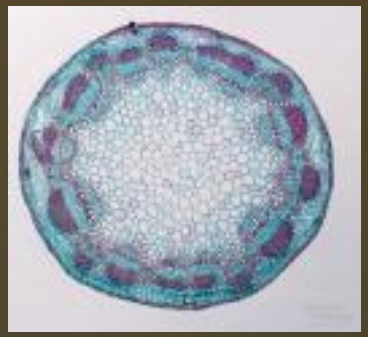
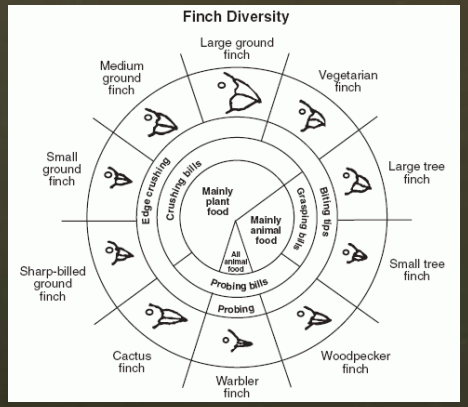
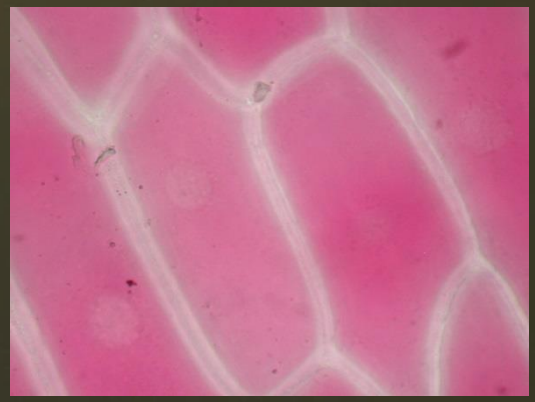
Living Environment Regents Review



Part D: Laboratory Review





- State Lab #1: Relationships and Biodiversity
- State Lab #2: Making Connections
- State Lab #3: The Beaks of Finches
- State Lab #4: Diffusion Through a Membrane

State Lab #1: Relationships and Biodiversity

Objective:

-*Botana curus* produces the fictitious compound Curol, which is used to treat types of cancer.

-Use structural and molecular data to determine which plant species (X, Y, or Z) is most closely related to *Botana curus*.

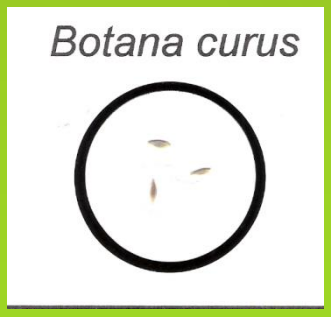
Botana curus

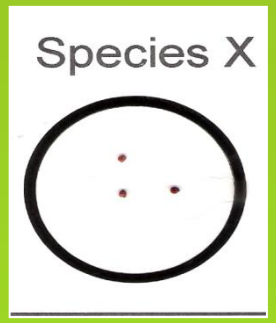
Procedure

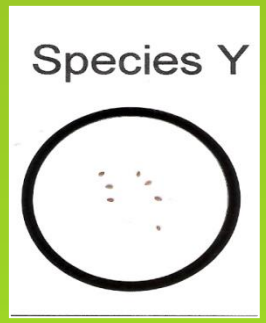
Structural Evidence for Relationships

Test 1- Structural Characteristics of Plants

Test 2- Structural Characteristics of Seeds

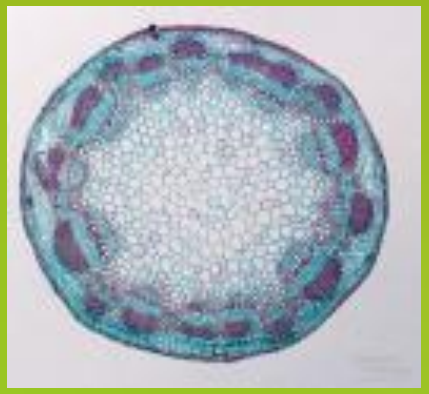






Structural Evidence for Relationships

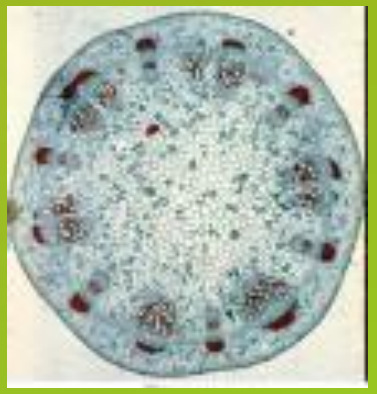
Test 3- Microscopic Internal Structure of Stems



Botana curus

Species X

Species Y

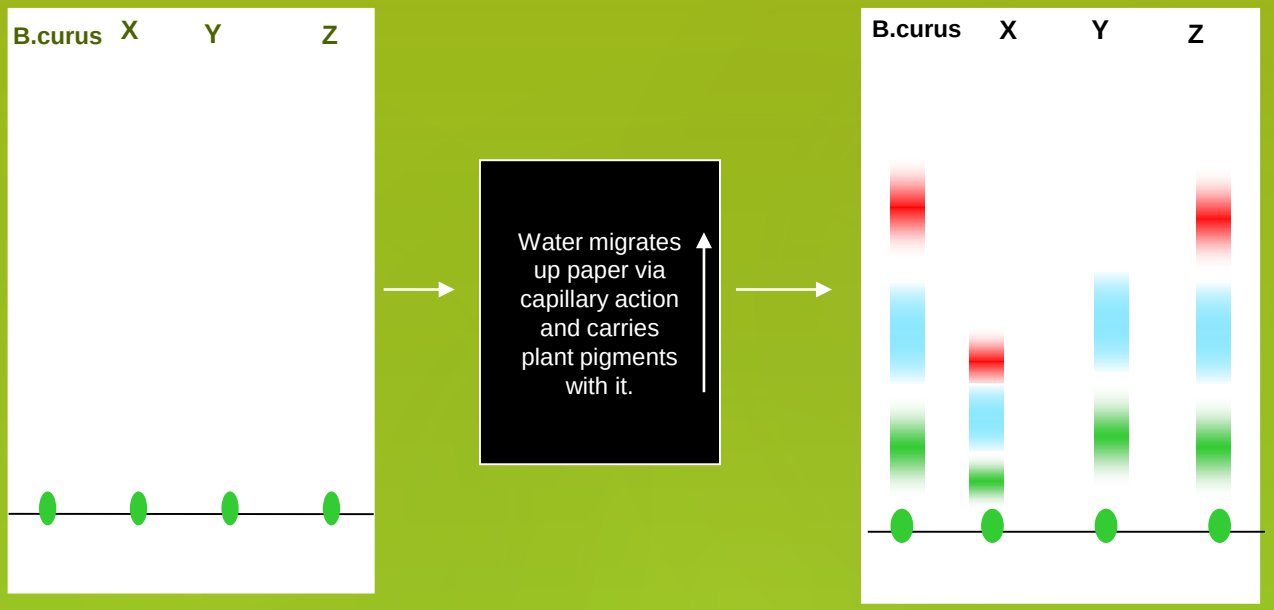


Species Z

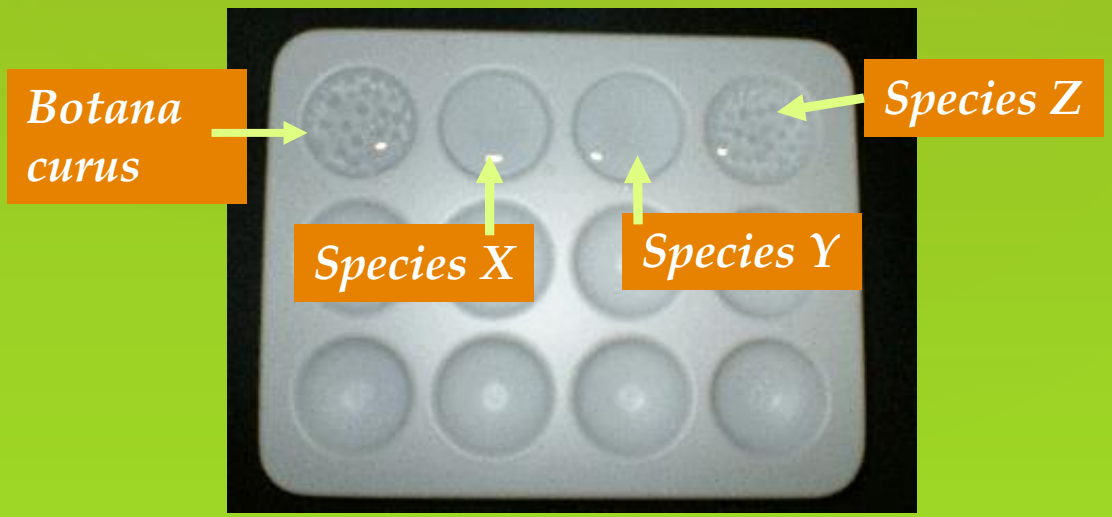
Figure 1

Molecular Evidence for Relationships

Test 4- Paper Chromatography to Separate Pigments



Test 5- Indicator Tests for Enzyme M



Molecular Evidence for Relationships

Test 6- Using Simulated Gel Electrophoresis to Compare DNA

Botana curus A T T C C/G G A T C G A T C G C C/G G A T A T A C T C C/G G T A A T A T C

Species X A T T G T A C C/G G G A T C C/G G A C G T C G C G A C T A A T A T A G C A

Species Y A C C/G G T C C/G G G A T C G C A C C C/G G T A C T C C T G T A A T A T C

Species Z A T T C C/G G A T C G A T C G C C/G G A T A T T C T C C/G G T A A T A T

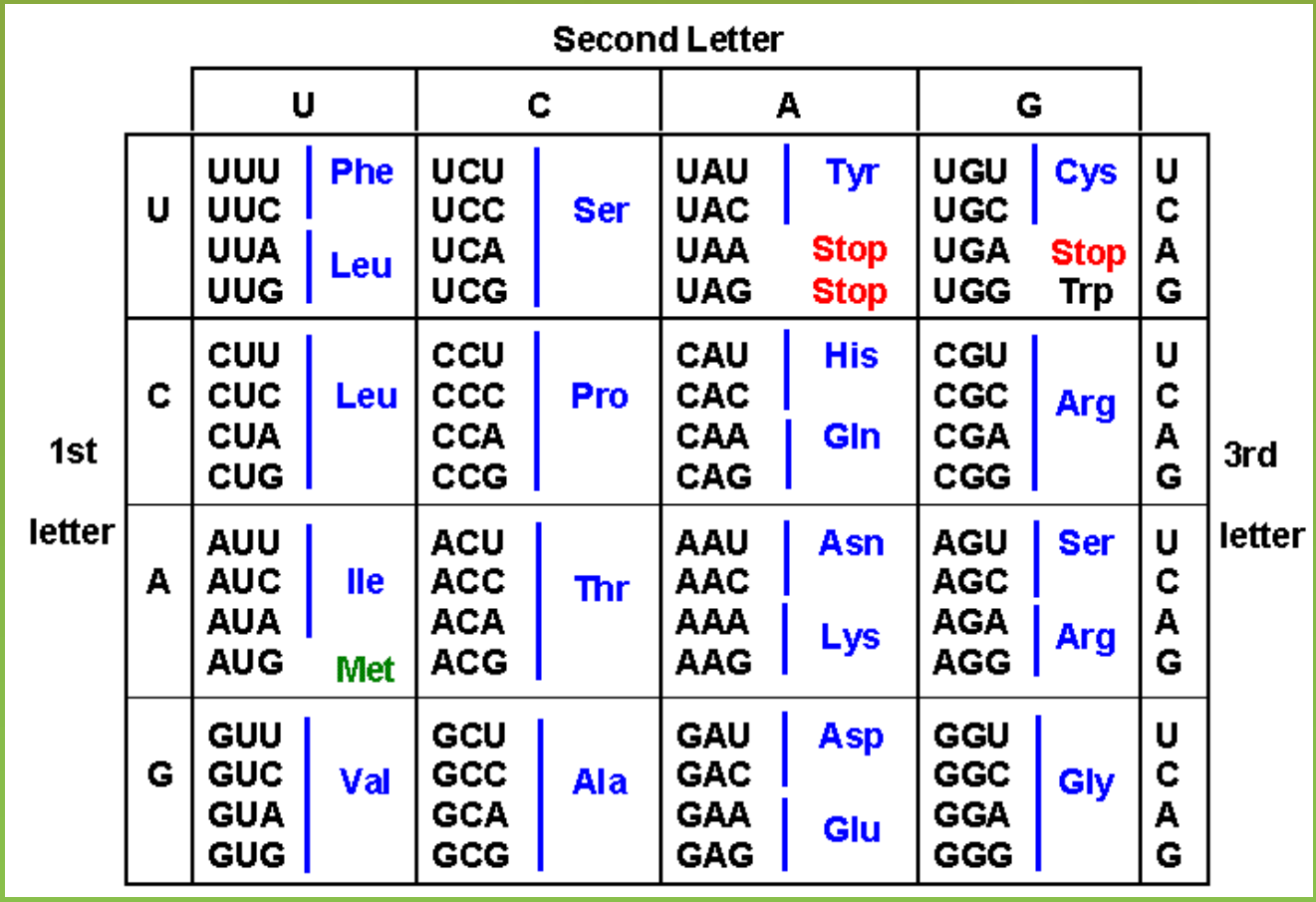
Simulated Gel Electrophoresis

# of Bases	*Botana curus*	Species X	Species Y	Species Z
22		GGACGTCGCGACTAATATAGCA		
21				
20				
19				
18				
17			GGTACTCCTGTAATATC	
16				
15				
14				
13				
12	GGATCGATCGCC		GGGATCGCACCC	GGATCGATCGCC
11	GGATATACTCC			GGATATACTCC
10				
9	GGTAATATC			GGTAATATC
8		ATTGTACC		
7		GGGATCC		
6				
5	ATTCC		GGTCC	ATTCC
4				
3			ACC	
2				
1				

Molecular Evidence for Relationships

Test 7- Translating the DNA Code to Make a Protein

Botana curus	CAC	GTG	GAC	TGA	GGA	CTC	CTC
mRNA	*GUG*	*CAC*	*CUG*	*ACU*	*CCU*	*GAG*	*GAG*
Amino acid	*Val*	*His*	*Leu*	*Thr*	*Pro*	*Glu*	*Glu*



Molecular Evidence for Relationships

Test 7- Translating the DNA Code to Make a Protein

Botana curus	CAC	GTG	GAC	TGA	GGA	CTC	CTC
mRNA	*GUG*	*CAC*	*CUG*	*ACU*	*CCU*	*GAG*	*GAG*
Amino acid	*Val*	*His*	*Leu*	*Thr*	*Pro*	*Glu*	*Glu*
Species X	CAC	GTG	GAC	AGA	GGA	CAC	CTC
mRNA	*GUG*	*CAC*	*CUG*	*UCU*	*CCU*	*GUG*	*GAG*
Amino acid	*Val*	*His*	*Leu*	*Ser*	*Pro*	*Val*	*Glu*
Species Y	CAC	GTG	GAC	AGA	GGA	CAC	CTC
mRNA	GUG	CAC	CUG	UCU	CCU	GUG	GAG
Amino acid	Val	His	Leu	Ser	Pro	Val	Glu
Species Z	CAC	GTA	GAC	TGA	GGA	CTT	CTC
mRNA	GUG	CAU	CUG	ACU	CCU	GAA	GAG
Amino acid	Val	His	Leu	Thr	Pro	Glu	Glu

Key Points

1. *Botana curus* shares the most characteristics with Species Z, making it most likely to produce Curol.

2. Genetic sequencing data should receive the most emphasis as many species are structurally similar but not related. Convergent Evolution

3. Biodiversity has important benefits for humans including increased medicinal uses.

State Lab #2: Making Connections

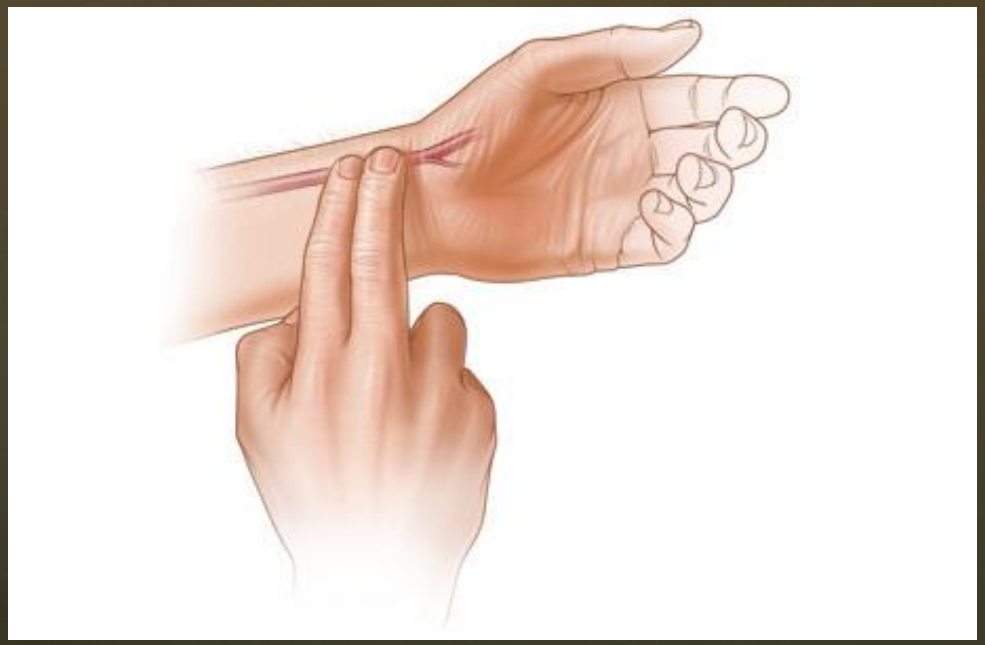
Objective:

-Record data on pulse rate and the influence of fatigue on heart beats per minute.

-Design a controlled experiment investigating the effects of exercise on squeezing rate.

Procedure

A1: Determine Resting Pulse Rate and create a histogram of class results



A2: Investigate the impact of fatigue on muscle performance while squeezing a clothespin

B: Investigating Claims

Investigate the following claims to determine which is supported with evidence.

Student A claims that a person will be able to squeeze a clothespin more times in a minute if the person exercises first.

Student B claims that a person will be able to squeeze the clothespin more times in a minute if the person does not exercise first.

Design an experiment to determine which claim is correct.

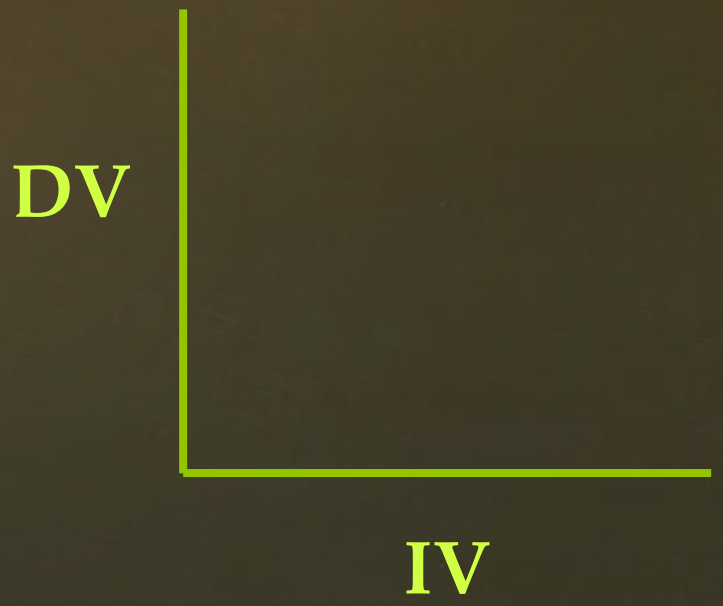
Key Points

1. Pulse rate increases under physical stress in order to allow more oxygen to reach cells.

2. Increased activity causes muscle fatigue due to lactic acid build up.

3. Organ systems interact to maintain homeostasis.

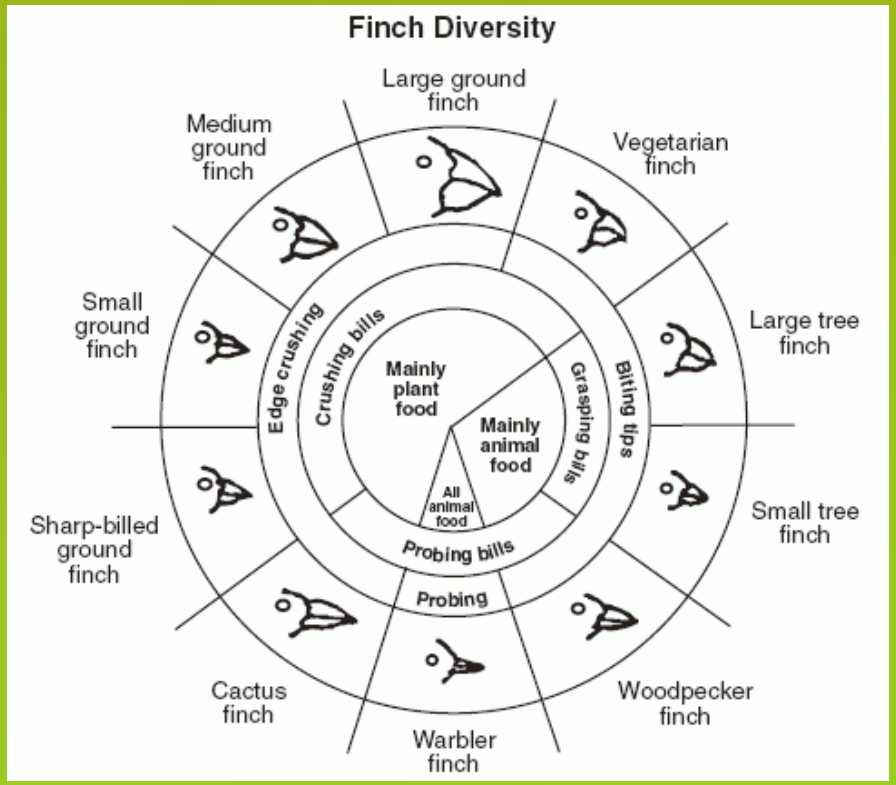
4. Experimental Design: control group, dependent variable, independent variable, hypothesis



State Lab #3: The Beaks of Finches

Objective:

- Demonstrate how Darwin's Finches adapted new beak characteristics yet remained similar to the common ancestor that most likely came from the mainland.



- Simulate competition and the effect of various adaptations on survival rate. Observe how the environment can act as a selecting agent.

Procedure

Round 1: No Competition, Original Island





Round 2: Competition


Round 3: Increased Competition







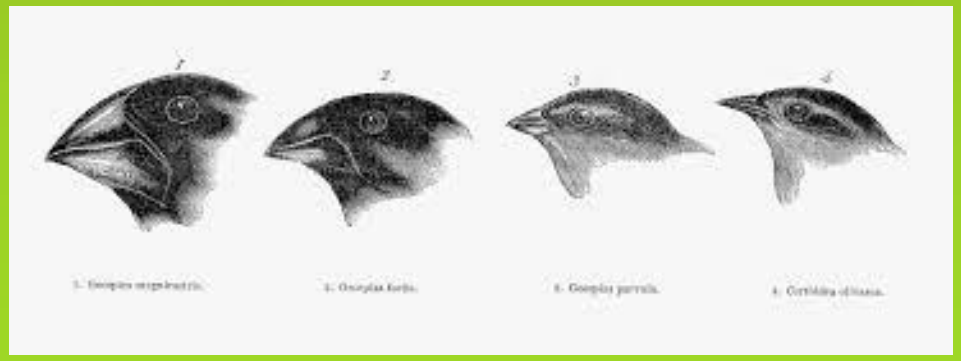
Compile and Compare Class Results

Key Points

1. Individuals with beaks best adapted for feeding on small seeds remained on the first island.

2. Some variations give individuals advantages over others in survival and reproduction. These individuals are more likely to survive and produce viable offspring.

3. Variation in a population increases the likelihood that some individuals will survive environmental changes.



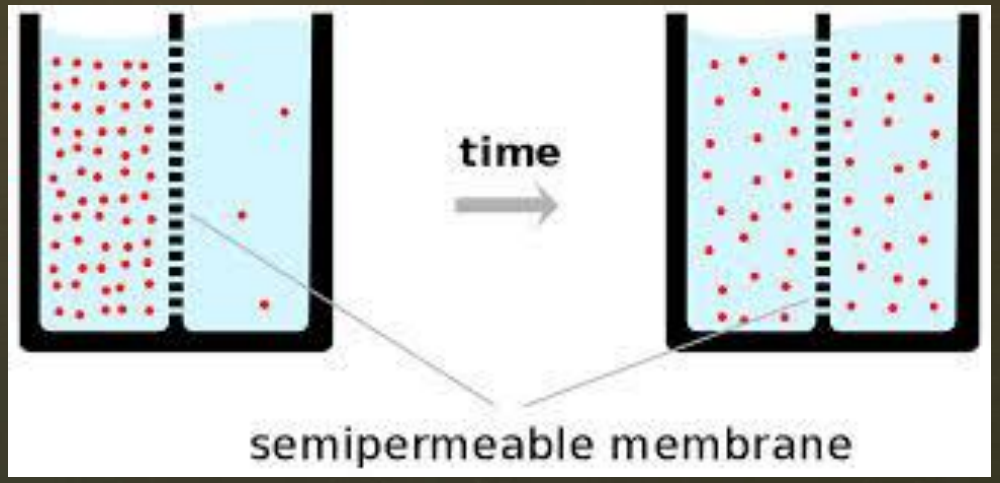
State Lab #4: Diffusion Through a Membrane

Part 1

Objective:

-Use chemical indicators to test for glucose and starch

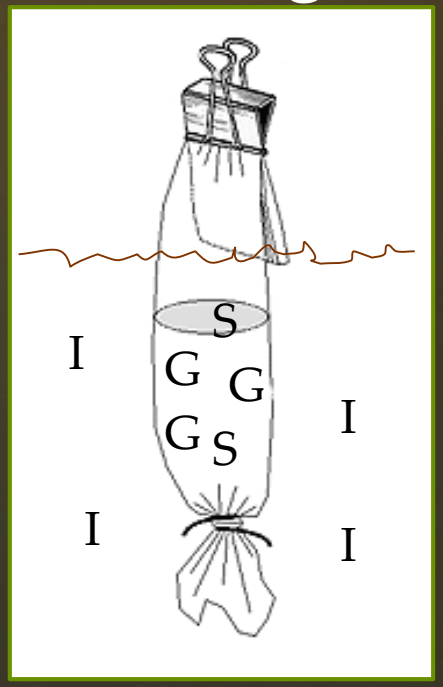
-Demonstrate the permeability of an artificial cell for glucose, starch, and Starch Indicator Solution and explain their diffusion.



Procedure

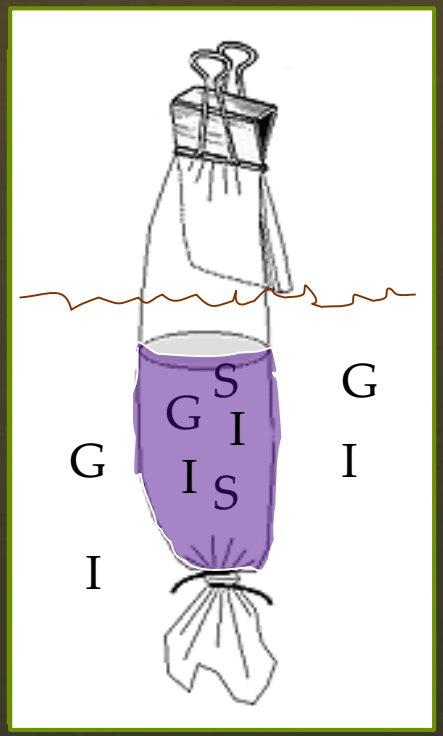
-Make an artificial cell using dialysis tubing, adding starch and glucose inside.

-Place the cell into a beaker with water and Starch Indicator Solution. Observe color change.



- Perform Chemical Tests using Glucose Indicator Solution and Starch Indicator Solution

- Transfer some of the solution in the beaker (outside of cell) to a test tube and heat with Glucose Indicator Solution. Note color change.



Key Points

1. Molecules move from areas of high concentration to low concentration without the use of energy (diffusion).

2. Membranes allow some kinds of molecules to pass while not allowing others. Selectively Permeable

3. Indicators can be used to test for the presence of various molecules.

Starch (white) + Iodine (brown)=

Blue-black color

Glucose Indicator (blue) + Glucose (clear) + Heat=

Orange or red color

State Lab #4: Diffusion Through a Membrane

Part 2: Diffusion of Water Across a Membrane

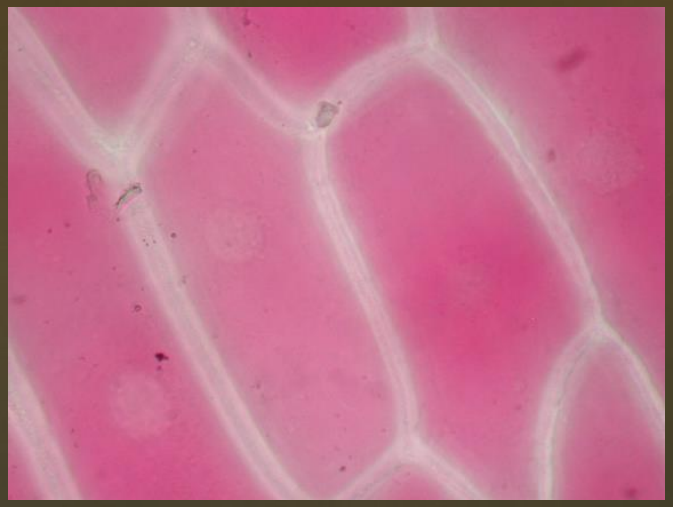
Objective:

-Demonstrate the impact that solutions with various concentrations have on cells.

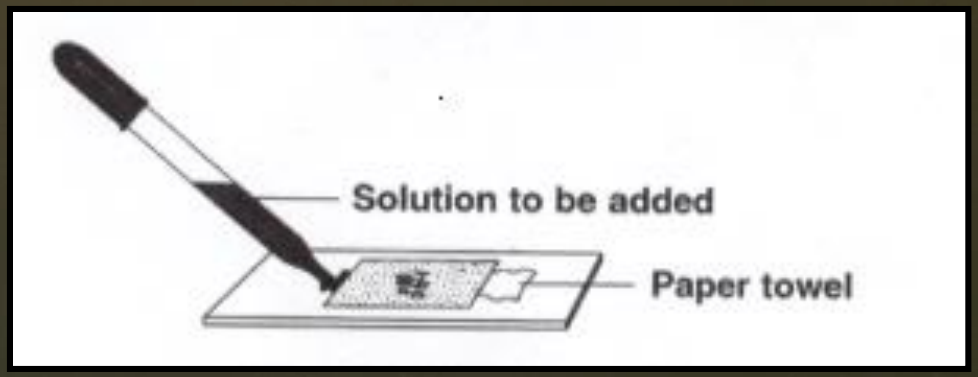
-Understand how water diffusion is important in real-world situations.

Procedure

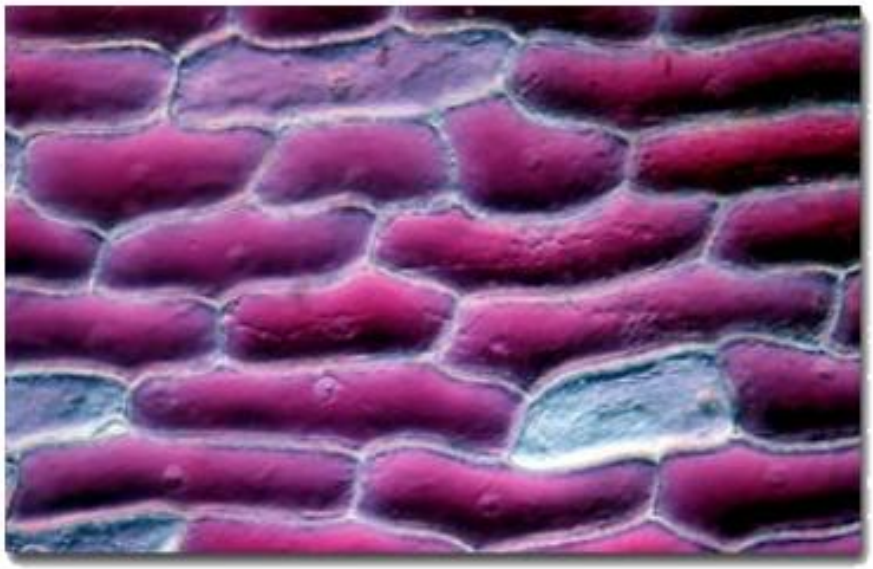
-Observe red onion cells mounted in water under the microscope after preparing the slide.



-Add salt solution to the slide and observe the effect on the onion cells.



Procedure



-Add distilled water to the slide, replacing the salt solution.

Key Points

1. The balance of water molecules in and out of the cell is important for the survival of organisms and is maintained by osmosis.

2. Cells placed in solutions with high salt concentration will lose water, causing them to shrink.

3. Cells placed in distilled water will gain water, causing them to swill and possibly burst.

4. Freshwater organisms must cope with the absorption of excess water, often using contractile vacuoles. Saltwater organisms have the opposite problem and tend to lose water easily.