

# Biology Final Exam Review

## UNIT 1: ECOLOGY [https://quizlet.com/\\_4yhif8](https://quizlet.com/_4yhif8)

### Population Density

1. How is [population density calculated](#)?

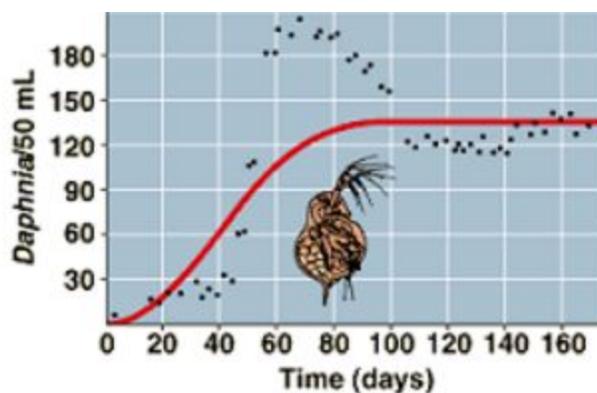
$$\text{Population density} = \frac{\text{\# of individuals}}{\text{unit area}}$$

2. Sample Problem: A small farming community in Texas covers 14 square kilometers. There are 420 individuals who live within the town limits. What is the population density of this community?

3. Students collected samples from a nearby stream and tracked the number of Daphnia over a period of time.

4. What is the maximum population density seen based on the graph to the right?

5. What factors (biotic or abiotic) might contribute to the pattern seen?



### Estimating Populations

#### Chart 1: Mushroom Plots

Another ecologist uses a different method to estimate the number of mushrooms in a forest. She plots a 10x10 area and randomly chooses 5 spots, where she counts the number of mushrooms in the plots and records them on the grid.

		5						2	
	3								
		2				3			

a. Calculate the number of mushrooms in the forest based on the grid data: \_\_\_\_\_

b. The technique is called \_\_\_\_\_

## Chart 2: Trapping Geese

In order to estimate the population of geese in Northern Wisconsin, ecologists marked 10 geese and then released them back into the population. Over a 6 year period, geese were trapped and their numbers recorded.

Year	Geese Trapped	Number with Mark
1980	10	1
1981	15	1
1982	12	1
1983	8	0
1984	5	2
1985	10	1

$$\frac{(\text{Total number captured}) \times (\text{number marked})}{(\text{total number recaptured with mark})}$$

- a. Use the formula to calculate the estimated number of geese in the area studied? \_\_\_\_\_
- b. This technique is called \_\_\_\_\_ & \_\_\_\_\_
- c. Supposing more of the geese found in the trap had the mark, would the estimated number of geese in the area be greater or lesser? \_\_\_\_\_

## Chart 3: Snakes & Mice

The data shows populations of snake and mice found in an experimental field.

- a. During which year was the mouse population close to zero population growth?
- b. What is the carrying capacity for snakes ?
- c. What is the carrying capacity for mice?

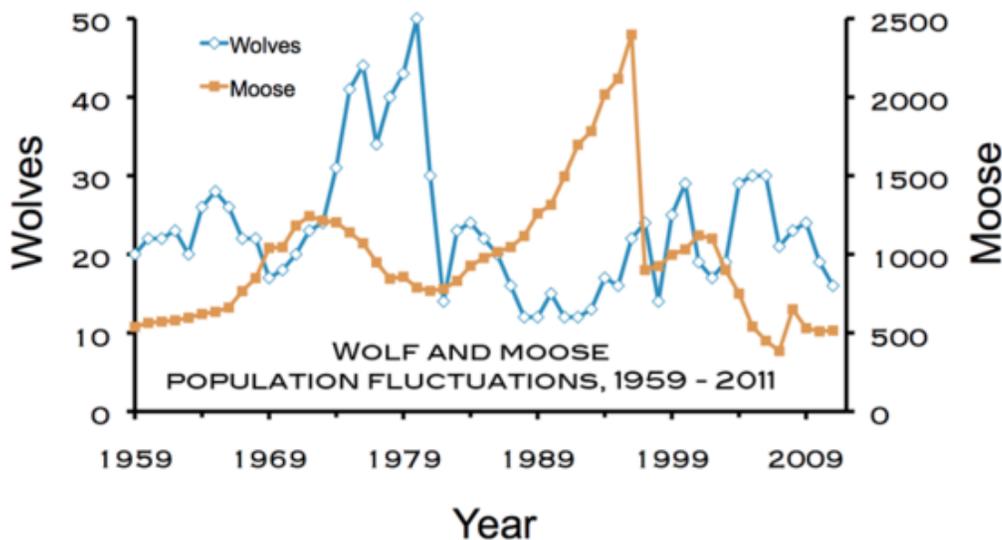
Year	Snakes	Number of Mice Born	Number of Dead Mice
1960	2	1000	200
1970	10	800	300
1980	30	400	500
1990	15	600	550
2000	14	620	600
2001	15	640	580

- d. What is the rate of growth (r) for mice during 1970? \_\_\_\_\_ During 1980? \_\_\_\_\_

## Isle Royale Predator/Prey Relationship

Ecological Studies of Wolves and Moose on Isle Royale Isle Royale is the largest island located in Lake Superior. The island is approximately 45 miles in length and 9 miles wide. Isle Royale consists of Isle Royale (main island) and multiple smaller islands. Isle Royale is about 12 miles south of Canada, 20 miles Southeast of Grand Portage, Minnesota and 53 miles north of Copper Harbor, Michigan. Isle Royale National Park was established in 1940, designated a wilderness area in 1976 and an International Biosphere Reserve in 1980. Isle Royale is a remote island, the only mode of transportation available is by boat or seaplane.

Moose first arrived at Isle Royale around 1900. The moose population tends to increase in years with mild winters, early spring green-up, abundant winter forage, low wolf numbers and low levels of tick infestation. Wolves first arrived at the island on an ice bridge from Canada in 1940. Disease has also influenced the wolf population. Between 1980 and 1982, the wolf population declined from 50 to 14, due to canine parvovirus. The Isle Royale wolves and moose have been studied since 1959. This Isle Royale wolf-moose study is unique because it entails just a single predator (the wolf) and a single prey (the moose) on a small island with very little human influence. This is the longest continuous study of a predator and its prey.



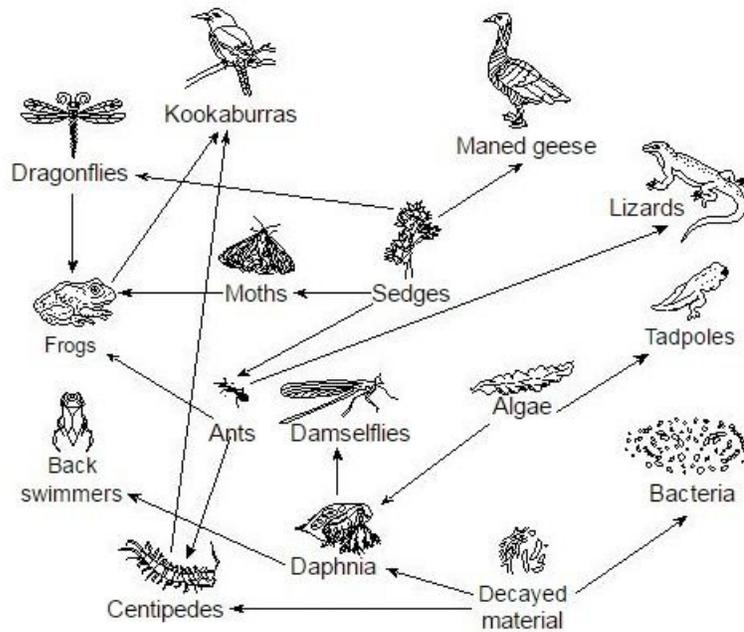
### Analysis Questions:

1. What is the greatest moose population? \_\_\_\_\_
2. What year did that occur? \_\_\_\_\_
3. What was the wolf population when the moose population the greatest? \_\_\_\_\_
4. What would happen to the moose population if the wolf population decreases? \_\_\_\_\_
5. What would happen to the wolf population if the moose population decreases? \_\_\_\_\_
6. What would happen to the moose population if the wolves were removed from Isle Royale?
7. Describe the pattern between the wolf population in relation to the moose population.
8. Identify a factor, other than moose population, that has influenced the wolf population in Isle Royale.

**UNIT 2: ENERGY TRANSFER** (Transfer of Energy and Matter in an Ecosystem, Photosynthesis and Respiration) [https://quizlet.com/\\_4yhitt](https://quizlet.com/_4yhitt)

**Food Webs**

1. A [food web](#) that included daphnia was researched.



Fill-in the chart below based on the Daphnia food web.

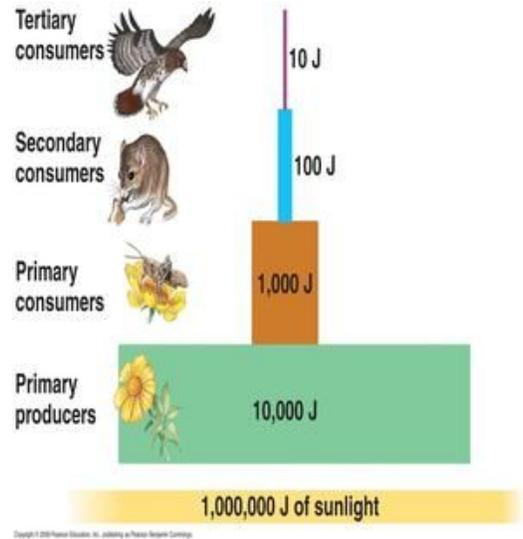
<u>Trophic (feeding) Level</u>	Species examples
Producer	
Primary Consumer (herbivore)	
Secondary Consumer (eats herbivores)	
Tertiary Consumer (eats carnivores)	

Which of the following observations are *most closely* connected to the Daphnia graph?

- When the algae decreased the amount of light increased.
- Algae is eaten by several organisms in the food web.
- Damsel flies are a predator of daphnia.
- An increase in Kookaburras would lead to a decrease in centipedes.

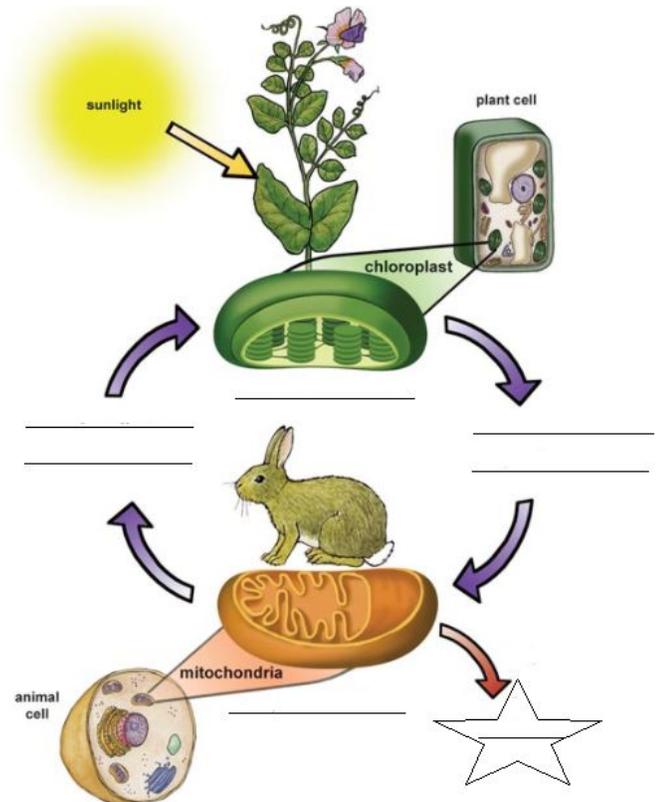
## 2. Food Webs and Energy

- How is [energy transferred](#) through a food web?
- What is the [10% rule](#)?
- How is 10% calculated? Convert 10% to 0.10 and multiply. For example, if producers converted 500 J (Joules) of energy from the sun and 10% was converted to the next level, how much energy would the primary consumers (herbivores) have?  $(500 \text{ J})(0.10) = 50 \text{ J}$  of energy for the herbivores.



- Example problem: If Producers converted 15,000 J from the sun, how much energy would the tertiary consumers have? Remember to calculate 10% for each step.

## 3. Fill-in the following [model](#) using the word bank.



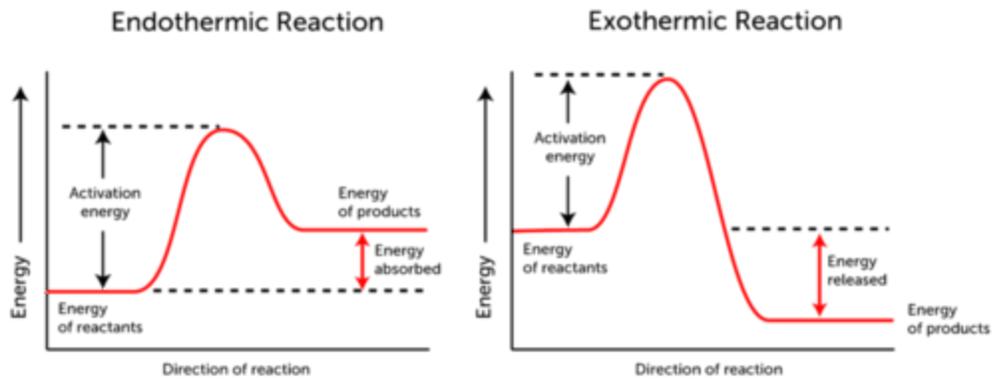
**Wordbank:** Cellular respiration, ATP, Carbon dioxide  
Glucose, Oxygen, Water, Photosynthesis

4. Using the diagram above, write out the [formulas](#) for Photosynthesis and Respiration. Label the [Reactants](#) and the [Products](#)

5. Which processes (photosynthesis or respiration) are performed by each cell? Explain.



6. Which of the [reaction graphs](#) below represent [photosynthesis](#) and which represents cellular [respiration](#)? How do you know?

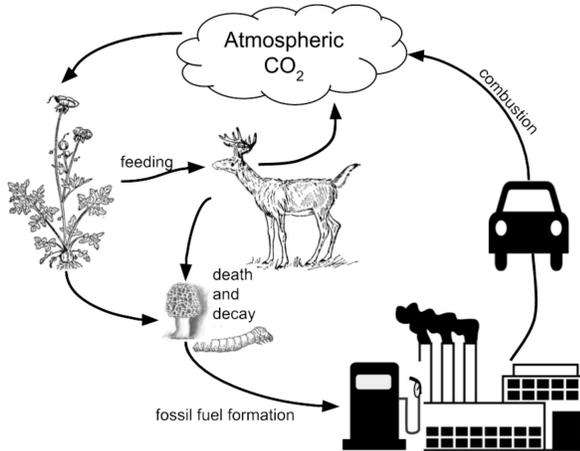


7. Name and define each [sphere of the earth](#) [BLAH]

B	
L	
A	
H	

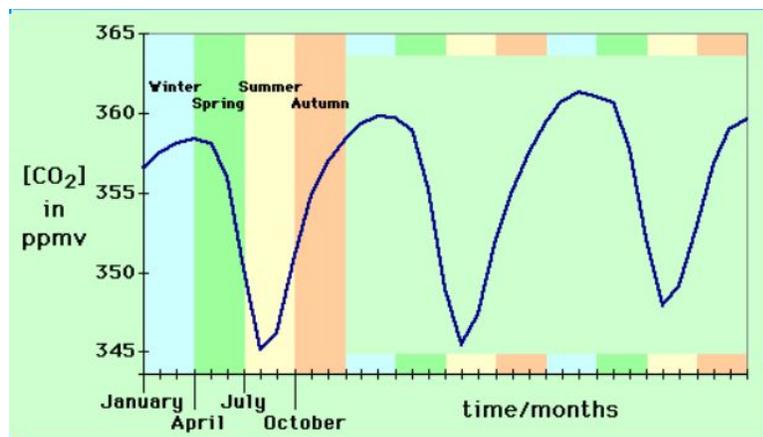
**Application**

8. Deforestation and increased fossil fuels will change the environment in the future. Revise the following model to show how these activities would change the carbon cycle. [Track the flow](#) of carbon through the earth's spheres from these events and describe the impact on each as a result.



Event	Effect on Carbon Cycle	Effect on Sphere (BLAH)
Deforestation		
Increased Fossil Fuel Use		

9. What happens to the levels of Carbon Dioxide over time (during [different seasons](#))? Why?



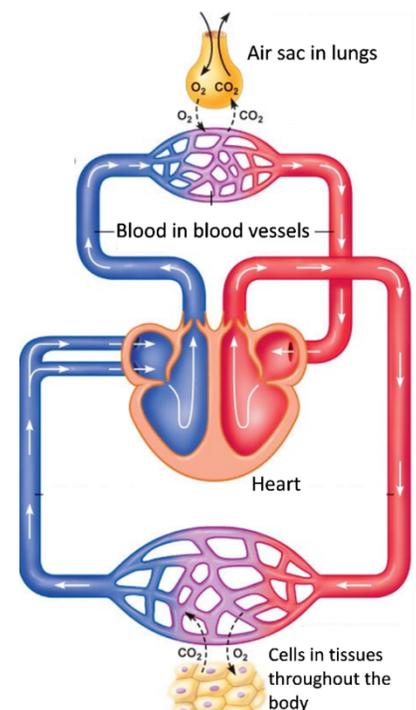


**Scenario:** Your brain regulates the rate and depth of your breathing to match the needs of your body for  $O_2$  intake and  $CO_2$  removal. Breathing rate refers to the number of breaths per minute. Depth of breathing refers to the amount of air taken in with each breath.

3. On the top of a high mountain, air pressure is significantly lower than at sea level, so there is less  $O_2$  in a given volume of air. Suppose a climber at high altitude maintained the same rate and depth of breathing as she had at sea level. What would happen to the  $O_2$  levels in his blood? Explain your reasoning.
4. What changes in breathing could maintain relatively constant  $O_2$  levels in the blood for a person who has gone from sea level to high altitude?

**Scenario:** In your lungs there are millions of tiny air sacs, each surrounded by many tiny blood vessels. This figure shows how  $O_2$  diffuses from the air in these air sacs to the blood in the surrounding blood vessels. Then blood with  $O_2$  is pumped by the heart through larger blood vessels to tiny blood vessels near each cell in your body. There, the  $O_2$  diffuses from the blood into the cells.

5. Draw a single long arrow to show how  $CO_2$  moves from the cells of the body via the blood to the air in the air sacs of the lungs.



6. The respiratory system includes the lungs, nose and tubes that carry air to and from the lungs. The circulatory system includes the heart, blood and blood vessels. Explain why a person needs to have both a respiratory system and a circulatory system to provide the body's cells with the  $O_2$  needed for cellular respiration.

State whether each of the following scenarios indicates negative or positive feedback:

7. \_\_\_\_\_ If blood temperature rises too high, specialized neurons in the hypothalamus of the brain sense the change. These neurons signal other nerve centers, which in turn send signals to the blood vessels of the skin. As these blood vessels dilate, more blood flows close to the body surface and excess heat radiates from the body.
  
8. \_\_\_\_\_ If the blood temperature falls too low, specialized neurons in the hypothalamus of the brain sense the change and signals are sent to the cutaneous arteries (those supplying the skin) to constrict them. Warm blood is then retained deeper in the body and less heat is lost from the surface.
  
9. \_\_\_\_\_ Part of the complex biochemical pathway of blood clotting is the production of an enzyme that forms the matrix of the blood clot. This has a self- catalytic, or self-accelerating effect, so that once the clotting process begins, it runs faster and faster until, ideally, bleeding stops.
  
10. \_\_\_\_\_ During childbirth stretching of the uterus triggers the secretion of the hormone oxytocin, which stimulates uterine contractions and speeds up labor.
  
11. \_\_\_\_\_ The walls of arteries stretch in the presence of high blood pressure. Baroreceptors located in these walls also stretch and as a result, a signal is sent to the brain which in turn slows down the body's heart rate. This slows the flow of blood through the arteries causing less pressure. As BP drops the baroreceptors become flaccid and a signal is sent to speed up the heart rate.

## PART 2. Osmosis & Diffusion ([short video](#))

Osmosis Quizlet: [https://quizlet.com/\\_2y801y](https://quizlet.com/_2y801y)

Diffusion Quizlet: [https://quizlet.com/\\_38ty26](https://quizlet.com/_38ty26)

### General Knowledge: Fill in the Blank

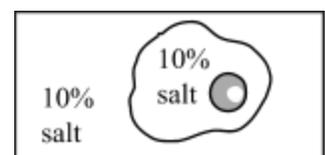
away	low	high	hypertonic	hypotonic
diffusion	molecules	osmosis	vacuole	changes shape
solute	permeable	towards	semi-permeable	concentration gradient
protein	into	out of	equal	channel protein
water	ATP	active transport		

12. The cell membrane regulates and controls what kind of \_\_\_\_\_ move in & out of the cell.
13. When molecules spread from an area of high to low concentration to, it is called \_\_\_\_\_
14. As molecules diffuse, they create a \_\_\_\_\_, which is a difference in concentrations across a space or barrier.
15. Cell membranes are \_\_\_\_\_. This means that they only allow certain things to pass through.
16. A membrane that would allow ANYTHING to pass through it would be called \_\_\_\_\_
17. Diffusion is the movement of molecules. Osmosis is the diffusion of \_\_\_\_\_
18. \_\_\_\_\_ is the process of water molecules moving across a cell membrane.
19. The direction that water molecules move is determined by the difference in the concentration of \_\_\_\_\_ dissolved in the solvent inside and outside the cell.
20. Osmotic pressure, or osmosis, pushes water molecules \_\_\_\_\_ the area of greater solute concentration.
21. Water molecules are pulled \_\_\_\_\_ from areas of lower solute concentration.
22. The word hypertonic means \_\_\_\_\_ % of solutes and a low % of H<sub>2</sub>O.
23. The word hypotonic means \_\_\_\_\_ % of solutes and a high % H<sub>2</sub>O.
24. A plant cell undergoes [plasmolysis](#), or shrinking of the cell membrane, when it is placed in a solution with a HIGH % solute / LOW % H<sub>2</sub>O. What type of solution causes plasmolysis? \_\_\_\_\_
25. An animal cell undergoes [cytolysis](#), or stretching and bursting of the cell membrane, when it is placed in a solution with a very LOW % of solute / very HIGH % H<sub>2</sub>O. What type of solution causes cytolysis? \_\_\_\_\_

26. Diffusion moves molecules from a \_\_\_\_\_ concentration to a \_\_\_\_\_ concentration.
27. True or false (circle one): after equilibrium is reached, molecules do not move anymore.
28. In a hypotonic solution, there is a low solute / high water concentration outside a cell → water moves \_\_\_\_\_ the cell.
29. Circle one: Which group does better in a hypotonic solution?    PLANTS    ANIMALS
30. In a hypertonic solution, there is a high solute / low water concentration outside a cell. Water moves \_\_\_\_\_ the cell.
31. In an isotonic solution, there is an \_\_\_\_\_ solute / water concentration outside and inside a cell.
32. Facilitated diffusion needs the help of a \_\_\_\_\_ to move large/charged molecules across a cell membrane.
33. What type of molecule is the “facilitator” in [facilitated diffusion](#)? \_\_\_\_\_
34. The only type of cellular transport to go AGAINST the concentration gradient is called \_\_\_\_\_
35. What important energy molecules allows active transport to happen? \_\_\_\_\_
36. What happens to the shape of the protein when the ATP binds to it?  
\_\_\_\_\_

### Isotonic Solutions

37. The concentration of the solutes inside the cell is \_\_\_\_\_ to the concentration outside the cell.  
(A) less than      (B) greater than      (C) equal to
38. Water molecules will move:  
(A) into the cell faster than out of the cell  
(B) out of the cell faster than they will move into the cell  
(C) in and out of the cell at the same rate
39. Turgor Pressure is the pressure that water places on the inside of a PLANT cell. An increase in turgor pressure can cause the cell membrane to press up against the cell wall and a decrease in turgor pressure can cause the cell membrane to shrivel. If the turgor pressure is kept constant, the cell membrane will maintain its shape. In an isotonic solution, the turgor pressure is:  
(A) normal      (B) decreasing      (C) increasing
40. In animal cells, the cell membrane will:  
(A) shrivel up      (B) be normal      (C) expand & possibly burst
41. In the picture to the right, the movement of water across the membrane will be  
(A) mostly out      (B) mostly in      (C) in and out equally

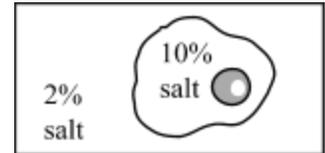


## Hypotonic Solutions

42. The concentration of the solutes inside the cell is \_\_\_\_\_ to the concentration outside the cell.  
(A) less than (B) greater than (C) equal to
43. Water molecules will move:  
(A) into the cell faster than out of the cell (B) out of the cell faster than they will move into the cell  
(C) in and out of the cell at the same rate
44. **Turgor Pressure** is the pressure that water places on the inside of a PLANT cell. An increase in turgor pressure can cause the cell membrane to press up against the cell wall and a decrease in turgor pressure can cause the cell membrane to shrivel. If the turgor pressure is kept constant, the cell membrane will maintain its shape. In a hypotonic solution, the turgor pressure is:  
(A) normal (B) decreasing (C) increasing

45. In animal cells, the cell membrane will:  
(A) shrivel up (B) be normal (C) expand & possibly burst

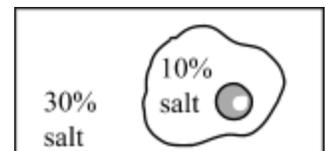
46. In the picture to the right, the movement of water across the membrane will be  
(A) mostly out (B) mostly in (C) in and out equally



## Hypertonic Solutions

47. The concentration of the solutes inside the cell is \_\_\_\_\_ to the concentration outside the cell.  
(A) less than (B) greater than (C) equal to
48. Water molecules will move:  
(A) into the cell faster than out of the cell (B) out of the cell faster than they will move into the cell  
(C) in and out of the cell at the same rate
49. **Turgor Pressure** is the pressure that water places on the inside of a PLANT cell. An increase in turgor pressure can cause the cell membrane to press up against the cell wall and a decrease in turgor pressure can cause the cell membrane to shrivel. If the turgor pressure is kept constant, the cell membrane will maintain its shape. In a hypertonic solution, the turgor pressure is:  
(A) normal (B) decreasing (C) increasing
50. In animal cells, the cell membrane will:  
(A) shrivel up (B) be normal (C) expand & possibly burst

51. In the picture to the right, the movement of water across the membrane will be  
(A) mostly out (B) mostly in (C) in and out equally

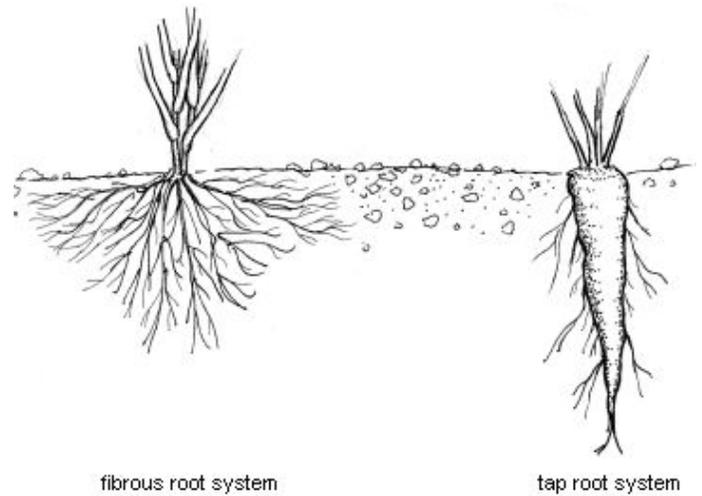


52. You decide to buy a new fish for your freshwater aquarium. When you introduce the fish into its new tank, the fish swells up and dies. You later learn that it was a fish from the ocean. Based on what you know of tonicity, the most likely explanation is that unfortunate fish went from a (n) \_\_\_\_\_ solution into a (n) \_\_\_\_\_ solution.

- a. isotonic, hypotonic      b. hypertonic, isotonic      c. hypotonic, hypertonic      d. hypotonic, isotonic

**Scenario:** The students now wanted to look at how plant cells behave and chose to look at root systems in corn (fibrous root system) and carrot (tap root system) plants. They found the roots of the plants have root hair cells that absorb water from the soil. Planting the plants in containers with a glass window on one side, they were able to see the root growth as shown in their diagram to the right. They hypothesized that the H<sub>2</sub>O concentration inside the cell must be lower than the concentration of H<sub>2</sub>O in the soil.

53. Explain why the students suspected water to move from the soil into the root hair cell.



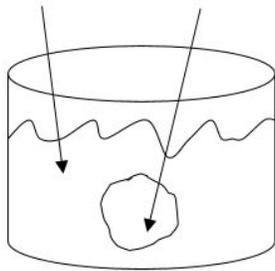
54. Suggest why root hair cells are long and thin and not short and stubby?

**Scenario:** Two students are performing an investigation on red blood cells (RBCs) for the movement of water into and out of an animal cell. Below you will see the different concentrations the students tested. Percent (%) solute and % water will total 100% for the solution outside of the cell as well as for the solution inside the cell.

55. For each of the following the students determined the % solute and H<sub>2</sub>O for the solution outside the cell (environment) as well as for the inside of the cell then predicted what would happen. The students noted their observations using the choices below for observations A, B, and C. What predictions do you think they should have made?

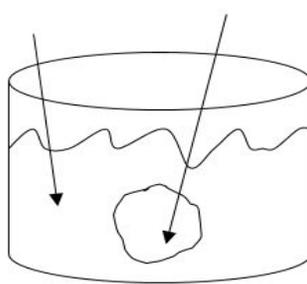
- A. Tell whether the solution *outside the cell* is **hypotonic, hypertonic, or isotonic**.
- B. Give the direction of the *net movement of water* (**into cell, out of cell, into or out of cell at equal rates**).
- C. Tell what will happen to the cell (**shrink, swell or stay the same**).

20 % solute      80 % solute  
 \_\_\_ % H<sub>2</sub>O      \_\_\_ % H<sub>2</sub>O



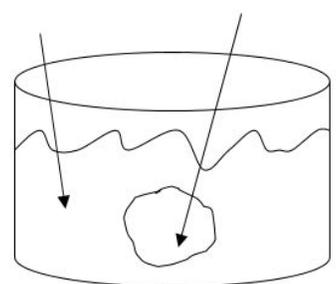
- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_

\_\_\_ % solute      \_\_\_ % solute  
 10 % H<sub>2</sub>O      90 % H<sub>2</sub>O



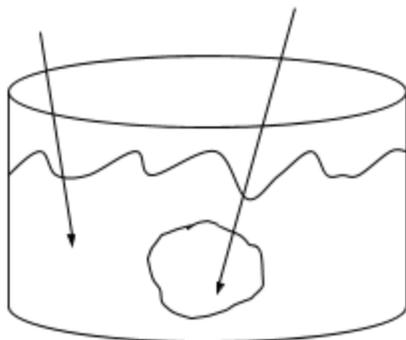
- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_

40 % solute      30 % solute  
 \_\_\_ % H<sub>2</sub>O      \_\_\_ % H<sub>2</sub>O



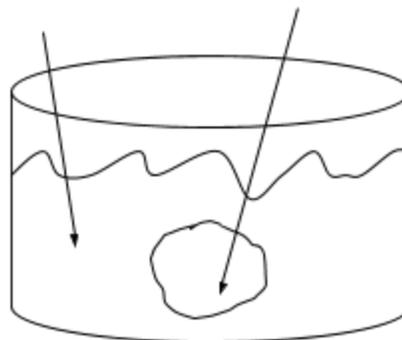
- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_

50 % solute      50 % solute  
 \_\_\_ % solvent      \_\_\_ % solvent



- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_

80 % solute      \_\_\_ % solute  
 \_\_\_ % solvent      10 % solvent



- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_

### PART 3. Feedback loops

Feedback Loops Quizlet: [https://quizlet.com/\\_3lim10](https://quizlet.com/_3lim10)

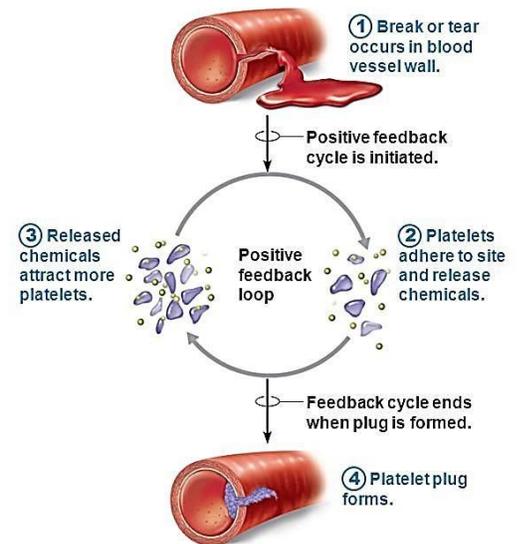
Two Types of Feedback:

Negative feedback occurs when a change in a variable triggers a response which reverses the initial change.

Positive feedback occurs when a change in a variable triggers a response which causes more change in the same direction.

**Scenario:** The figure to the right shows how positive feedback contributes to the rapid formation of a platelet plug in an injured blood vessel. The injured area attracts platelets, and each of these platelets secretes chemicals that attract more platelets. Thus, many platelets accumulate quickly and together these platelets plug the hole in the injured blood vessel and prevent excessive blood loss.

56. Explain how this example illustrates the general principle that *"Positive feedback is useful when there is an advantage to making a rapid change."*

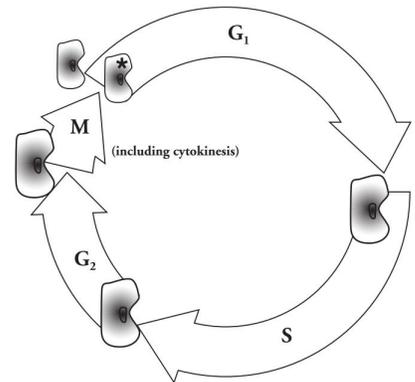


57. Shivering in a cold environment can raise your body temperature. Is shivering part of positive feedback or negative feedback? Explain your reasoning using the information above.

58. What would go wrong if your body used positive feedback to regulate body temperature? For example, what would happen if a person sweated when temperature decreased?

Unit 4 - Inheritance and Variation in Traits [https://quizlet.com/\\_2xc3d](https://quizlet.com/_2xc3d)

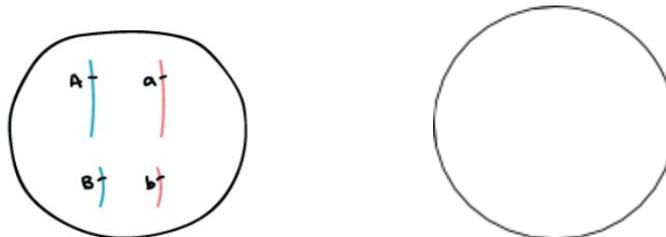
1. What happens in each stage of the [cell cycle](#).



A gene for bone growth causes Achondroplasia (a common type of dwarfism). A gene for blood cells can cause leukemia (white blood cell cancer). Use the key to answer the questions and sketch a model.

Gene Function	Genotype or Gene Symbol (version of the gene)	Phenotype or appearance
Bone growth	AA or Aa	Dwarfism (short height)
	aa	average height
White Blood Cell Reproduction	BB or Bb	Healthy white blood cell count
	bb	Leukemia

View the following chromosomes with their genotypes. Sketch what the chromosomes would look in prophase of mitosis (**after each chromosome duplicates**).



2. What would be the phenotype of the cell above? \_\_\_\_\_
3. Write the genotype of a person with average height and leukemia. \_\_\_\_\_
4. If a skin cell had a genotype of AaBb, what would the daughter cell have? \_\_\_\_\_

5. Using the data below, calculate the **mitotic index** of the tissue. SHOW WORK.

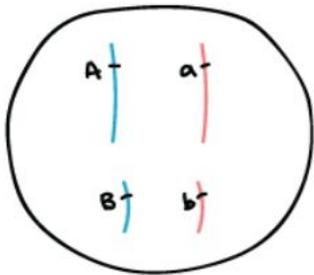
Lung Tissue Sample:

Stage	Number of cells
Interphase	462
Prophase	23
Metaphase	24
Anaphase	4
Telophase	16

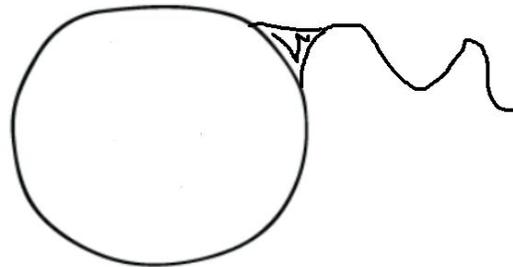
$$\text{mitotic index} = \frac{\text{number of cells in mitosis}}{\text{total number of cells}} \times 100$$

6. If Cell A represented a skin cell and Cell B represented a sperm cell in the same person what would the chromosomes look like in cell B?

Cell A



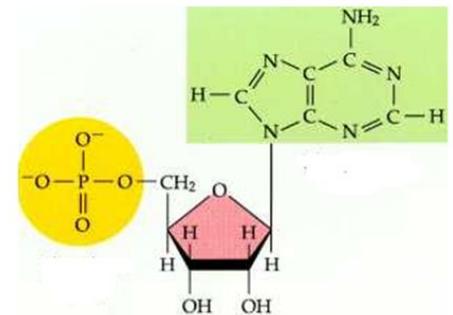
Cell B



7. Which cell type would be a result of meiosis vs. mitosis? What is the difference?

8. What three molecules make up a nucleotide? Label the diagram to the right with the terms: Nitrogen base, phosphate and sugar.

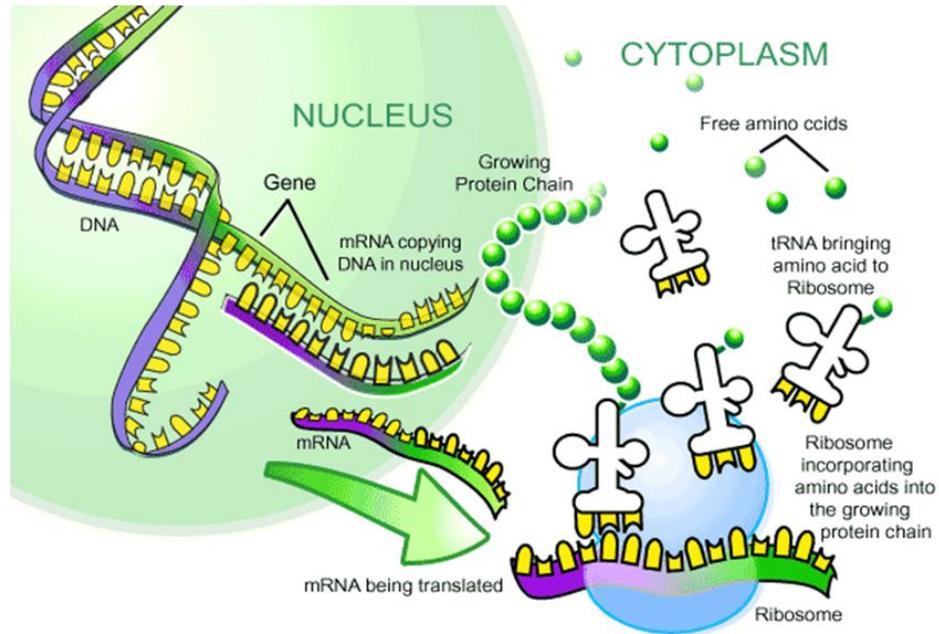
9. How do nucleotides form the double helix?



10. How does base pairing work?

A binds with \_\_\_\_\_

C binds with \_\_\_\_\_



11. Using the diagram below highlight and add to the description of the major events in DNA [transcription](#) and [translation](#) on the next page.

**Transcription and Translation Steps**

Step 1 \_\_\_\_\_

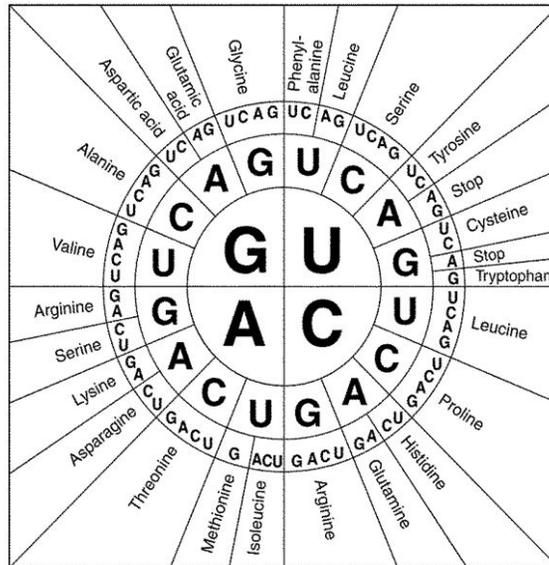
Step 2 \_\_\_\_\_

Step 3 \_\_\_\_\_

Step 4 \_\_\_\_\_

Step 5 \_\_\_\_\_

12. Transcription/Translation Table: Fill in the following table, use the chart to determine the amino acid from the codon.



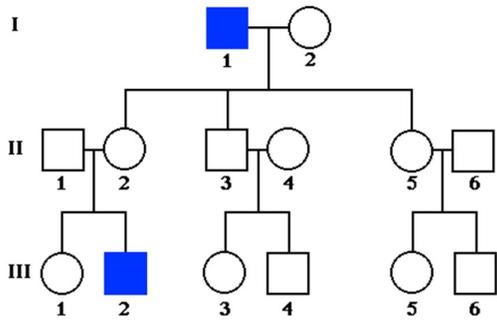
DNA Code	mRNA Codon	tRNA Anticodon	Amino Acid (1st 3 Letters Only)
GAG	CUC	GAG	Leu
	UCC		
		GAC	
		UCC	
	GGU		
	UUU		
	GCG		
TTC			

13. What are the [different types of mutations](#) and their effects on the amino acids/protein produced?

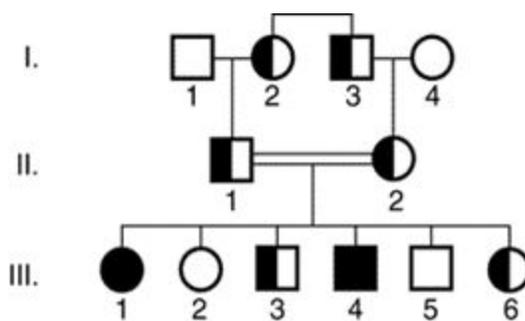
Mutation Type	DNA Change (single letter substitution, insertion, deletion)	Effect on Amino Acid(s)
Nonsense		
Missense		
Silent		
Frameshift		

14. What is the type of inheritance pattern seen in the pedigrees below? How do you know?

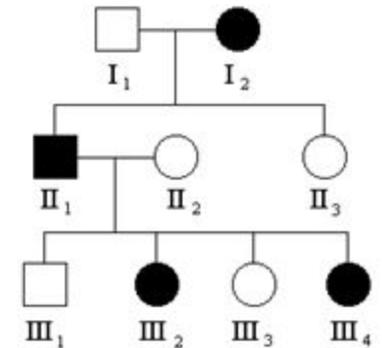
Pedigree A



Pedigree B



Pedigree C



\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

15. A woman comes to a genetic counselor with concerns about her son who has an unknown genetic disorder. A family history is taken to the right.

a. What are the possible patterns of inheritance? Explain.

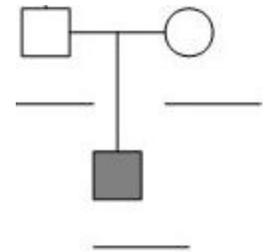
\_\_\_\_\_

\_\_\_\_\_

b. Write the possible genotypes on the pedigree.

c. What suggestions do you have for the genetic counselor to have more certainty?

\_\_\_\_\_



16. The genetic counselor meets with the family again and is able to obtain more information. Answer the questions based on the updated family history.

a. What is the likely pattern of inheritance now? Based on what newly obtained evidence?

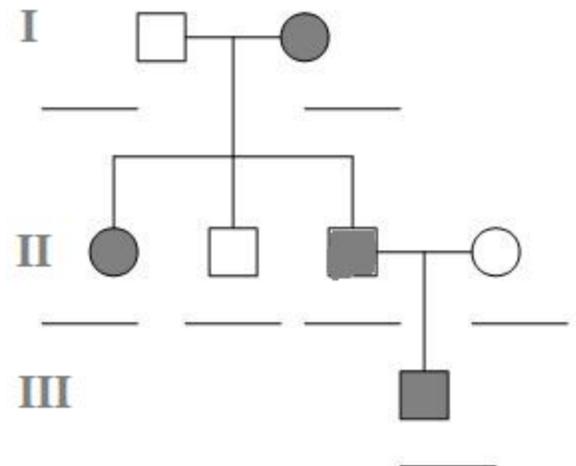
\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

b. Write in the genotypes of the individuals in the pedigree.

c. What would be the chance for I-1 and I-2 to have another affected child? Show work in punnett square.

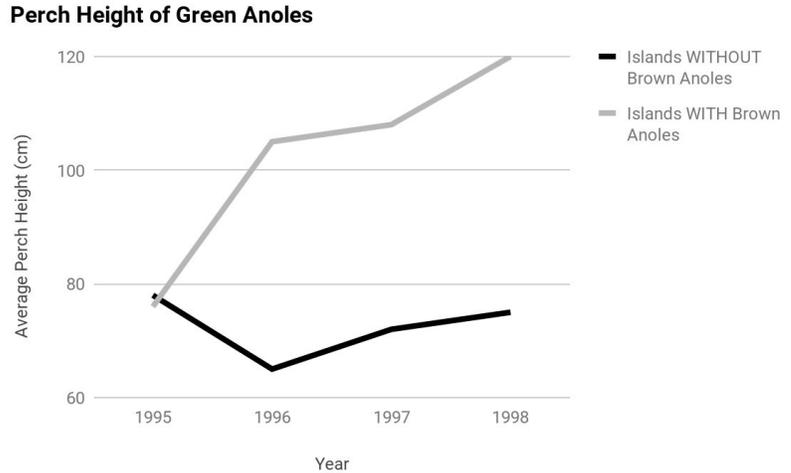
## Unit 5 Evolution

The green anole is a type of lizard that live in trees in Florida. In the 1950s, a similar species of lizard called the brown anole invaded Florida from Cuba. We know two things about the two species of anoles:

- They live in similar habitats and eat similar food.
- They are known to eat the newly hatched lizards of the other species.

Scientists conducted two investigations to determine whether or not the population of green anoles was evolving due to the invasion of brown anoles.

First, they introduced brown anoles to three islands and left three islands alone. Then they measured the average height green anoles could be found in the trees (perch height) before and after introducing the invasive brown anoles. Here is a graph of the data they collected on perch height:

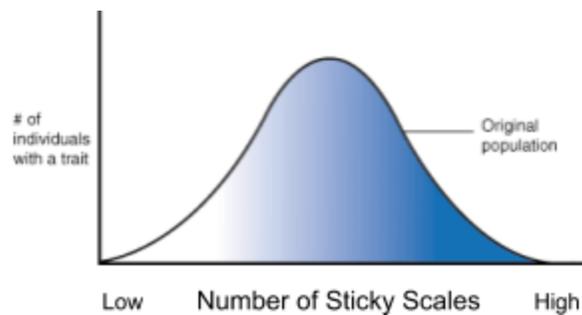


Next, scientists knew that living higher in the trees was associated with larger footpads and more sticky scales on the anoles' feet. So in 2010, the scientists collected data on the populations of green anoles that had been invaded by brown anoles and those that had not been invaded to investigate whether or not the population of green anoles adapted because of the invasion. Below is a summary of the data the scientists collected:



	Green Anoles on an Island <b>WITHOUT</b> Brown Anoles	Green Anoles on an Island <b>WITH</b> Brown Anoles
Average Perch Height in Trees	70 cm	120 cm
Average Size of the Toe Pads (Standardized for body size)	1.27 cm	1.33 cm (4.5% increase)
Average Number of Sticky Scales on the Feet (Standardized for body size)	51 Sticky Scales	54 Sticky Scales (6.5% increase)

1. What pattern do you see in the perch height data? Support with evidence.
  
2. When the brown anoles invaded, scientists noted that they ate similar food and lived in similar habitats as the green anoles, why does this matter for the survival of the green anoles?
  
3. Why might being able to go higher in trees be an advantage for survival?
  
4. On the following graph using the evidence provided **add a line** to show how selection has driven change in the population of green anoles on the islands with brown anoles.

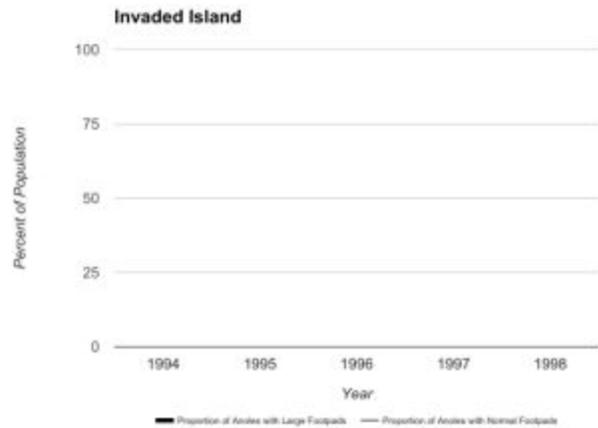
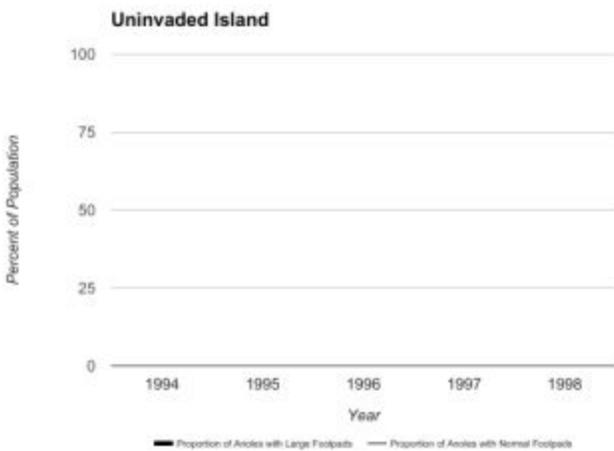


5. What type of selection would you identify this as?
  - a. Stabilizing
  - b. Directional
  - c. Disruptive
  
6. For each of Darwin's observations and inferences describe how they relate to the green anole.

<b>Variation</b>	
<b>Heritability</b>	
<b>Overproduction</b>	
<b>Struggle for Existence</b>	
<b>Survival of the Fittest</b>	

7. Write an explanation for how [natural selection](#) led to the adaptation of the population of green anoles when the brown anoles invaded their habitats in Florida.

8. Complete the graphs below showing how you think the proportion of green anoles with larger foot pads in the population changed over time on the invaded and uninhabited islands.

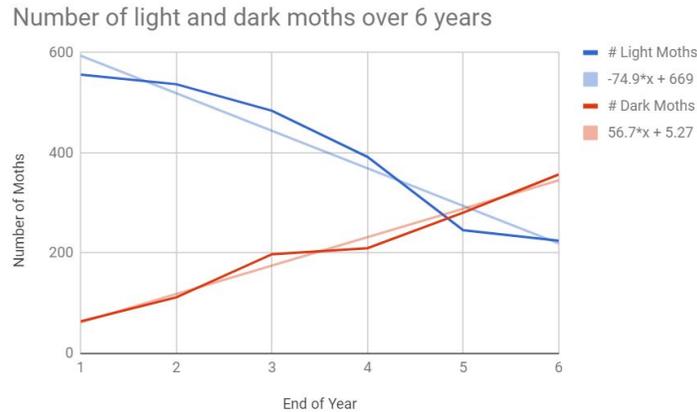


9. Students posed the question: Are green anoles more closely related to the brown anole or the cuban green anole? Listed below are the different types of [evidence](#) students collected to answer the question. Rank each piece of evidence by placing a check in the appropriate column.

	<b>Most Helpful (Only 1)</b>	<b>Helpful</b>	<b>Least Helpful</b>
Anatomical Structures			
DNA Similarity			
Embryological Development			
Behavior			
Fossil Record			
Diet			

## Peppered Moths - Simulation

The economic changes known as the industrial revolution began in the middle of the eighteenth century. Since then, tons of soot have been deposited on the countryside around industrial areas. The soot discoloured and generally darkened the surfaces of trees and rocks. In 1848, a dark-coloured moth was first recorded. Today, in some areas, 90% or more of the peppered moths are dark in colour. More than 70 species of moth in England have undergone a change from light to dark. Similar observations have been made in other industrial nations, including the United States. Below is data collected over six years.



- Given the data and information above:
  - What pattern do you notice?
  - Identify a cause and effect relationship to explain the pattern.
- What evidence presented supports that variation is present in the peppered moth population?
- What are sources of variation in the population of peppered moths?
- If the trendline equation for light moths is  $Y = -74.9X + 669$ . What would you expect the number of moths to be at the end of year 7?
- If the trendline equation for dark moths is  $Y = 56.7X + 5.27$ . What would you expect the number of moths to be at the end of year 7?