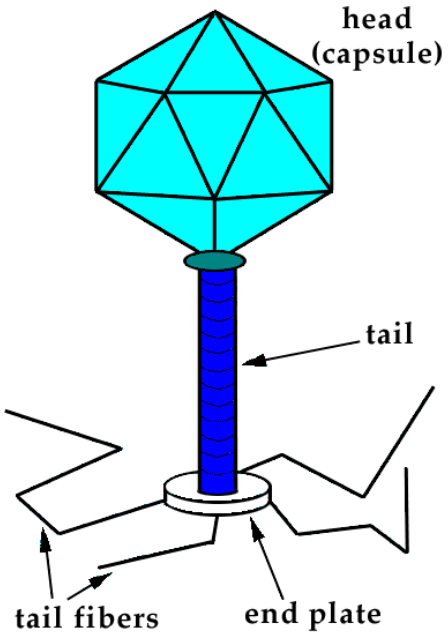
Why NOT alive?

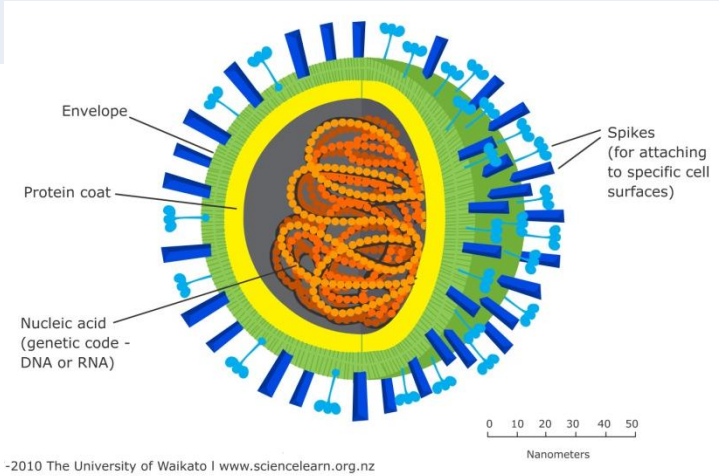
Viruses do not have all characteristics of living things. They are not made of cells, they do not maintain homeostasis, they do not obtain and use energy.

Components:

- Capsid (protein coat)
- Nucleic Acid (DNA or RNA)

Sketch it:

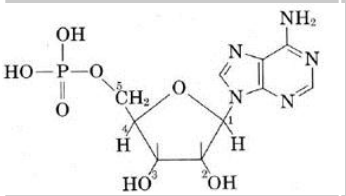
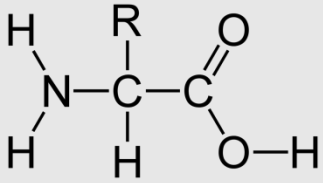
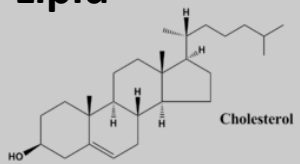
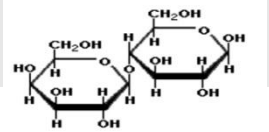




Examples:

- HIV
- Influenza
- Chicken pox
- Measles
- Mumps
- Polio
- Common cold
- Rabies

Cell Structure & Function

	Elements	Monomers	Functions
Nucleic Acid 	Carbon Hydrogen Oxygen Nitrogen Phosphorus Sulpher	•Phosphate group •Sugar (ribose or deoxyribose) •Nitrogenous base	Stores and transmits hereditary information
Protein 	Carbon Hydrogen Oxygen Nitrogen	Animo Acids	•Controls rate of reactions (enzymes) •Forms bones and muscles •Transports materials in and out of cells •Fights diseases
Lipid 	Carbon Hydrogen Oxygen	Glycerol Fatty Acids	•Building block of biological membranes •Makes coverings waterproof •Stores energy & provides insulation
Carbohydrate 	Carbon Hydrogen Oxygen	Monosaccarides	Provides most the energy for cell processes.

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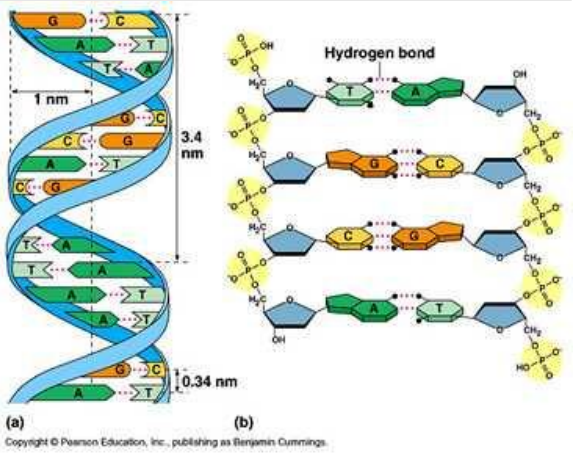
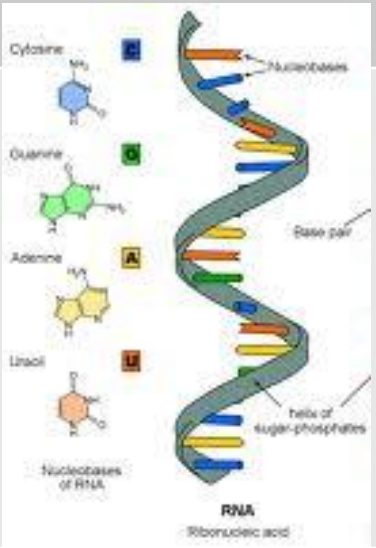
REPORTING CATEGORY 2 MECHANISMS OF GENETICS

Mechanisms of Genetics

	DNA	RNA
Name the nitrogenous bases	Adenine – Thymine Guanine – Cytosine	Adenine – Uracil Guanine – Cytosine
Double or single stranded	Double stranded	Single stranded
Type of sugar	Deoxyribose	Ribose
Draw the nulceotide		
Where is it found?	Nucleus	Nucleus, cytoplasm, ribosomes

Mechanisms of Genetics

- A change in DNA is called a:
  - MUTATION
- Types of Mutations
  - Insertion: when a base (or gene) is added;
    - ATATGGC
  - Deletion: when a base (or gene) is deleted;
    - ATTGC
  - Substitution: when a base (or gene) is change;
    - GTTGGC
  - Translocation: when bases (or genes) are moved;
    - GGCATT

Original DNA
ATTGGC

Mechanisms of Genetics

Replication

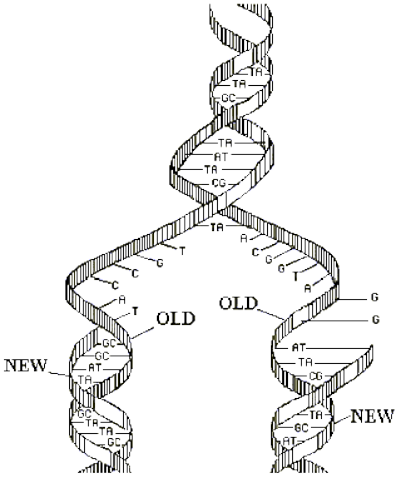
DNA to DNA.
Occurs in the nucleus.

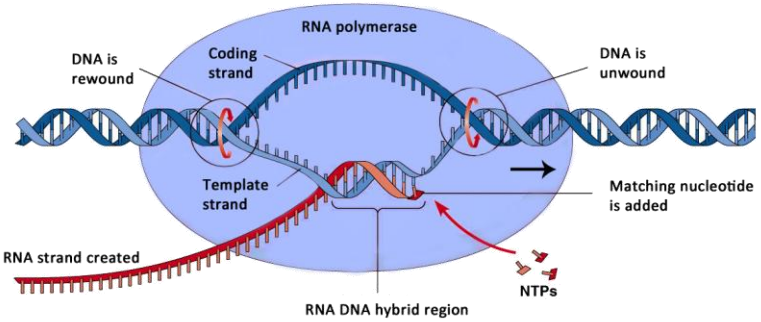
Transcription

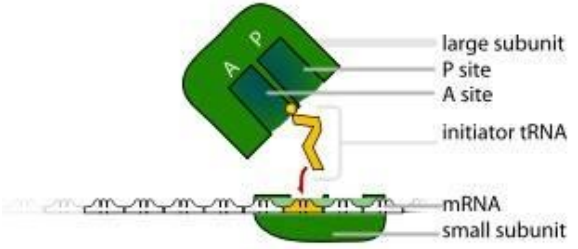
DNA to mRNA.
Occurs in the nucleus.
mRNA then leaves and travels to the ribosome.

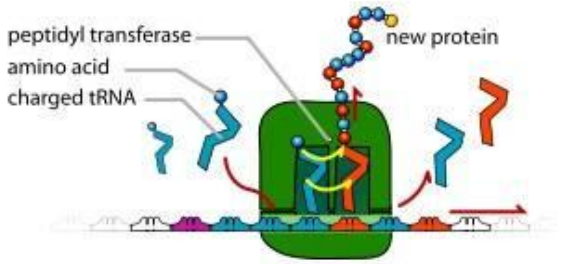
Translation

mRNA to protein.
Occurs on the ribosome.
rRNA and tRNA play a role in the process of translation.









Mechanisms of Genetics

- Dominant:
  - An allele is considered dominant when it hides or masks other alleles. Represented with CAPITAL letters.
- Recessive:
  - An allele is considered recessive when it can be expressed only if no other allele for that trait is present. Represent with lowercase letters.
- Homozygous:
  - Have two identical alleles for a trait. HH or hh
- Heterozygous:
  - Having two different alleles for a trait. Hh

Mechanisms of Genetics

- Allele:
  - An allele is a specific form of a gene
- Trait:
  - Characteristics of an organism; height, hair color, eye color, flower color, etc.
- Genes:
  - Genes are the parts of a chromosome that determine a specific trait of an organism.

Mechanisms of Genetics

- Genotype:
  - The genotype for an organism is represented by the actual alleles for a trait. Bb
- Phenotype:
  - The phenotype for an organism is the actual physical expression of the alleles, brown hair.

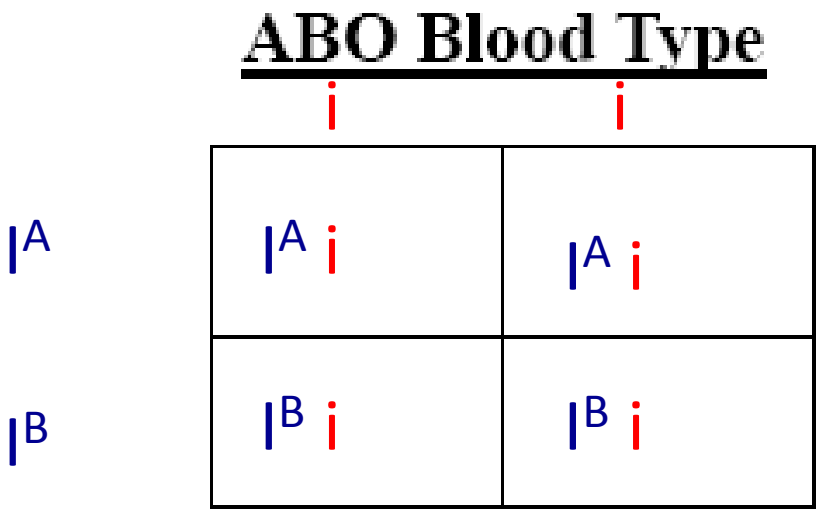
Punnett Squares

	H	h
H	HH	Hh
h	Hh	hh

Punnett Squares

A and B are codominant.
O is recessive to both A and B

Example: A man with AB blood marries a woman with O blood. What are the possible genotypes of their children



Punnett Squares

Sex-linked traits are genes that are carried only on the X chromosome. Males are more likely to have a sex-linked trait because they only have one X chromosome.

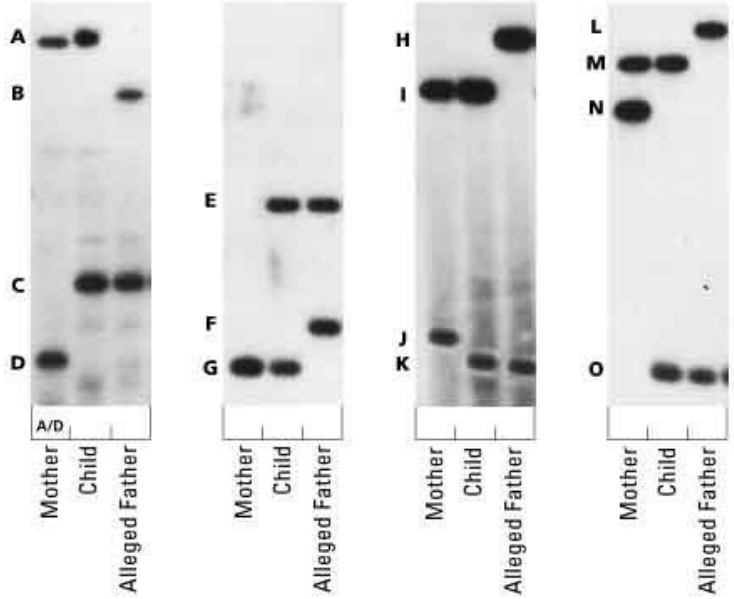
Hemophilia and color-blindness are examples of sex linked traits.

Sex-Linked Trait

	X^B	Y
X^B	X^BX^B	X^BY
X^b	X^B X^b	X^bY

Mechanisms of Genetics

- DNA Fingerprinting:
  - A method to compare DNA samples. Can be used to determine paternity or solve crimes.



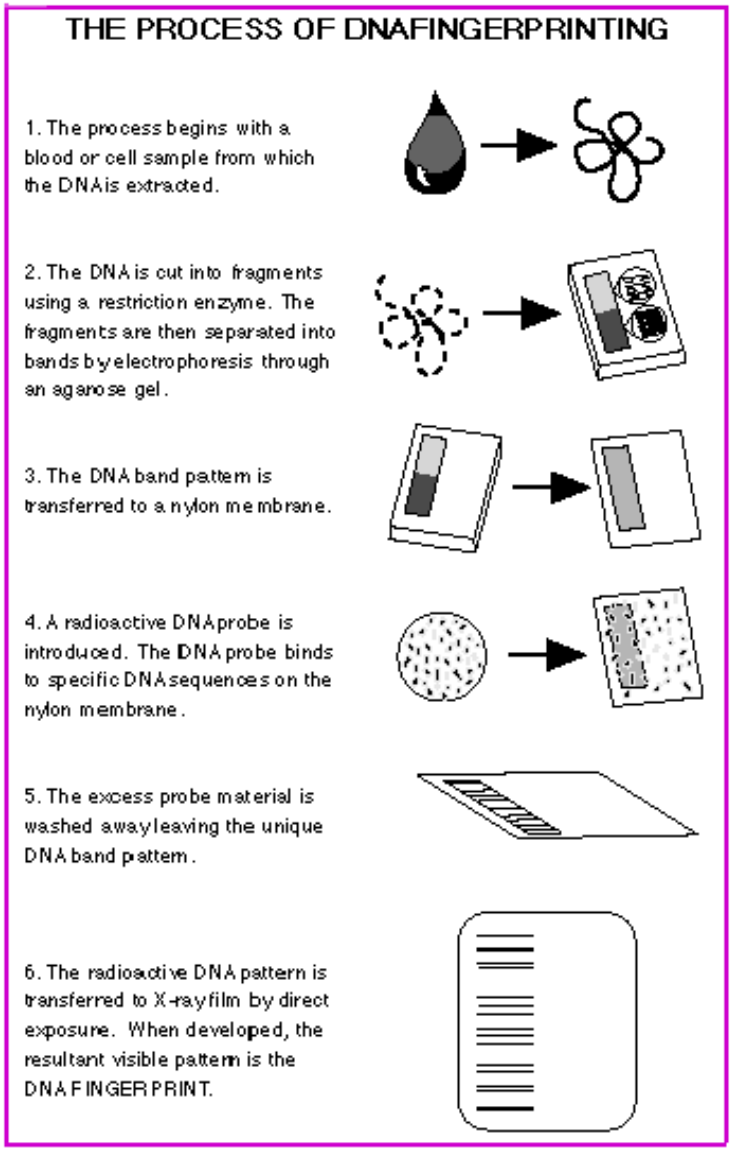
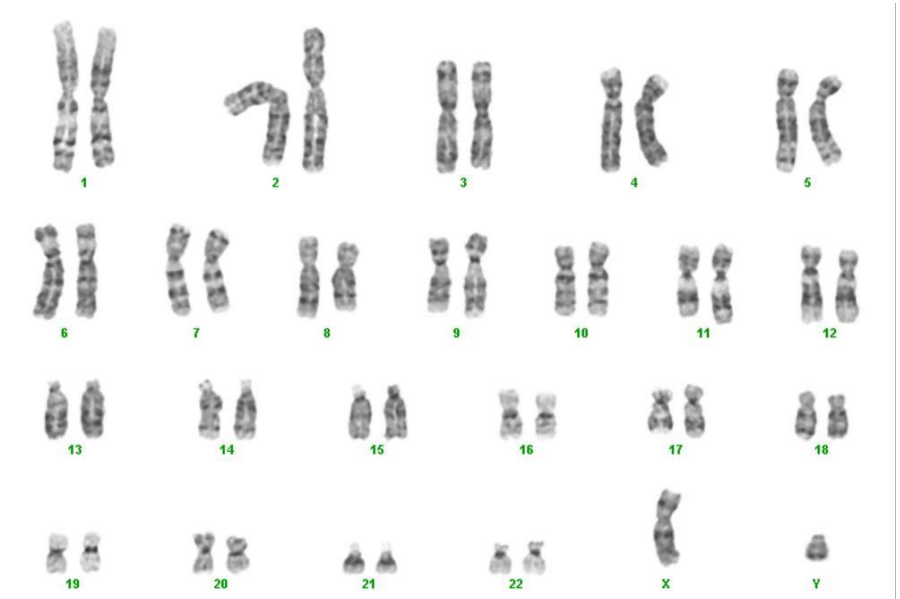


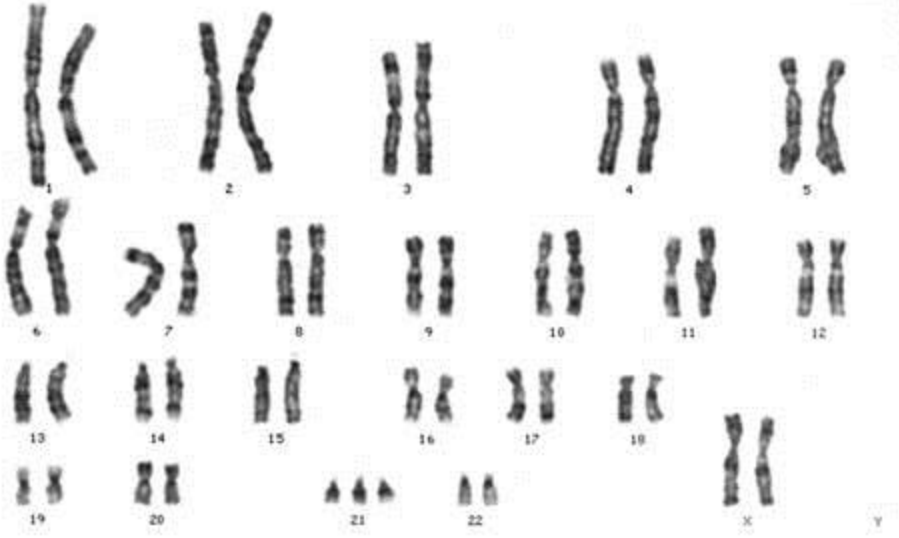
Figure 3.

Mechanisms of Genetics

- Karyotype/Chromosomal Analysis:
  - Picture of a person's homologous chromosomes, can be used to determine chromosomal mutations and disorders.



Normal Male



Female with Down's Syndrome (trisomy 21)

Mechanisms of Genetics

- Genetic Engineering/Modifications:
  - Uses viruses to insert beneficial genes into other organisms.
  - Commonly used in agriculture to make plants that are resistant to weed killers.

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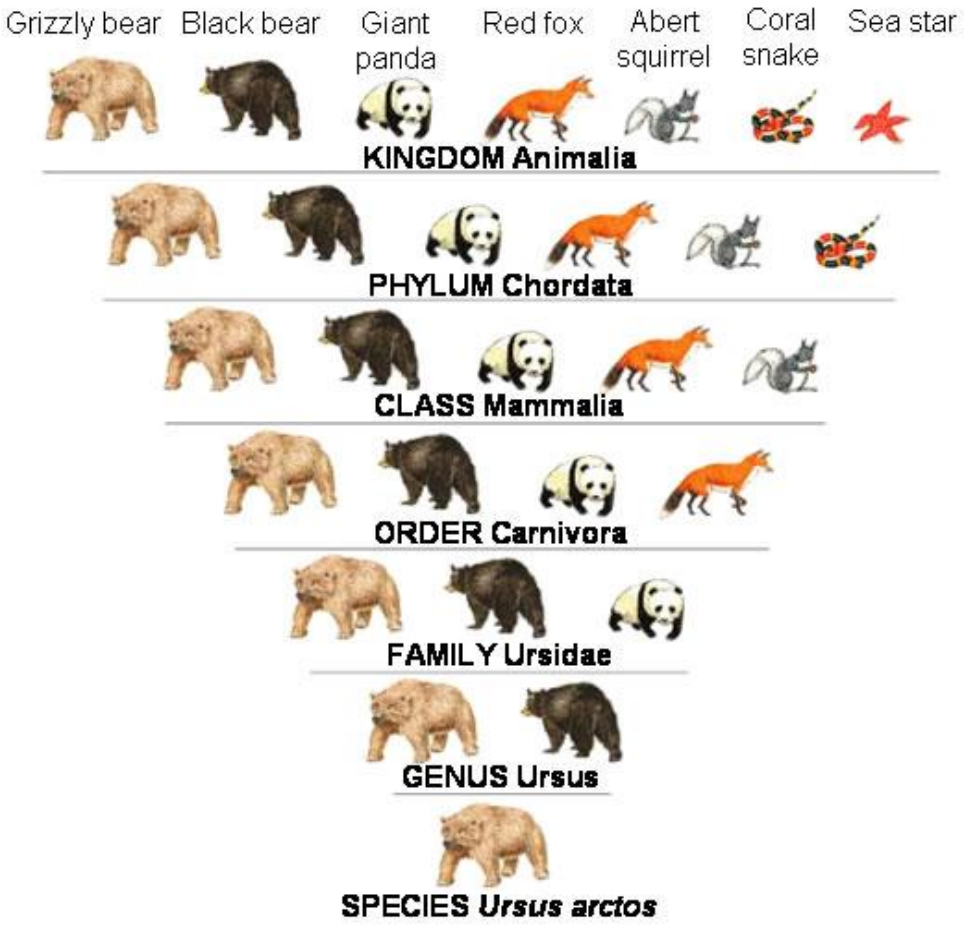
REPORTING CATEGORY 3 BIOLOGICAL EVOLUTION AND CLASSIFICATION

- DOMAIN Eukarya



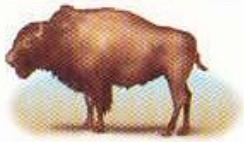
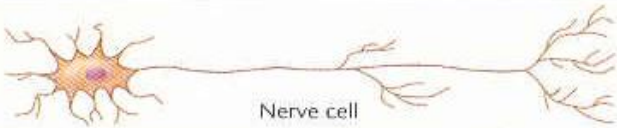
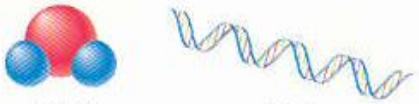
- What is a scientific name?
  - A name used by scientists, especially the taxonomic name of an organism that consists of the genus and species. Scientific names usually come from Latin or Greek. An example is *Homo sapiens,* the scientific name for humans.
- Binomial nomenclature?
  - A two part name including the *Genus* and *species* names of an organisms

Classification of Living Things

DOMAIN	Bacteria	Archaea	Eukarya			
KINGDOM	Eubacteria	Archaebacteria	Protista	Fungi	Plantae	Animalia
CELL TYPE	Prokaryote	Prokaryote	Eukaryote	Eukaryote	Eukaryote	Eukaryote
CELL STRUCTURES	Cell walls with peptidoglycan	Cell walls without peptidoglycan	Cell walls of cellulose in some; some have chloroplasts	Cell walls of chitin	Cell walls of cellulose; chloroplasts	No cell walls or chloroplasts
NUMBER OF CELLS	Unicellular	Unicellular	Most unicellular; some colonial; some multicellular	Most multicellular; some unicellular	Multicellular	Multicellular
MODE OF NUTRITION	Autotroph or heterotroph	Autotroph or heterotroph	Autotroph or heterotroph	Heterotroph	Autotroph	Heterotroph
EXAMPLES	*Streptococcus*, *Escherichia coli*	Methanogens, halophiles	*Amoeba*, *Paramecium*, slime molds, giant kelp	Mushrooms, yeasts	Mosses, ferns, flowering plants	Sponges, worms, insects, fishes, mammals

Levels of Organization
from atom to biosphere:

- Atom (smallest)
- Molecule
- Organelle
- Cell
- Tissue
- Organ
- Organ System
- Organism
- Population
- Community
- Ecosystem
- Biosphere (largest)

Biosphere	The part of Earth that contains all ecosystems	 Biosphere
Ecosystem	Community and its nonliving surroundings	 Hawk, snake, bison, prairie dog, grass, stream, rocks, air
Community	Populations that live together in a defined area	 Hawk, snake, bison, prairie dog, grass
Population	Group of organisms of one type that live in the same area	 Bison herd
Organism	Individual living thing	 Bison
Groups of Cells	Tissues, organs, and organ systems	 Nervous tissue Brain Nervous system
Cells	Smallest functional unit of life	 Nerve cell
Molecules	Groups of atoms; smallest unit of most chemical compounds	 Water DNA

What evidence supports the idea of Common Ancestry?

- Shared homologies (similarities)
  - Fossil record
  - Biochemistry (amino acid sequence)
  - Embryology
  - Homologous Anatomical Structures

Natural selection changes populations NOT individuals!

- How does natural selection to adaptations develop diversity in species?
  - Different populations can adapt to different habitats.
- What is an adaptation?
  - A variation that is favorable to the organisms survival. In forests with dark trees it is an adaptation to have dark colored wings.

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REPORTING CATEGORY 4
BIOLOGICAL PROCESSES AND SYSTEMS

Photosynthesis

- Organelle involved:
  - Chloroplast
- Equation:
  - $6CO_2 + 6H_2O + \text{light} + \text{chlorophyll} \rightarrow C_6H_{12}O_6 + 6O_2$
- In simple English this means:
  - Water and carbon dioxide (from the air) are combine to make sugar (glucose) and oxygen. Light and chlorophyll must be present.
- Occurs in what type of cells:
  - Plants, some plant-like protists & blue-green algae
- Why it is important:
  - Autotrophs gather energy from the sun. This energy then is passed through the food web.

Cellular Respiration

- Organelle involved:
  - Mitochondria
- Equation:
  - $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ + energy (ATP)
- In simple English this means:
  - Sugars and oxygen are broken down into carbon dioxide, water and energy
- Occurs in what type of cells:
  - All cells (plants, animals, bacteria, fungi & protists)
- Why it is important:
  - Transforms energy stored in the bonds of carbohydrates into a form usable by the cell (ATP)

Interactions of Animal Body Systems

What body systems work together to do the following tasks? Explain.

Regulation/Homeostasis	**Nutrient Absorption**
Nervous System & Endocrine System The brain sends electrical signals the body to control body temperature, blood sugar, etc. Certain glands also sends hormones (chemical signals) to help regulate homeostasis.	*Digestive System & Circulatory System* The digestive organs break down food into small pieces to be used by cells. The blood vessels absorb the nutrients from the food from the small intestine and carry it throughout the body.
Reproduction	**Defense from injury/illness**
Endocrine System & Reproductive System Hormones (testosterone and estrogen) control when a person goes through puberty. These same hormones also control the production of gametes (sperm and eggs).	*Immune System & Integumentary System* The white blood cells attack and kill invaders (bacteria, viruses, etc.). The skin and hair protects the body from physical injury. Some animals have claws that are used in defense.

Interactions of PLANT Systems

What body systems work together to do the following tasks? Explain.

Transport Vasular tissues carry water from roots and sugars from leaves to the rest of the plant.	**Response** Plants have hormones. These hormones can cause buds to open into flowers, some plants can close their leaves as well (thigmotrophism). Hormones also cause roots to grow downward (gravitotropism) and stems to grow towards the light (phototropism).
Reproduction Flowers contain the gametes. Pollinators spread pollen (male gamete) between different flowers. The stems and leaves support the flowers.	**Co-evolution with birds/bugs** Flowers are brightly colored and scented to attract pollinators (birds and bugs)

You will have a total of 11 questions from this concept.

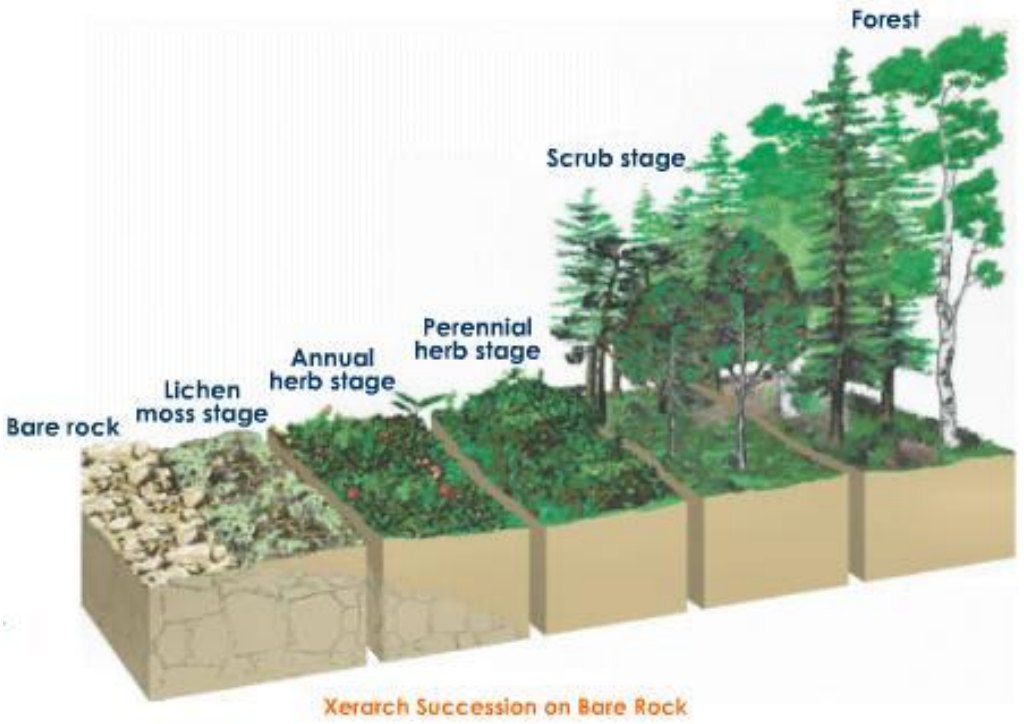
REPORTING CATEGORY 5 INTERDEPENDENCE WITHIN ENVIRONMENTAL SYSTEMS

Interpret Relationships

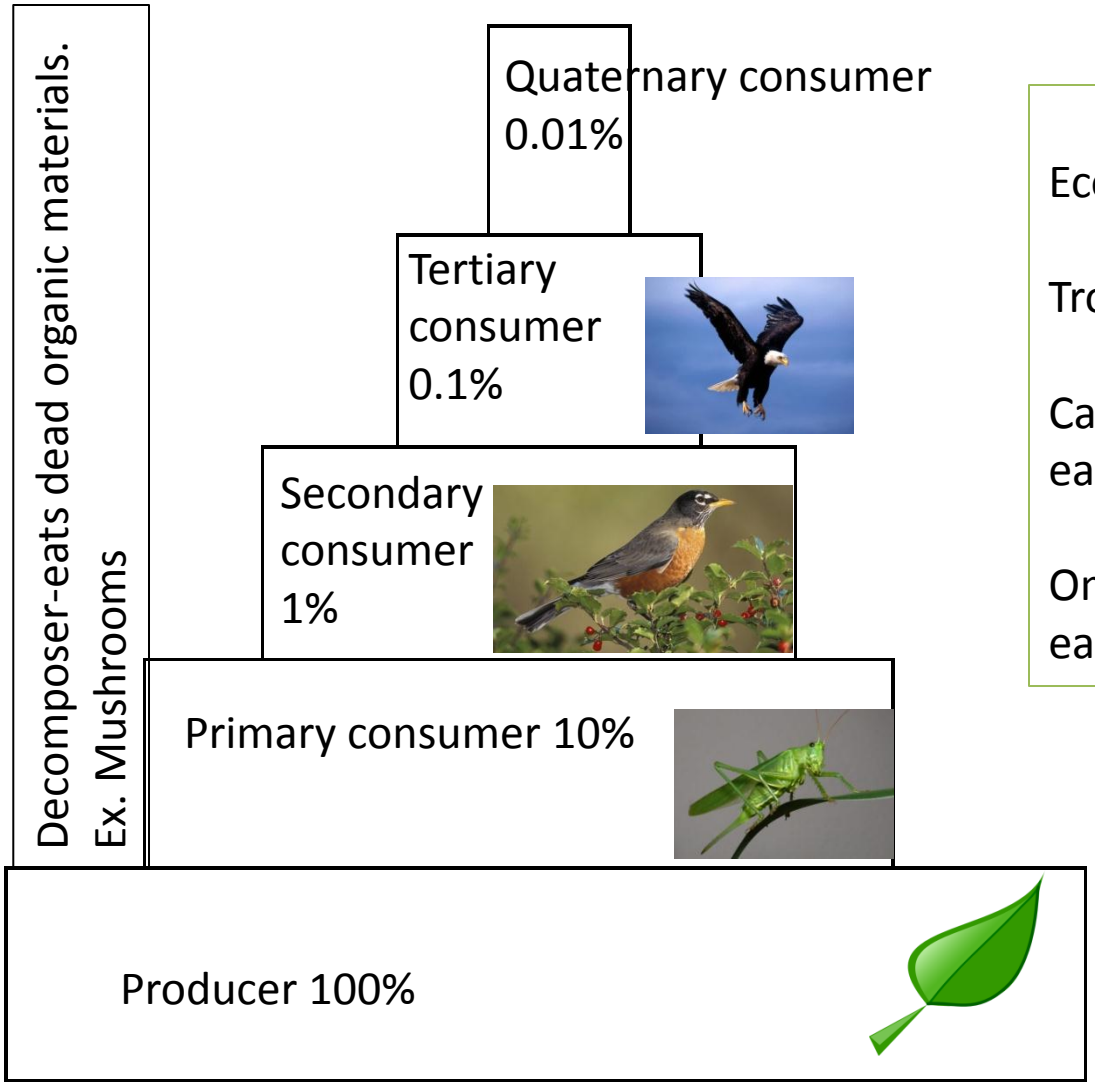
Relationship	Description	Example
Predation	One organism kills and eats another organism.	Snake and mouse 
Parasitism	One organism (host) is harmed and the other organism (parasite) is benefited.	Dog and flea 
Commensalism	One organism is benefited, but the other is not harmed.	Cattle and egret 
Mutualism	Both organisms benefit by living together.	Bees and flowers 
Competition	When two organisms try to use the same resources.	Vultures fighting over food 

How can ecological succession change populations?

- Different populations of plants will replace others as soil condition improve on new rock or after disasters like a forest fire.



Interdependence within Environmental Systems



Definitions

Ecological Pyramid:

Tropic Level:

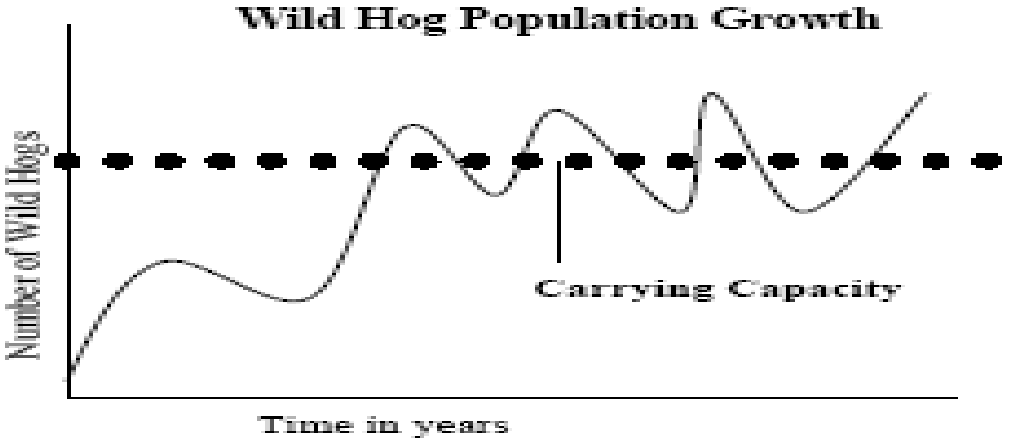
Carnivore: Animal that eats only meat

Omnivore: Animal that eats plants and meat.

Reporting Category 5

Interdependence within Environmental Systems. You will have a total of 11 questions from this concept.

Survival of Species



Limiting Factors:

Factors that can reduce the population size; such as space, food, water and shelter

Capstone Species:

The top predator in an ecosystem. Sea otters are the capstone species in a kelp forest. Without sea otter, urchins would destroy the kelp habitat.

Biotic Potential vs. Carrying Capacity:

Few populations can live up to their **biotic potential** = where conditions are ideal, every member has food, shelter, no predators or pathogens in the environment, maximum reproduction. **Carrying capacity:** maximum number of individuals an environment's resources can sustain

Process Skills

This information is not going to be tested directly; you will have questions that use this information to test other concepts.

- Lab Safety:
  - Never work alone
  - Always follow directions
- Conservation of Resources:
  - Dispose of materials properly
  - Always reuse or recycle when possible

Process Skills

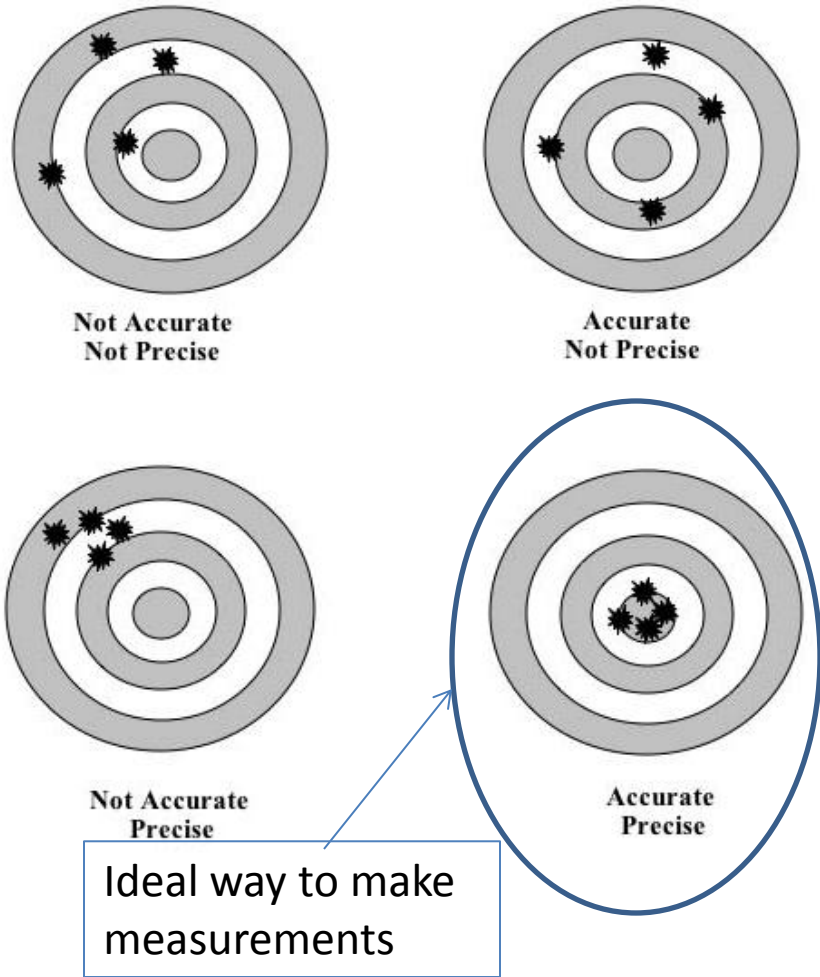
This information is not going to be tested directly; you will have questions that use this information to test other concepts.

- Nature of science, theory, law, hypothesis…
  - Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not scientifically testable.
  - Scientific hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories.
  - Scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly-reliable explanations, but they may be subject to change as new areas of science and new technologies are developed.

Process Skills

This information is not going to be tested directly; you will have questions that use this information to test other concepts.

- Data Collection
  - collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micropipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, dissection equipment, meter sticks, and models, diagrams, or samples of biological specimens or structures



Process Skills

This information is not going to be tested directly; you will have questions that use this information to test other concepts.

- History of Science
  - Darwin – studied the evolution of finches on the Galapagos Islands
  - Hooke – saw dead cells in cork
  - Pasteur – created first vaccine
  - Linneaus – developed taxonomy system
  - Watson & Crick – discovered shape of DNA, with the help of a picture from Franklin
  - Mendel – studied genetics of peas
  - Leewenhooke – saw living microorganisms in pond water
  - Schlieden & Schwann – discovered all living things are made of cells.