**Topic One: Chemistry of Living Things**

1. All living things must maintain \_\_\_\_\_\_\_\_\_\_\_in order to stay alive.
   1. **Homeostasis**: A \_\_\_\_\_\_\_\_\_state in the body.
   2. Failure to maintain homeostasis results in \_\_\_\_\_\_\_\_\_or death.
   3. Homeostasis is often maintained using \_\_\_\_\_\_\_\_\_\_mechanisms.
      1. Feedback mechanisms are \_\_\_\_\_\_\_\_in which the product of one reaction causes another to start or stop.
   4. While organisms are balanced, they are not unchanging. The term used to describe the balanced state is\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.**
      1. **Dynamic Equilibrium:** A balanced state created by many small, \_\_\_\_\_\_\_\_\_\_\_changes.



**Word Bank:** feedback opposing dynamic-equilibrium cycles disease balanced homeostasis

1. **Life Processes:** All living things carry out the same basic chemical\_\_\_\_\_\_\_\_\_\_\_\_. Taken together, these process make up an organism’s\_\_\_\_\_\_\_\_\_\_\_\_.
   1. **Metabolism:** All chemical processes used to maintain\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
      1. **\_\_\_\_\_\_\_\_\_\_:** Using nutrients for growth, synthesis, repair and energy.
      2. **\_\_\_\_\_\_\_\_\_\_:** Converts energy in food into a usable form (ATP).
      3. \_\_\_\_\_\_\_\_\_\_: Making complex chemicals from simple substances.
      4. \_\_\_\_\_\_\_\_\_\_: Absorbing and distributing materials throughout the body.
      5. \_\_\_\_\_\_\_\_\_\_: The control and coordination of life processes.
      6. \_\_\_\_\_\_\_\_\_\_: Removing of wastes produced by metabolic activities.
      7. \_\_\_\_\_\_\_\_\_\_: Passes on genes to offspring.

**Word Bank**: homeostasis processes metabolism reproduction excretion regulation transport synthesis respiration nutrition

1. **Inorganic Chemicals**: \_\_\_\_\_\_\_\_compounds
   1. \_\_\_\_\_\_\_\_\_ ( H2O) : Most common substance in all living things (about 60% of body mass)
      * + Needed for chemical \_\_\_\_\_\_\_\_\_\_(won’t happen in “dry” conditions)
        + Dissolves other molecules into\_\_\_\_\_\_\_\_\_\_**,** allowing them to be **transported** through the body.
   2. \_\_\_\_\_\_\_\_\_ (O2): Needed by **most** (not all) organisms for **cellular respiration**.
      * + Released by plants and algae as a waste product of\_\_\_\_\_\_\_\_\_\_\_\_\_**.**
        + **Aerobic respiration:** Process that uses oxygen to extract \_\_\_\_\_\_\_\_\_\_from glucose (sugar). Used by most organisms.
        + Anaerobic respiration: Process that extracts energy from glucose \_\_\_\_\_\_\_\_\_\_using oxygen. Gives \_\_\_\_\_\_\_\_\_\_energy, so only used by some simple organisms (some bacteria, yeast). These organisms do not need to \_\_\_\_\_\_\_\_\_\_in oxygen.

**Word Bank**: solution reactions water simple breathe without less energy oxygen photosynthesis

* 1. **Carbon Dioxide** (CO2): With water, used by plants to make glucose (**photosynthesis)**.
     + - Waste product of\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  2. **Nitrogen** (N2): Most common gas in air (70%)
     + - Needed to make\_\_\_\_\_\_\_\_\_\_\_.
       - Converted into \_\_\_\_\_\_\_\_\_\_\_by soil bacteria. Nitrates are \_\_\_\_\_\_\_\_\_\_\_by plants and then eaten by animals.
       - Excreted as waste in ammonia or \_\_\_\_\_\_\_\_\_\_\_.
  3. Acids and Bases: Used for different functions in body (such as digestion).
     + - Measured by the \_\_\_\_\_\_\_\_\_\_scale
       - Very high and very low pHs are usually\_\_\_\_\_\_\_\_\_\_\_.
       - pH can affect rates of chemical reactions; for example, digestive \_\_\_\_\_\_\_\_\_work fastest in acidic environments, which is why we make stomach \_\_\_\_\_\_\_\_\_\_(hydrochloric acid, or HCl).

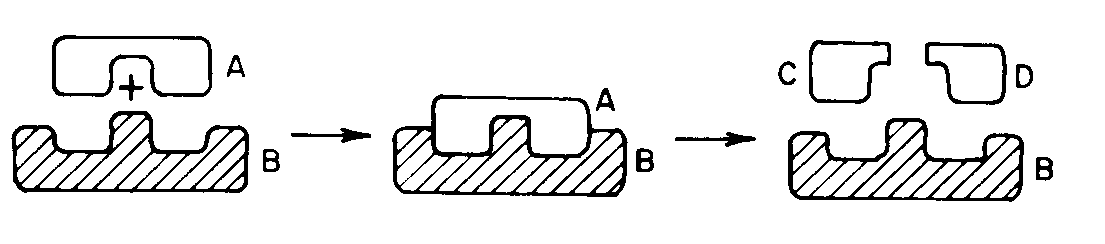
**Word Bank**: urea absorbed nitrates protein acid enzymes lethal pH aerobic-respiration.

1. **\_\_\_\_\_\_\_\_\_\_Compounds**: Larger, more complex chemicals. Always contain the elements like carbon (C)and hydrogen (H). Synthesized from simpler substances (building blocks).
   1. **Carbohydrates:** Sugars and\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
      1. **Building blocks**: simple\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
      2. Functions:
         * \_\_\_\_\_\_\_\_\_\_\_\_\_energy.
         * \_\_\_\_\_\_\_\_\_\_\_\_\_energy (starch in plants).
   2. **Lipids:** fats, \_\_\_\_\_\_\_\_\_and waxes.
      1. Functions:
         * Store energy.
         * Cell membrane.
         * Water\_\_\_\_\_\_\_\_\_\_\_\_\_.
         * \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Word Bank**: store provide sugars starches organic oils proofing insulation

* 1. **\_\_\_\_\_\_\_\_\_\_\_:** Complex compounds that carry out all the body’s activities.
     1. **Building blocks:** \_\_\_\_\_\_\_\_\_\_\_\_\_.
     2. After water, proteins are the most \_\_\_\_\_\_\_\_\_\_substances in the body.
     3. Have many different functions as determined by their\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
     4. **Lock and \_\_\_\_\_\_\_Model:** Proteins must have the right shape to “\_\_\_” with other molecules.
        + **Changing the shape of a protein will change what it can interact with its\_\_\_\_\_\_\_\_\_\_.**
     5. Important types of proteins:
        + **Hormones** and **neurotransmitters** – carry \_\_\_\_\_\_\_\_\_\_\_through the body.
        + Cell receptors – in cell membrane; \_\_\_\_\_\_\_\_\_\_hormones and neurotransmitters.
        + Antibodies –\_\_\_\_\_\_\_\_\_\_\_\_foreign **pathogens**
        + **Enzymes**- act as **catalysts**, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_all chemical reactions in the body.
          - High temperatures will cause enzymes to denature (lose their shape) and stop\_\_\_\_\_\_\_\_\_\_\_\_\_. This is why high fevers are\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  2. **Nucleic Acids (DNA and RNA)**: Make up \_\_\_\_\_\_\_\_\_\_\_and chromosomes.
     1. **Building blocks**: Nucleotides; molecular \_\_\_\_\_\_\_\_\_\_\_\_\_(ATCGU)

**Word Bank**: functioning dangerous controlling attack receive messages genes bases function key fit shape plentiful amino-acids proteins enzyme



A starch (A) is broken down by an \_\_\_\_\_\_\_\_\_\_\_(B) into two simple sugars (C, D). This is also a good example of the **lock and key model**.

**Topic Two: The Cell**

1. **Definition:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.
2. **Cell Theory**  has three parts:
   * 1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Unicellular – single celled organisms (amoeba, paramecium)

Multicellular – have more than 1 cell; may be only a few (vorticella), or many *trillions* of cells (humans). Almost all structures in multi-celled organisms are made of or by cells.

* + 1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Everything you do is the result of the work of your cells – walking, talking, even thinking and feeling. When you get sick, it is because your cells are not working correctly.

* + 1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

This seems obvious now, but at one time people believed in *spontaneous generation*, the idea that living things regularly emerged from nonliving things.

* 1. **Exceptions to the Cell Theory**
     1. \_\_\_\_\_\_\_\_\_\_\_\_\_are not made of cells. However, they also do not carry out all life processes, so many biologists do not consider them true living things.
     2. \_\_\_\_\_\_\_\_\_\_\_\_\_obviously could not come from another cell.

1. **Organization**

\_\_\_\_\_\_\_\_\_\_– A cell part

**Cell**

\_\_\_\_\_\_\_\_\_\_– A group of specialized cells

\_\_\_\_\_\_\_\_\_\_– Group of tissues that work together

\_\_\_\_\_\_\_\_\_\_– Group of organs that work together

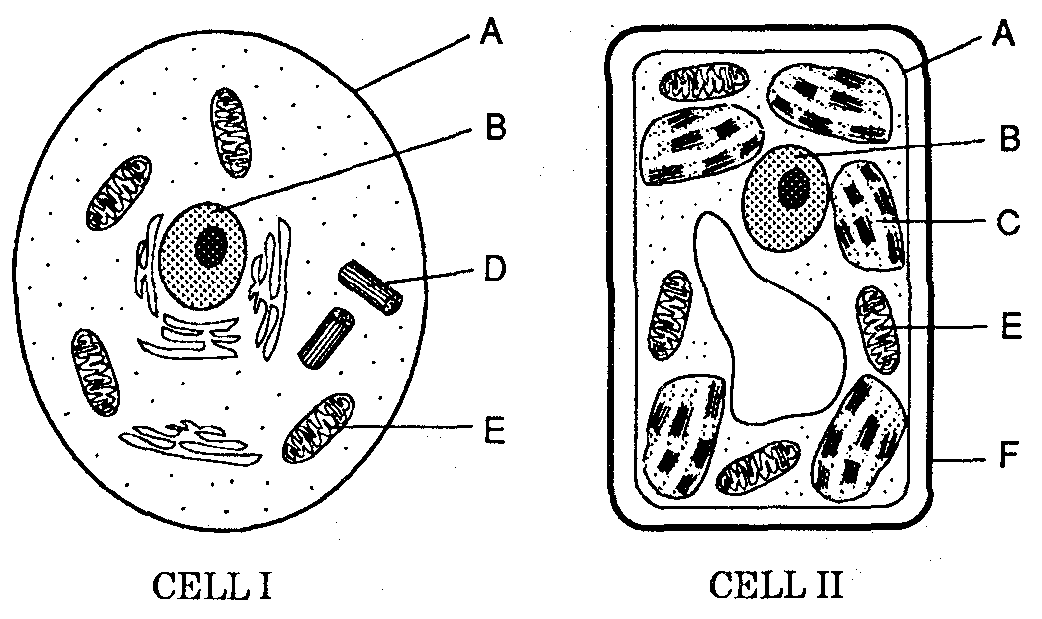
**Word Bank**: viruses tissue organ organ-system organelle The-first-cell

All life functions are the result of the cell activities

All cells come from pre-existing cells.

All organisms are made of one or more cells

basic unit of structure and function in an organism

1. **Cell Organelles:** These are the tiny cell parts that make up a cell.
   * 1. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
        + ****Controls the cell
        + Contains hereditary material (chromosomes, genes, DNA)
     2. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
        + Fluid/liquid in the cell – mostly water
        + Helps transport material
     3. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
        + Carries out cellular respiration.
        + Gives cell energy (Powerhouse of the cell).
     4. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
        + Makes proteins from amino acids.
     5. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
        + Stores food, water and waste
        + Food vacuoles may digest large molecules.
        + Waste vacuoles may excrete waste out the cell membrane
     6. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
        + Carries out **photosynthesis**
        + Plant and algae cells only
     7. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
        + Gives shape, structure and protection.
        + NEVER found in animal cells.
     8. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
        + Separates cell interior from environment
        + Controls what enters and leaves the cell using\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.**
        + Has \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_that pick up signals from other cells.

Has **\_\_\_\_\_\_\_\_\_\_\_\_\_** which are proteins that identify the cell; prevent the cell from being attacked by the immune system.

**Word Bank:** antigens transport chloroplast cell-wall receptor-proteins cell-membrane vacuole ribosome mitochondrion cytoplasm nucleus

**Topic Three: Nutrition, Photosynthesis and Respiration**

**Reminder:** All life processes are **chemical activities** which make up your\_\_\_\_\_\_\_\_\_\_\_\_.

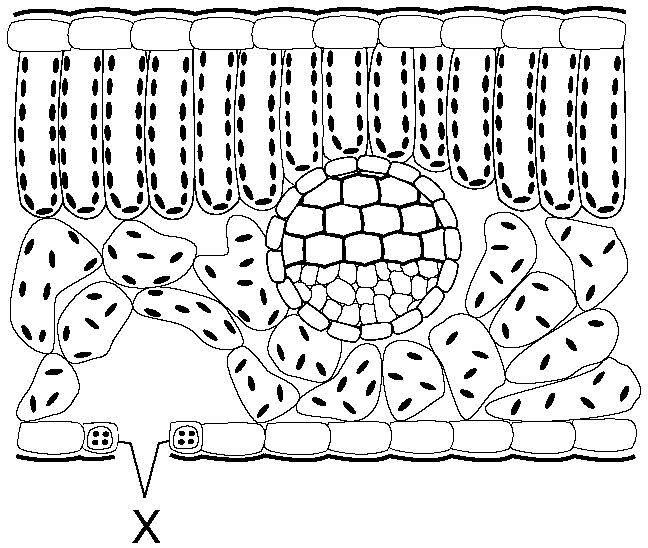
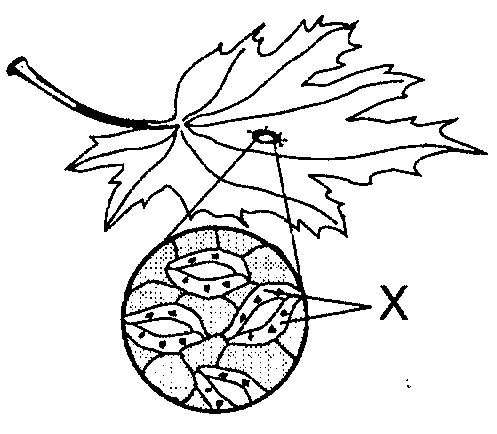
1. **Nutrition**: Taking in nutrients (\_\_\_\_\_\_\_\_) for various activities including:
   * 1. Respiration (\_\_\_\_\_\_\_\_\_)
     2. Growth
     3. Repair
     4. \_\_\_\_\_\_\_\_\_\_\_
   1. **Ingestion: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**
   2. **Digestion**:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
      1. Nutrients must be broken down into smaller parts so that they can be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_into the blood and cells of organisms.
         * Starches are digested into\_\_\_\_\_\_\_\_\_\_\_\_\_.
         * Proteins are digested into\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Word Bank:** amino-acids absorbed sugars synthesis taking-in-nutrients

metabolism breaking down-nutrients food energy

* 1. **Autotrophic Nutrition:** Organisms take \_\_\_\_\_\_\_\_\_\_\_\_materials (\_\_\_\_\_\_**,** H2O) and convert them into organic nutrients (\_\_\_\_\_\_\_\_\_\_\_).
     1. Auto =\_\_\_\_\_\_\_\_; troph = \_\_\_\_\_\_\_\_\_so Autotroph = \_\_\_\_\_\_\_\_\_\_.
     2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_is most common form of autotrophic nutrition
     3. **Ex:** plants,\_\_\_\_\_\_\_\_\_\_\_**.**
  2. **Heterotrophic Nutrition:** Organisms must \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_nutrients made by other organisms.
     1. Hetero =\_\_\_\_\_\_\_\_\_\_\_, so Heterotroph =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
     2. All \_\_\_\_\_\_\_\_\_\_and \_\_\_\_\_\_\_\_\_\_are heterotrophs.
     3. Includes:
        + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: consumes animals.
        + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: consumes plants.
        + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: consumes both.
        + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: breaks down dead matter.

**Word Bank:** other fungi animals consume feeds-on-others self photosynthesis self-feeding glucose simple-organic decomposers CO2 omnivore herbivore carnivore other feeding algae

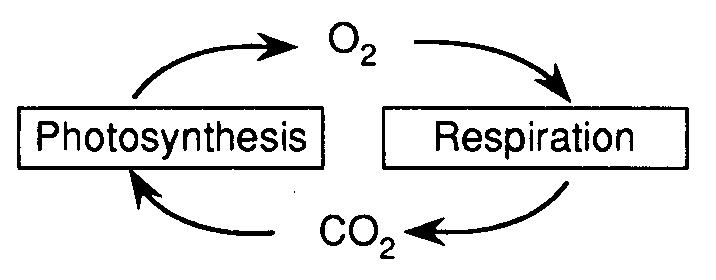
1. **Photosynthesis:** Process in which sun’s energy is trapped in the chemical \_\_\_\_\_\_\_\_\_of sugar.
   1. Requires\_\_\_\_\_\_\_\_\_\_, **CO2** and **H2O**.
   2. Makes \_\_\_\_\_\_\_\_\_\_\_(**C6H 12O6**) as food.
   3. \_\_\_\_\_\_\_\_\_\_and \_\_\_\_\_\_\_\_\_\_are waste products.
   4. Benefits:
      1. Provides \_\_\_\_\_\_\_\_\_\_\_for all plants, animals and other organisms.
      2. Provides oxygen to\_\_\_\_\_\_\_\_\_\_\_\_\_.
      3. Removes \_\_\_\_\_\_\_\_\_\_\_\_\_\_from atmosphere.
   5. Plant adaptations:
      1. **Chloroplast**: Cell organelle that does\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.**
      2. Gas exchange:
         * **Stomata :** \_\_\_\_\_\_\_\_\_\_\_\_\_under a leaf; let gases in and out
         * **Guard cells:** open and close stomata to prevent\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
      3. Transport:
         * **Xylem and Phloem:** “tubes” \_\_\_\_\_\_\_\_\_\_\_food and water throughout the plant.

**Word Bank**: photosynthesis transport dehydration holes oxygen water carbon-dioxide bonds glucose sunlight food stomates

Two different views of the \_\_\_\_\_\_\_\_and their **guard cells** (X)**.**

1. **Cellular Respiration:** Process that takes **\_\_\_\_\_\_\_\_\_\_\_**from sugar molecules and places it in molecules of\_\_\_\_\_\_\_\_\_\_**.**
   1. ATP is the \_\_\_\_\_\_\_\_\_\_\_all life uses for **energy**.
      * + No organism can get energy from \_\_\_\_\_\_\_\_\_\_\_or sugar without first putting the energy into ATP.
   2. Requires\_\_\_\_\_\_\_\_\_\_\_, oxygen and water.
   3. \_\_\_\_\_\_\_\_\_\_\_\_and \_\_\_\_\_\_\_\_\_\_are waste products.
   4. Most organisms carry out **aerobic respiration** (uses oxygen) in their\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
   5. **\_\_\_\_\_\_\_\_\_\_\_\_\_respiration** does not require oxygen, but gives less ATP (energy) for each molecule of sugar.
      * + When exercise causes human muscles to run out of\_\_\_\_\_\_\_\_\_\_\_\_, their cells will do **anaerobic respiration**. The waste product, \_\_\_\_\_\_\_\_\_\_\_\_\_\_, causes muscles to “burn” so that you will **stop**.

**Word Bank**: ATP molecule energy glucose lactic-acid sunlight carbon-dioxide water mitochondria anaerobic

* 1. **Photosynthesis and Cellular Respiration are \_\_\_\_\_\_\_\_\_\_\_\_\_\_reactions!** They are also important in \_\_\_\_\_\_\_\_\_\_\_\_\_oxygen, carbon, hydrogen and water through the environment.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_+ CO2 + H2O 🡪 glucose + O2 + H2O

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

glucose + O2 + H2O 🡪 CO2 + H2O + \_\_\_\_\_\_\_\_\_

* 1. **Common mistakes:** 
     + - “Plants use photosynthesis, animals use respiration.”

*All organisms, including plants, use respiration to get their\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.*

* + - * “Respiration is breathing.”

*Breathing is* ***not*** *respiration. Breathing \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_the gases needed for respiration. Inhaling and exhaling does not give you ATP.*

* + - * “Oxygen is used to breathe.”

*This is backwards. Breathing is used to get oxygen which is used for respiration. Without oxygen, you have no\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, no ATP, and no energy.*

* + - * “All living things need oxygen/need to breathe.”

*Anaerobic organisms do not need oxygen, and do not have to\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.*

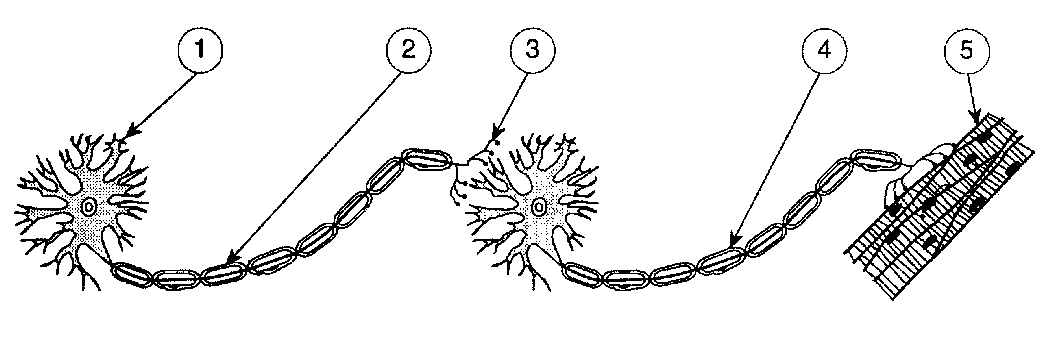
**Word Bank**: cycling opposite exchanges energy respiration ATP sunlight cellular-respiration photosynthesis breathe

**Topic Four: The Human Body**

1. **Organization:** The human body is made up of\_\_\_\_\_\_\_\_\_\_\_\_.
   1. All humans (and most other organisms) begin life as a \_\_\_\_\_\_\_\_\_\_\_cell.
      1. This single cell is called a\_\_\_\_\_\_\_\_\_\_\_\_\_.
      2. The nucleus of this cell has \_\_\_\_\_\_\_the genes needed to become a complete organism.
   2. Humans grow as a result of \_\_\_\_\_\_\_\_\_\_\_cell division).
      1. This quickly increases the number of cells in the body until there many \_\_\_\_\_\_\_\_\_of cells.
      2. Since all new cells come from the same single cell, they all share the same\_\_\_\_\_\_\_\_\_\_.
   3. As cells divide, they begin to develop into specialized\_\_\_\_\_\_\_\_\_\_\_.
      1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_or **Differentiation:** Process in which a cell changes to have a special shape and function.
      2. Cells specialize by \_\_\_\_\_\_\_\_\_\_specific genes on or off.
         * Ex: A \_\_\_blood cell has turned off all genes needed to make skin, bone, or nerves. It still has those genes, but only the genes \_\_\_\_\_\_to be a white blood cell remain turned on.
   4. As the body continues to develop, tissues will work together to form\_\_\_\_\_\_\_\_\_\_.
   5. Organs will work together to form\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
   6. Org an systems will work together to help a person **maintain\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.

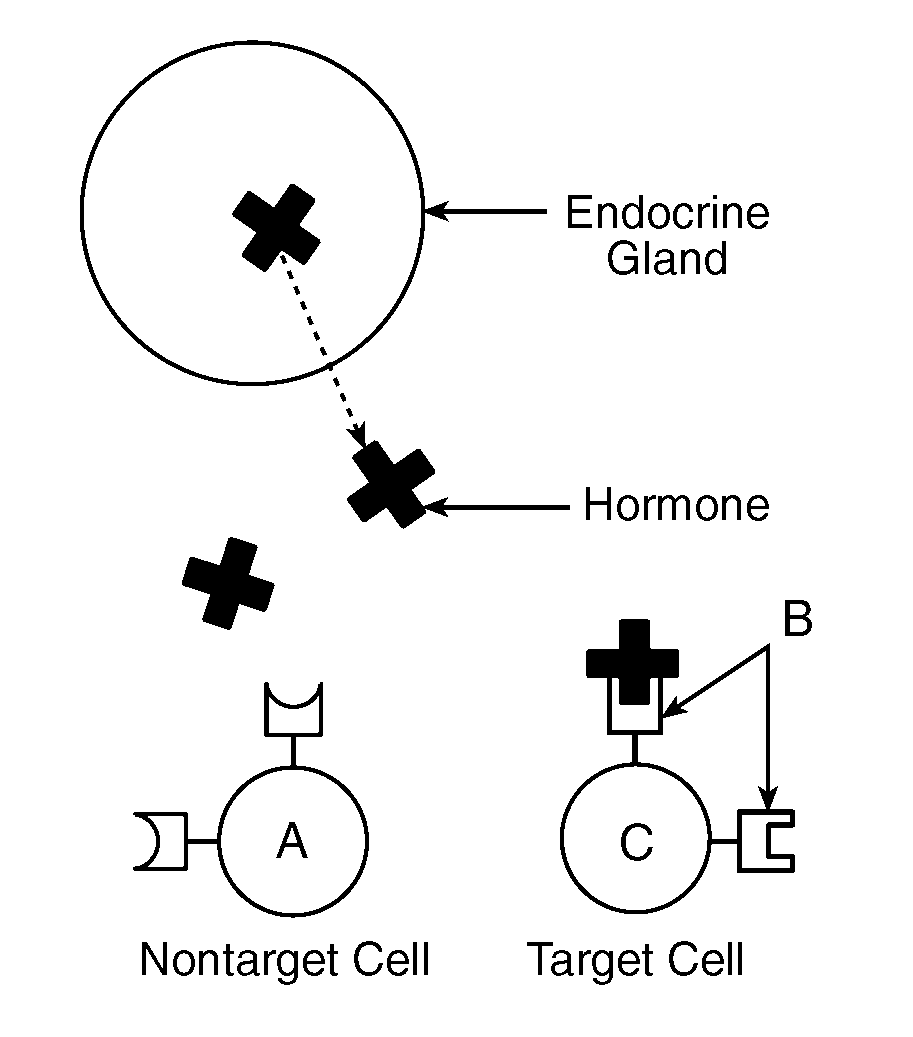
**Word Bank**: trillions cells single tissues zygote needed white all mitosis specialization genes homeostasis organs turning organ-systems

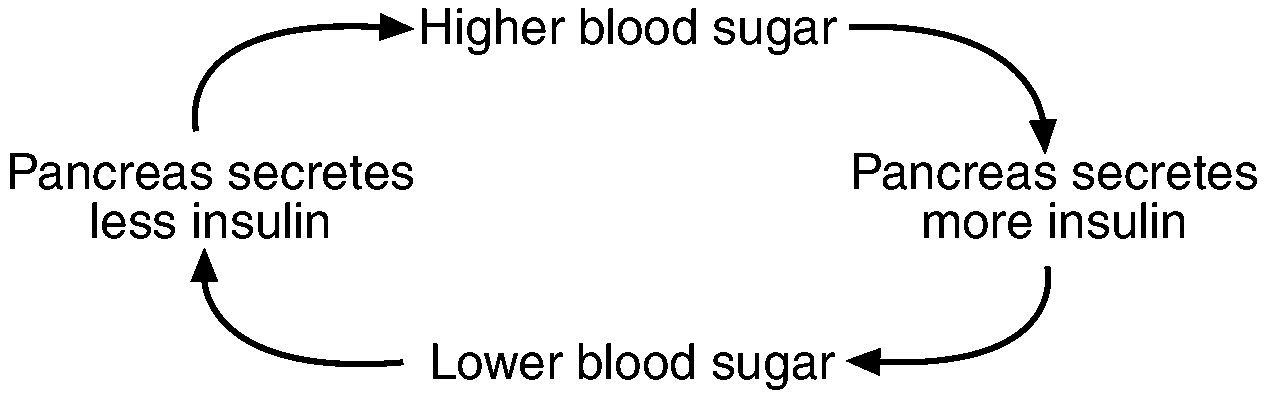
1. **Nervous System**
   1. The nervous system \_\_\_\_\_\_\_\_\_\_your body with electrochemical\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
      1. The chemical portion of a nerve impulses is called a\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
      2. Neurotransmitters released by 1 nerve cell are received by \_\_\_\_\_\_\_\_\_\_\_\_in the cell membrane of the next nerve cell.
      3. The \_\_\_\_\_\_\_\_\_\_of the receptor molecule determines which neurotransmitter it can receive.
   2. A nerve cell is also called a\_\_\_\_\_\_\_\_\_\_\_\_.
   3. The main organs of the nervous system are the \_\_\_\_\_\_\_and\_\_\_\_\_\_\_\_\_\_\_\_\_.
   4. The **spinal cord** controls \_\_\_\_\_\_\_\_\_\_and relays impulses between the brain and body.



**Two neurons** carry an impulse to a \_\_\_\_\_cell. (3) shows where a **neurotransmitter** would carry the \_\_\_\_\_\_\_\_\_from one cell to the next.

**Word Bank:** shape regulates reflexes impulses neurotransmitter receptor-proteins muscle neuron brain signal spinal-cord

1. **Endocrine System**
   1. Uses **\_\_\_\_\_\_\_\_\_\_\_\_\_**to **regulate** thebody.
      1. A hormone is a chemical \_\_\_\_\_\_\_\_\_\_\_\_secreted by endocrine **glands.**
      2. Hormones are slower than nerve impulses, but with \_\_\_\_\_\_\_\_\_lasting effects.
      3. Hormone levels are controlled by \_\_\_\_\_\_\_\_\_\_\_\_**mechanisms**.



**Receptor Molecules** in the cell membrane can only accept \_\_\_\_\_\_\_\_of the correct shape. This is a good example of the **Lock and Key Model.**

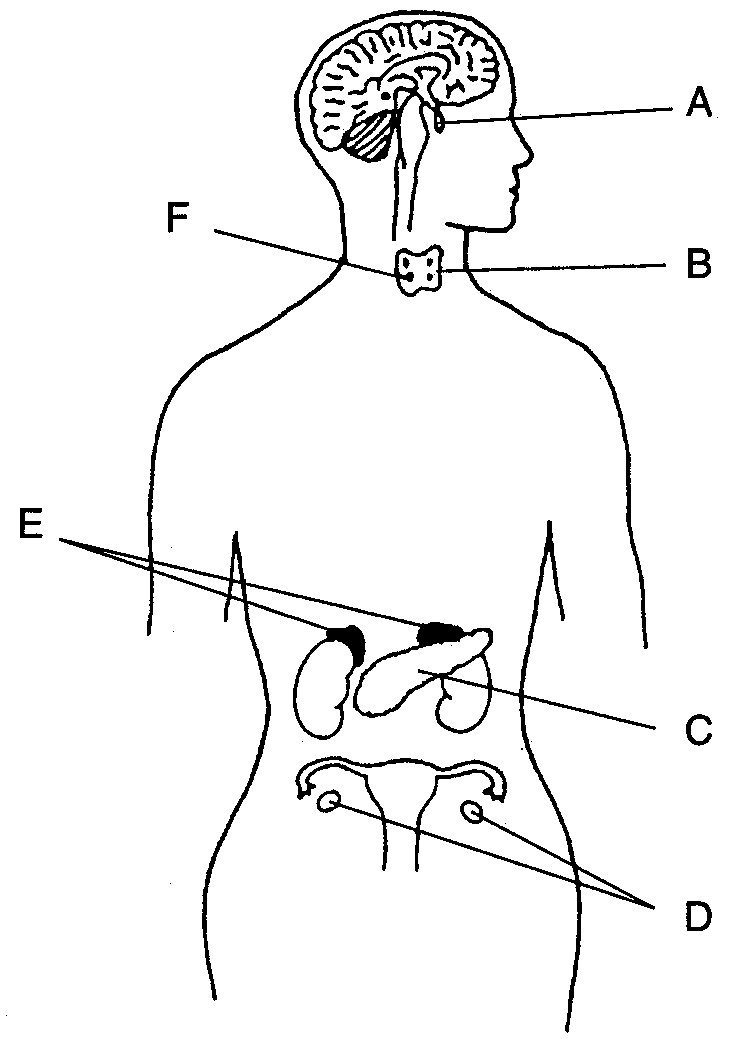
**A feedback mechanism**

* + 1. **\_\_\_\_\_\_\_\_\_\_molecules** on the surface of the cell membrane receive hormones. **As with all proteins, it is the \_\_\_\_\_\_\_\_\_\_\_\_\_of the receptor molecule that determines which hormone it can receive.**
  1. The \_\_\_\_\_\_\_\_\_\_\_makes \_\_\_\_\_\_\_\_\_\_\_and glucagon which control blood sugar.
     + - **Common mistake:** “Insulin lowers blood pressure.”

*Insulin (and glucagon) directly control blood \_\_\_\_\_\_\_\_\_\_(or glucose) levels, not blood pressure.*

* 1. Adrenal glands make \_\_\_\_\_\_\_\_\_\_\_\_\_when the body is under stress.
  2. **Testosterone** (male), **estrogen** and **progesterone** (female) are the sex hormones. These are made in the \_\_\_\_\_\_\_\_\_\_\_\_(testes for males, ovaries for females).

**Word Bank**: longer hormones feedback messenger receptor shape pancreas gonads insulin adrenaline sugar molecule

****

**The brain (nervous system) and some endocrine glands.**

# Circulatory System

# Moves \_\_\_\_\_\_\_\_\_\_\_through the body to the organs and cells that need them.

* 1. Transported material includes:
     1. \_\_\_\_\_\_\_\_\_\_\_and \_\_\_\_\_\_\_\_\_\_from **intestines** to all cells of body.
     2. \_\_\_\_\_\_\_\_\_\_from lungs to all cells of the body.
     3. \_\_\_\_\_\_\_\_\_\_\_from glands to target cells
     4. \_\_\_\_\_\_\_\_\_\_\_from all cells to the **excretory organs.**
  2. Materials usually enter and leave the blood through\_\_\_\_\_\_\_\_\_\_\_**.**
     1. **Diffusion**: Process in which material moves from a \_\_\_concentration to a low concentration.
        + **Ex**: There is a high concentration of oxygen in the lungs, so oxygen will diffuse from the lungs into the\_\_\_\_\_\_\_\_\_, which has less oxygen.
     2. **\_\_\_\_\_\_\_\_\_\_\_:** Microscopic blood vessels where diffusion occurs.

## The \_\_\_\_\_\_\_\_\_\_is the pump that drives the circulatory system.

## \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_carry oxygen and carbon dioxide

* + 1. Hemoglobin: \_\_\_\_\_\_\_\_\_\_\_\_in red blood cells that carries oxygen.
  1. \_\_\_\_\_\_\_\_\_\_\_\_\_is the fluid of the blood. It transports everything *except oxygen*.
  2. Platelets \_\_\_\_\_\_\_\_\_\_\_the blood.

## Common mistakes:

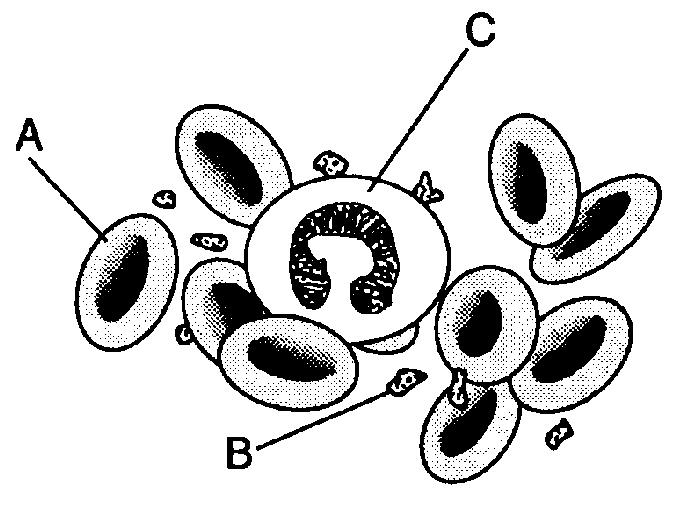
### “The heart pumps oxygen to the brain.”

### *Technically true, but the heart pumps blood (which carries the oxygen) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_in your body.*

### “Oxygen diffuses into and out of the heart.”

### *No materials \_\_\_\_\_\_\_\_\_\_\_\_\_in or out of the blood when it is in the heart. This \_\_\_\_\_\_\_\_\_\_occurs in capillaries.*

**Word Bank**: material nutrients water protein high diffusion oxygen hormones wastes clot capillaries heart blood red-blood-cells everywhereplasma diffuse only white-blood-cells

****

Red blood cells (A), platelets (B) and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(C)

**.**

# Respiratory System:

## Breathing provides \_\_\_\_\_\_\_\_\_\_\_\_needed for cellular respiration (which uses energy from sugar to make\_\_\_\_\_\_\_\_\_\_).

## Excretes the waste \_\_\_\_\_\_\_\_\_\_which is produced from cellular respiration.

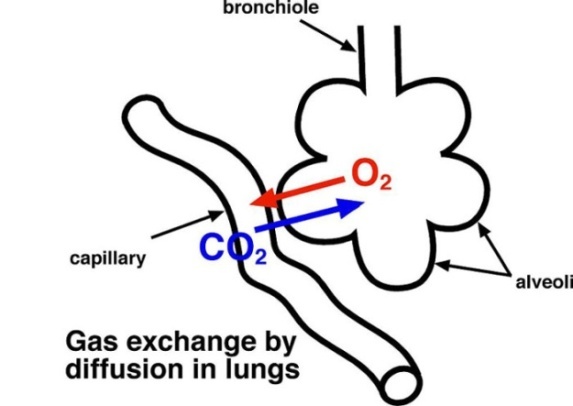
## The \_\_\_\_\_\_\_\_\_\_\_\_\_is the muscle that allows breathing to occur.

## You breathe faster when CO2 builds up in the \_\_\_\_\_\_\_\_\_\_\_(not when you need oxygen).

## The \_\_\_\_\_\_\_\_\_\_are microscopic sacs where oxygen enters the blood and CO2 leaves the blood.

## The alveoli are surrounded by \_\_\_\_\_\_\_\_\_\_which pick up oxygen and drop off CO2.

## Word Bank: diaphragm capillaries oxygen ATP alveoli blood CO2



1. **Digestive System:** 
   1. Food is \_\_\_\_\_\_\_\_\_\_\_down so that it is small enough to enter the body tissues/cells.
      1. Food is broken down mechanically and\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
      2. Nutrients and water are \_\_\_\_\_\_\_\_\_\_\_\_into the body in the small and large intestines.
   2. The digestive system is a one way \_\_\_\_\_\_\_\_\_through the body that includes the **mouth**, **stomach** and **intestines**.
   3. Food is moved through the digestive system by muscular contractions (\_\_\_\_\_\_\_\_\_\_\_).
   4. Undigested food is \_\_\_\_\_\_\_\_\_\_\_\_\_as solid waste (**feces**).
   5. Common mistakes:
      1. “The digestive system excretes waste.”

*The digestive system does not excrete waster (see excretory system)*.

* + 1. “The digestive system gives you energy.”

*The digestive system gives\_\_\_\_\_\_\_\_\_\_\_\_\_. Energy is gained by cellular respiration.*

**Word Bank:** passage chemically nutrients absorbed peristalsis broken eliminated excretes

## Excretory System:

## 0000663Removes waste produced by the \_\_\_\_\_\_\_\_\_\_\_of your body.

## These wastes include \_\_\_\_\_\_\_,\_\_\_\_\_\_\_\_\_\_,\_\_\_\_\_\_\_\_\_ and\_\_\_\_\_\_\_\_\_.

## Lungs excrete \_\_\_\_\_\_\_\_\_and\_\_\_\_\_\_\_\_\_\_.

## The skin excretes \_\_\_\_\_\_\_and \_\_\_\_\_\_\_as sweat.

## The kidneys excrete \_\_\_\_\_\_\_and \_\_\_\_\_\_\_and other substances as urine.

**Kidneys and Urinary Tract**  - part of the human excretory system.

## \_\_\_\_\_\_\_\_\_\_\_also control the amount of water in your body.

## The \_\_\_\_\_\_\_\_\_\_\_\_\_filters toxins and dead red blood cells from the blood.

## Common mistake:

## “The body excretes feces.”

## *Feces never enters cells of the body, so technically it is not excreted. The correct term is “\_\_\_\_\_\_\_\_\_\_\_\_\_\_” or “egested.”*

**Word Bank**: cells salt (2) water (4) urea (2) liver CO2 (2) kidney eliminated excretory

1. **Immune System**
   1. The job of the immune system is to protect the body against\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
   2. **Pathogen:**  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
      1. Types of pathogens include viruses, bacteria, and\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
   3. **\_\_\_\_\_\_\_\_\_\_\_\_\_Blood Cells** are the main components of the immune system.
      1. Different w.b.c’s have different roles, including:
         * \_\_\_\_\_\_\_\_\_\_\_\_pathogens.
         * “\_\_\_\_” pathogens for destruction by other wbc’s.
         * Destroy pathogen by \_\_\_\_\_\_\_\_\_\_it.
         * Destroy pathogen using\_\_\_\_\_\_\_\_\_\_**.**
         * Make\_\_\_\_\_\_\_\_\_\_\_\_**.**
   4. **Antibodies** are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_made by white blood cells to attack pathogens.
      1. Every antibody is specific in its\_\_\_\_\_\_\_\_\_\_– it can attack one and only one \_\_\_\_\_\_\_\_\_of pathogen. As with all proteins, this is because the shape of the antibody must fit its \_\_\_\_\_\_\_\_\_\_(lock and key model).

**Word Bank**: parasites identify pathogens disease-causing-organism tag white chemicals proteins eating antibodies action type target

* 1. **Antigens** are protein “\_\_\_\_\_\_” that identify a cell or virus.
     1. Your blood type is determined by your \_\_\_\_\_\_\_\_\_(you can have A or B antigens, both or nether (type O).
     2. Any cell of virus with the wrong antigen will be seen as \_\_\_\_\_\_\_\_by your immune system, attacked, and destroyed. This is why you must match blood types before receiving blood or an organ\_\_\_\_\_\_\_\_\_\_.
  2. **A \_\_\_\_\_\_\_\_\_\_\_is an injection of a dead or weakened pathogen.**
     1. Triggers the body to make antibodies \_\_\_\_\_\_\_\_\_\_that pathogen.
     2. Effective against both \_\_\_\_\_\_\_\_\_\_and bacteria.
     3. Can only \_\_\_\_\_\_\_\_\_disease, not cure it.
  3. \_\_\_\_\_\_\_\_\_\_are drugs used to stop infections by **bacteria**.
     1. Antibiotics will not \_\_\_\_\_\_\_\_\_against viruses.
     2. Unlike vaccines, antibiotics can \_\_\_\_\_\_\_\_\_diseases.
  4. **Common mistake:**
     1. “Antibodies are cells that attack pathogens.” *Antibodies are\_\_\_\_\_\_\_\_\_, not cells.*

**Word Bank**: tags vaccine foreign antibiotics antigens transplant prevent cure against viruses work proteins

1. **Interactions between body systems**
   1. The different systems of the body work together to maintain homeostasis. For example:
      1. *Nutrients from the \_\_\_\_\_\_\_\_\_\_system are transported to cells by the \_\_\_\_\_\_\_\_\_\_system.*
      2. *Wastes from the \_\_\_\_\_\_\_\_system are removed by the \_\_\_\_\_\_\_\_\_system.*
      3. *The \_\_\_\_\_\_\_\_and \_\_\_\_\_\_\_\_\_systems work together to control the body.*
      4. *The \_\_\_\_\_\_\_\_system protects the \_\_\_\_\_\_\_\_\_\_system from disease.*

**Word Bank**: respiratory immune nervous (2) endocrine excretory circulatory digestive

1. **Diseases and Disorders**
   1. Typically the exam asks you to name a disease, what \_\_\_\_\_\_\_\_it, its effect on the\_\_\_\_\_\_\_, and how to prevent/treat/cure it. The most important diseases and disorders for you to know are:
      1. **AIDS**
         * Caused by the \_\_\_\_\_\_\_virus (a pathogen)
         * Weakens human immune system, leaving body \_\_\_\_\_\_\_\_\_\_\_to other diseases.
         * Spread through bodily\_\_\_\_\_\_\_\_\_\_\_, usually sexual contact, intravenous (IV) drug use (sharing needles), or blood\_\_\_\_\_\_\_\_\_\_\_.
         * Can’t be cured, but spread may be \_\_\_\_\_\_\_\_\_\_\_by sexual abstinence, “safe” sex (using condoms), not sharing needles, or \_\_\_\_\_\_\_\_\_\_blood before using it for a transfusion.

**Word Bank**: HIV transfusions causes prevented vulnerable fluids testing body

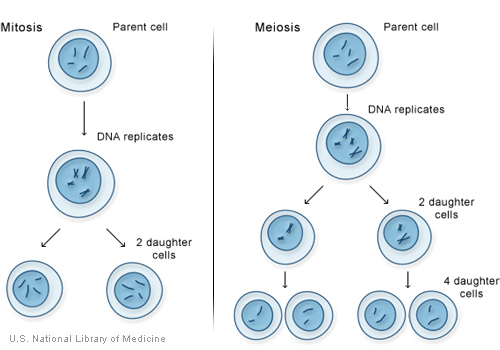
* + 1. **Cancer**
       - Caused when a cell reproduces (divides) at an \_\_\_\_\_\_\_\_\_\_rate, forming a **tumor**.
       - Cancer cells **do not specialize** and take \_\_\_\_\_\_\_\_\_\_\_from healthy tissue.
       - May be caused by\_\_\_\_\_\_\_, chemicals (such as asbestos or cigarette smoke), and viruses.
       - Treatments include surgery, radiation therapy, and\_\_\_\_\_\_\_\_\_\_\_\_\_.
    2. **Diabetes**
       - Affects body’s ability to control blood\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
       - Some diabetics may be treated using injections of \_\_\_\_\_\_\_\_\_\_made by genetically engineered bacteria.
    3. **Allergies**
       - Occur when the immune system \_\_\_\_\_\_\_\_\_\_to a harmless substance (such as pollen)
       - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_is a form of allergy caused by a reaction to dust particles in the air.

**Word Bank**: radiation sugar chemotherapy insulinuncontrolled resources reacts asthma

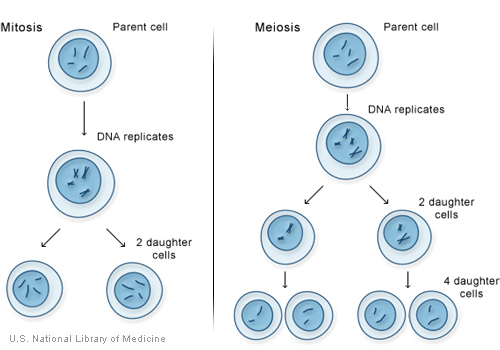
**Topic Five: Reproduction**

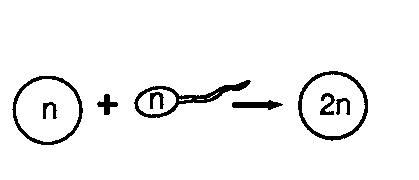
1. **Asexual reproduction:** 
   1. Advantages: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Disadvantage: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. **Sexual reproduction:** 
   1. Advantage: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Disadvantage: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Word Bank**: slower-harder-risker no-variety faster-easier-safer variety

1. **Mitosis**
   1. Used in all forms of \_\_\_\_\_\_\_\_\_\_\_ reproduction.
   2. The number and types of chromosomes in the daughter cells are \_\_\_\_\_\_\_\_\_\_\_\_\_\_ as in the parent cell.
   3. Large organisms use mitosis for \_\_\_\_\_\_\_\_\_\_\_and \_\_\_\_\_\_\_\_\_\_\_\_\_. Simple organisms use it to \_\_\_\_\_\_\_\_\_\_\_\_\_.
   4. One division of a cell 🡪 two identical, \_\_\_\_\_\_\_\_ (2n) cells.
      1. Diploid: Cell with a \_\_\_\_\_\_\_\_ sets of chromosomes.

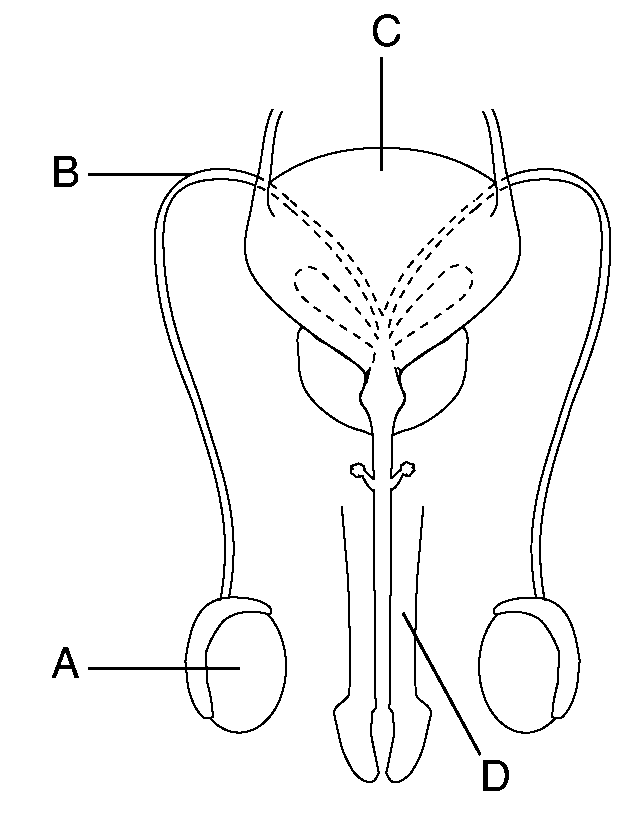
**Mitosis vs. Meiosis.** Notice the number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ stays the same in mitosis, and is halved in meiosis.

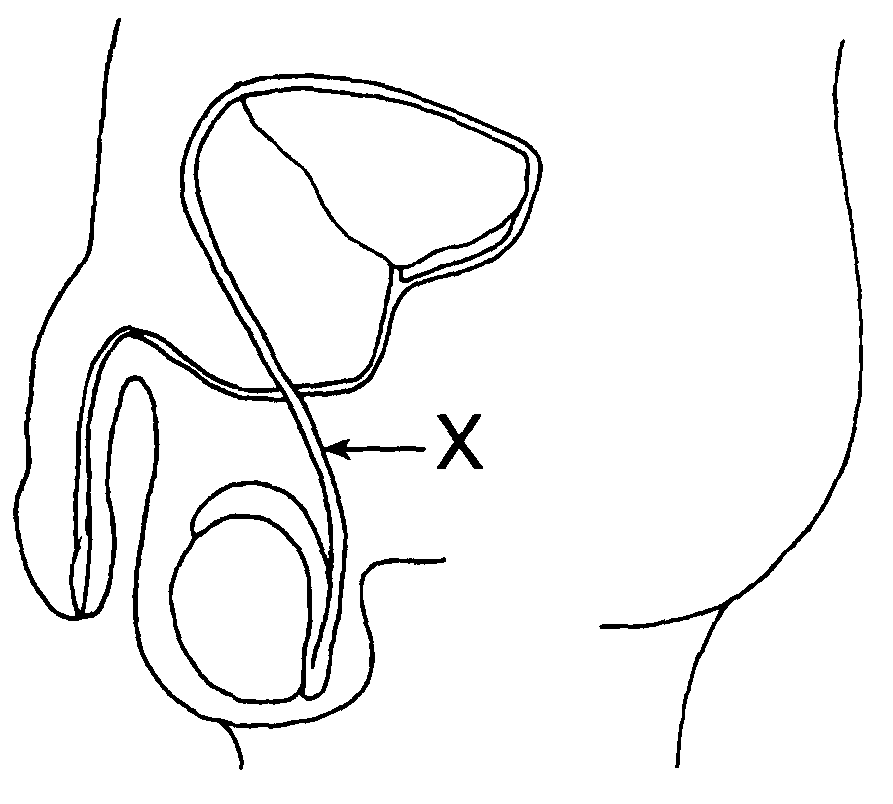
1. **Meiosis**
   1. Makes \_\_\_\_\_\_\_\_\_\_\_\_\_\_ used in sexual reproduction.
      1. Gamete: \_\_\_\_\_\_\_ cells; egg and sperm
   2. One cell divides *twice* 🡪 four DIFFERENT \_\_\_\_\_\_\_\_\_ (1n) cells.
      1. Haploid: Cell with \_\_\_\_\_\_\_\_\_\_ set of chromosomes ( ½ normal)
   3. Separates pairs of chromosomes so that offspring get \_\_\_\_\_\_\_\_ chromosome of each pair from that parent.
   4. Each daughter cell (gamete) gets only one half of the chromosomes of the “\_\_\_\_\_\_\_\_\_\_” cell.

****

**Word Bank**: two the-same healing growth gametes one asexual one reproduce diploid sex haploid parent chromosomes

1. **Male Reproductive System**
   1. Testes produce and \_\_\_\_\_\_\_\_\_ sperm.
      1. Sperm are haploid cells made by \_\_\_\_\_\_\_\_\_\_\_\_\_\_
      2. Sperm are produced in large numbers throughout a males \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
      3. Sperm are \_\_\_\_\_\_\_\_\_ than the egg and mobile
      4. Sperm only provide offspring with 23 chromosomes – everything else is in the \_\_\_\_\_\_\_\_\_.
   2. Testosterone is the male sex hormone, and is made in the \_\_\_\_\_\_\_\_\_\_\_\_.
   3. Penis transfers \_\_\_\_\_\_\_\_\_\_\_\_ into the female reproductive system.
   4. Semen is the \_\_\_\_\_\_\_\_\_ that carries sperm.
      1. Semen contains sugar to give sperm \_\_\_\_\_\_\_\_\_\_\_\_.

**Word Bank**: testes meiosis store egg fluid energy smaller life sperm

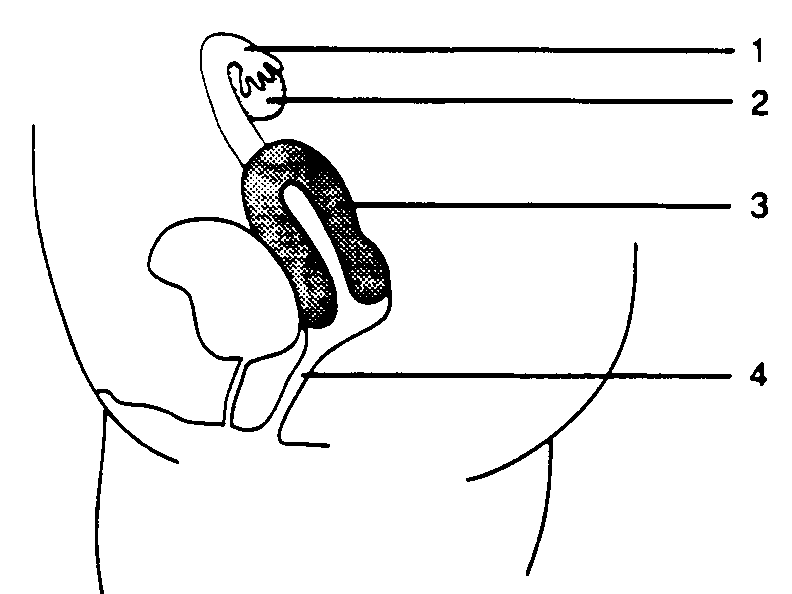


1. **Female Reproductive System**
   1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ produce eggs.
      1. Eggs are haploid cells made by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
      2. Females are born with all eggs they will ever \_\_\_\_\_\_\_\_\_\_\_\_.
         * An egg is not fully developed until \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
         * Females are born with \_\_\_\_\_\_\_\_\_\_\_ of eggs, enough for several lifetimes.
      3. Eggs are largest \_\_\_\_\_\_\_\_\_ in the body.
      4. Eggs do not \_\_\_\_\_\_\_\_\_\_\_\_\_on their own.
      5. Contain 23 chromosomes and all cell parts (mitochondria, ribosomes, etc.) that the offspring will need to \_\_\_\_\_\_\_\_\_ and develop.
   2. The \_\_\_\_\_\_\_\_\_\_\_ cycle lasts 28 days (on average)
      1. Ovulation – \_\_\_\_\_\_\_\_\_\_\_\_\_ of an egg (typically 1 per cycle)
      2. Menstruation – \_\_\_\_\_\_\_\_\_\_\_\_ of the uterine wall if fertilization doesn’t occur
      3. If pregnancy occurs, the menstrual cycle will temporarily \_\_\_\_\_\_\_\_\_\_.
   3. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ carries the egg to the uterus.
   4. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the womb where the baby will develop.
   5. The vagina is the \_\_\_\_\_\_\_\_\_\_\_ canal where the baby will leave the body.

**Word Bank**: millions need meiosis ovulation ovaries uterus release

fallopian-tubes move cells grow menstrual shedding

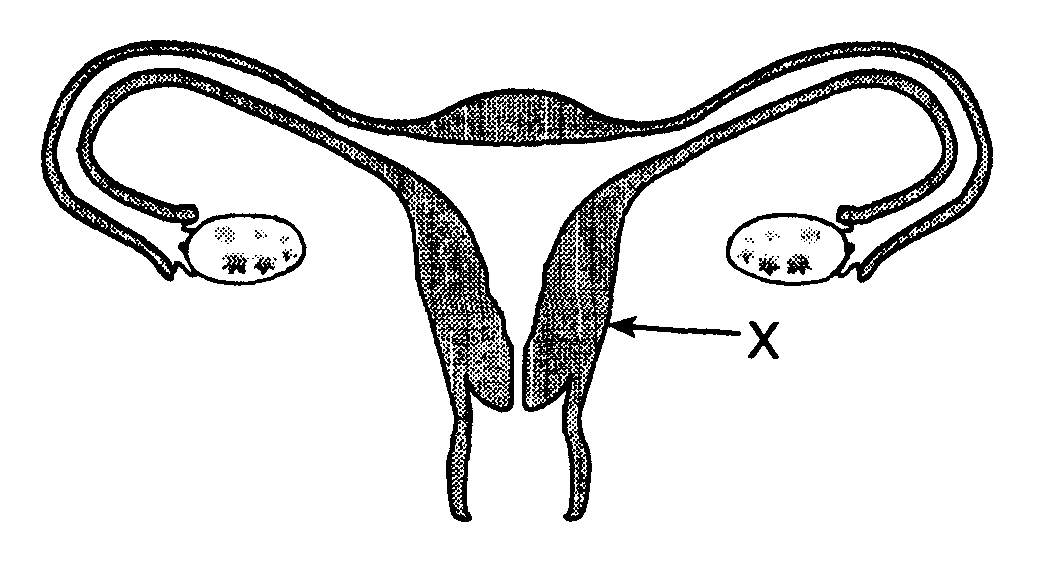
stop birth

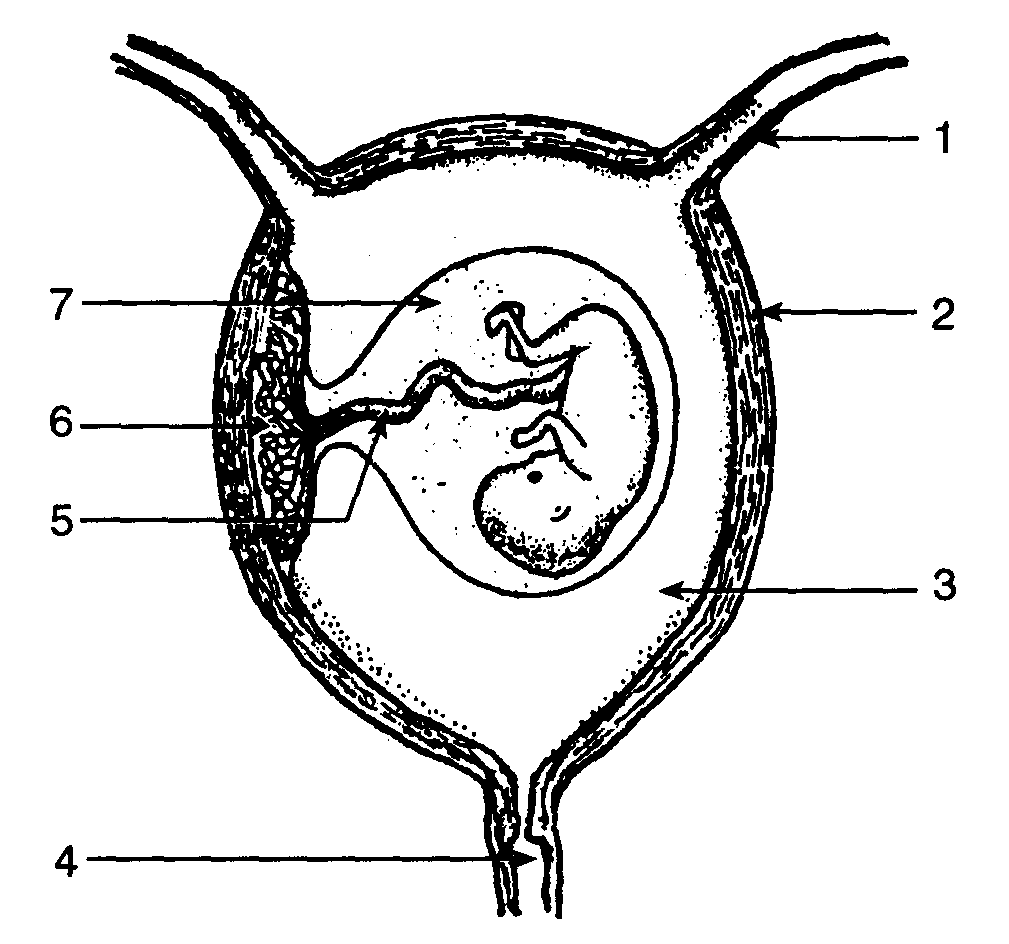
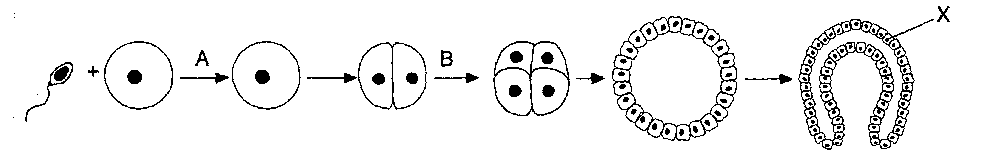
1. **Development**
   1. Fertilization occurs in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
      1. A fertilized egg is called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
      2. Fertilization \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the complete set of chromosomes, so the zygote is diploid (23 from the egg + 23 from the sperm = \_\_\_\_\_\_).
   2. A zygote \_\_\_\_\_\_\_\_\_ in the following order:
      1. Cleavage – A form of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_; cells divide but do not differentiate
      2. Differentiation – Cells begin to form into tissues and \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
      3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_
      4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_– most major organs are formed (but not completed)
         * Continues to grow through cell \_\_\_\_\_\_\_\_\_\_\_\_\_ (mitosis)
   3. The\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ transfers nutrients and oxygen from the mother’s blood into the blood of the fetus through the process of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
      1. The \_\_\_\_\_\_\_\_\_ of the mother and fetus do not mix.
      2. The fetus is attached to the placenta by the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
      3. Waste produced by the fetus is also \_\_\_\_\_\_\_\_\_\_ by the placenta.
         * Waste (CO2, urea, salts) *\_\_\_\_\_\_\_\_\_\_\_* from placenta into mother’s blood.
         * Since the fetus does not eat solid food, it does not have to eliminate \_\_\_\_\_\_\_\_\_\_.
   4. The child is vulnerable to alcohol, drugs, etc. because organs and systems are still \_\_\_\_\_\_\_\_\_\_\_.

**Word Bank**: restores fallopian-tube 46 zygote mitosis embryo fetus placenta organs diffusion umbilical-cord division blood removed *diffuse* feces developing born correct process

**Late Development** – The fetus pictured here is nearly ready to be \_\_\_\_\_\_\_. Note the umbilical cord, placenta and amniotic sac.

**Fertilization** restores the \_\_\_\_\_\_number of chromosomes.





**Early development –** Fertilization (A) forms a single celled **zygote** which then begins the process of **cleavage (B)** which will eventually create a layered ball of cells that will form the embryo.

**Topic Six: Genetics**

1. **Chromosomes:**
   1. Humans have \_\_\_\_\_\_ chromosomes, or \_\_\_\_\_\_ homologous pairs.
      1. **Homologous:** Chromosomes with the \_\_\_\_\_\_\_ genes, size and shape.
   2. **Chromosome pairs** carry genes for the same \_\_\_\_\_\_\_.
      1. Most organisms have \_\_\_\_\_\_\_\_ genes for each trait - 1 from each parent, 1 on each member of the homologous pair.
   3. **Sex chromosomes –** In humans, females are \_\_\_\_\_\_ and males are \_\_\_\_\_\_.
      1. The Y chromosome is much \_\_\_\_\_\_\_\_\_\_\_\_\_ than the X, so it is missing many genes. This means many genes on the X chromosome do not have a “\_\_\_\_\_” so:
         * If a male has a recessive trait on the X chromosome, the Y chromosome will not be able to “\_\_\_\_\_\_\_” it with a dominant gene, so...
         * This makes \_\_\_\_\_\_\_\_ more likely to have some traits (like color blindness). These are called **sex \_\_\_\_\_\_\_\_\_ traits.**
   4. **Common mistake**:“Humans have 23 \_\_\_\_\_\_\_\_\_\_\_\_\_ (or 46 pairs of chromosomes, or some other incorrect number).”

*These numbers are often confused. You must memorize them correctly.*

**Word Bank**

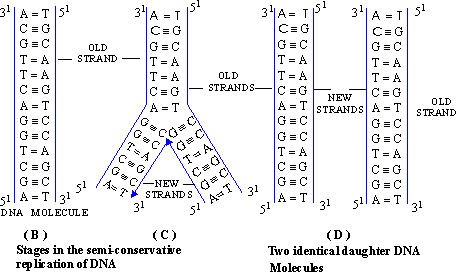
46 same traits XY smaller hide partner 23 linkedtwo XX males chromosomes

1. **Chromosomes and Genes**
   1. Each chromosome has hundreds or thousands of \_\_\_\_\_\_\_\_\_\_\_\_.
   2. **Each gene codes for a particular \_\_\_\_\_\_\_\_\_\_**.
      1. **Common mistake:** “Genes/DNA are made from protein.”

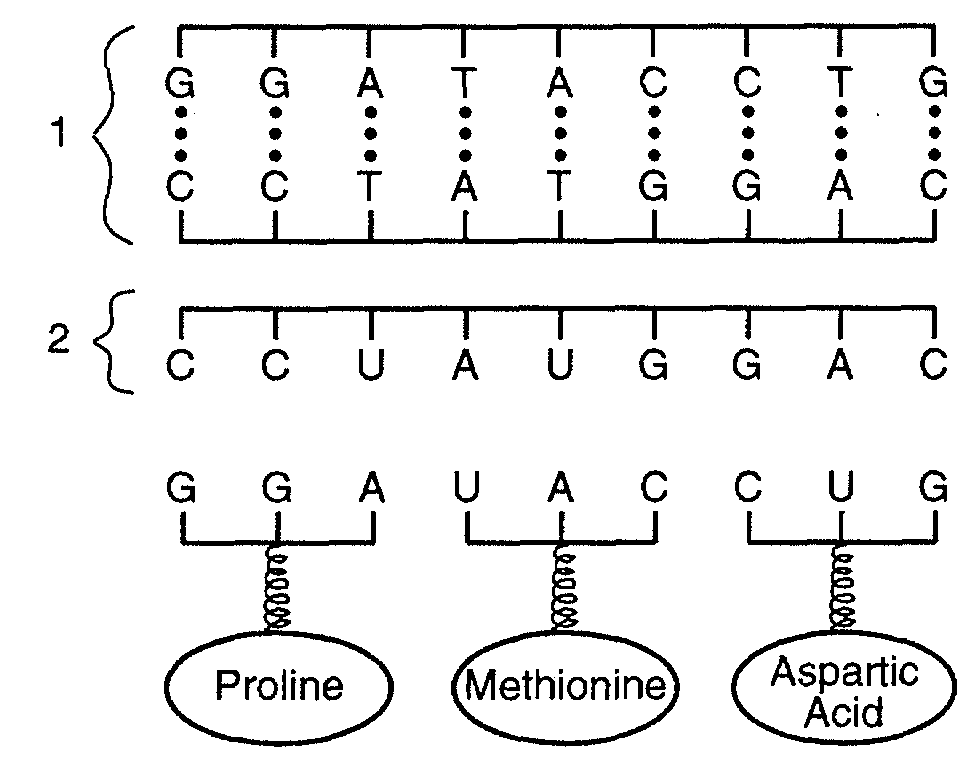
*Genes carry the instructions to make protein. The genes themselves are made from \_\_\_\_\_\_\_\_\_\_\_\_\_.*

* + 1. While genes determine our traits, **the \_\_\_\_\_\_\_\_ can affect expression of genes.**

**Word Bank**: genesproteinnucleic-acidsenvironment

1. **DNA**
   1. DNA is the chemical that makes up your \_\_\_\_\_\_\_\_\_\_\_ and chromosomes.
      1. Analogy: If your genes and chromosomes are the “instruction manual” for your body, DNA would be the paper it is \_\_\_\_\_\_\_\_\_\_ on.
   2. The shape of a DNA molecule is a\_\_\_\_\_\_\_\_\_\_\_\_, which resembles a twisted ladder.
   3. The shape of DNA allows it to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (copy) itself almost perfectly.
   4. DNA is made of 4 bases: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.
      1. The DNA to DNA base pairs are: \_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_
         * The DNA to RNA base pairs are \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_

**Word Bank**

C-G double-helix A-T genes A-U replicate A-T-C-G C-G printed

1. **Protein Synthesis**: This is how genes \_\_\_\_\_\_\_\_\_\_\_ your body:
   1. A **\_\_\_\_\_\_\_\_\_\_** is a sequence of **amino-acid bases** in DNA**.**
      * + Each codon represents a specific **amino acid**.
        + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ assemble amino acids in the same order that they are listed in the DNA codons.
        + The amino acids will make a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
        + The \_\_\_\_\_\_\_\_\_ of the amino acids (determined by the DNA sequence) determines the shape of the protein.
        + The shape of a protein \_\_\_\_\_\_\_\_\_\_\_\_\_ its function.
        + Therefore: The sequence of bases in DNA will determine the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of all the proteins in the body.
        + The proteins build and run the body.
   2. **\_\_\_\_\_\_** carries the genetic code to **ribosomes**.

**Word Bank**

ribosomes function amino-acid protein control three RNA shape bases shape determines codon order

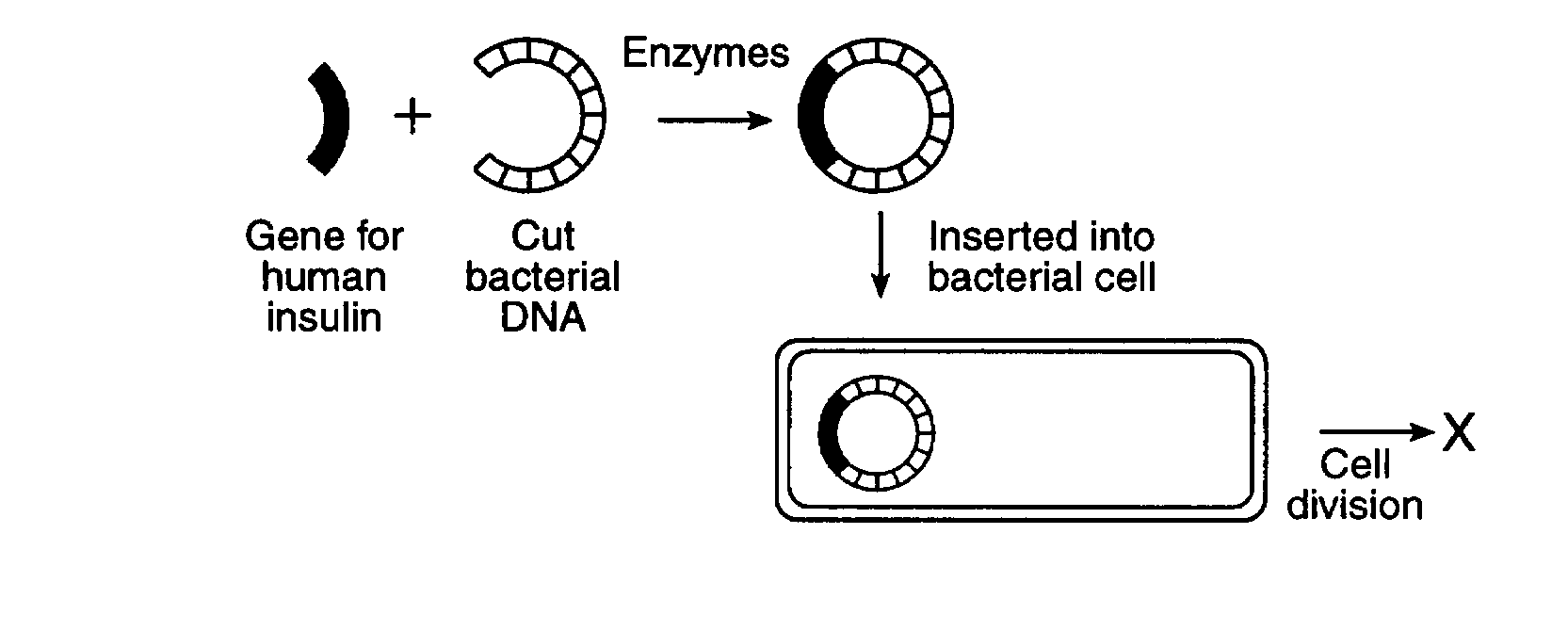
The order of DNA \_\_\_\_\_\_\_\_\_\_ in your genes determines the order of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in your proteins, which determines the protein’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and function.

**Therefore: How your body functions depends on the order of the bases in your genes!**

1. **Mutations:** Any \_\_\_\_\_\_\_ in an organism’s genetic material.
   1. Can only be passed on if they occur in \_\_\_\_\_\_\_\_\_\_\_\_ cells (sperm or egg).
   2. Common **\_\_\_\_\_\_\_\_\_\_\_\_ agents** include radiation, chemicals and viruses.
      1. Mutagenic agent: Any \_\_\_\_\_\_\_\_\_\_ factor that causes mutations.
   3. **Gene mutations** may cause a change in a gene which can change the \_\_\_\_\_\_\_\_\_\_ of a \_\_\_\_\_\_\_\_\_\_\_. This will have an \_\_\_\_\_\_\_\_\_ on the way the protein works (if it still works at all).
      1. Gene mutations are caused when DNA bases are in some way \_\_\_\_\_\_\_\_\_\_.
   4. **Chromosome mutations** are usually caused when a person \_\_\_\_\_\_\_ too many or too few chromosomes.
      1. Chromosome mutations affect many genes at once. Most are \_\_\_\_\_\_\_\_\_.
      2. **Down’s Syndrome**: Non lethal mutation, caused by inheritance of an \_\_\_\_ copy of chromosome 21. (Note – only chromosome 21 can cause Down Syndrome).

**Word Bank**

change shape environmental inherits effect protein reproductive changed mutagenic extra lethal

1. **Genetic technology:**
   1. **Selective breeding**: Controls the breeding of animals or plants to produce offspring with \_\_\_\_\_\_\_\_\_\_\_\_ traits.

Ex: Dogs are **selectively bred** for temperament and a variety of   
\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ traits (coat type, color, size).

* 1. **Genetic engineering:** “\_\_\_\_\_\_\_” a gene from one organism and “pastes” it into the DNA of a new organism.
     1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_are used to cut and paste the DNA segments.
     2. Organism that receives the new gene will begin to make the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or hormone coded for by that gene.

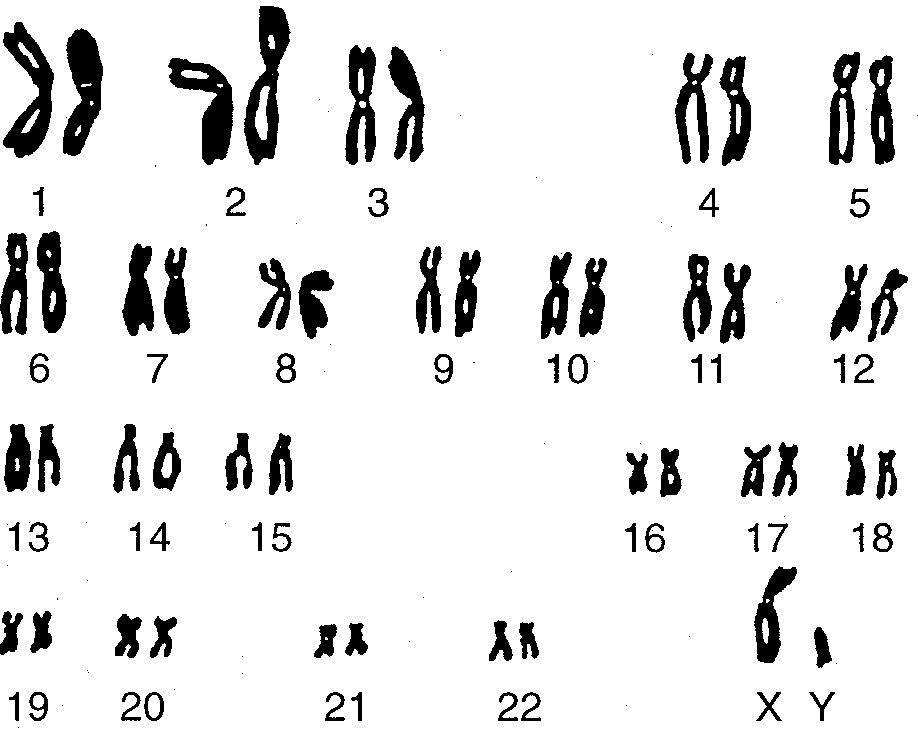
**Word Bank**

desirable protein cuts enzyme appearance restriction-enzymes

* + 1. The new protein/enzyme/hormone will be exactly the same as the one produced by the \_\_\_\_\_\_\_\_\_ organism.
    2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_are often used because they are simple and reproduce quickly.
    3. The example of gene splicing you MUST know:
       - **Bacteria have been engineered to make \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for diabetics.**
       - **Bacteria have been engineered to make \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**
       - In both cases the \_\_\_\_\_\_\_\_\_\_\_ hormones are safe to use because they are identical to normal human hormones.

**Word Bank**

original engineered bacteria insulin growth-hormone



* 1. New technologies (**karyotyping, DNA fingerprinting**) are making it easier to diagnose and treat genetic \_\_\_\_\_\_\_\_\_\_, though we cannot yet cure them.
     1. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_:** A photograph of an organism’s chromosomes.
        + Can determine if a person has a chromosome \_\_\_\_ such as Down Syndrome.
     2. **DNA \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, or gel electrophoresis, creates banded patterns based on a person’s DNA base sequence.
        + Each fingerprint is unique, so it can be used to \_\_\_\_\_\_\_\_\_\_ people.
        + Fingerprints of relatives are similar to each other, so can be used to determine genetic \_\_\_\_\_\_\_\_\_\_ between two people, or even two groups of organisms.
  2. Genetic research has posed many **\_\_\_\_\_\_\_\_** problems (ie right and wrong) that science alone cannot answer.
     1. Ethics: Study of what is \_\_\_\_\_\_\_\_\_\_ right or wrong.

**A karyotype** shows all 23 pairs of human chromosomes. Note the last pair identifies this as a male.

**Word Bank**

disease karyotype disorder fingerprinting identify relationships morally ethical **Topic Seven: Evolution**

1. **Evolution**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. **Modern Theory of Evolution:**
   1. **Charles Darwin:**
      1. Was not the first to think of \_\_\_\_\_\_\_\_\_\_, but he did figure out how it works (mostly).
      2. Darwin didn’t know about \_\_\_\_\_\_\_\_\_\_, so he couldn’t know about mutations.
   2. The \_\_\_\_\_\_\_\_ theory (which combines Darwin’s ideas with genetics and other new ideas) contains the following ideas:
      1. Earth is old (4.55 billion years) and is constantly \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
      2. As the environment changes, evolution causes species to \_\_\_\_\_ to their environment.
      3. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is the **mechanism** that causes species to change.
      4. **Common Descent:** Modern species evolved from \_\_\_\_\_\_\_, different species and share a **\_\_\_\_\_\_\_\_\_ ancestor**.
      5. Species that can not adapt become \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
      6. New traits arise in a species from \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Word Bank**

genes changing common evolution adapt

modern earlier natural-selection extinct mutations

gene-recombination

1. **Environment and Evolution**: Species usually \_\_\_\_\_\_\_\_\_\_\_ when the environment changes.
   1. Changes need to be long term – species do not evolve because of changes in the \_\_\_\_\_\_\_.
   2. Changes can include:
      1. Climate change
      2. Change in temp
      3. Change in \_\_\_\_\_\_\_\_\_ availability
      4. Change in \_\_\_\_\_\_\_\_\_ availability
      5. Introduction of \_\_\_\_\_\_\_ species (new food, new predator)
      6. Species may be moved to a new \_\_\_\_\_\_ (accidentally taken to an island for example)
   3. Environmental change **DOES NOT** **CAUSE** \_\_\_\_\_\_\_\_\_\_\_\_ to occur. A temperature or climate change does not itself force a species to change its \_\_\_\_\_\_\_\_\_\_\_ characteristics.
      1. If this were the case, then all \_\_\_\_\_\_\_\_ would be able to \_\_\_\_\_\_\_\_\_\_ to the new environment, and \_\_\_\_\_\_\_\_\_ would be a very rare event.

**Word Bank**

season evolve inherited location evolution water food adapt new species extinction

1. **Natural Selection:** The basic steps in natural selection are:
   1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: Members of a species are different from each other due to \_\_\_\_\_\_\_\_\_\_\_ and sexual reproduction.
      1. No variation = no evolution or natural selection, as there is nothing to “\_\_\_\_\_\_.”
         * Species with no variation are usually the first to \_\_\_\_\_ when the environment changes.
   2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: Too many offspring are produced.
   3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: Offspring must struggle to survive and reproduce.

**Word Bank**

die mutations select variation overproduction competition

* 1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_:
     1. Offspring who inherited “fit” traits are, on average, better able to get \_\_\_\_\_\_\_\_\_, escape from predators and find mates.
     2. Offspring with “unfit” traits will have more difficulty \_\_\_\_\_\_ and finding mates.
     3. **Fitness:** A \_\_\_\_\_\_\_\_\_ of how well a trait helps an organism to survive and reproduce in its environment. Note that there is no absolute rule for fitness – what is fit in one environment may be \_\_\_\_\_\_\_ in another.
     4. **Note:** This “selection” is not a conscious act – no one is “choosing” who survives and who doesn’t. It is the result of the conditions of the organism’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Word Bank**

unfit survival-of-the-fittest environment surviving resources measure

* 1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_:
     1. More \_\_\_\_ organisms reproduce and pass on their genes than unfit organisms.
     2. On average, the next generation will have more traits from the “fit” parents than the \_\_\_\_\_\_\_ ones.
     3. NOTE: Traits are still inherited \_\_\_\_\_\_\_\_\_\_\_. Individuals offspring of “fit” parents can still \_\_\_\_\_\_\_\_\_ “unfit” traits (though it will be unlikely to survive and reproduce). It is only by looking at the ENTIRE population that you will see the “fit” traits become more \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: Evolution does not happen overnight. It takes many generations of \_\_\_\_\_\_\_\_\_\_ selection to weed out the unfit traits.

**Word Bank**

reproduction randomly inherit repetition fit unfit common repetitive

**V. Speciation:** The process of making a new species from an \_\_\_\_\_\_\_\_\_\_\_ one.

* 1. **\_\_\_\_\_\_\_\_\_\_\_\_\_ Isolation**: A population is separated into 2 or more different habitats.
  2. **New \_\_\_\_\_\_\_\_\_\_\_\_\_ and adaptation:** Each population adapts to its new environment in different ways. This results in physical and \_\_\_\_\_\_\_\_\_\_\_ differences between the two populations.
  3. **Add time:** The longer two populations are \_\_\_\_\_\_\_\_\_\_\_\_\_, the greater their differences will become.
  4. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Isolation:** Eventually the populations change so much that they are unable to interbreed, even when brought together.
     1. **Once two populations can no longer \_\_\_\_\_\_\_\_\_\_\_\_ together, they are considered new species.**

**Word Bank**

genetic reproductivebreedapart geographicvariationexisting

1. **Classification**- Organisms are classified based on their \_\_\_\_\_\_\_\_\_\_\_\_\_ relationship.
   1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are large groups of related organisms (fungi, bacteria, protists, animals, plants).
   2. A **species** is able to successfully \_\_\_\_\_\_\_\_\_\_\_\_\_\_ amongst its members.
      1. Note that this is not a perfect definition – Lions and tigers can breed together, as can dogs and wolves. Because evolution is a constantly ongoing and a \_\_\_\_\_\_\_\_\_\_\_ process, there are many, many examples in which the lines between \_\_\_\_\_\_\_\_\_\_\_\_\_\_ are blurry (see Ring Species)
   3. Branching \_\_\_\_\_\_\_\_\_ diagrams (cladograms) are often used to show evolutionary relationships.

**Word Bank**

reproduce kingdoms tree evolutionary species gradual relationships

1. **Evidence:** Evidence in \_\_\_\_\_\_\_\_\_\_\_\_\_ of evolution comes from many fields:
   1. **\_\_\_\_\_\_\_\_\_\_\_** **record** preserves extinct species as well as transitional forms between different types of organisms.
   2. **Radiometric \_\_\_\_\_\_\_\_\_\_\_\_\_** of rocks consistently confirm the age of the Earth and fossils
   3. Comparisons of the \_\_\_\_\_\_\_\_\_\_\_\_\_ (physical structures), embryology (development), chemistry and genes of species confirm expected \_\_\_\_\_\_\_\_\_\_\_\_.
   4. **Direct observation**: Humans have seen evolution occur both in \_\_\_\_\_\_\_\_\_\_\_\_\_ and in the lab. Examples include:
      1. **Bacteria** evolving \_\_\_\_\_\_\_\_\_\_\_\_ to antibiotics.
      2. **Insects** evolving resistance to \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
      3. Modeling natural selection with \_\_\_\_\_\_\_\_\_\_\_\_ breeding to alter a species’ traits.
      4. \_\_\_\_\_\_\_\_\_\_ examples of speciation

**Word Bank**

anatomy support relationships datingfossil

nature resistance pesticides selective observed

1. **Common Mistakes**
   1. “Stronger organisms are more \_\_\_\_\_\_ than weak ones.”

*Evolutionary fitness is not \_\_\_\_\_\_\_\_\_\_ fitness. Fitness is determined by who is better \_\_\_\_\_\_\_\_\_ to survive in a particular environment and who can pass on their \_\_\_\_\_\_\_. Stronger is not always \_\_\_\_\_\_\_\_\_. There are many examples of species for whom it is better to be slow, \_\_\_\_\_\_, or stupid, than fast, strong or smart. It all depends on the \_\_\_\_\_\_\_\_\_\_\_\_\_ you are in.*

* 1. “The organism evolved to live in its environment.”

*Individual organisms do not \_\_\_\_\_\_\_\_\_\_\_. Only \_\_\_\_\_\_\_\_\_\_\_ can evolve.*

* 1. “The organism could not adapt and it went extinct.”

*Individual organisms die; they cannot go \_\_\_\_\_\_\_\_\_. Only \_\_\_\_\_\_\_ can become extinct.*

**Word Bank**

adapted weak fit genes physical better

environment evolve populations extinct species

* 1. “The bacteria became resistant to antibiotics when they were exposed to them”

*To evolve, \_\_\_\_\_\_\_\_\_ must exist in a species BEFORE the \_\_\_\_\_\_\_\_ changes (pre-adaptation). Bacteria who did not already have a \_\_\_\_\_\_\_\_\_ to antibiotics would die when exposed to them, a Chihuahua who is left out in the cold will not grow \_\_\_\_\_, warm fur and a squirrel who plays in traffic will not evolve \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ resistance.*

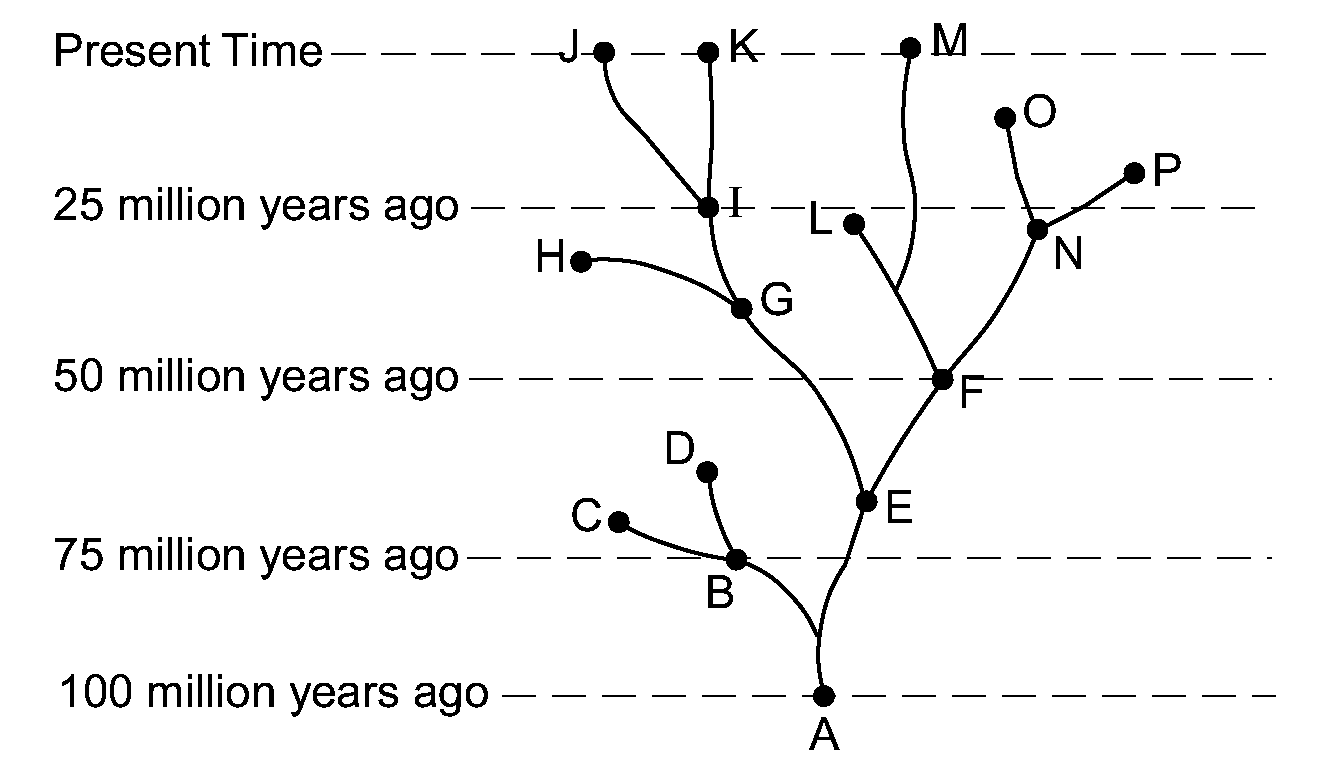
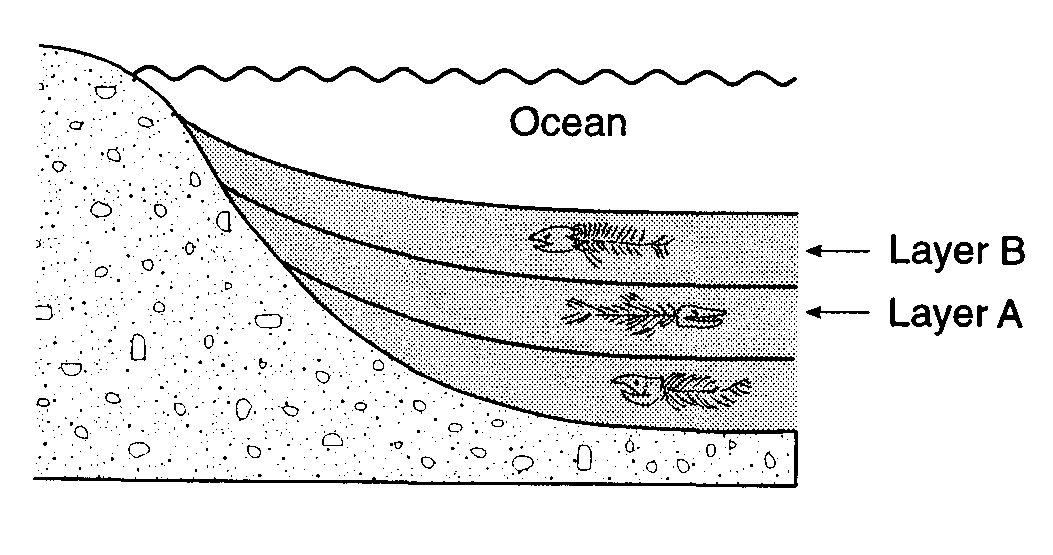
* 1. “Giraffes got long necks because they \_\_\_\_\_\_\_\_\_ them to eat leaves at the tops of trees.” *Species do not \_\_\_\_\_\_\_ traits because they need them - Life would be much better if we could! \_\_\_\_\_\_\_\_\_ necked giraffes were never given long necks any more than slower antelopes are given \_\_\_\_\_\_\_\_\_ when confronted by a predator. The reason there are no short necked giraffes (or slow antelope) is that they were out \_\_\_\_\_\_\_\_ by members of their species with more \_\_\_\_\_\_ traits. Better answers are*
     + - “Giraffes evolved long necks because the ones with longer necks were better \_\_\_\_\_\_\_\_\_\_ to get food than short neck giraffes.”
       - “Giraffes evolved long necks because more short necked giraffes \_\_\_\_\_\_\_, and more long neck giraffes lived and \_\_\_\_\_\_\_\_\_\_\_\_\_.”

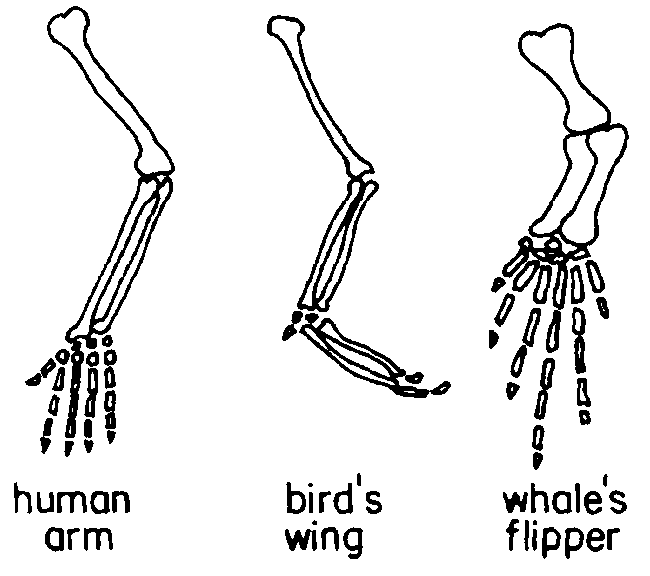
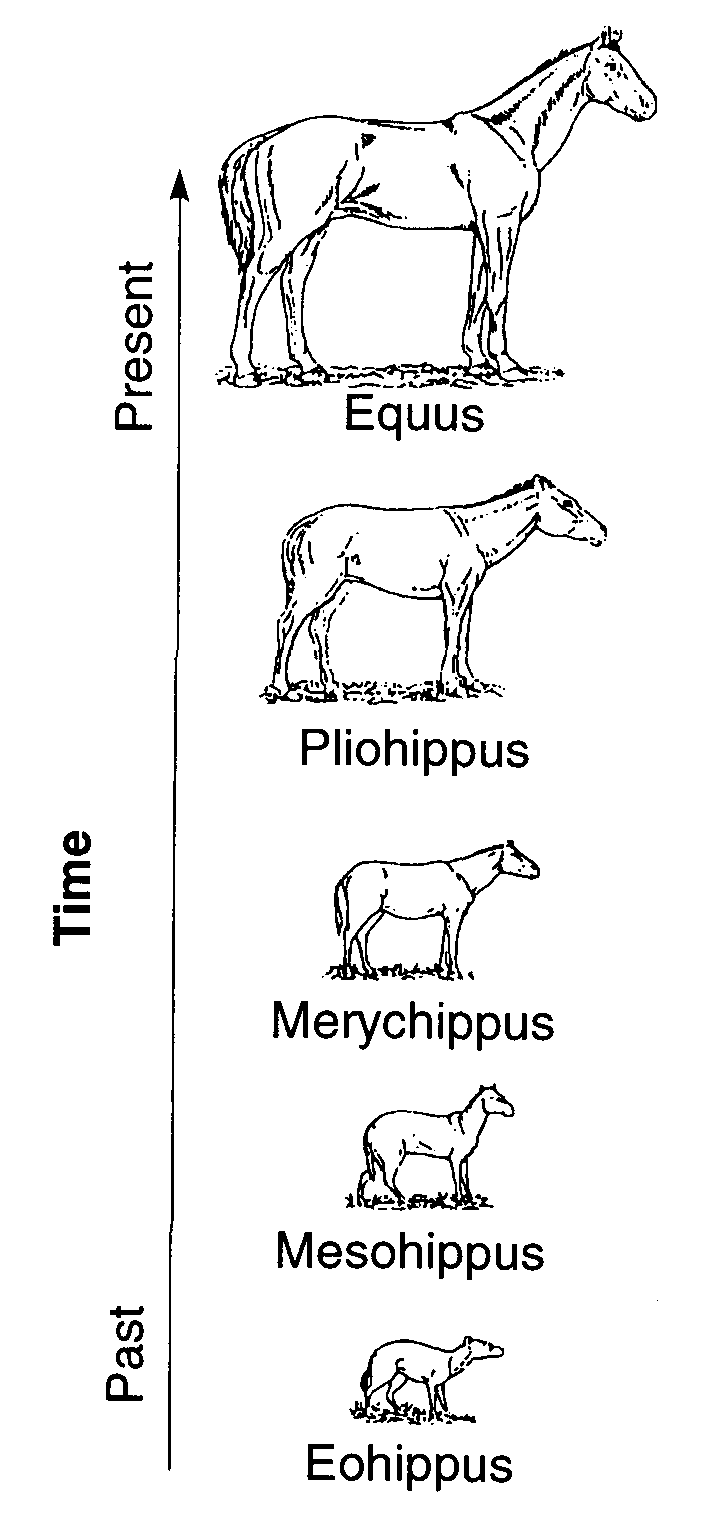
**Word Bank**

long environment variations resistance automobile

speed needed evolve short competed

reproduced fit adapted died



1. 

Deeper fossils are typically older than those above them.

**Transitional forms** for many species can be found in the fossil record. This diagram shows the evolution of the modern horse from a small, many-toed ancestor.

**Homologous Structures** reveal that the same body parts can be modified to perform different functions.

**Evolutionary trees** can show the relationship between living and extinct species.

**Topic Eight: Ecology**

**Ecology:** Study of organisms and their \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* 1. **Habitat:** Where an organism \_\_\_\_\_\_\_\_\_\_\_.
  2. **Niche:** What an organism \_\_\_\_\_\_\_\_ and how it gets nutrients.
     1. **Two species in an ecosystem trying to fill the same niche will create** \_\_\_\_\_\_\_\_\_\_\_\_\_, which usually results in only one species \_\_\_\_\_\_\_\_\_\_\_ a niche at any one time. Organisms with similar needs will often \_\_\_\_\_\_\_\_\_\_\_ resources to reduce competition (ex: birds eat insects during the day, bats eat \_\_\_\_\_\_\_\_\_ at night).

**Word Bank**

competition does divide lives insects occupying environment

* 1. **How organisms \_\_\_\_\_\_\_\_\_ with each other:**
     1. Competition: occurs when two or more organisms \_\_\_\_\_\_\_ the same resource.

Ex: A squirrel and a chipmunk \_\_\_\_\_\_\_\_\_\_ for food.

* + 1. Feeding: One organism \_\_\_\_\_\_\_ on another.
       - \_\_\_\_\_\_\_\_\_\_ – An autotroph; organisms that makes its own nutrients from simple substances.
       - Consumer – A \_\_\_\_\_\_\_\_\_\_\_; may be an herbivore, carnivore, omnivore or decomposer.
    2. \_\_\_\_\_\_\_\_\_\_\_: A close relationship between two organisms in which at least one benefits.
       - Can include 2 organisms working together for \_\_\_\_\_\_\_\_ benefit (bee and flower) or 1 organism harming another (parasite-host).

**Word Bank**

feeds mutual interact compete symbiosis producer need heterotroph

1. **Organization**
   1. Abiotic Factors are \_\_\_\_\_\_\_\_\_ things.
   2. Biotic Factors are \_\_\_\_\_\_\_\_ things.
   3. Levels of organization:

Population – one \_\_\_\_\_\_ in an area.

Community – \_\_\_\_\_ species in an area.

Ecosystem – All species and \_\_\_\_\_\_\_\_ factors in an area.

Biome – Similar \_\_\_\_\_\_\_\_\_ (desserts, rain forests, etc.)

Biosphere – All of \_\_\_\_\_\_\_\_\_ecosystems.

**Word Bank**

species living ecosystems all abiotic non-living Earth’s

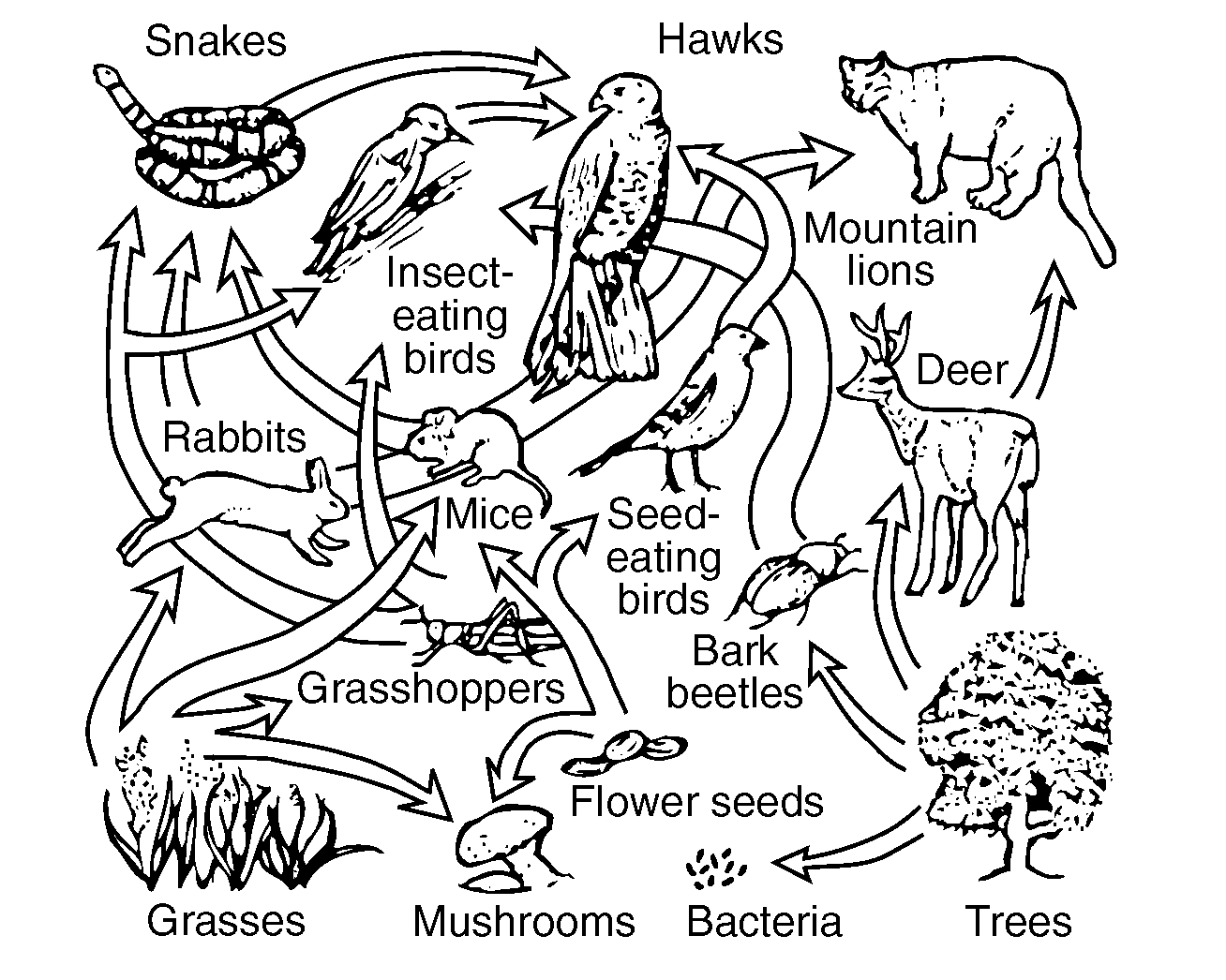
1. **Populations**: A given area can only supply enough \_\_\_\_\_ for a limited number of organisms.
   1. Carrying capacity: \_\_\_\_\_\_\_\_ population that an ecosystem can support.
   2. Limiting factors: Anything which limits the \_\_\_\_\_\_ of a population, including: food, water, sunlight, soil, predators and disease.
   3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: When a population exceeds the carrying capacity. Usually results in a large number of organisms dying off until a new balance is \_\_\_\_\_\_\_\_\_\_. This fluctuation in population is an example of dynamic \_\_\_\_\_\_\_\_\_\_\_\_.



**Word Bank**

size resources equilibrium largest reached overpopulation

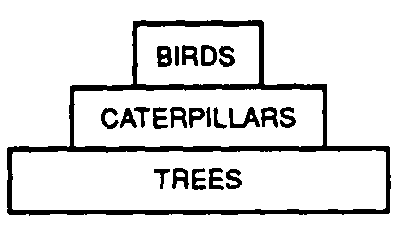
1. **Energy in an Ecosystem**
   1. Sunlight provides all \_\_\_\_\_\_\_\_\_ for life on Earth.
   2. Sun’s energy is stored in the chemical bonds of food through the process of \_\_\_\_\_\_\_\_\_\_.
   3. Food chain – Shows 1 way that energy can “\_\_\_\_\_\_” through an ecosystem.

****

* 1. Food web – Shows many \_\_\_\_\_\_\_\_\_ pathways.

**Word Bank**

many energy flow photosynthesis

* 1. Energy pyramid: Shows that energy gets \_\_\_\_\_\_\_ with each step in a food chain
     1. Energy is lost because every organism uses some of the energy for it’s own life \_\_\_\_\_\_\_\_\_\_\_\_. Only about 10% of energy is \_\_\_\_\_\_\_ from one step to the next.
     2. This is why populations of \_\_\_\_\_\_\_\_\_\_\_ are typically less than the populations of their prey.

**Word Bank**

processes predators lost passed

1. **Biodiversity** refers to the variety of \_\_\_\_\_\_\_ on earth.
   1. **\_\_\_\_\_\_\_\_\_\_\_ ecosystems** (those with many types of species) are more stable than ones that are not diverse.
   2. As habitats are lost and species become \_\_\_\_\_\_\_\_\_\_, biodiversity is reduced. This is considered to be bad because:
      1. Ecosystems with low diversity are less \_\_\_\_\_\_\_\_ than ecosystems with more diversity,
      2. Ecosystems with low diversity take longer to recover from environmental \_\_\_\_\_\_\_\_\_.
      3. Humans use organisms for many things such as \_\_\_\_\_\_\_\_ and medicine; by reducing \_\_\_\_\_\_\_\_\_ we are losing potentially valuable resources.

**Word Bank**

diverse life changes biodiversity food stable extinct

1. **Ecological Succession**: Process in which existing communities are gradually replaced by a series of \_\_\_\_\_\_ communities.
   1. The organisms in each \_\_\_\_\_\_\_\_ of succession change the environment, and allow new organisms to move in and replace them.
   2. **Climax Community**: \_\_\_\_\_\_\_\_\_ stage of succession.
      1. The climax community is determined by the \_\_\_\_\_\_\_\_\_ climate.
         * Ex: Kansas has very fertile soil, but not enough rain to support trees, so succession \_\_\_\_\_\_\_\_\_\_\_\_ with grasses and shrubs.
   3. Any temporary \_\_\_\_\_\_\_\_ of a community will begin the process of succession all over again.
      * + Ex: If a forest fire \_\_\_\_\_ all the trees in an area, succession will eventually return the area back into a forest, but it much first pass through all the \_\_\_\_\_\_\_\_\_ stages.

**Word Bank**

kills local necessary disruption stops stage new final

1. **Human Impact**: Human \_\_\_\_\_\_\_\_\_\_ can have both a negative or positive impact on the environment.
   1. **The primary reason humans have a \_\_\_\_\_\_\_\_\_ impact on the environment is because the human population is growing, which places a greater demand on \_\_\_\_\_\_\_\_\_ such as food, water and space.**
   2. **There are no easy solutions to any ecological \_\_\_\_\_\_\_\_\_\_\_. Every \_\_\_\_\_\_\_\_\_ can have negative consequences. Choosing the “right” actions requires weighing the \_\_\_\_\_\_\_\_\_\_ with the risks.**
   3. \_\_\_\_\_\_\_\_ actions that generally have a negative impact on the environment include:
      1. Development/\_\_\_\_\_\_\_\_\_\_
      2. Pollution
      3. Farming
      4. \_\_\_\_\_\_\_\_\_\_\_\_/overgrazing
      5. Clear cutting/\_\_\_\_\_\_\_\_\_\_\_\_
      6. Introduction of \_\_\_\_\_\_\_\_\_ species

**Word Bank**

negativeindustrialization solutionresourcesdeforestation actions benefitsproblem human overhunting foreign

* 1. **Actions being taken by humans to reduce or repair \_\_\_\_\_\_\_\_\_\_\_ to the environment include:**
     1. Recycling \_\_\_\_\_\_\_\_\_\_\_
     2. Conserving \_\_\_\_\_\_\_\_\_\_ resources
     3. Using \_\_\_\_\_\_\_\_\_ resources (ex: solar over fossil fuels)
     4. \_\_\_\_\_\_\_\_\_\_\_ of habitats and endangered species
     5. Use of biological controls instead of pesticides and \_\_\_\_\_\_\_\_\_\_\_\_
     6. Farming native plants (ex: cocoa in the rainforest)
     7. Planting \_\_\_\_\_\_\_\_\_\_ to replace those cut down.
     8. Rotating crops or planting cover crops to reduce soil \_\_\_\_\_\_\_\_\_\_\_\_.
     9. Passing \_\_\_\_\_\_\_ to control pollution, land management, hunting, fishing, etc.

**Word Bank**

available trees loss damage protection wastes cleaner herbicides laws

1. **Specific Environmental Problems:**
   1. Acid rain
      1. **Cause**: Burning fossil fuels which emit \_\_\_\_\_\_\_\_ and SO2 which react with water to form acid.
      2. **Negative effect**: \_\_\_\_\_\_\_\_\_\_\_ of soil and water which kills plants and wildlife.
      3. **What can be done**: Reduce use of \_\_\_\_\_\_ fuels. Use air scrubbers to reduce \_\_\_\_\_\_\_\_\_\_. Use \_\_\_\_\_\_\_\_ to neutralize acid. \_\_\_\_\_\_ have a pH level between 0 and near 7. Bases have a pH level from near 8 to 14. A pH of 7 is \_\_\_\_\_\_\_\_\_.

**Word Bank** acidification fossil NO2  acids emissions buffers neutral bases

* 1. Depletion of ozone layer
     1. **Cause**: Using CFC’s in coolants and \_\_\_\_\_\_\_ sprays.
     2. **Negative effect**: Increases skin \_\_\_\_\_\_\_\_.
     3. **What can be done**: \_\_\_\_\_\_\_ using CFCs.
  2. Industrialization
     1. **Cause**: Change from agriculture to factory or \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
     2. **Negative effect**: Increased \_\_\_\_\_\_\_\_\_\_. Uses more land and \_\_\_\_\_\_\_\_\_\_.
     3. **What can be done**: \_\_\_\_\_\_\_\_\_ to regulate pollution, recycling, set aside land for preservation and state and national \_\_\_\_\_\_\_\_\_\_\_\_.

**Word Bank**

stop resources aerosol parks pollution industry cancer laws

* 1. Loss of habitat (ex: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)
     1. **Cause**: Industrialization, farming and housing
     2. **Negative effect**: Species lose habitat which is a loss of biodiversity and possible \_\_\_\_\_\_\_\_\_\_\_\_\_\_. This may disrupt the food chain and ecosystems.
     3. **What can be done**: \_\_\_\_\_\_\_\_\_\_\_\_ the development of industries. Preserve the \_\_\_\_\_\_\_\_\_ and national parks.
  2. Loss of bio diversity
     1. **Cause**: \_\_\_\_\_\_\_\_\_\_ loss, overhunting/harvesting, pollution, climate change and introduction of new species.
     2. **Negative effect**: Extinction. Ecosystems become less \_\_\_\_\_\_\_\_\_\_. Potential loss of valuable \_\_\_\_\_\_\_\_\_\_\_\_.
     3. **What can be done**: Regulate hunting / fishing / \_\_\_\_\_\_\_\_\_. Endangered species act \_\_\_\_\_\_\_\_ endangered species. Breeding programs to increase \_\_\_\_\_\_\_\_\_\_\_.

**Word Bank:** habitat resources stable protects population extinction regulate land collecting deforestation

* 1. Global warming
     1. **Cause**: Greenhouse gas \_\_\_\_\_\_\_\_\_ (CO2) from fossil fuels.
     2. **Negative effect**: May lead to habitat loss, loss of biodiversity, extinction and climate \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
     3. **What can be done**: Reduce emissions. Use \_\_\_\_\_\_\_\_\_ fuels and alternative energy. \_\_\_\_\_\_\_\_\_\_ energy. Plant trees. Use new \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  2. Introduced \_\_\_\_\_\_\_\_\_\_\_\_
     1. **Cause**: \_\_\_\_\_\_\_ species brought to new ecosystems by human travel and trade.
     2. **Negative effect**: Alien species can out compete \_\_\_\_\_\_\_\_\_ species. Reduces biodiversity.
     3. **What can be done**: Use biological controls to \_\_\_\_\_\_\_\_\_\_ species or limit population. Control trade and sale of \_\_\_\_\_\_\_\_\_\_ plants and animals. Screen cargo ships, planes, etc. for “\_\_\_\_\_\_\_\_\_\_\_\_.”

**Word Bank:** technology emissions conserve change species native exotic cleaner remove foreign hitchhikers

**Topic Nine: Experiments and Graphing**

1. **Terms:**
   1. **\_\_\_\_\_\_\_\_\_\_\_:** What is seen or measured.
   2. **\_\_\_\_\_\_\_\_\_\_\_:**  A conclusion based on observation or evidence.
   3. **Hypothesis:** A \_\_\_\_\_\_\_\_\_based on available evidence. A good hypothesis states both cause and \_\_\_\_\_\_.
      1. A correct hypothesis can be \_\_\_\_\_\_and **falsified** (proven incorrect) using an **experiment**.
      2. The easiest way to write a correct hypothesis is as an **“\_\_\_\_\_\_\_\_\_\_\_\_”** statement. (ex: IfI give patients this pill, then they will not get sick.)
   4. **Theory:** An \_\_\_\_\_\_\_\_\_\_\_of natural events that is supported by strong evidence.
      1. Theories tie together many scientific facts, hypotheses and \_\_\_\_\_\_\_\_\_\_\_.
      2. **Common Mistake:** “Theories are things that are \_\_\_\_\_\_\_\_, or are not proven.”

*This is an incorrect use of the word “theory” in a scientific \_\_\_\_\_\_\_\_\_. A scientific theory is* ***not*** *a simple \_\_\_\_\_\_\_\_or conjecture, and* ***is*** *strongly supported by\_\_\_\_\_\_\_\_.*

**Word Bank**

effect explanation inference tested evidence if-then-because prediction context observation opinions guess laws

**Example of a Controlled Experiment:**

**\_\_\_\_\_\_\_\_\_\_\_\_\_:**  
**If** people chew gum **then**, it will improve their memory **because** of the ingredients . . .

\_\_\_\_\_\_\_\_\_\_\_\_\_\_**variable:**

Chewing gum – some people will chew gum, some will not.

**Dependent variable**

Memory – \_\_\_\_\_\_groups should have their memory checked both before and after the experiment to see if it was improved.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_**Group**

Group that chews gum.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_**Group**

Doesn’t chew gum (remember – the control group never receives the new treatment)

**Constants**Should be the \_\_\_\_\_\_\_\_\_for both groups:

People in each group should be of similar health with \_\_\_\_\_\_\_\_\_\_\_\_memory, with similar mixes of sexes, ages, and ethnicities. Each group should also be \_\_\_\_\_\_\_\_\_\_in the same way.

\_\_\_\_\_\_\_\_\_\_\_**collected**

You should test people’s memories both before and \_\_\_\_\_\_\_\_\_the experiment.

**Word Bank**: similar data tested experimental after same independent control all hypothesis

1. \_\_\_\_\_\_\_\_\_\_\_\_\_**Experiments:**  Compares the results of an experiment between one or more experimental groups with a “\_\_\_\_\_\_\_\_\_” group.
   1. **Experimental group:**  Group being \_\_\_\_\_\_\_\_\_\_\_or receiving treatment.
   2. \_\_\_\_\_\_\_\_\_\_\_**group:**  “Normal” group. Should be \_\_\_\_\_\_\_\_\_to experimental group in every way except *one*: it does not receive the new treatment.
   3. **Placebo:** A sugar pill or other “fake” treatment \_\_\_\_\_\_\_\_to the control group. Usually only needed when using human subjects.
   4. \_\_\_\_\_\_\_\_\_\_\_**Variable:** \_\_\_\_\_\_\_\_\_\_\_\_that is being tested (ex: new drug, new fertilizer).
      1. The “If” part of an “If-then” hypothesis.
      2. The independent variable is always plotted on the \_\_\_\_\_axis.
   5. **Dependent Variable:** Variable that is \_\_\_\_\_\_\_\_\_\_\_at the end of an experiment; the results.
      1. The “then” part of an “If-then” \_\_\_\_\_\_\_\_\_\_.
      2. The dependent variable is always plotted on the \_\_\_\_\_\_ axis.

**Word Bank**

measured hypothesis tested independent control X variable identical normal controlled Y given

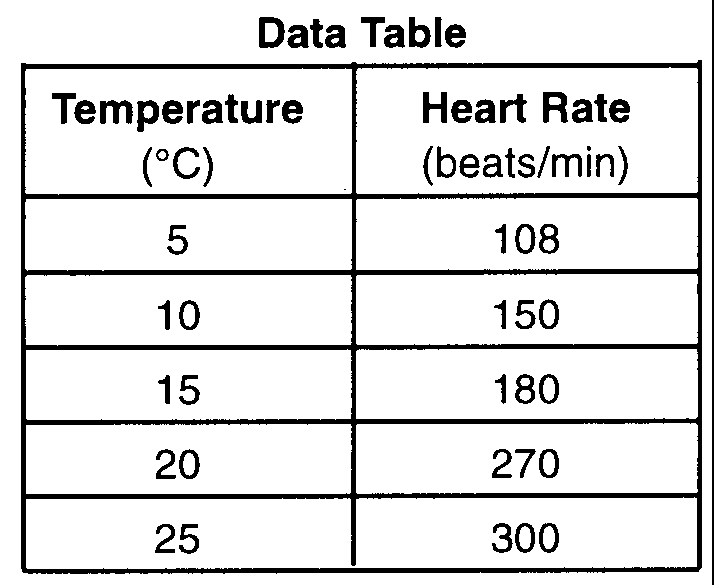
1. **Graphs and Data Tables**
   1. \_\_\_\_\_\_\_\_\_\_\_are used to organize data which will be plotted in a graph.
      1. First column in the table is for the \_\_\_\_\_\_\_\_\_\_\_**variable**.
      2. \_\_\_\_\_\_\_\_\_\_column is another for the **dependent variable.**
      3. Each column should be \_\_\_\_\_\_\_\_\_, and include units of measurement.
      4. Data in the table must be \_\_\_\_\_\_\_\_\_\_in ascending or descending

order.

* 1. Both the x and y axis of the graph must be \_\_\_\_\_\_\_\_or titled. These labels are typically the \_\_\_\_\_\_\_\_\_ones used in the data table. Once again units of \_\_\_\_\_\_\_\_\_\_must be written with the title.
     1. The **independent variable** is always plotted on the \_\_\_\_\_\_\_\_\_\_\_.
     2. The **dependent variable** is always plotted on the \_\_\_\_\_\_\_\_\_\_\_\_.

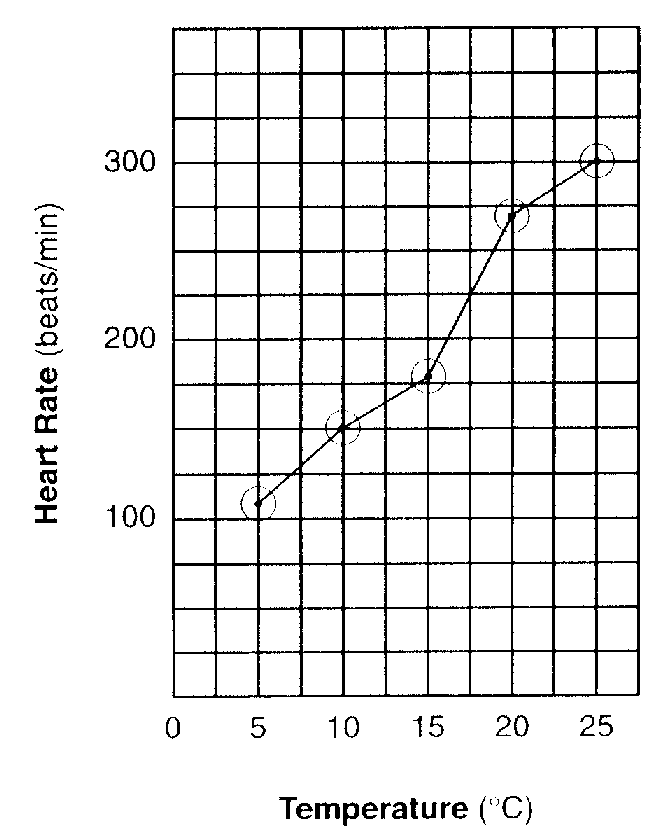
**Word Bank**

labeled measurement x-axis same second arranged independent titled data-tables y-axis

****

* 1. The x and y axis must be \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
     1. **These numbers must increase by a uniform \_\_\_\_\_\_\_\_\_\_\_\_\_** (that is you must count by 1’s, 2’s, 5’s, 10’s, etc).
     2. **Your numerical scales should take up most of the** \_\_\_\_\_\_\_\_. \_\_\_\_\_\_\_\_\_\_\_\_\_it all into the bottom corner makes the graph impossible to read and no credit will be given.
     3. The **numbers must line up with the** \_\_\_\_**lines** of the graph, not with spaces between them.
     4. **You do not need to start numbering your axis with** \_\_\_\_\_\_\_\_\_\_.
  2. To date, all graphs drawn on the LE Regents have been \_\_\_\_\_\_\_\_**graphs**. Any student who draws a bar graph instead of a line graph will be \_\_\_\_\_\_\_\_credit for this part of the test.
  3. All points plotted on your graph must be **surrounded by a** \_\_\_\_\_\_\_\_\_(or sometimes a square or triangle, depending on the directions).

**Word Bank**

line 0 axes squeezing denied circle grid numbered increment

**Characteristics of a good experiment:**

* 1. **Can be** \_\_\_\_\_\_\_\_\_\_\_**the same way and get the same results.**
  2. **Have** \_\_\_\_\_\_\_**sample size/many test subjects.**
  3. **Are performed over** \_\_\_\_\_\_\_\_\_**periods of time.**
  4. **Test only one** \_\_\_\_\_\_\_\_\_\_\_**variable.** All other characteristics of the \_\_\_\_\_\_\_\_\_groups should be the same.
  5. **Are** \_\_\_\_\_\_\_\_\_**reviewed –** examined by other scientists to determine its accuracy.
  6. **Must test the hypothesis and show** \_\_\_\_\_\_\_\_\_\_**it is wrong or right**.
  7. **Is objective –** the experiment and conclusion are fair and \_\_\_\_\_\_\_\_\_\_\_. Fact and opinion are not \_\_\_\_\_\_\_\_\_\_\_\_\_.
  8. The experiment follows established \_\_\_\_\_\_\_\_\_\_\_\_and **legal** standards.

**Word Bank**

mixed whether tested large longer peer independent unbiased repeated ethical

**Topic Ten: The State Labs (Part D)**

1. **Making Connections (aka The Clothespin Lab)**
   1. **Part A**
      1. **What you did:** measured how exercise affected \_\_\_\_\_\_\_\_\_\_\_ rate.
      2. **What you learned:** exercise \_\_\_\_\_\_\_\_\_\_ pulse rate.
   2. **Part A2**
      1. **What you did:** Squeezed a clothespin for 1 minute, then \_\_\_\_\_\_\_\_\_ it again for another minute
      2. **What you learned:**
         * If you squeezed more in the second round, it may have been because your finger muscles were “warmed up” from increased \_\_\_\_\_\_\_\_\_\_\_.
         * If you squeezed less the second round, it may have been because your finger muscles were \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
   3. **Part B**
      1. **What you did:** Designed an experiment to test how exercise \_\_\_\_\_\_\_\_\_\_ squeezing a clothespin.
      2. **What you learned:** How to \_\_\_\_\_\_\_\_\_ an experiment (see pages 3-5).

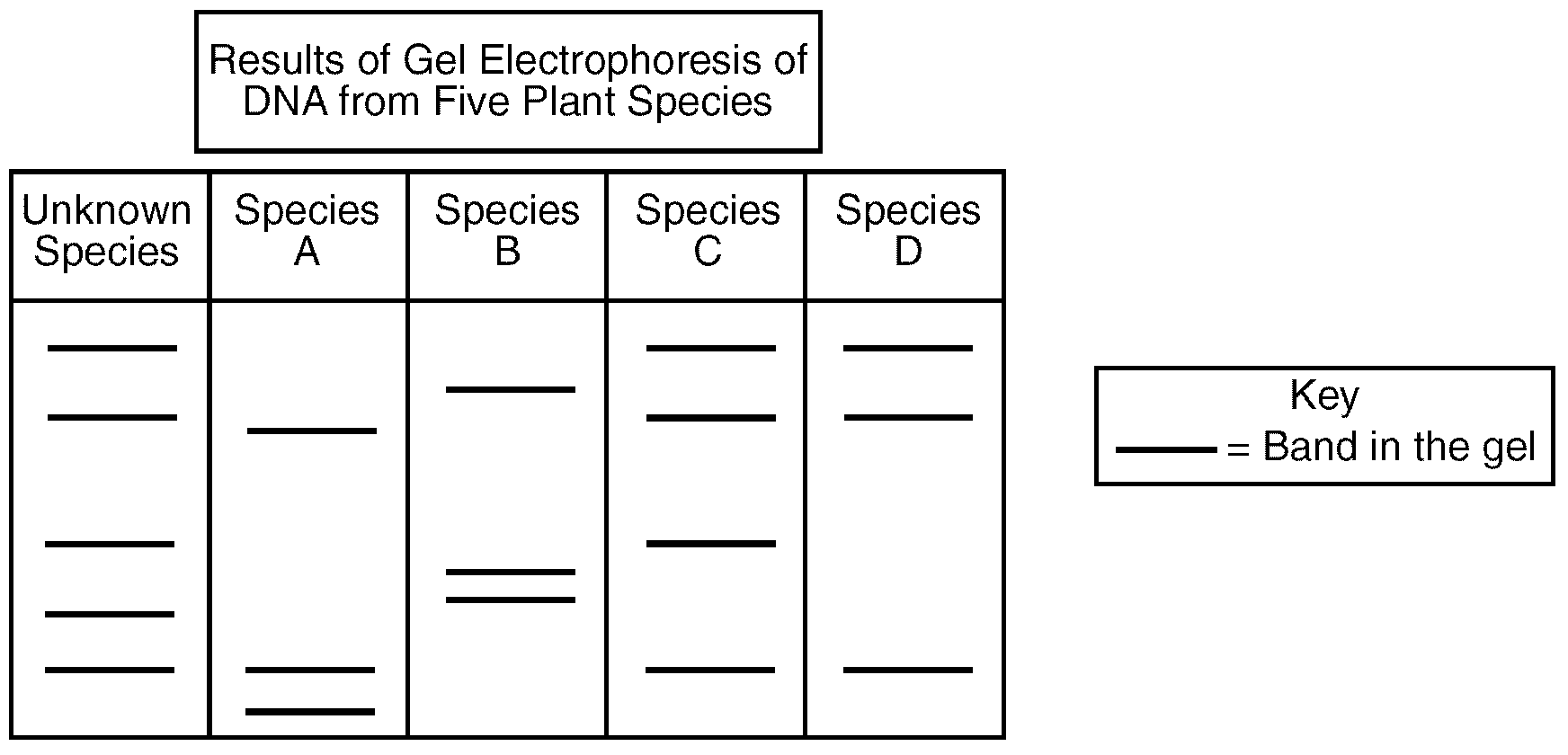
**Word Bank**

increases affects design fatigued pulse squeezed circulation

****

1. **Relationships and Biodiversity (*Botana curus* lab)**
   1. **What you did:** Compared 4 species of plants, based on \_\_\_\_\_\_\_\_\_ (physical) and \_\_\_\_\_\_\_\_\_\_\_\_ (chemical and genetic) traits.
   2. **What you learned:**
      1. Species that are related \_\_\_\_\_\_\_\_\_\_ similar traits.
      2. Different techniques (such as **gel electrophoresis** and **paper chromatography**) can be used to determine \_\_\_\_\_\_\_\_\_\_\_ between organisms.
      3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ species should be protected because they may offer benefits to humans.

**Word Bank**

****molecular endangered relationships share structural

**Gel \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ –** A technique used to show how species are related to one another.

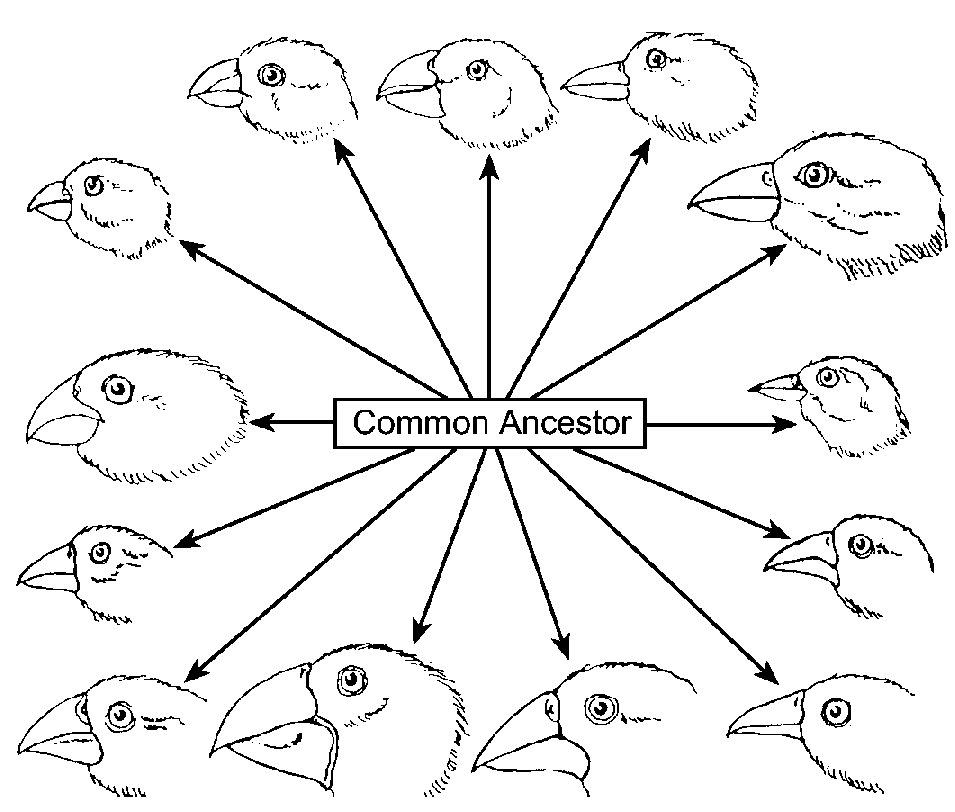
**Restriction enzymes** cut DNA into \_\_\_\_\_\_\_\_\_\_\_\_\_, which are placed into a well in a gel plate.

An **electric current** carries the DNA fragments through the gel, separating them according to \_\_\_\_\_\_ (smaller pieces of DNA are carried farther from the well than larger pieces). **This creates a pattern of \_\_\_\_\_\_\_\_\_\_\_ which is unique for every organism.**

Related organisms will show similar banding patterns because their DNA have similar base sequences.

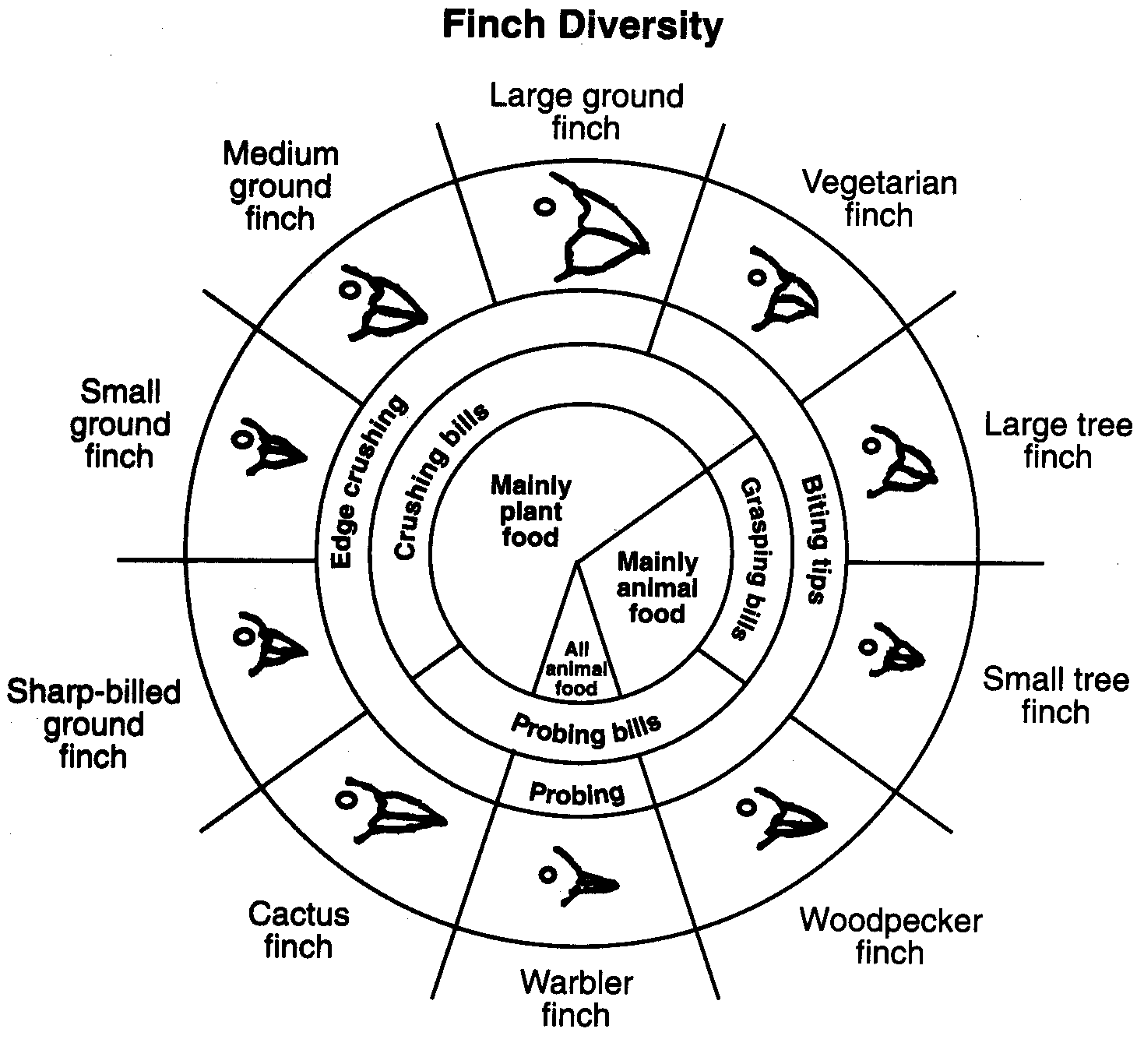
**Word Bank**

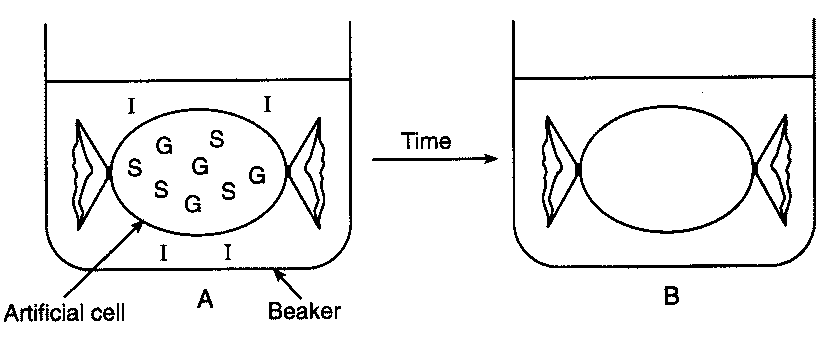
fragments size bandssimilar electrophoresis

1. **Beaks of Finches**
   1. **What you did:** Played different finch species \_\_\_\_\_\_\_\_\_\_\_\_ for food.
   2. **What you learned:** Different environmental conditions (food) \_\_\_\_\_\_\_\_ different species of finch, allowing some to \_\_\_\_\_\_\_\_\_\_\_ and reproduce, but not others.

**Word Bank**

favored survive competing

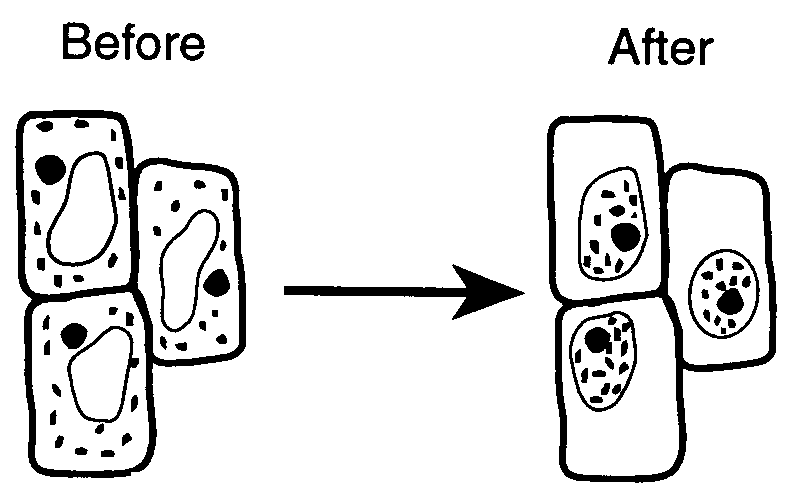
****

****

1. **Diffusion Through A Membrane**
   1. **Part A**
      1. **What you did:**
         * Made a model \_\_\_\_\_\_ using **dialysis tubing**.
         * Put \_\_\_\_\_\_\_\_\_\_ and starch inside your “cell.”
         * Put starch indicator (\_\_\_\_\_\_\_\_) outside cell
      2. **What you saw:**
         * Inside of cell turned black because iodine \_\_\_\_\_\_\_ *into* the cell
         * Because outside of the cell was not black, you know the starch did not diffuse through the \_\_\_\_\_\_\_\_\_\_\_.
         * Used blue glucose indicator (Benedict’s solution) to \_\_\_\_\_\_ that glucose did diffuse through the membrane.
      3. **What you learned**
         * \_\_\_\_\_\_\_ molecules (glucose, iodine) can **diffuse** through a membrane on their own.
         * Large molecule (starch) \_\_\_\_\_ diffuse through a membrane on their own.
         * You can use \_\_\_\_\_\_\_\_\_ to identify the presence of specific substances.

**Word Bank**

iodine indicators diffused cannot membrane cell glucose see small

* 1. **Part B**
     1. **What you did:**
        + Looked at red onion cells under the \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
        + Added \_\_\_\_\_\_\_\_ water to the onion cells.
        + Added distilled (pure) \_\_\_\_\_\_\_\_\_ to the onion cells.
     2. **What you saw:**
        + Salt water caused the onion cells to \_\_\_\_\_\_\_\_.
        + Distilled water caused the cells to \_\_\_\_\_\_\_ back to normal.
     3. **What you learned:** 
        + **Salt water causes water to diffuse \_\_\_\_\_\_ of a cell.**
        + **In pure water, water will diffuse \_\_\_\_\_\_ a cell.**

**Word Bank:** swell outsalt shrivel water into microscope