

Biology Final Exam Review KEY

UNIT 1: ECOLOGY https://quizlet.com/_4yhif8

Population Density

- How is population density calculated?

The number of people in the numerator (on top of the fraction) and the number of square miles/meters/acres/kilometers in the denominator (on the bottom)

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

- 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?

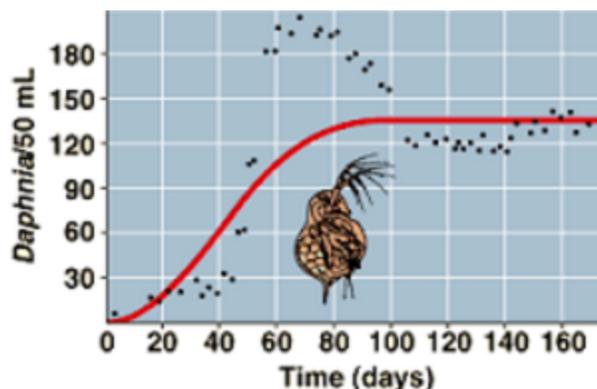
$420/14 = 30$ individuals per square kilometer

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

Looking at the data collected the trend line indicates logistic growth.

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

140 daphnia per 50 ml



- What factors (biotic or abiotic) might contribute to the pattern seen? **Biotic** - amount of food (algae, larval shrimp, yeast), amount of daphnia (new daphnia being born) **Abiotic** - temperature, dissolved oxygen concentration amount of water, space

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			

- Calculate avg. number of mushrooms per box

$$5+2+3+2+3 = 15 \quad 15/5=3 \text{ mushrooms/box}$$

- Multiply average by number of boxes (3x100)

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

_____ 300 _____

b. The technique is called _____ random sampling _____

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

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

- Use the formula to calculate the estimated number of geese in the area studied? $60 \times 10 / 6 = 100$ geese
- This technique is called **Mark & Recapture**
- 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? **Less**

Chart 3: Snakes & Mice

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

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

- During which year was the mouse population close to zero population growth?

Year 2000 closest to 0

- What is the carrying capacity for snakes ?

~14

- What is the carrying capacity for mice?

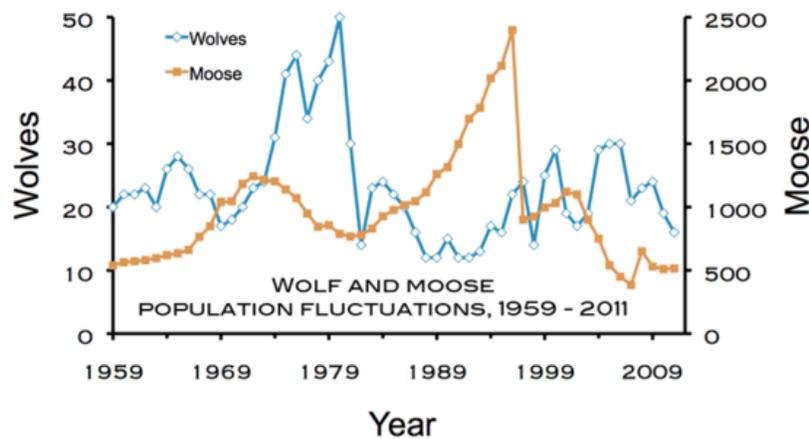
*****Need more information to answer this question**

- What is the rate of growth (r) for mice during 1970? **+500** During 1980? **-100**

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? **approx. 2400**
2. What year did that occur? **1994**
3. What was the wolf population when the moose population the greatest? **approx. 22**
- 4.. What would happen to the moose population if the wolf population decreases? **Increase**
5. What would happen to the wolf population if the moose population decreases? **Decrease**
6. What would happen to the moose population if the wolves were removed from Isle Royale?

Initially, the moose population would increase due to less predation. However, over time, the moose population would decrease due to competition for food.

7. Describe the pattern between the wolf population in relation to the moose population.

This is a typical predator/prey relationship where the population of one species lags behind the population of the other.

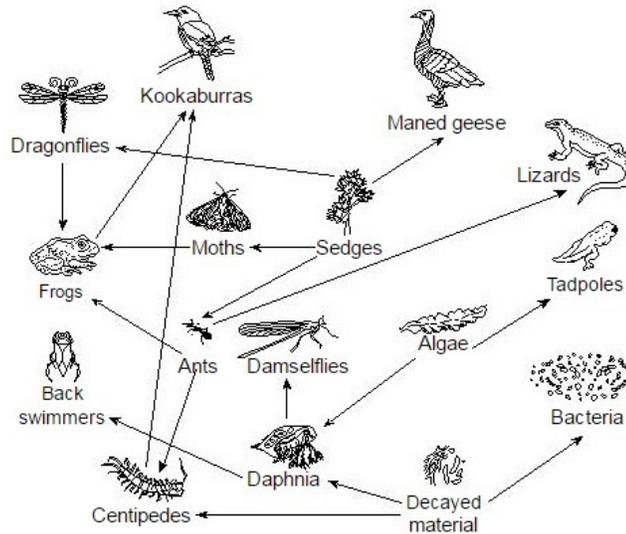
8. Identify a factor, other than moose population, that has influenced the wolf population in Isle Royale.

Geography, disease (parvovirus), weather patterns.

UNIT 2: ENERGY TRANSFER (Transfer of Energy and Matter in an Ecosystem, Photosynthesis and Respiration) 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. ****There are several correct answers. The importance is following the connections between organisms.**

<u>Trophic (feeding) Level</u>	Species examples
Producer (Photosynthesis and Cell Respiration (CR))	Algae, sedges
Primary Consumer (herbivore) (CR)	Moths, dragonflies, ants, tadpole, maned geese
Secondary Consumer (eats herbivores) (CR)	Centipedes, back swimmers, frog
Tertiary Consumer (eats carnivores) (CR)	Lizard, Kookaburras

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.
- Damsselfies are a predator of daphnia.
- An increase in Kookaburras would lead to a decrease in centipedes.

2. Food Webs and Energy

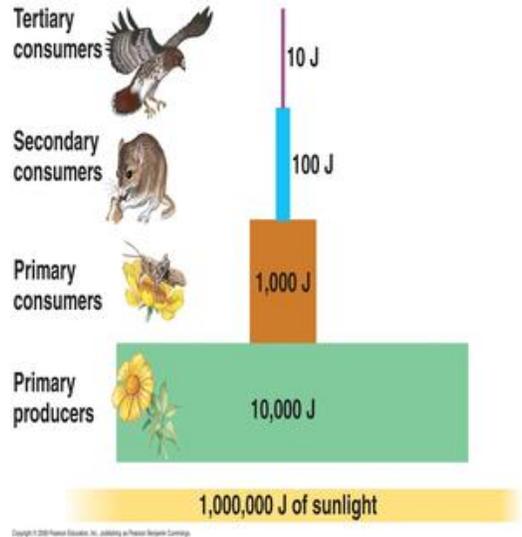
a. How is energy transferred through a food web?

From the primary producers which are plants

b. What is the 10% rule?

The 10% rule refers to the amount of energy available to the next trophic (feeding) level.

c. 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.



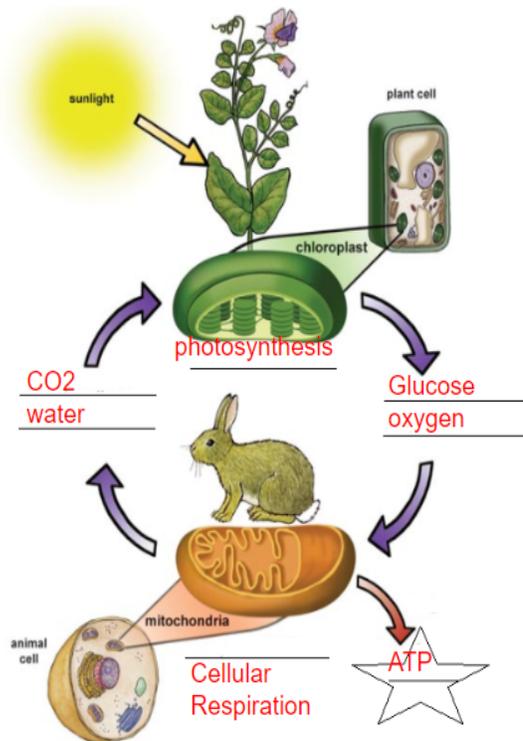
d. Example problem: If Producers converted 15,000 J from the sun, how much energy would the tertiary consumers have? Remember to calculate 10% for each step.

$(15,000 \text{ J})(0.10) = 1,500 \text{ J}$ for primary consumers

$(1,500 \text{ J})(0.10) = 150 \text{ J}$ for secondary consumers

$(150 \text{ J})(0.10) = 15 \text{ J}$ for the tertiary consumers

3. Fill-in the following model using the word bank.



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

Photosynthesis - $6 \text{ CO}_2 + 6 \text{ H}_2\text{O} + \text{energy} \rightarrow \text{C}_6 \text{ H}_{12} \text{ O}_6 + 6 \text{ O}_2 + \text{energy}$

Reactants- light energy, water, carbon dioxide

Products- glucose, oxygen

Respiration - $\text{C}_6 \text{ H}_{12} \text{ O}_6 + 6 \text{ O}_2 \rightarrow 6 \text{ CO}_2 + 6 \text{ H}_2\text{O} + \text{energy}$

Reactants - glucose, oxygen

Products - carbon dioxide, water, ATP

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

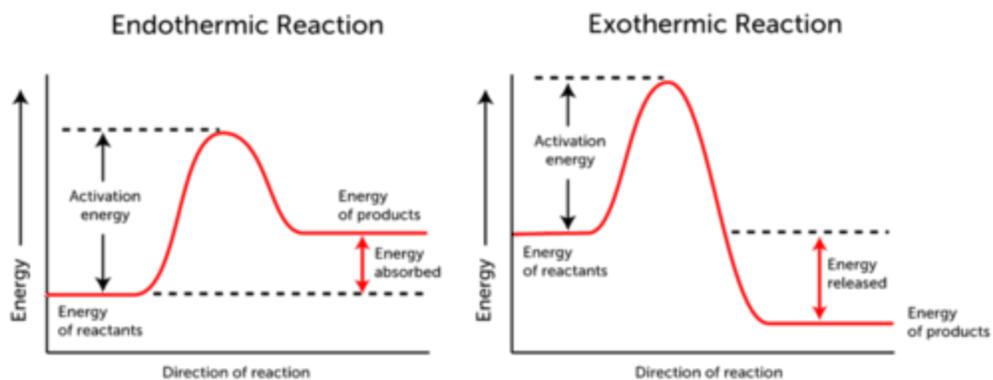
Plant cells perform both processes; photosynthesis and respiration

Animal cells only perform respiration.

Animal cells do not have chloroplasts. Chloroplasts contain a green substance called chlorophyll. This absorbs the light energy needed to make photosynthesis happen.



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



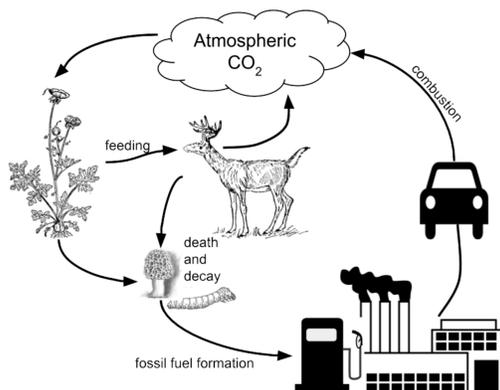
Photosynthesis is an endothermic reaction. The energy in the product glucose is greater than the reactants water and carbon dioxide. Respiration is an exothermic reaction because it releases energy. There is more energy in the glucose molecule which is the reactant than there is in the products water and carbon dioxide.

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

B Biosphere	The atmosphere, lithosphere and hydrosphere combine together to form the biosphere. It is where the plants and animals live on earth.
L Lithosphere	Also known as the geosphere. Solid rock portion of the earth's surface.
A Atmosphere	Layer of gases that surround the earth protecting it from radiation and space debris.
H Hydrosphere	Consists of the water elements of the earth ranging from bodies of water to water particles found in the atmosphere.

Application

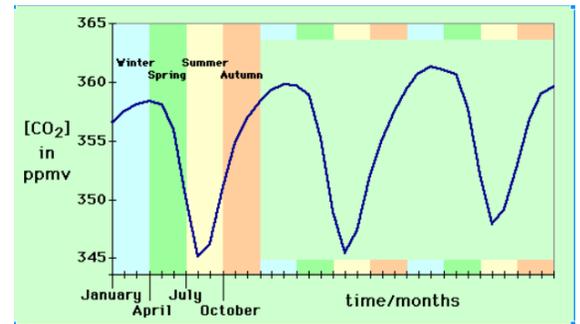
8. Deforestation and increased fossil fuels will change the environment in the future. Revise the following model to show how these activities would change the carbon cycle. [Track the flow](#) of carbon through the earth's spheres from these events and describe the impact on each as a result.



Event	Effect on Carbon Cycle	Effect on Sphere (BLAH)
Deforestation	Global Warming Trees and forest balance the amount of Carbon in the atmosphere through the process of photosynthesis in which plants make their own food with carbon dioxide.	Higher temperatures Biosphere (atmosphere, lithosphere, hydrosphere)
Increased Fossil Fuel Use	Global Warming Burning coal, oil, natural gas, and other fossil fuels – for industrial activity and power generation for example, removes the carbon from the fossil fuels and emits it as CO2 into the atmosphere.	Higher temperatures Biosphere (atmosphere, lithosphere, hydrosphere)

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

There's more **carbon dioxide** in the **winter** and **autumn** and less in the **spring** and **summer**. Plants are accumulating carbon in the **spring** and **summer** when they're active, and they're releasing carbon back to the air in the **fall** and **winter**.



Unit 3 Structure and Function

PART 1. Homeostasis ([video](#) or [reading](#))

Homeostasis Quizlet: https://quizlet.com/_41ulfa

Scenario: When blood levels of O₂ and/or CO₂ get too low or too high, negative feedback regulation restores these blood levels to a healthy set point. This negative feedback regulation can increase or decrease the rate and/or depth of breathing.

- Complete this flowchart diagram to show how negative feedback regulation could change the rate and/or depth of breathing to maintain relatively constant levels of CO₂ in the blood.

