

# **LIVING ENVIRONMENT BOOT CAMP**

## **SURVIVAL GUIDE**

100 Important Topics you need to know to pass the  
Living Environment Regents Exam

## TOPIC 1: CELLS

1. **Homeostasis** is the ability of an organism to maintain a stable internal balanced environment. **Failure to maintain homeostasis** can result in SICKNESS or DEATH
2. **Metabolism** is the sum of all the chemical reactions that occur within the cells of an organism.
3. **Organic molecules** contain skeleton structures of **carbon** with hydrogen and oxygen.

Organic Molecule	Basic Unit - (Lego Blocks)	Foods found
<b>Carbohydrates (starch)</b>	Glucose (Simple Sugars)	Grains, vegetables, fruit
<b>Proteins</b>	Amino Acid (20 kinds)	Meat, egg whites, beans
<b>Lipids</b>	Fatty Acid & Glycerin	Animal fats, nuts, oils
<b>Nucleic Acid</b>	Nucleotide	Small amounts in all foods

### 4. **Organization of living things:**

[smallest] Cells → Tissues → Organs → Organ Systems → Organism [biggest]

### 5. **Organelles** are the small parts that make up a cell (each has at least one specific function)

a. **Vacuoles**-- store waste and water (large in plant cells, small in animal cells)

b. **Ribosome** – (very small and is often represented by a dot) located on the ER or in cytoplasm. Ribosomes are where proteins are made (**protein synthesis**).

c. **Mitochondria**-(The POWERHOUSE of the cell where energy is made) the **Site of cellular respiration** in both plant and animal cells.

Formula for cellular respiration:

**Glucose + oxygen → carbon dioxide + water + ENERGY (ATP)**

d. **Chloroplasts**-only in plant cells; where the process of photosynthesis occurs.

Formula for photosynthesis:

**Sun's energy + carbon dioxide + water → glucose + water + oxygen**

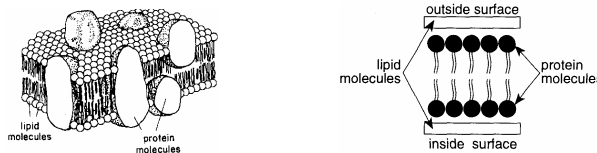
e. **Nucleus** is the control center of the cell and contains DNA (the program or code of life)

f. **Cytoplasm** is the liquid media that fills the cell.

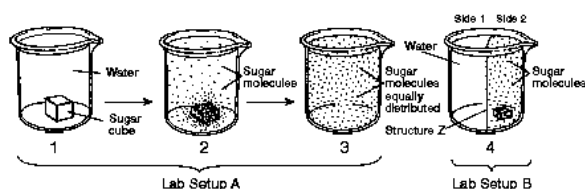
### g. **Cell Membrane:**

1. separates the contents of the cell from the outside environment
2. controls the transport of materials into and out of the cell.(selective permeability)

3. Cellular communication: Recognizes and responds to chemical signals by using receptor molecules.



6. **Passive Transport or Diffusion** is the movement of molecules from areas of high concentration to areas of low concentration. (NO ENERGY USED)



7. **Active Transport** is the moving a molecule from LOW concentration to a HIGH concentration (USES ENERGY in the form of ATP).

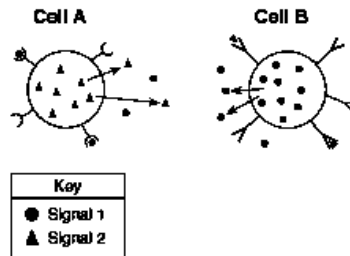
### 8. Human Body Systems:

Name of system	What it does	Parts of the system	Organelles with the same function
Digestive	breaks down food into nutrients & puts them in the blood stream	mouth, esophagus, stomach, small intestine, large intestine, rectum	Vacuole and Lysosome
Circulatory	carries gasses and nutrients throughout the body	heart, arteries, veins, capillaries	Cytoplasm, ER or Golgi
Respiratory	exchanges carbon dioxide and oxygen	lungs, alveoli, diaphragm	Cell Membrane
Excretory	removes wastes from the blood and then from the body	kidneys, bladder, urethra	Cell Membrane or vacuole
Nervous	<b>Fast</b> control of the functioning of all body systems.	brain, spinal cord, nerve cells	Nucleus
Endocrine	<b>Slow</b> control of the functioning of all body systems.	Pituitary, Thyroid, Adrenal, Pancreas, Gonads	Nucleus

## TOPIC 2: LIFE FUNCTIONS AND HOMEOSTASIS

9. **Control** - Chemicals produced in the endocrine glands (HORMONES) and chemicals produced by nerve cells are primarily responsible for communication between cells.

RECEPTOR SITES:



10. **Respiration** is the process used by ALL organisms to produce energy by using oxygen to burn sugar in order to release energy in the form of (ATP).

Organelle used in this process: Mitochondria

11. **Digestion**- breaking large molecules down into smaller molecules.

1. **Proteins** are broken down into **Amino Acids**.

2. **Carbohydrates and Starches** are broken down into **Simple Sugars**.

3. **Fats (Lipids)** are broken down to **Fatty Acids & Glycerol**

12. **Transport** - involves the movement of materials inside the cell as well as the movement between parts of a multicellular organism.

13. **Excretion** - the removal of all waste produced by the cells of the body.

14 **Synthesis** is the making or building of large molecules from smaller ones.

15. **Photosynthesis** is the process of storing the energy from the sun in the chemical bonds of glucose (sugar) Organelle used in this process: Chloroplast

### **Formula for Photosynthesis:**

Sun + Carbon Dioxide + Water -----enzymes-----→ Glucose + Oxygen + Water

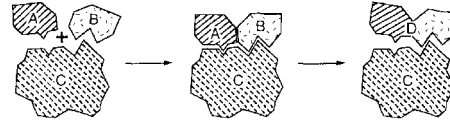
Where is photosynthesis carried out? **Chloroplasts** of Producers (plants)

16. **Cellular Respiration** occurs in the Mitochondria of All Organisms both plants and animals

### **Formula for Cellular Respiration:**

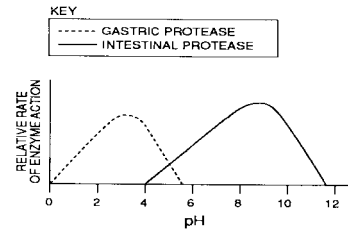
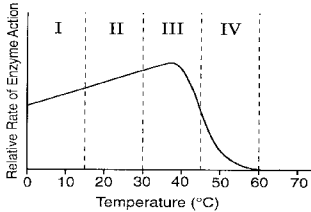
Glucose + Oxygen -----enzymes-----→ Carbon Dioxide + Water + Energy (ATP)

17. **Enzymes** -special proteins that affect the rate of chemical reactions. Enzymes are catalysts used in digestion and synthesis.



**Enzyme reaction rates are affected by:**

1. **Shape**- “Lock and Key Model” if it is the wrong shape it will not work.
2. **Temperature**- each enzyme works best at a specific temperature
3. **Ph**-- each enzyme works best at a specific ph



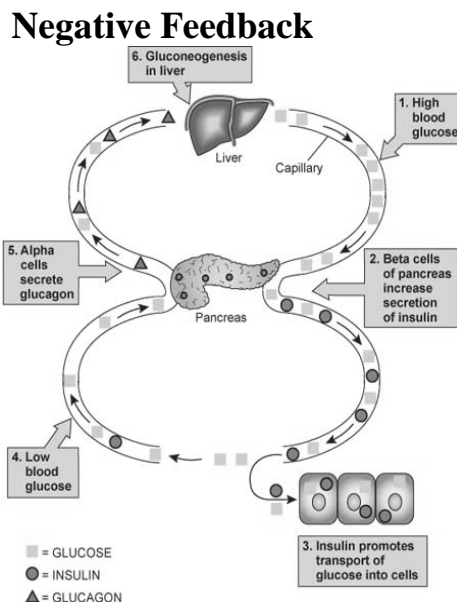
18. **Dynamic Equilibrium** is a steady state-balance- : HOMEOSTASIS

19. **Negative Feedback** - controls hormone levels to maintain homeostasis.

**Analogy = Thermostat**; as the temperature in your house goes up, the thermostat turns your heat off; as the temperature goes down, the thermostat turns on. This maintains a balance or a comfortable home.

*A good example is how our body regulates the amount of sugar in our blood:*

When glucose (sugar) levels are above normal the **pancreas** secretes **INSULIN**. This hormone prompts glucose to move from the blood into body cells, resulting in a lower glucose level in the blood. Another hormone secreted by the pancreas (glucagon) works in the opposite way. When the glucose level in the blood is too low, this hormone prompts the release of glucose stored in the liver which raises **BLOOD SUGAR LEVEL**.



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20. Our **Skin** and **Circulation Systems** are the body's primary defense against disease-causing pathogens. (**Immunity**) via White blood cells

21. **Surface Receptor Protein**- a molecule found on the cell membrane that the immune system recognizes as either part of the body or an outside invader. **Antigens are the receptor proteins on the membrane of pathogens (germs).**

22. **Antibodies** are special proteins produced by the white blood cells that can be thought of as your body's army to fight diseases.

1. Antibodies have specific shapes that fit over specific antigens
2. When an antibody fits into the antigen (receptor on the pathogen) it blocks communication preventing the germ from reproducing and making you sick.

23. **Immunity** is our body's ability to fight disease. Once you have been exposed to a specific virus white blood cells remember the antigens and produce antibodies that prevent you from getting sick from the same virus for the second time.



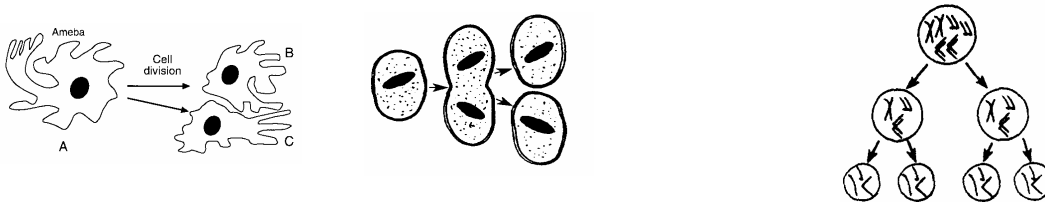
24. **Vaccination** is composed of a weakened or dead virus that triggers our white blood cells to produce antibodies to fight a specific pathogen.

25. **Diseases** are caused pathogens (**virus, bacterium, and fungus**)

## TOPIC 3 REPRODUCTION

26. **Cell Division** Two types: mitosis and meiosis

<i>Mitotic division</i>	<i>Meiotic division</i>
Asexual reproduction	Sexual reproduction
ONE cell division $1 \rightarrow 2$	TWO cell divisions $1 \rightarrow 4$
Parent cell divides equally to produce 2 identical daughter cells	Parent cell divides twice to produce either 4 sperm cells or (female) 3 polar bodies + 1 Egg (ovum)
Genetic makeup identical to parent $2n$ – Diploid #	Genetic makeup $1/2$ of the parent cell $1n$ – Haploid #
Function: To produce Identical cells used for growth and repair.	Function: To produce sex cells with $1/2$ of the species chromosome number.



Mitosis is used for growth, repair and asexual reproduction.

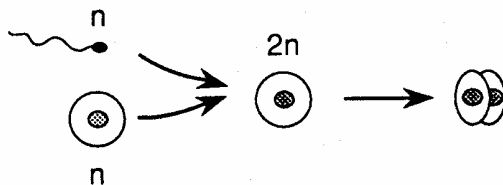
Meiosis occurs only in the male and female gonads and solely produces gametes.

27. **Gonads** are the sex glands. (Ovaries and Testis)

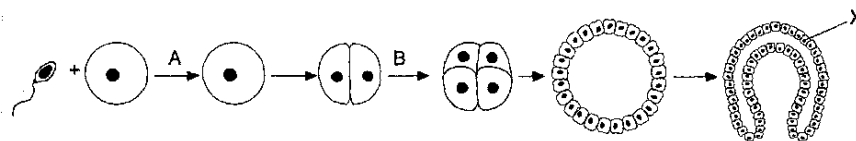
28. **Gametes** are sex cells that unite in fertilization to form a ZYGOTE.

29. **Zygote** is a fertilized egg.

30. **Fertilization** is when a male and female gamete unit. If the gametes each have 23 chromosomes, then what does their zygote have? 46



31. **Differentiation** is the process that transforms developing cells into specialized cells with different structures and functions. Tissues are specialized groups of cells.



### 32. Human female reproductive system:

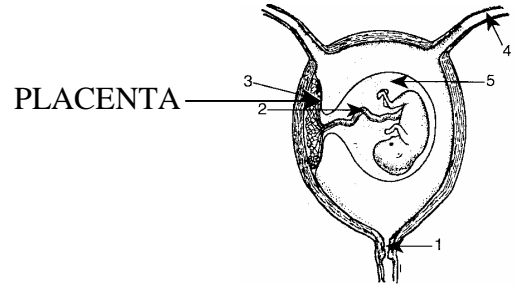
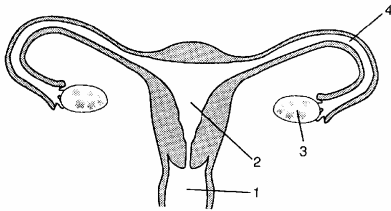
1. **Vagina**

2. **Uterus** is where the baby develops

3 **Ovaries** are the female gonads that produce the egg and important female hormones. The **Placenta** is the organ that is attached to the baby via the umbilical chord and provides nutrients, oxygen to the fetus and removes waste through the process of **diffusion**.

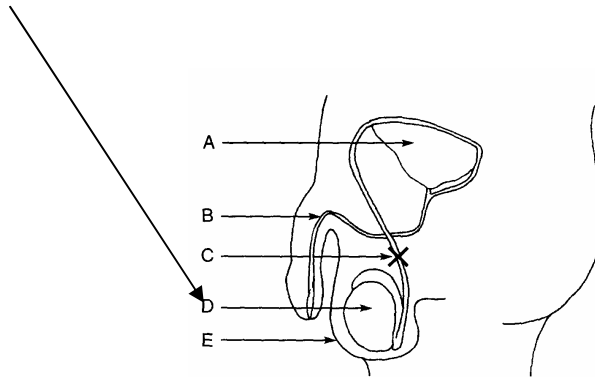
**Mother and baby's blood does not mix!**

4. **Oviducts** or fallopian tubes are the place where **fertilization occurs**



### 33. Human male reproductive system:

1. **Testis** is the male gonads that produce sperm and male hormones like testosterone.

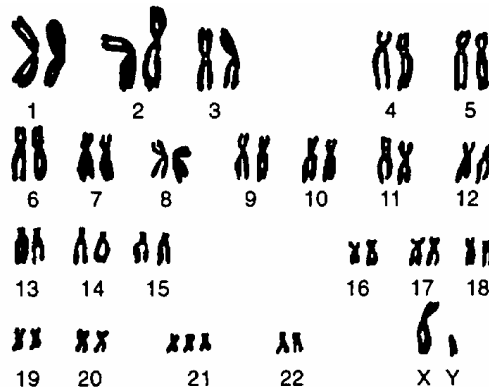


### 34. Reproductive Technology:

1. **Artificial insemination:** using sperm from a donor

2. **Amniocentesis:** removing some of the cells from the amniotic fluid which protects the fetus and analyzing their DNA.

3. **Karyotype:** is a visual map of chromosomes. Can be used to see if the fetus has any chromosomal problems like Down's syndrome (3 copies of chromosome #21)





## TOPIC 4: GENETICS

35. **Cancer** occurs when certain genetic mutations in a cell can result in uncontrolled cell division. Cancer can be caused either by heredity or environmental factors like radiation, chemicals or virus.

36. **Heredity** is the passing of genetic information from one generation to the next through reproduction.

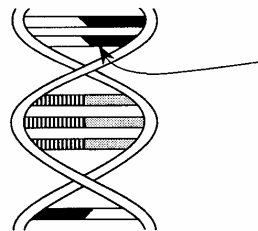
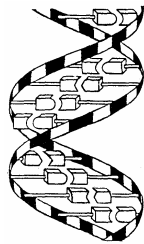
37. The hereditary information **DNA** is organized in the form of genes located in the **Nucleus** of each cell.

### 38. Differences between asexual and sexual reproduction

<i>Asexual reproduction</i>	<i>Sexual reproduction</i>
Identical Cells	Not Identical Cells
1 Parent	2 Parents
Little Genetic Variation	Much Genetic Variation
Ex) Ameba, Paramecium, Fungi	Ex) Humans, Plants
MITOSIS	Meiosis and Fertilization

39. Identical genetic copies are known as **Clones**.

40. **DNA** is a double stranded helix polymer of nucleotides that contains the genetic code of the individual.

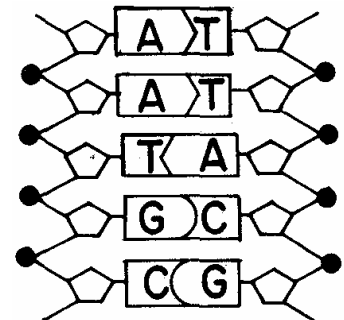


41. **Nucleotide** is the basic unit of DNA which is made of a Phosphate, a Sugar and a Base.

42. **DNA bases** are A, T, G, C

A IS PAIRED WITH T  
G IS PAIRED WITH C

**All Teachers  
Go Crrazy**



43. **RNA** is a single stranded polymer that is produced by DNA.

1. There are 3 types: Messenger RNA, Transfer RNA and Ribosomal RNA
2. Bases are A, U, G, C. Notice there is no T in RNA base code rule

#### 44. How does DNA use RNA to make a protein?

##### Protein Synthesis:

DNA is stuck in the nucleus, so it sends a messenger single- stranded mRNA to the ribosome where the Ribosome reads the message and directs the tRNA (TRUCKS) to bring it Amino Acids. The Ribosome then assembles the Amino Acids together in the correct order TO MAKE A PROTEIN.

45. **Mutation** is any alteration of the DNA sequence which changes the normal message carried by the gene.

1. **Substitution**- ONE BASE IS PUT IN THE PLACE OF ANOTHER

2. **Deletion**-A BASE IS LEFT OUT

3. **Addition**-A BASE IS ADDED

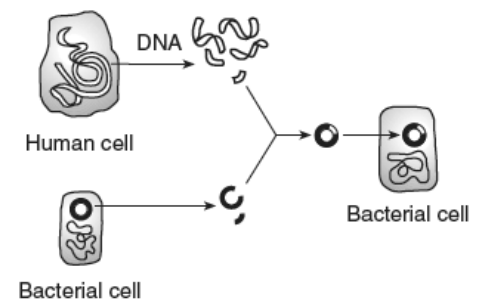
4. **Inversion**-BASES ARE SWITCHED

46.. **Gene Expression** An organism's environment can affect the way that some genes are expressed. Example- HIMALILIAN RABBIT – fur color is influenced by temperature.

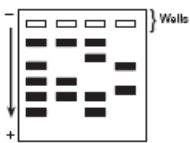
47. **Genetic Engineering** is a technology that humans use to alter the genetic instructions in organisms.

48. **Gene Splicing** is cutting DNA and placing it into another organism

Example: **Insulin**-putting the gene for insulin into bacteria, and the bacteria produces insulin for humans



49. **Restriction Enzyme** is an enzyme that **cuts DNA** in specific places and is an essential tool in gene splicing as well as in Gel-electro phoresis.



**DNA fingerprint** from gel phoresis – just like a bar code the more common the bars the more common heritage or ancestry

50. **Selective Breeding** is a process of picking parents with favorable traits to produce those traits in the offspring. Ex) domestic animals and hybridization of plants.

51. **Species** is a group of closely related organisms that share certain characteristics and can produce offspring capable of reproduction.

## TOPIC 5: EVOLUTION

52. **Evolution** is the process by which organisms have changed over time from simple, single-celled: complex-single-celled: complex, multicellular to complex organisms.

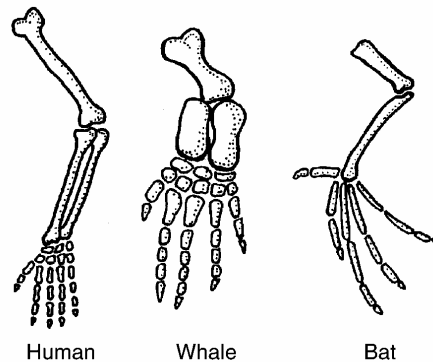
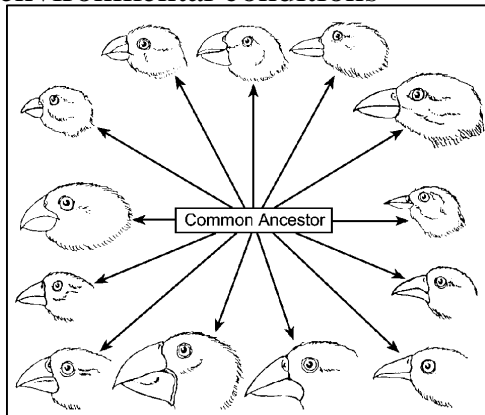
53. **Natural Selection** - nature selects those individuals who are best fit for the environment.

54. **Overproduction** - more offspring are produced than can survive

55. **Competition** - the fight for limited resources

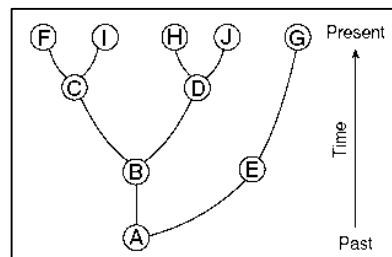
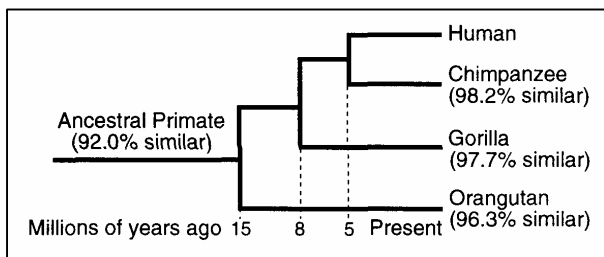
56. **Variation** - differences among organisms in a species (sexually reproducing organisms have more variation than asexually reproducing organisms)

57. **Adaptive Value** Any trait that helps an organism survive and reproduce under a given set of environmental conditions



58. **Extinction** is the disappearance of an entire species caused by a failure to adapt to a changing environment. Extinction occurs when the Environment changes and the Species cannot adapt.

59. **ANCESTRY:** cladograms or family tree

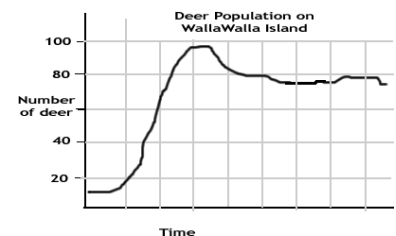


## TOPIC 6: ECOLOGY

60. **Ecology** is the study of how organisms interact with the living and nonliving things.
61. **Biotic** factors: are living parts of the ecosystem ex. Plants and animals.
62. **Abiotic** factors- non-living parts of the environment (rocks, air, ph, sunlight)
63. **Niche** is a species' role in it's environment (it's JOB and what it EATS)
64. **Population**- all the organisms of a species that live in the same area.
65. **Community** - all the different populations in an area.
66. **Biosphere** - all of earth's ecosystems
67. **Competition** - is the struggle for resources among organisms.
68. **Limiting Factors** are the living and non living things in the environment that limit the size of populations.

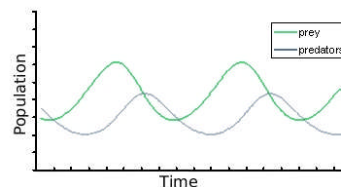
Examples: Food, Shelter, Sun, Space, Oxygen, ETC.

69. **Carrying Capacity** is the maximum population (number or organisms of any species) that an ecosystem can support.



70. **Predators** kill and eat other organisms called **Prey**.

Graph of Prey/ predator relationship



### 71. **Feeding Relationships:**

1. **Autotrophs** - (producers) make their own food by photosynthesis
2. **Heterotrophs** - must eat something for food (consumers)
3. **Herbivores** - can only eat plants
4. **Carnivores** - can only eat animals
5. **Omnivores** - can eat plants & animals (all humans!!!!)
6. **Consumers** - same as heterotrophs
7. **Decomposers** - break organisms down and return nutrients to the soil. They are the recyclers in the ecosystem.
8. **Scavengers** - eat dead organisms that they did not kill themselves example: vultures
9. **Parasites** - live off of another organism (host) and do not kill them usually (the parasite

benefits, the host is harmed)

10. **Producers** - same as autotrophs

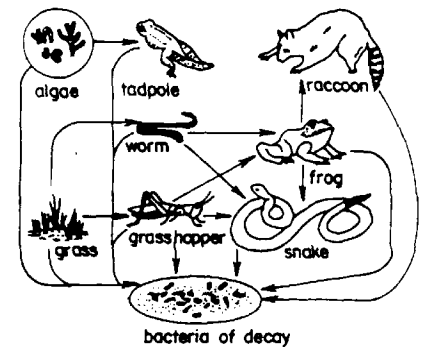
72. **Food Chain** is diagram of the linear feeding relationship of organisms in an ecosystem.

Rules in Drawing a Food Chain:

1. All food chains begin with a Producer (Autotroph or Plant)
2. All food chains end with a Decomposer
3. Arrows in a food chain show the direction of the energy flow

Grass → Grasshopper → Frog → Snake → Hawk → Decomposer

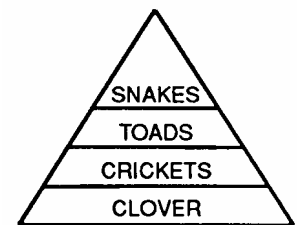
73. **Food Web** is a diagram composed of many interlocking food chains. It is more accurate than a food chain because most organisms eat more than one type of food in their environment)



74. The **Sun** is the primary source of life energy on the earth.

75. **Energy Pyramid** is a diagram showing the energy available at each trophic level.

The bottom layer (Producers) has the greatest amount of energy and the amount of energy Decreases by 90% at each level as you move UP through the pyramid. Where does the energy go? Into the environment (Lost as heat)



\*\*Energy is not recycled in an ecosystem it is transferred from one trophic level to the next.

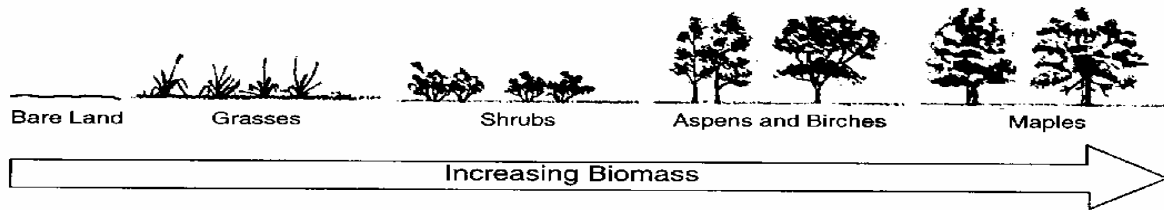
76. **Self Sustaining Ecosystem Requires:**

1. a constant source of energy ( usually the SUN )
2. a process to capture the energy and store it in organic molecules.(Photosynthesis)
3. a way to recycle elements back to the ecosystem. (Decomposers)

77. **Ecological Succession** is the orderly sequence of changes in the communities living in a given ecosystem over time. **Pioneer Organisms** → **Climax Community**

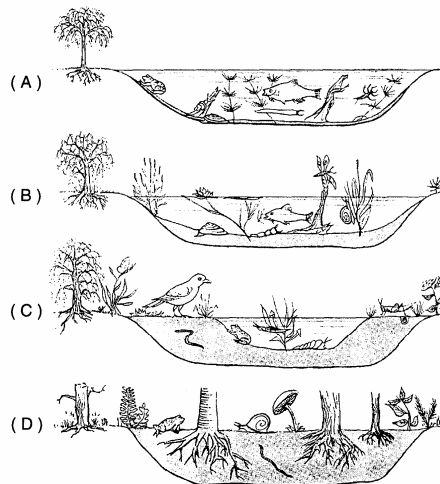
Ex. 1. Ecological Succession from bedrock to a forest:

Rock → Lichens & Moss → Grasses → Shrubs → small Trees → Hardwood Trees



2. Ecological succession in a pond:

Pond (Plants and Organisms die over time) → Sediment builds → Pond gets shallow → Swamp develops → grassy field → forest



## TOPIC 7: HUMAN IMPACT

### 78. **Material Cycles:**

1. Carbon/ Oxygen Cycle (photosynthesis/ Respiration)
2. Water Cycle (Evaporation, Condensation, Precipitation)
3. Nitrogen Cycle (N<sub>2</sub>, nitrogen fixing bacteria, plants, animals, waste)

79. **Biodiversity** is a measurement of the degree to which species vary within an ecosystem. The more species present in an ecosystem the higher the biodiversity.

\*\* As biodiversity increases, the **stability** of an ecosystem increases.

### 80. **How man has affected biodiversity?**

1. Cutting down trees (for wood)
2. Planting all of the same crop in an area (loss of biodiversity)
3. Removed vegetation for houses, parking lots, roads, etc.
4. Killed organisms and destroyed the food web (because all organisms are linked to one another in one way or another)

81. **Renewable Resources** - resources that can replenish themselves if not abused (planting of trees)

**Nonrenewable Resources** - resources that take a long time to replace or form (like coal, oil)

### 82. **Preserving our resources:**

1. **Reduce** - cut down on the amount used (smaller packaging)
2. **Reuse** - use it for another application (old tires as flower planters)
3. **Recycle** - can be used to make the product again (like pop bottles)

83. **Pollution** is a harmful change in the chemical makeup of the air, water, or soil.

### 84. **Human Activities and the Loss of Diversity:**

1. Direct Harvesting - the destruction or loss of a species by over hunting.
2. Land Use - finding the best way to live in the environment- building around trees instead of cutting them down and planting new ones.
3. Habitat Destruction - destroying a part of the natural environment.
4. Deforestation - removing forests for wood or clearing trees for farms.
5. Imported Species (invasive species or exotic species) example: purple loosestrife; zebra mussels; dandelions

## 85. Impact of technology and industrialization:

1. Industrialization- increases pollution of air and water- uses more energy, water, fossil and nuclear fuels.
2. Water pollution-from sewage, wastes from homes and factories and animal wastes
3. Toxic wastes- DDT
4. Thermal pollution- Heat Pollution
5. Human overpopulation
6. Air pollution- burning fossil fuels

1. **Acid Rain**- Sulfur and nitrogen compounds in air pollution dissolve in the moisture of the atmosphere to form acids, causing rain to have a low pH (acidic). Acid rain kills trees and destroys historical artifacts.

**pH scale:**     14 ←----- basic -----→ 7 ←----- acid -----→ 0

2. **Global Warming** - an increase in the earth's temperature caused by an increase in greenhouse gases (GREENHOUSE EFFECT is caused by increasing amounts of CO<sub>2</sub> in the atmosphere caused by the increasing use of fossil fuels for energy).

3. **Ozone Depletion**- hole in ozone layer caused by use of fluorocarbons. \*\*Ozone acts as a Sun block for all organisms on the earth!!! UV causes skin cancer.



## TOPIC 8 EXPERIMENTATION

86. **Independent Variable** is the one thing that “I change” to test my hypothesis.

The EFFECT of     IV (sunlight)     on     DV (plant growth)    .

87. **Dependant Variable** is the thing that changes because of the IV (DATA collected)

88. **Control Group** is the group that is studied under the normal conditions.

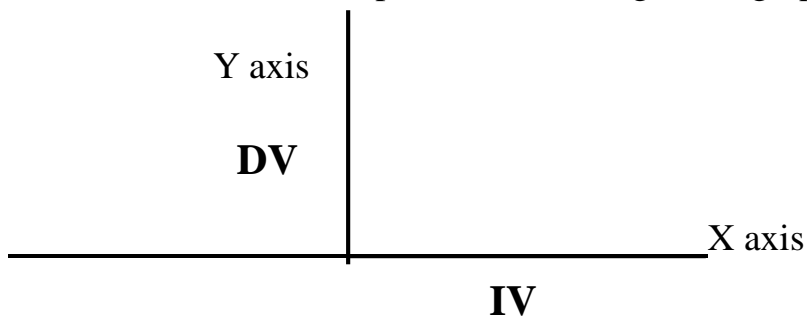
89. **Experimental Group** is the group that is identical to the control group with the ONE CHANGE or difference (the Independent Variable).

### 90. **Organizing Data**

Where does the Independent Variable (IV) go on a data table? What about the Dependent Variable (DV)?

Independent Variable <i>Graph on the X - axis</i>	Dependant Variable <i>Graph on the Y axis</i>
Ex. sunlight	Ex. growth

Where does the Independent variable go on a graph? What about the Dependent variable?



### 91. **Labeling a graph:**

1. Title the graph (The affect of \_\_\_\_\_ on \_\_\_\_\_.)
2. Label the X and Y axis.
3. Determine a proper scale for X and Y axis.
4. Set up a key or legend if necessary.

### 92. **How can you make an experiment more valid?**

1. Repeat the experiment
2. Increase the number of specimens or trials.
3. Peer review

### 93. Parts of the microscope:

1. **Eyepiece:** the part that you look through (closest to the eye) usually 10x
2. **Objective Lens:** the magnifying part closest to the slide (high power=usually 40x; low power=usually 10x)
3. **Fine Adjustment Knob:** used to focus on low & high power
4. **Course Adjustment Knob:** used to focus only on low power
5. **Stage:** where the slide is placed
6. **Stage Clips:** hold the slide in place
7. **Diaphragm:** controls the amount of light used

94. **How to calculate total magnification:** if a microscope has a 10X eyepiece, and 10X and 40X objectives.

Total Magnification on low power:  $10 \times 10 = 100X$  (it looks 100 times bigger than real life)

Total magnification on high power:  $10 \times 40 = 400X$  (it looks 400 times bigger than real life)

95. If you looked at the



letter under a microscope, what would it look like?

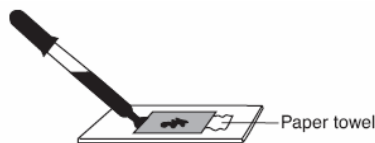
1. Mirror image and flipped up side down.
2. Increasing magnification reduces the field. (Larger image but you see less of it)
3. Increasing the magnification reduces the amount of light. (Field darkens)

### 96. How to make a wet mount slide:

Put the cells on the center of a slide, put a drop of water with a dropper onto the cells (do not touch the cells); lower a cover slip slowly at an angle (to reduce the number of air bubbles)

### 97. How to put stain on a slide without lifting the cover slip:

Put a drop of the stain onto the edge of the cover slip; place a paper towel on the edge of the other side of the cover slip, the paper towel will pull the water from under the cover slip, and in turn pull the stain onto the cells.



### 98. Laboratory Tests to Know:

1. Paper Chromatography is a laboratory technique that is used to separate different molecules from one another. (Separation of compounds in a solution by size and color).
2. Gel electrophoresis - separation of DNA using electrical current by size
3. Indicators for pH, Glucose, Starch – color or state change indicating the presence of a particular substance.

99. **Dichotomous Keys:** are tools to help in the classification of organisms.

100. **Know the 4 State Mandated Labs (Part D):**

**I. Making Connections (The Clothespin Lab)**

A) Part A

1. What you did: measured how exercise affected pulse rate.
2. What you learned: exercise increases pulse rate

B) **Part A2**

1. What you did: Squeezed a clothespin for 1 minute, then squeezed it again for another minute
2. What you learned:
  - If you squeezed more the second round, it may have been because your finger muscles were “warmed up” from increased circulation.
  - If you squeezed less the second round, it may have been because your finger muscles were fatigued.

C) **Part B**

1. What you did: Designed an experiment to test how exercise affects squeezing a clothespin.
2. What you learned: How to design an experiment (see pages 3-5).

**II. Relationships and Biodiversity (*Botana curus* lab)**

A) **What you did:** Compared 4 species of plants, based on structural (physical) and molecular (chemical and genetic) traits.

B) **What you learned:**

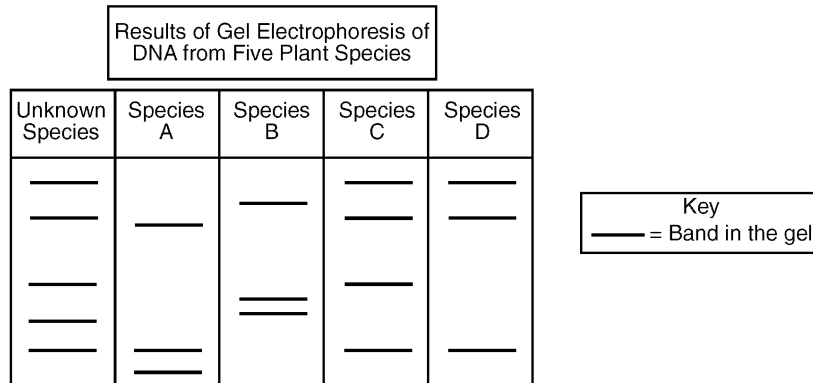
1. Species that are related share similar traits.
2. Different techniques (such as **gel electrophoresis** and **paper chromatography**) can be used to determine relationships between organisms.
3. Endangered species should be protected because they may offer benefits to humans.

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

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

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

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

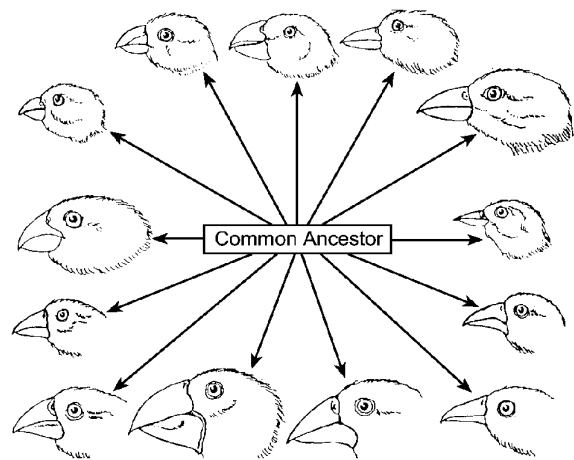
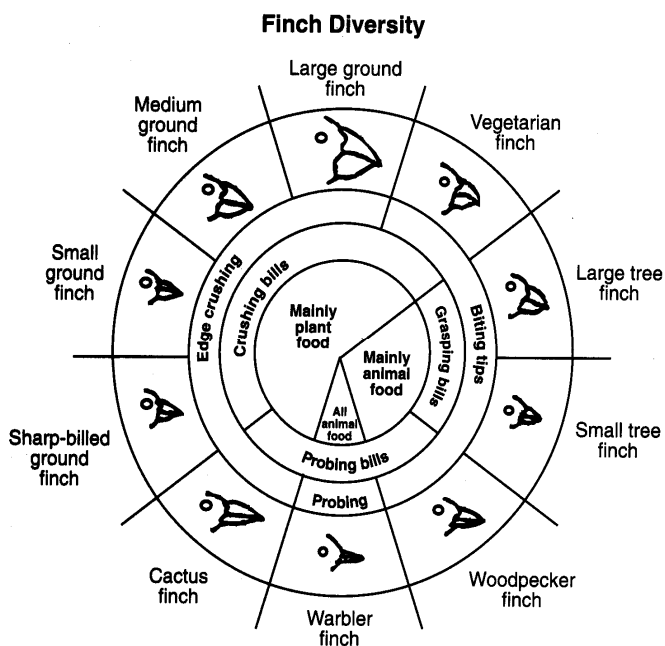


### III. Beaks of Finches

A) **What you did:** Played finches with different beak characteristics competing for food.

B) **What you learned:**

- Different environmental conditions (food) favored different species of finch (**beaks**), allowing some to survive and reproduce, but not others. (**Survival of the fittest**)
- Natural selection, competition and variation drive evolution. (**Species change over time**)

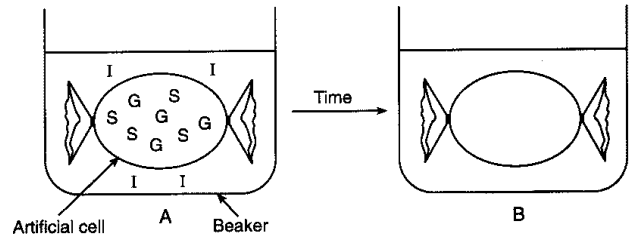


## IV. Diffusion Through A Membrane

### A) Part A

#### 1. What you did:

- Made a model cell using **dialysis tubing**.
- Put glucose and starch inside your “cell.”
- Put starch indicator (iodine) outside cell



#### 2. What you saw:

- Inside of cell turned black because iodine diffused *into* the cell
- Because outside of the cell was not black, you know the starch did not diffuse through the membrane.
- Used blue glucose indicator (Benedict’s solution) to see that glucose did diffuse through the membrane.

#### 3. What you learned

- Small molecules (glucose, iodine) can **diffuse** through a membrane on their own.
- Large molecule (starch) cannot diffuse through a membrane on their own.
- You can use indicators to identify the presence of specific substances.

### B) Part B

#### 1. What you did:

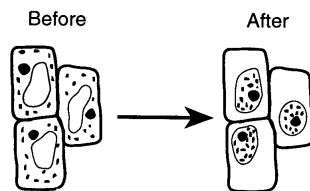
- Looked at red onion cells under the microscope.
- Added salt water to the onion cells.
- Added distilled (pure) water to the onion cells.

#### 2. What you saw:

- Salt water caused the onion cells to shrivel and peel away from their cell walls.
- Distilled water causes the cells to swell back to normal.

#### 3. What you learned:

- Salt water causes water to diffuse out of a cell.



- In pure (distilled) water, water will diffuse into a cell.