

Name_____



Biology Activity Book

To be completed with Edgenuity Biology A & B

Developed with funding from



www.kbsgatewayproject.weebly.com



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Use the QR codes to access a video for each activity

Plop Plop Fizz Fizz

Scientific Process

Edgenuity Unit: Scientific Knowledge
Conclusions
Time: 30-60 minutes
<http://kbsgatewayproject.weebly.com/plop-plop-fizz-fizz.html>



Learning Target

I can make predictions based on prior knowledge, test them using an experiment, and analyze my results.

Materials

<ul style="list-style-type: none">3 Alka-Seltzer tablets3 plastic cups (18 oz.)SaltTeaspoon	<ul style="list-style-type: none">VinegarWaterStopwatch or clock with second hand
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The fizzing you see when you drop an Alka-Seltzer tablet in water is the same sort of fizzing that you see from baking powder. A baking powder **reaction** is caused by an acid reacting with baking soda (sodium bicarbonate). If you look at the ingredients for Alka-Seltzer, you will find that it contains citric acid and sodium bicarbonate (baking soda). When you drop the tablet in water, the acid and the baking soda react -- this produces the fizz.

The question for this investigation will be: "What factors will make an Alka-Seltzer tablet dissolve faster?" You will compare 3 factors:

- Room temperature water
- Acidic water
- Salt water

The **control group** is the group that is separated from the rest of the investigation; the factors will not influence this group. What should be your **control group**?

The **independent variable** is the factor that changes between groups, for this investigation the **independent variable** will be the type of water (acidic, salt, etc).

The **dependent variable** is what changes or is different because of the **independent variable**. Based on the original question, what will you observe as the **dependent variable**?

Develop your **hypothesis** by completing this statement:

Alka-Seltzer will dissolve fastest in _____ water, and slowest in _____ water.

I think this because _____.

Procedures:

Label and fill the 3 cups halfway (~9 oz.) with the following:

- 1- Room temperature water
- 2- Room temperature water with 2 tsp. vinegar
- 3- Room temperature water with 1 tsp. salt

Drop one Alka-Seltzer tablet into Cup 1 and use the stopwatch to keep track how long it takes to dissolve completely. Record your results here:

Type of Water	Dissolve Time

Repeat with Cups 2 and 3.

What factors made the Alka-Seltzer tablet dissolve faster?

In a complete sentence, answer the question:
Did your results support your **hypothesis**? Why or why not?

Source: www.sciencebuddies.org

The Enormous Letter ‘E’

Introduction to Compound Microscope

Edgenuity Unit: Cell Biology

Lesson: Plant and Animal Cells

Time: 30-60 minutes

<http://kbsgatewayproject.weebly.com/the-enormous-letter-e.html>



Learning Target

1. I can identify the functional parts of a compound microscope
2. I can demonstrate how to prepare a wet mount slide

Materials

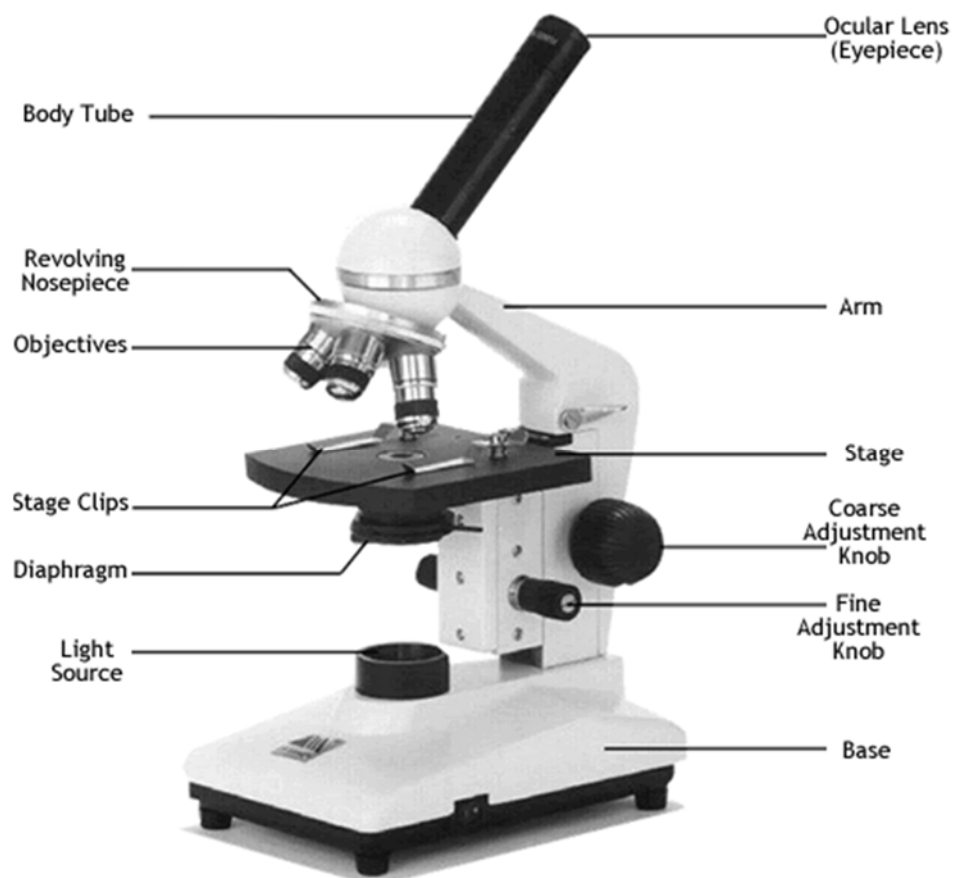
- | | |
|--|--|
| <ul style="list-style-type: none">Compound microscopeSmall tweezersLetter ‘e’sClear microscope slides | <ul style="list-style-type: none">Cover slipsEyedropperHand lens |
|--|--|

The compound microscope was first used in the late 1500s, but was not used in biology until a hundred years later. At first it was just a novelty, but in 1660, Italian Marcello Malpighi used the microscope to view blood **capillaries** in the tails of live fish.

The first compound microscopes could magnify over 100x, but the quality of the glass in lenses was poor and objects could not be seen clearly. An optical compound microscope developed in 2011 can magnify an object over 6,500x.

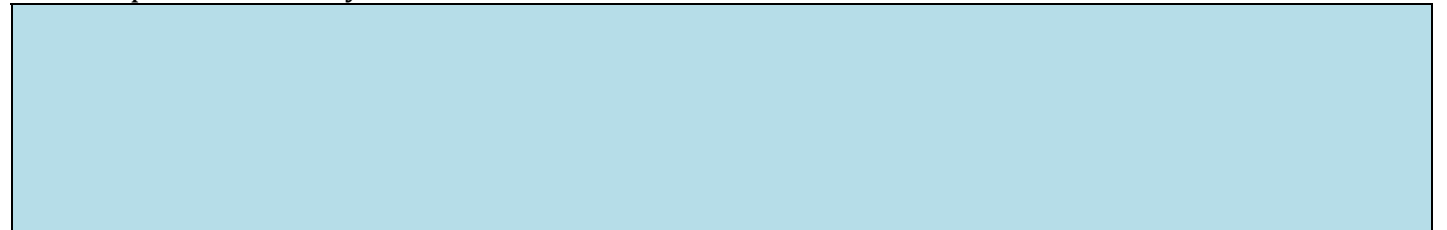
Procedures:
Begin by becoming familiar with all labels on the microscope. (Always carry microscope with 2 hands by holding the arm and base.)

- Turn microscope light on and set magnification to lowest power:
- a. RED – 4x (lowest)
- b. YELLOW – 10x
- c. BLUE – 40x
- d. WHITE – 100x (highest)



Credit: www.biologycorner.com

Draw a picture of what you observe below:



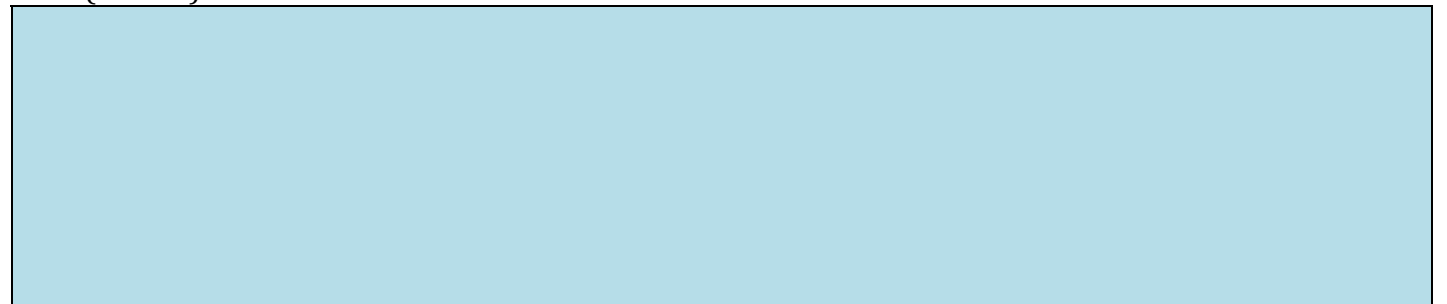
Place the slide onto the microscope stage and focus the image on the lowest power (4x).

Draw a picture of what you observe:



View the letter 'e' with a higher magnification. (Change the power to yellow, blue, or white.)

10x (Yellow):



Source: *Magnificent Microworld Adventures*, AIMS Education Foundation

The largest knob controls major adjustments (start with stage as low as possible and then adjust), the smaller knob controls fine-tuning.

Clean a microscope slide with water and tissue. (CAREFUL! They break easily.)

Use an eyedropper to place one single drop of water in the middle of the slide.

Use tweezers to place the letter 'e' right side up on top of the drop of water.

Gently place the cover slip on the edge of the drop of water and then lower the cover slip over the letter 'e' (Watch the video a couple times for this one!)

Before you use the microscope, use a hand lens to observe the slide.

40x (Blue):

100x (White):

Why is important to use a clean slide and cover slip?

Which magnification (power) gave you the clearest image of the letter ‘e’?

What is the difference between a compound microscope and a simple microscope?

What are some reasons that scientists would use a compound microscope?

Fermentation in a Bag

Cellular Respiration



Time: ~60 minutes

<http://kbsgatewayproject.weebly.com/fermentation-in-a-bag.html>

Learning Target

I can construct an explanation for the production of gas during fermentation.

Materials

- | | |
|---|---|
| <ul style="list-style-type: none">• Dry active yeast• Sugar• 100mL graduated cylinder | <ul style="list-style-type: none">• Teaspoon• Snack-size Ziplock bags• Bag labels |
|---|---|



To release stored energy from glucose (sugar) molecules, humans and other animals use a type of **cellular respiration** called **aerobic respiration**. This process requires oxygen (**aerobic** means "with oxygen"). Some organisms do not use oxygen, however. In this case, the respiration is **anaerobic**.

Fermentation is the metabolic process used by yeast and other living **organisms** without oxygen (**anaerobic**). Yeast use this process to convert sugar into ethyl alcohol (with carbon dioxide as a byproduct). The ethyl alcohol can then be **distilled** into pure ethanol that can be used to fuel vehicles. While most fuel ethanol in the US is currently made from corn grain, the Great Lakes Bioenergy Research Center is studying the use of corn stalks and other **cellulosic biomass** (like grasses from prairies) as an alternative source.

Procedures:

In a pre-labeled Ziplock snack bag, combine 1 tsp. of sugar and 1 tsp. of yeast.

Add 50mL of warm tap water and zip the bag closed, removing as much air as possible.

Mix gently. Lay bag on a flat surface and watch for results (15-20 minutes).

Observe and answer the following questions:

If the bag is inflating, what is filling it up?

Warning: the bag will expand - it may even pop! Be sure to monitor the bag and release the gas if it becomes too inflated.

Are you observing **fermentation**? How do you know?

Where are the new gas particles coming from?

Discard bag and contents into garbage and make sure any mess is cleaned up!

Source: Great Lakes Bioenergy Research Center

Mitosis Investigation

Cell Division

Edgenuity Unit: Cell Processes

Time: ~30 minutes

<http://kbsgatewayproject.weebly.com/mitosis-investigation.html>

Learning Target

Lesson: Mitosis

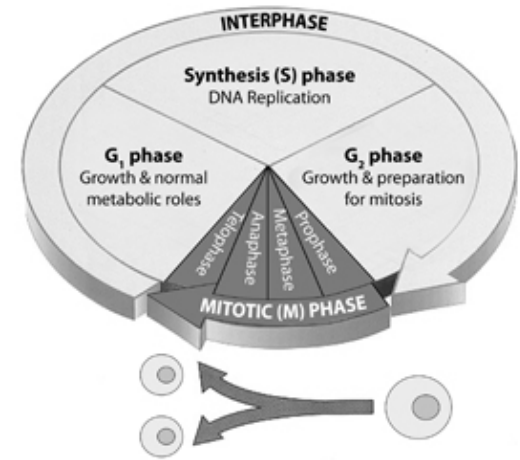


I can identify and label the steps of mitosis.

Materials

- Compound microscope
- Prepared slides of onion root tips

Cells divide in **multicellular organisms** for growth and to replace dead cells. Cells divide through a process called **mitosis** that makes sure each new cell contains a **nucleus** and **chromosomes** identical to the original cell. The regular sequence of events for cells is called the cell cycle:



Credit: Hartnell College Biology

Each cell goes through five main steps:

- **Interphase**
- **Prophase**
- **Metaphase**
- **Anaphase**
- **Telophase**

Turn on microscope and adjust to the lowest power (4x – Red).

Hold a slide with onion root tips up to the light (there will be three root tips on a slide). Look for the pointed ends where the cells were actively dividing.

Place the slide on the microscope stage with the root tips pointing away from you. Use the low-power objective to find a root tip and focus with the coarse adjustment (large knob) until it is clearly visible.


Just above the root “cap” is a region that contains many new small cells. These cells were in process of dividing when the slide was prepared. Center the image and switch to high power. Observe the box-like cells that are arranged in rows. The **chromosomes** of these cells have been stained to make them easily visible. Select one cell with **chromosomes** that are clearly visible. (Remember to only use the small knob fine adjustment when using high power.)

Sketch the cell that you selected in the box below:

2. Look at the rest of the cells and select four cells whose internal appearances are different from each other and the first cell that you sketched. Sketch these four cells in the remaining boxes.


3. Use the pictures below to identify and label the phases of each sketch.

Interphase




(dark mass)

Prophase




(chromosomes visible but not organized)

Metaphase



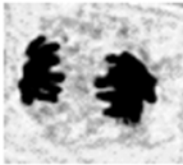
(chromosomes lining up along equator)

Anaphase



(pulling apart)

Telophase



(two nuclei)

Credit: Nancy Clark Biology

4. Look at the rows of cells in the microscope and count how many are in each different phase. Use the data table to record the numbers for each phase.

Stage of Cell Cycle	Number of Cells
Interphase	
Prophase	
Metaphase	
Anaphase	
Telophase	

What stage was the majority of cells in?

What evidence shows that **mitosis** is a continuous process instead of a series of separate events?

Source: Nancy Clark Biology

Plant Paternity Test

Heredity Investigation

Edgenuity Unit: Heredity
Time: 7 weeks ~ 45 minutes per week
<http://kbsgatewayproject.weebly.com/plant-paternity-test.html>
Learning Target

Lesson: Laws of Inheritance



I can explain the inheritance of a trait in Fast Plants.

Materials

- | | |
|---|--|
| <ul style="list-style-type: none">• Wisconsin Fast Plant seeds<ul style="list-style-type: none">○ Non-purple stem (P₁)○ Purple stem (P₂)○ F₁ non-purple stem• 4 deli container growing systems<ul style="list-style-type: none">○ 16 oz deli container○ 8 oz deli container○ Wicking cord or string | <ul style="list-style-type: none">• Light box – growing house<ul style="list-style-type: none">○ 2 crates○ Aluminum foil○ Hanging light fixture○ 24 watt CFL• Potting soil• Wisconsin Fast Plant fertilizer• Labels• Q-tips |
|---|--|



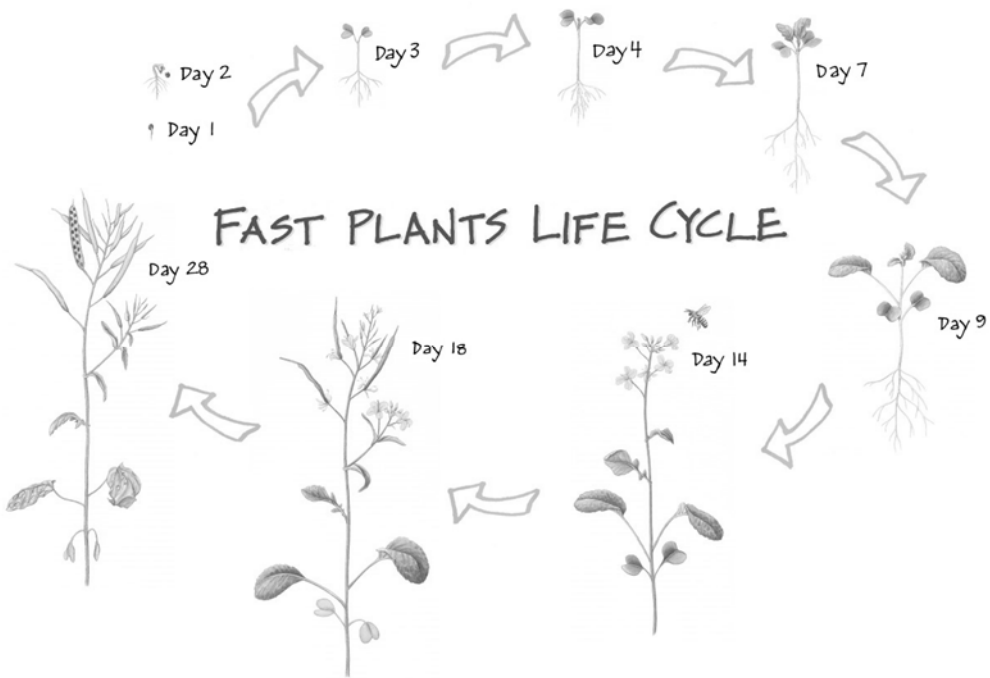
Genes

Every cell in plants and animals contains DNA that is made up of thousands of **genes**. Every cell (except **gametes**) has two copies of each **gene** (one from each parent) and the two sets of **genes** are different from each other. Cells with two copies of **genes** are called **diploid**. During **meiosis**, each **gene** pair is spilt apart randomly so that the resulting **gametes** (eggs or sperm/pollen) have a single copy of reassorted **genes**. Cells that have only one set of **genes** are called **haploid**. During mating, two parents each contribute a single **gamete**. The two **gametes** fuse and create a single **diploid** offspring.

Alleles

Each **gene** can have a different form, called an **allele**. Different **alleles** are represented by the same letter, but coded by capitalization. **Dominant alleles** are capitalized and **recessive alleles** are lower case (e.g. Pp). The interaction of paired **alleles**, along with environment, determines the **phenotype** (the **gene's** expression) of the offspring. **Recessive alleles** are expressed when paired with another **recessive allele** (pp).

This activity will investigate a purple pigment found in many plants, Anthocyanin (anl), and how the **gene** is passed from parents to offspring. It is best observed when plants are between 4 and 7 days old. You will be testing the **inheritance** of a specific trait by growing Fast Plants for two generations.



Procedure:

Day 0

1. Plant the seeds from the mother plants (P₁) in 1 container and plant seeds from first generation (F₁) in 3 containers using the following directions:
2. Poke a hole in the center of the bottom of the 8 oz. deli container.
3. Cut a wick 12-14 cm long, wet thoroughly with water and insert 2 cm into the bottom of 8 oz deli container.
4. Pour ¼ cup (2 oz.) of soil into the 8 oz. container.
5. Spread 18 pellets of fertilizer evenly on top of the soil.
6. Add ½ (4 oz.) cup of soil on top of fertilizer pellets.
7. Sprinkle water over soil until it is dripping from the wick.
8. Label containers based on the seeds that were planted.
9. Place 5 seeds in a circle pattern on top of the soil.
10. Cover seeds with ¼ cup of soil.
11. Pour 1 cup (8 oz.) of water into the 16 oz. deli container.
12. Set the small container on top of the larger container.
13. Place in light box and cover front (the plants will need plenty of water and 24 hours of light!)

Days 4-7

1. Observe the stem and leaf color of the young P₁ and F₁ plants.
2. Record the number of individuals with each trait in the table below.

List each phenotype	Purple stem	Green stem	Purple leaf	Green leaf
P ₁ generation				
F ₁ generation				

3. Discard the P₁ plants but continue to maintain the F₁ plants.
4. Thin F₁ plants to 2 per container.
5. Explain how you think stem and leaf colors are inherited in Fast Plants.

6. Predict the father's (P₂) stem and leaf colors based on your explanation.

Days 15-17

1. Pollinate the entire **population** of F₁ plants for 3 days. Use Q-tips to spread pollen from one flower to another. Make sure all flowers receive pollen from more than one plant.

Fast Plants require outcrossing to reproduce. This can happen in the wild with help from pollinators (like bees) or can be aided by wind.

2. Based on your **hypothesis**, predict the stem color of the second-generation offspring (F₂) that will result from the pollination you did today.

Day 18

1. Cut off any new flower buds that were not pollinated on previous days

Day 37

1. Stop watering plants. Let them dry out for a full week

Day 44

1. Harvest the seeds from the F₁ plants (these will be the F₂ seeds)
2. Place the F₂ seeds in a manila envelope and label them
3. Remove plants from the first generation and clean deli containers and dry (so they can be reused the next day)

Day 45

1. Plant the F₂ seeds following the growing directions from Day 0

Day 49

1. Observe the stem color of the young F₂ plants
2. Record the number of individuals with each trait in the table below

List each phenotype	Purple stem	Green stem	Purple leaf	Green leaf
F ₂ generation				

3. Put your claims to the test! Was the ratio of the phenotypes in the F2 generation what you predicted it would be? Was it even close?

A χ^2 (chi-squared) test will compare your observations with your **hypothesis**.

$$\chi^2 = \sum \frac{(\text{Observed frequency} - \text{Expected frequency})^2}{\text{Expected frequency}}$$

Chi-square is a statistical test commonly used to compare observed data with data we would expect to obtain according to a specific **hypothesis**. For example, if, according to Mendel's laws, you expected 10 of 20 offspring from a cross to be male and the actual observed number was 8 males, then you might want to know about the "goodness to fit" between the observed and expected. Were the deviations (differences between observed and expected) the result of chance, or were they due to other factors. How much deviation can occur before you, the investigator, must conclude that something other than chance is at work, causing the observed to differ from the expected. The chi-square test is always testing what scientists call the **null hypothesis**, which states that there is no significant difference between the expected and observed result.

Step 1. What is your **null hypothesis**?

Step 2- Determine the ratio of **phenotypes** you expected in the F2 generation, based on your **hypothesis**.

Phenotype	Expected Number of Plants (e)
1. ___purple stem_____	_____
2. ___green stem_____	_____
3. ___purple leaf_____	_____
4. ___green leaf_____	_____

Step 3 - Record the ratio of **phenotypes** you observed in the F2 generation.

Phenotype	Observed Number of Plants (o)
1. ___purple stem_____	_____
2. ___green stem_____	_____
3. ___purple leaf_____	_____

4. ___green leaf_____

Step 4 - Fill out the following table. Note: For o and e values, use the actual numbers of plants, not percentages or ratios.

List Each Phenotype:	1	2	3	4
Observed value (o)				
Expected value (e)				
Deviation (d) = o-e				
Deviation squared (d ²)				
d ² /e				

Add all of the d²/e values together to get the χ^2 value.

$$\chi^2 = \sum \frac{(\text{Observed frequency} - \text{Expected frequency})^2}{\text{Expected frequency}}$$

Step 5 Calculate the degrees of freedom by subtracting one from the number of **phenotypes**.
degrees of freedom = (Number of **phenotypes** possible) – 1

Step 6 Determine whether to accept or reject your **hypothesis**. Find the probability that the deviation of the observed values from the expected values was a chance occurrence. Look up your degrees of freedom in the table below. Find where your χ^2 value falls in that row.

Degrees of Freedom	Probability of Chance Occurrence								
	90%	80%	70%	50%	30%	20%	10%	5%	1%
1	0.016	0.064	0.148	0.455	1.074	1.642	2.706	3.841	6.635
2	0.211	0.446	0.713	1.386	2.408	3.219	4.605	5.991	9.210
3	0.584	1.005	1.424	2.366	3.665	4.642	6.251	7.815	11.341
4	1.064	1.649	2.195	3.357	4.878	5.989	7.779	9.488	13.277

Probability value:

If the probability is 5% or greater, then you can accept your **hypothesis**. If the probability is less than 5%, then reject your **hypothesis**.

Do you accept or reject your **null hypothesis**? Why? What does it mean?

Day 50

1. Plant the P₂ seeds following the growing directions from Day 0.

Day 53

1. Observe the stem color of the young P₂ plants. Record your observations in the table.

List each phenotype	Purple stem	Green stem	Purple leaf	Green leaf
F ₁ generation				

Does this activity show how traits are passed from parents to offspring? Why or Why not?

Source: Wisconsin Fast Plants

Peppered Moth Investigation

Natural Selection

Edgenuity Unit: Evolution

Lesson: Factors Affecting Natural Selection

Time: 30-60 minutes

<http://kbsgatewayproject.weebly.com/peppered-moth-investigation.html>

Learning Target



I can explain how natural selection impacts phenotypes and genotypes of a species over time.

Materials

<ul style="list-style-type: none">Paper punch2 small plastic cups	<ul style="list-style-type: none">Two sheets dark gray paperTwo sheets medium gray paperTwo sheets light gray paper
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Wikipedia Commons: Khaydack

Before the year 1845, in the city of Manchester, England a **population** of light gray colored moths known as Peppered moths lived in the surrounding forests. They would cling to the trunks of trees that were themselves covered with a light gray colored bark. The fact that these moths were able to blend in with this light gray background served as an advantage, providing protection in the form of camouflage from birds (predators). However, a gene controls the coloration of moths with **alleles** than can be expressed in different shades of gray. Because of this **genetic variation**, dark and medium gray colored moths were sometimes born. Around 1845 the city started becoming more industrialized, with factories pouring black coal smoke into the air. This pollution fell into the surrounding forests and slowly turned the bark of the trees to a darker gray color thereby making the lighter gray moths more vulnerable to **predation**. Suddenly the dark gray colored moths possessed an advantage. As a result, over a period of approximately fifty years the moth **population** experienced a “shift” in the frequency of the **alleles** that determine moth coloration.

In this example, the trait of coloration is the targeted selection while the agent of selection is the predation. This investigation will allow you to role-play as the predator.



- Procedures:
- Label the following papers on one side:
- Light Gray – Environment 1.
 - Medium Gray – Environment 2.
 - Dark Gray – Environment 3.

Fill a plastic cup with room temperature or cool water.

Punch out 30 circles each from the three UNLABELED sheets .

Ask a neighbor or the teacher to place 10 dark, 10 medium, and 10 light gray dots on the Environment 1 sheet without you watching.

When your assistant is finished setting up, dip your pointer finger in the cup of water. You’ll be using this finger to pick up the dots.

Begin with “Environment 1” and pick up as many dots as you can in 10 seconds with your wet finger. Place these into an empty plastic cup and record the colors in the table below:

	Light Gray Dots	Medium Gray Dots	Dark Gray Dots
Light Gray Environment 1			
Medium Gray Environment 2			
Dark Gray Environment 3			

Repeat with Environments 2 & 3 and record in the table.

Complete the following questions remembering that dots represented peppered moths.

What color was the majority of peppered moths in Manchester before 1845?

Was the shift coloration, from light gray to dark gray, a beneficial change for the moth **population** as a whole? Why or why not?

In this investigation, which “moths” had the best chance for survival in environment 1? Why?

In this investigation, which “moths” had the worst chance for survival in environment 1? Why?

In this investigation, which “moths” had the best chance for survival in environment 2? Why?

In this investigation, which “moths” had the best chance for survival in environment 3? Why?

What do you think would happen to the peppered moth **population** if after the industrial revolution the trees changed back to their original light gray colored bark?

In your opinion, is natural variation within a **population** beneficial to the long-term survival of a **population** (or **species**) as a whole? Please explain, why or why not.

Investigating Plant Nutrition

Fast Plants and Fertilizer

Edgenuity Unit: Ecology Lesson: Cycles of Matter

Time: 4 weeks 60 minutes on Day 0 and ~5 minutes per day after

<http://kbsgatewayproject.weebly.com/feed-your-plants.html>

Learning Target



I can design an experiment to determine the best amount of nutrients to add for plant growth.

Materials

- Wisconsin Fast Plant seeds (standard)
- 4 deli container growing systems

- Light box – growing house
 - 2 crates

<ul style="list-style-type: none">○ 16 oz. deli container○ 8 oz. deli container○ Wicking cord or string• Labels• Q-tips	<ul style="list-style-type: none">○ Aluminum foil○ Hanging light fixture○ 24 watt CFL• Potting soil• Wisconsin Fast Plant fertilizer
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Green plants make their own food through the process called **photosynthesis**, but they also require nutrients they obtain from the soil. Nutrients in Fast Plant fertilizer are nitrogen, phosphorus, and potassium. Farmers need to decide each season how much fertilizer they should add to their fields. If fertilizer additions are doubled, will the crops produce more than previous years? Fertilizer can be expensive – will the additional yield cover the costs of more fertilizer use? Fertilizer that is not used by plants can have harmful environmental impacts, including eutrophication. During eutrophication, nitrogen and phosphorous are washed into lakes and cause too much algae to grow, which can decrease the amount of oxygen available to rest of the living things.

Notes on Nutrients in Fertilizer

- Nitrogen
 - Optimum: Plants are rich green and protein content increases.
 - Deficient: Plants are stunted and light green in color; lower leaves are yellow, stem is slender.
 - Excessive: Plants have very lush foliage with sappy, soft stems; flowering is delayed.
- Phosphorous
 - Optimum: Plants have a vigorous start due to stimulated root formation and growth; phosphorus also stimulates flowering and aids in seed formation.
 - Deficient: slower growth and delayed flower and pod development; leaves are dark green and dull; root system is poor with little branching; stem is slender.
 - Excessive: Plants have very lush foliage with sappy, soft stems; flowering is delayed.
- Potassium
 - Optimum: plants have increased vigor and disease resistant.
 - Deficient: Leaves can be mottled; flowers do not achieve vibrant yellow color; stem is slender.
 - Excessive: Plants have dark foliage and stiff stems and leaf branches.

Day 0

1. Answer the questions below:

If nutrients are important for your plants to grow, develop, and reproduce, is there some particular amount of fertilizer that is best for the plants?

In the previous investigation with Fast Plants, there was a suggested amount of fertilizer to add. Do you think that there is a minimum amount of fertilizer that plants must have to grow, develop, flower, and produce seed? How can you find out?

If fertilizer is good for plants, is more fertilizer always better? How can you find out?

What are some characteristics that you could observe to determine the best amount of fertilizer to add? Circle the one characteristic that you will observe.

2. Complete the top row of the data table by writing in the characteristic that you will be observing. You will complete the rest of the table with your daily observations.

Days	Characteristic:	Days	Characteristic:
1		15	
2		16	
3		17	
4		18	
5		19	
6		20	
7		21	
8		22	
9		23	
10		24	

11		25	
12		26	
13		27	
14		28	

If fertilizer is good for plants, is more fertilizer always better? What evidence backs up your answer?

Source: Wisconsin Fast Plants

- Procedures:
- Plant the seeds in 4 containers using the following directions:
 - Poke a hole in the center of the bottom of the 8 oz. deli container.
 - Cut a wick 12-14 cm long, wet thoroughly with water and insert 2 cm into bottom of 8 oz. deli container.
 - Pour $\frac{1}{4}$ cup of soil into the 8 oz. container.
 - Label containers based on the amount of fertilizer that was added. (0, 2, 4, 10)
 - Spread fertilizer pellets evenly on top of the soil. Put a different amount in each container (as labeled) and make sure that one container has NO fertilizer added.
 - Add $\frac{1}{2}$ cup of soil on top of fertilizer pellets.
 - Sprinkle water over soil until it is dripping from the wick.
 - Place 5 seeds in a circle pattern on top of the soil.
 - Cover seeds with $\frac{1}{4}$ cup of soil.
 - Pour 1 cup of water into the 16 oz. deli container.
 - Set the small container on top of the larger container.
 - Place in light box and cover front (the plants will need plenty of water and 24 hours of light!)

Days 1-28

- Make an observation each day and record it in the previous table.

Day 28

- Compare your observations to your predictions before you started. Answer the following questions:

If nutrients are important for your plants to grow, develop, and reproduce, is there a particular amount of fertilizer that is best for the plants? What evidence backs up your answer?

Do you think there is a minimum amount of fertilizer that plants must have to grow, develop, flower, and produce seeds? What evidence backs up your answer?

Cutting Down the Rain

Human Impact on the Environment

Edgenuity Unit: Ecology Lesson: Human Impact and the Environment
Time: 2 weeks 30 minutes on Day 0 and 15-30 minutes on Days 14 & 15
<http://kbsgatewayproject.weebly.com/cutting-down-the-rain.html>
Learning Target



I can explain an example of human impact and the affect on ecosystems.

Materials

<ul style="list-style-type: none">Wisconsin Fast Plant seeds (standard)4 deli container growing systems<ul style="list-style-type: none">16 oz. deli container8 oz. deli containerWicking cord or string2 sandwich Ziplock bags2 binder clipsScissors	<ul style="list-style-type: none">Light box – growing house<ul style="list-style-type: none">2 cratesAluminum foilHanging light fixture24 watt CFLPotting soilWisconsin Fast Plant fertilizer
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The destruction of the tropical rainforests gets a lot of media coverage. This **biome** is in great danger as trees are being cut or burned down at an alarmingly fast rate. Many **species** of plants and animals are also disappearing with the forests. The changing of one **ecosystem** on the Earth can have a ripple effect on the rest of the world. In this activity, you will investigate the difference between **ecosystems** with different amounts of leaf surface area.

You will be using Fast Plants that are about 2 weeks old. If there are none available, begin by following the directions to grow the plants (Skip to Day 14 if you have plants that are ready).

Plant the seeds in 2 containers using the following directions:

- Poke a hole in the center of the bottom of the 8 oz. deli container.
- Cut a wick 12-14 cm long, wet thoroughly with water and insert 2 cm into bottom of 8 oz. deli container.
- Pour ¼ cup of soil into the 8 oz. container.
- Label containers based on the amount of fertilizer that was added.
- Spread fertilizer pellets evenly on top of the soil. Put a different amount in each container and make sure that one container has NO fertilizer added.
- Add ½ cup of soil on top of fertilizer pellets.
- Sprinkle water over soil until it is dripping from the wick.
- Place 5 seeds in a circle pattern on top of the soil.

- Cover seeds with ¼ cup of soil.
- Pour 1 cup of water into the 16 oz. deli container.
- Set the small container on top of the larger container.
- Place in light box and cover front (the plants will need plenty of water and 24 hours of light!)
- Check on water daily.

Day 7

- Keep the 3 best plants in each container and remove all others.

Day 14

- Cover the plants in one container with a plastic bag. Secure bag with binder clip. Be careful not to break or damage the plant while putting on the bag. These plants represent an intact tropical rainforest.
- Using the scissors, snip off all the leaves on the plants in the other container. Cover these plants as in step 2. They will represent an area in which the tropical rain forest has been cut down.
- Return the plants to the light box.

Day 15

- Observe the plants to answer the following questions:

What are the differences between the “**ecosystems**” that you observed?

Where do you think the water on the bag came from?

If the “**ecosystem**” with leaves cycled more water into the atmosphere (bag), what can you infer about the amounts of water cycled into the air by undisturbed forests compared to cleared areas?

Explain why the destruction of forests might lead to change in rainfall.

Why should people who live in other areas of the world be concerned about clearing of tropical rainforests?



Glossary

- Aerobic respiration – A form of cellular respiration that requires oxygen in order to generate energy
- Allele – One member of a pair of genes occupying a specific spot on a chromosome that controls the same trait
- Anaerobic respiration – A form of cellular respiration that occurs when oxygen is absent or scarce
- Anaphase – The stage of mitosis or meiosis beginning with the separation of sister chromatids (or homologous chromosomes) followed by their movement towards the poles of the spindle
- Biome – A major ecological community of organisms adapted to a particular climatic or environmental condition on a large geographic area in which they occur
- Capillaries – The smallest vessels which contain oxygenated blood
- Cell cycle – Sequence of growth and division of a cell; consists of Interphase, Mitosis and Cytokinesis

- Cellular respiration – Series of metabolic processes that take place within a cell in which biochemical energy is harvest from organic substance (i.e. glucose) and stored as energy carriers (ATP) for use in energy-requiring activities of the cell
- Cellulosic biomass – Processed plant material containing high levels of cellulose that may be used for ethanol
- Chromosome – Structure within the cell that bears the genetic material as a threadlike linear strand of DNA
- Control group – Group in a scientific experiment where the factor being tested is not applied so that it may serve as a standard for comparison against another group where the factor is applied
- Dependent variable – A factor whose value changes when the independent variable is changed
- Diploid – A cell or an organism consisting of two sets of chromosomes
- Distillation – A lab technique used to purify a substance
- Dominant – An allele or gene that is expressed in an organism’s phenotype, masking the effect of the recessive allele or gene when present.
- Ecosystem – A system that includes all living organisms in an area as well as its physical environment functioning together as a unit
- Evolution – Change in genetic composition of a population over successive generations, which may be caused by natural selection, inbreeding, hybridization or mutation.
- Fermentation – An anaerobic cellular process in which organic foods are converted into simpler compounds and chemical energy is produced
- Gamete – A reproductive cell or sex cell that contains the haploid set of chromosomes
- Gene – Fundamental unit of heredity on a specific site on a chromosome that is responsible for the physical and inheritable characteristics or phenotype of an organism.
- Genetic variation – Variations of genomes between members of species, or between groups of species thriving in different parts of the world as a result of genetic mutation
- Genotype – A set of alleles that determines the expression of a particular characteristic or trait (phenotype)
- Haploid – A cell or an organism having half of the number of chromosomes in somatic (non-gamete) cells

Hypothesis – A supposition or tentative explanation that may be tested, verified or answered by further investigation or experiment

Independent variable – The variable that is manipulated in an experiment

Inheritance – The acquisition of traits genetically transmitted from parents to offspring

Interphase – The phase in the life cycle of a cell wherein the cell is not undergoing cell division
Meiosis – Form of cell division happening in sexually reproducing organisms by which two consecutive nuclear divisions (meiosis I and meiosis II) occur without the chromosomal replication in between, leading to production of four haploid gametes

Metaphase – The stage of mitosis (and meiosis) following prophase and preceding anaphase. At this stage, condensed chromosomes have aligned along the metaphase plate

Mitosis – Process where a single cell divides resulting in generally two identical cells, each containing the same number of chromosomes and genetic content as that of the original cell

Multicellular – Having or consisting of many cells or more than one cell to perform all vital functions

Natural selection – Process in nature in which organisms possessing certain genotypic characteristics that make them better adjusted to an environment tend to survive, reproduce, increase in number or frequency, and therefore, are able to transmit their DNA to offspring

Nucleus – The large, membrane-bound organelle that contains the genetic material in the form of DNA called chromosomes

Organism – A living thing that can react to stimuli, reproduce, grow and maintain homeostasis

Phenotype – Physical appearance or biochemical characteristic of an organism as a result of the interaction of its genotype and the environment

Photosynthesis – The making of glucose using carbon dioxide, water, and light energy

Population – A group of organisms of one species that interbreed and live in the same place at the same time

Predation – A form of symbiotic relationship between two organisms of unlike species in which one of them acts as predator that captures and feeds on the other organism that serves as the prey

Prophase – First phase of mitosis (or meiosis) in which the chromosomes condense and become visible

Reaction – A rearrangement of the atoms or molecules of two or more substances that come into contact with each other, resulting in the formation of one or more new substances

Recessive – A gene or allele whose phenotypic expression is masked by a dominant gene or allele

Species – A group of organisms having common characteristics and usually are capable of mating with one another to produce fertile offspring.

Telophase – Final stage of mitosis or meiosis, when chromosome separation is completed.