Botany Course

Description of course: This is a full year high school level botany course. I used the table of contents from a high school botany textbook to create the topics. It is recommended for freshmen and up. It has some elements of biology, so it could work well to do this in conjunction with the EP biology course, but it is not necessary.

This course covers the following topics:

- *chocolate as a plant*
- *culinary botany*
- *binomial nomenclature and classification of plants*
- *Carl Linnaeus*
- *plant cells*
- *xylem and phloem*
- *parts of a plant*
- *roots and potatoes*
- *soil*
- *worms*
- *peanuts*
- *George Washington Carver*
- *leaves*
- *sexual and asexual reproduction in flowering plants*
- *seeds*
- *cones and flowers*
- *bees and pollen*
- *fruits photosynthesis*
- *moving materials through plants*
- *regulating plant development and growth*
- *plant genetics*
- *characteristics of plants in different environments*
- *mosses and ferns*
- *fungi (mold and mushrooms)*
- *gymnosperms and angiosperms*
- *plant ecology and biomes*
- *symbiosis*
- *trees*
- *strange plants*
- *plant diseases*
- *Beyond the Seeds and Living with the Land (botany initiatives in today's world)*
- *Final Project (Choice)*

Here are some EXTRA Activities that relate to BOTANY. If you finish your work early, consider trying one or more of these:

- Spider web trellis: http://jdaniel4smom.com/2013/05/gardens-for-kids-spider-web-trellis.html
- Science experiment: How many days does it take different types of seeds to sprout? http://www.mommytheteacher.com/2013/04/spring-time-science.html
- Flower Pigment: Pounding Craft https://buggyandbuddy.com/spring-banners-from-leaf-flower-pounding-science-invitation-saturday/
- Extra resource: https://kidsgardening.org/wp-content/uploads/2018/09/DiggingIntoSoil_KidsGardening_201809.pdf
- Volunteer at a farm that donates its yield to a local food bank. If there is no such farm near you, start your own community garden for this purpose.
- Visit a living history farm
- Visit botanical gardens or greenhouses and write and draw what you observe

Week 1- Chocolate

Monday:
https://www.youtube.com/watch?v=V-4FsJ6-bzc
Watch the video and **describe the steps** in harvesting and making chocolate.
Tuesday:
https://www.ecolechocolat.com/en/how-chocolate-is-made.html
Use the pictures for ideas to **make a slide show** showing the process of making chocolate.
Wednesday:
http://ymiclassroom.com/wp-content/uploads/2012/09/chocolate_program.pdf
Complete activity 4 by **creating or finding recipes using some form of cocoa or chocolate for each of the following courses:**

- Appetizer
- Salad
- Main Dish (entree')
- Dessert

Thursday:
https://www.youtube.com/watch?v=ibjUpk9Iagk
Watch the video and **complete the questions (5 multiple choice and 3 open-ended):**
1) The first transatlantic chocolate encounter occurred in:
A 1509
B 1513
C 1519
D 1527
2) Chocolate has a long history of being linked to love. _____ drank cocoa before visiting with his wives.
A King Henry VIII
B Montezuma
C Zeus
D King Louis VIII
3) Which European country explored the seas and encountered chocolate first?
A France
B Italy
C Spain
D Greece
4) Conrad Van Houten invented the _____. This allowed the separation of cocoa solids from cocoa butter.
A Cocoa press
B Cocoa filter
C Cocoa iron
D Cocoa roller
5) The Aztec people use cacao beans for:
A Currency and rituals
B Celebrations at royal feasts
C Rewards for soldiers
D All of the above

OER #1- Cocoa has been consumed as a medicine for hundreds of years and is now thought to be heart healthy. Why is that so? (Hint: search the web for chocolate and medicine to read about the vasodilation of arteries)

OER #2- Cocoa beans are primarily grown in West African countries and linked with human rights abuses. What are some solutions to solving this problem?

OER #3- Chocolate is made into cakes, cookies, candy and ice creams. What are the chemical properties of chocolate that enables the product to be transformed into so many other items?

Friday:
https://www.readworks.org/article/The-Latest-Buzz/73e29f73-68c9-4480-844c-0f88d6195e55#!vocabularySection:circulation/questionsetsSection:2918/answerKey:true/articleTab:content/

Complete this activity. It is from Readworks.

Week 2: Cooking with plants

Monday:

https://www.youtube.com/watch?v=-yA412FDAMg

Watch the video from start to 0:55 and answer the questions.

1. Define root.
2. What is the function of the root?
3. What are some examples of the types of roots we eat?
4. What is a taproot?
5. What is a tuber?
6. Does a tuber need to be pollinated? Explain.

Tuesday:

https://www.youtube.com/watch?v=-yA412FDAMg

Watch the video from 0:56-1:37 to and answer the questions.

1. Define stem.
2. What is the function of the stem?
3. What are some examples of stems we eat?
4. What is a rhizome?
5. Give an example of a rhizome.
6. What is a petiole?
7. Give an example of a petiole.

Wednesday:

https://www.youtube.com/watch?v=-yA412FDAMg

Watch the video from 1:38 - 1:56 to and answer the questions.

1. What is a bulb?
2. What is the function of the bulb?
3. Give two examples of bulbs we can eat.

Thursday:

https://www.youtube.com/watch?v=-yA412FDAMg

Watch the video from 1:57 - 2:10 to and answer the questions.

1. Define leaves.
2. What is the function of leaves?
3. What leaves do we eat?
4. Explain how photosynthesis plays a role.

AND

https://www.youtube.com/watch?v=-yA412FDAMg

Watch the video from 2:11 - 2:38 to and answer the questions.

1. Define flowers.
2. What is their function?
3. Can we eat flowers? If so, which ones?

Friday:

https://www.youtube.com/watch?v=-yA412FDAMg

Watch the video from 2:39- 3:27 and answer the questions.

1. What is a fruit according to a botanist? How is this different from the definition of a fruit in, let's say, the grocery store?
2. What is its function?
3. What are some fruits they mentioned that you already knew?
4. What fruits mentioned surprised you?

AND

https://www.youtube.com/watch?v=-yA412FDAMg

Watch the video from 3:28-4:44 and answer the questions.

1) What is the function of a seed?
2) Give examples of seeds we eat.
3) What is a seed?

Week 3: Binomial nomenclature and classification of plants

Monday

https://www.youtube.com/watch?v=Kq6faK3XHuM

Watch the video and answer the questions.

1. Define binomial nomenclature.
2. Define genus and its purpose.
3. Should you capitalized the genus?
4. Define species (also called specific epithet) and its purpose.
5. Should you capitalize the species?
6. What two parts are there in a full scientific name of an organism?

Tuesday

https://www.youtube.com/watch?v=IYxfz1PSfZ0

Watch from the beginning to 2:45 and answer the questions

1. What are the functions of all living things? (You will have 5 answers.)
2. About how many species of plants are there (according to scientists)?
3. Explain the process of photosynthesis.
4. What do plants take in? What do they release? Why is this important to humans?
5. Explain chlorophyll.

Wednesday

https://www.youtube.com/watch?v=IYxfz1PSfZ0

Watch from 2:45- 4:50 and answer the questions

1. What are the 4 groups in plant classification?
2. Explain algae. What don't they have that other plants have? Where do they live? Are they simple or complex?
3. Explain mosses. Are they simple or complex? Where do they live? What do they need? Do they have roots?
4. Explain ferns. What are the parts of a fern? Where do they live?
5. Explain phanerogams. Are they common or rare? How do they reproduce? What are the parts of a phanerogam?

Thursday

https://www.youtube.com/watch?v=LeSeUM5k10M (This video sounds like a robot. Bear with it. The info is good.)

1. What is taxonomy?
2. What kingdom are plants in?
3. How many classifications are plants organized into?
4. What is phylum?
5. What is tissue structure?
6. What is seed structure?
7. What is stature?
8. What language is used by scientists when talking about plants?
9. What would a scientist call a sunflower?

Friday

- Take a nature walk and observe. What do you see based on what you learned this week?

  OR

- Take a trip to the grocery story. Make a list of what you see and categorize them into leaves, flowers, stems, and roots.

  OR

- Create a menu for a meal that uses all 4 types. Make it over the weekend!

Extra credit: Earn 10 extra points for completing an addition activity on Friday (see above).

Week 4: Carl Linnaeus

Monday- Friday (Present on Friday)

This week you will research Carl Linnaeus and you will make a slide show.

Include:

Slide 1: Title Slide (title and your name, a graphic)
Slide 2: Who was Carl Linnaeus?
Slide 3: What did he create? Why?
Slide 3: What are the two parts to his plant classification system? What language does the system use?
Slides 4-8: Give at least 5 slides with examples of plants with their common names and their Latin names.

Resources:
https://www.tigtagworld.com/clil/film/carl-linnaeus-PRM00688/
https://kids.kiddle.co/Carolus_Linnaeus
https://easyscienceforkids.com/carl-linnaeus/

Rubric:

Title slide:	3 points
Who was Carl Linnaeus slide:	3 points
What Linnaeus created and why	3 points
Two parts of the classification system and the language used	3 points
5 slides with examples	3 points per slide x 5 slides

Week 5: Plant Cells

https://www.youtube.com/watch?v=3nBtY6LR030

Use this video to answer the questions. They are in order.

Monday

What is a cell?
What do cells have in common? (Both plant and animal cells)
What do plants have that animal cells don't? Why do plants need cell walls?
What are organelles? What do they do?

Tuesday

What is cytoplasm?
What are the major organelles of a cell?
What is another thing that plant cells have that animal cells don't?

Wednesday

What is the nucleus? What is its function?
What is the vacuole? What is its function? How many does a plant have? Is it big or small? What happens if a plant doesn't get enough water?

Thursday

What is the mitochondria? What is its role?
What is cellular respiration?
What are ribosomes? What are their functions? Where are they in a plant cell?
What is endoplasmic reticulum? What is its role?
What is the chloroplast? What is its role in a plant cell?
What is the role of a cell in a plant?

Friday

Today you will create a model of a plant cell.
(TPT "Let's Build a Plant Cell handouts)

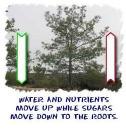
Week 6: Xylem & phloem

Materials for this week: several stalks of celery with leaves, dark food coloring, print worksheet

Monday

Use this information to **complete the guided notes.**
http://www.biology4kids.com/files/plants_xylemphloem.html

Vascular Systems of Plants



X_____ and **p**_____ make up the big t_____ system of v_____ plants. As you get bigger, it is more difficult to transport nutrients, water, and sugars around your body. You have a circulatory system if you want to keep growing. As plants evolved to be larger, they also developed their own kind of circulatory systems. The main parts you will hear a lot about are called **x**_____ and **p**_____**.**
It all starts with a t___ and a b_____. Logically, it makes sense. Trees and other **vascular plants** have a top and a bottom. The top has a _____, _____, _____ or _____. The bottom is a system of _____. Each needs the other to _____. The roots _____ the plant steady and grab m_____ and n_____ from the s_____. The top is in the light, conducting p_____ and helping the plant r_____. You have to c_____ the two parts. That's where **x**_____ and **p**_____ come in.

Zippy Xylem

The xylem of a plant is the system of t_____ and t_____ cells that c_____ water and d_____ minerals. As a plant, you have r_____ to help you absorb water. If your leaves need water and they are ____ feet above the ground, it is time to put the x_____ into action! Xylem is made of **v**_____ that are connected end to end for the maximum speed to move water around. They also have a secondary function of s_____. When someone cuts an old tree down, they reveal a set of r_____. Those rings are the remains of old x_____ t_____, one ring for every y_____ the tree was a_____.

Phloem Fun

The fun never stops in the plant's circulatory system. Most plants have g_____ leaves, where the p_____ happens. When those s_____ are made, they need to be given to every c_____ in the plant for e_____. Enter phloem. The p_____ cells are laid out end-to-end throughout the entire plant, t_____ the s_____ and other molecules created by the plant. P_____ is always a_____. X_____ t_____ dies after one year and then develops anew (rings in the tree trunk).
What is the best way to think about phloem? Think about s___ coming out of a t_____. That dripping **s___** usually comes from the p_____.

Tuesday

Watch this video on the rings of the trees.
https://youtu.be/FAOYkx8E-Gc
What do the rings show about the tree? Give more than one answer.
https://www.forestry-suppliers.com/Documents/1641_msds.pdf
What is a Swedish increment bore? What is it used for? (This was also mentioned in the video.)

Wednesday

Watch the video and answer the questions.
https://www.youtube.com/watch?v=ebWlgSoerWA

1. Explain **transportation** as it relates to plants.
2. Define **xylem**
3. Define **phloem.** Is phloem thinner or thicker than xylem?

Thursday

- Watch the color-changing celery experiment video.

https://www.youtube.com/watch?v=KIug9Foou3s

- Write up and do the experiment using the scientific method. I will print this for you: https://allinonehomeschool.files.wordpress.com/2018/08/y4sm-day-6.pdf

Friday

1. Write your conclusion about the celery experiment. Explain WHY this happened.
2. Watch this video: https://www.youtube.com/watch?v=PdQsvW7QjIM

Week 7- Stems
Materials needed for this week: drinking straw, potato with eyes, toothpicks

Monday
https://www.youtube.com/watch?v=VuMxN1j9f6Y

1. What is a stem?
2. What are the parts of the stem?
3. What are the functions of the stem?
4. Define:
    - Shoot
    - Branch
    - Woody
    - Leaves
    - Buds
    - Nodes
    - Runner stems
    - Twig
5. What kitchen item can you use to compare to a stem?
6. **Activity:** Use a straw to suck water in. Don't drink it. Use the water in your straw to push water out. See how the straw, just like the stem, functions to move water up and down in a plant?

Tuesday

Watch the video. https://www.youtube.com/watch?v=H1eb0u59TUw

Write at least one sentence about each of these functions of a stem:

- Support
- Transportation
- Food Storage
- Food Manufacturing
- Perennation
- Climbing

Wednesday
Watch the video:
https://www.youtube.com/watch?v=2klJcpdeEEc

Start the potato experiment.
https://sciencing.com/grow-potato-water-science-project-6239373.html

Thursday
Write a poem about what you learned about stems so far. It should be at least 10 lines long. You may use any format you like. It does not have to rhyme.

Friday (You can complete this part on Sunday or next week if no change happens by Friday)

Write the **conclusion** part of the potato experiment on your worksheet.

1. What do you think will happen if you stop refilling the water? Why?
2. What do you think will happen if you continue to provide sunlight and water? Explain.

Week 8- Roots and potatoes

Materials needed this week: Carrots (full uncleaned roots with leafy tops), print the worksheet, grass with roots (can pull it up yourself)

Monday

https://www.youtube.com/watch?v=hliu9WRo4h8

1. What did you learn from this video?
2. What was most interesting about this video?
3. Why do you think this farmer does not use pesticides?

Tuesday

https://www.agclassroom.org/teacher/matrix/lessonplan.cfm?lpid=320

1) Define:
   - fibrous root system
   - harvest
   - root hairs
   - roots
   - tap root system
   - Tuber

2) What is the function of the root?

3) What are some examples of edible roots?

Wednesday

I will print this for you:
https://naitc-api.usu.edu/media/uploads/2015/12/01/Root_Identification_Worksheet.pdf

Thursday

- https://www.youtube.com/watch?v=_-ROXGqBSxI Watch the video.
- Complete the T-Chart for Tap Roots vs Fibrous Roots I will print this for you: https://naitc-api.usu.edu/media/uploads/2015/12/01/Roots_T-chart.pdf

Bonus:

Observe the roots picture in artwork of a tree. You find the picture. Are the roots tap or fibrous in the picture?
Here is an example if you can't find one:
https://www.art.com/products/p22971172957-sa-i7892402/andrija-markovic-tree-roots-silhouette.htm?RFID=217825&ProductTarget=105221383647&utm_medium=cpc&utm_source=google&utm_campaign=PLA&gclid=EAIaIQobChMI-vHjv_714AIVRT0MCh2YwgG1EAQYAiABEgLjyPD_BwE&gclsrc=aw.ds

Friday

1. Watch the video on how to harvest potatoes: https://www.youtube.com/watch?v=c61RRvCIEMU
2. What did you observe and learn? **Write 2-3 sentences.**
3. **https://www.jessicagavin.com/types-of-potatoes/ What are some different types of potatoes? What characteristics make them different?**
4. **Choose a recipe** involving several types of potatoes and **make it** over the weekend.

Week 9- Soil

Materials needed:can of spray polyurethane, some soils clods, three 2-liter bottles, string, three water bottles to catch the water, soil, leaves, grass with roots or plants, chocolate and butterscotch chips mixed together, chocolate pudding, whole Oreos, crushed Oreos, shredded coconut mixed with green food coloring, gummy worms, clear cups or glasses, sticky post-its or labels

Monday

https://www.youtube.com/watch?v=I6HGPoQ3dZY

1) Explain how soil is:
   - Food
   - Life
   - Protection
   - Home

https://www.youtube.com/watch?v=if29mjcd5bc

2) What is soil?

3) What are the five main parts of soil?

https://www.youtube.com/watch?v=bgqea0E2eAY

And

https://www.youtube.com/watch?v=ysIm7ImsK6c

4) What are the layers of soil?

5) What can be found in each layer?

Tuesday

https://www.youtube.com/watch?v=ysIm7ImsK6c

Make a model of the layers of soil

You will need:

- Chocolate and butterscotch chips mixed together
- Chocolate pudding
- Whole Oreos, crushed Oreos
- Shredded coconut mixed with green food coloring
- Gummy worms
- Clear cups or glasses
- Spoons
- Sticky post-its or labels)

http://blog.learningresources.com/diy-earth-day-edible-soil-layers/

Wednesday

What is **soil erosion?**

Do the experiment to show the impact of wind on soil:

https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=nrcs142p2_054301

Write up the experiment (I will print this for you):

https://allinonehomeschool.files.wordpress.com/2018/08/y4sm-day-6.pdf

Thursday

What is water erosion and how is it different from wind erosion?

Do the experiment to show the impact of water on different types of soils.

https://www.youtube.com/watch?v=im4HVXMGI68

Write up the experiment (I will print this for you):

https://allinonehomeschool.files.wordpress.com/2018/08/y4sm-day-6.pdf

Friday

Talk to someone who has a backyard that borders a river. How does soil erosion impact that person's land? What can be done to help that problem? If you don't have anyone to interview, find an educational video about water eroding river banks. Write about what you learned.

Week 10- Worms

Materials needed:

- Clear plastic 2-liter soda bottle
- Scissors
- Sand, soft soil, garden soil, compost (as many different types of soil as you can find)
- Water
- Earthworms (about 5)
- Leaves
- Piece of construction paper or cardboard

This week is not broken down by days. You will have to decide what to do each day. The reason for this is that the WORMERY takes a few days to make; be sure to start that early in the week. In addition to building a wormery, you will read about earthworms, complete an online worm dissection, and write a reflection paper about what you learned this week.

1) Build a Wormery

Want to learn about worms? We think the best way is to watch them! Here's how you can collect some worms and watch what they do.

What You Do:

1. The first thing you need to do is prepare a place for worms to live – called a wormery. Clean the soda bottle and remove the label the best you can. Have an adult help you cut off the top of the bottle where it starts to get smaller to form the neck of the bottle.
2. Fill it with alternating layers of soil and sand. Use at least two different types of soil, but the more you have, the better.
3. Add water to the soil to get it damp, but not too wet or goopy. Place some leaves on top of the soil.
4. Once your wormery is ready, you'll need to get some worms. The easiest way is to buy some from a local bait shop or pet supply store. However, it's not hard to find them out in your yard! If you have a bare patch of earth, try watering the area and then placing a piece of cardboard, carpet, or wood over it. Leave it for a day and then lift the cardboard off the dirt to find the worms hidden underneath. You can also just start digging in the dirt to find worms.
5. As you find worms, carefully put them into the wormery. You can use a twig or a plastic cup to gently scoop them up and move them. Try to find 4-6 worms.
6. Once your worms are in, cover the top of the bottle with construction paper or cardboard to make it dark for your worms.
7. Over the next few days and weeks, watch them tunnel through the soil and leaves and see how long it takes for the layers of soil to become mixed together. You may even see the worms tunnel along the side of the bottle.
8. Worms need their soil to be moist so that they can breathe and not dry out. Check on the soil every day. If it looks like it is starting to dry out, add a little water to keep it damp.
9. When you are done watching the worms, simply dump the entire contents (worms, too!) back in your garden or a patch of dirt in your yard.

What Happened:

Worms can move an amazing amount of soil for their small size. An earthworm can eat its own weight in soil and other matter every day! As you saw in this project, worms help till or turn up the soil as they tunnel through it. Worms make a natural fertilizer. If you place compost (plant material like fruit or vegetable peels) on your garden you can be sure some friendly earthworms will help get it down to the roots of your plants and provide your soil with lots of important and rich nutrients, which in turn will help your plants grow.

2) Read:

All About Earthworms

Earthworms live in the soil of every continent in the world except for Antarctica! There are about 2700 different kinds of them.

They aren't much to look at (they may even seem a little gross), but earthworms are really good at what they do. You might be surprised to learn that their job is a very important one. So, what do they do? They dig tunnels through soil in the ground. As they go, they eat, digest their food, and then excrete it. That doesn't sound very important. Well, it turns out, the "waste" that worms excrete is actually very valuable for soil. It is full of nutrients that help plants grow. The tunnels they form also help keep the soil healthy by supplying it with oxygen and making it easier for water to soak into the ground. Worms periodically come up to the surface of the ground to find food, then go back down and continue tunneling. This process helps mix up the richer soil from farther down in the earth with the soil at the top. This is important because lots of the nutrients in topsoil have already been used up by plants and the soil down below has more nutrients. All of these things make the soil better for plants to grow in. This is important for us since most of our food comes from plants or from animals that eat plants.

Earthworms are excellent recyclers! They eat things like fallen leaves and decaying animals. They can also eat food scraps, fruit and vegetable peels, eggshells, and some garbage (like coffee grounds and tea bags). Organic matter – something that came from a living thing, such as a plant or animal – will break down on its own eventually, but an earthworm can eat and digest an amount of food and dirt equal to its own weight in a single day, so the process goes much faster with their help! This keeps the soil full of helpful nutrients.

Worms need food, oxygen, and moisture to live. They breathe through their skin instead of with lungs. Oxygen from water in the ground can pass through a worm's skin to keep it alive. They like the soil to be damp so that their skin can stay moist and slimy, but not too wet. If you go outside after a rainstorm, you might be able to spot some earthworms on the sidewalk. Sometimes after heavy rain, earthworms come up to the surface because they've gotten too much water while in the ground. UV rays from sunlight can kill worms very quickly, though, so if the rain storm happens during the day and the sun starts shining again, earthworms that have come up to the surface often get burned by the sun's rays and die. If you happen to see any earthworms on the sidewalk, it's a good idea to use a stick to move them back to an area with dirt.

3) Read:
Anatomy of an Earthworm

Earthworms are very simple creatures. They don't have arms, legs, or ears. Instead of eyes, they have special cells on the outsides of their body that are very sensitive to light. Those cells help them see light, but nothing else. They have small simple brains that are used to help them move their bodies. They can also have up to five hearts to help pump blood through their long bodies.

An earthworm's body is divided into lots of segments and they have a head end and a hind end. The very first of the tiny segments is the earthworm's mouth and the last segment is its anus, where waste, called ***castings***, exits its body. Both ends look similar, but you can tell the head end by the thick ring-like segment that is located near it.

An earthworm's mouth is very small, but it is strong enough that it can hold onto a leaf and drag it around as the worm moves! When an earthworm eats, it uses a muscle in its throat to move the food down into a little space called a crop. The food stays in the crop for a little while, sort of how food stays in your stomach for awhile. Then it is pushed into another space called a gizzard. The gizzard has large grains of sand and small stones in it from the sand and dirt the worm has eaten. To digest the food, the gizzard squeezes in and out and the sand and stones rub together and grind up the food! From there it passes through the worms intestines where the worm gets all the nutrition it needs from the food. Then it exits the worm's body as castings.

4) Online Earthworm Dissection (No worms were harmed in the making of this dissection.)
http://glencoe.mheducation.com/sites/dl/free/0078802849/383950/BL_14.html

- **Read about worms on the left of this page and below.**
- **Click on the lab manual (bottom right).**
- **Click external anatomy and drag and drop the labels. Keep going until you have them all correct.**
- **Click on internal anatomy and drag and drop the labels. Keep going until you have them all correct.**

5) Write a reflection paper (2-3 paragraphs) about what you learned about earthworms.

Week 11- Peanuts and George Washington Carver

Materials needed: raw, unroasted peanuts, peanuts and salt or seasonings for roasting and an oven, possibly a food processor or a peanut butter machine at a grocery store

Monday:
Read this:
https://www.farmflavor.com/us-agriculture/peanut-power-grow-peanuts/
Explain the steps for growing peanuts (planting, pegging, watering, and harvesting).

Tuesday:
Watch this video: https://www.youtube.com/watch?v=YDTkS_y0H6k
Write 3-5 sentences about what you learned.

Wednesday:
Learn how to roast peanuts and do it.
Taste raw peanuts and taste the roasted peanuts. Describe the difference in taste. Which did you like better?

Thursday:
Make fresh peanut butter. You can do this at most local food markets such as Fresh Market and Wegman's. If your store does not offer this option, you can make it in a food processor.

Taste fresh peanut butter. Taste peanut butter that was pre-packaged (like Jif or Peter Pan). Describe the difference. Which did you like better? Why?

Friday:
Read these:
https://gobotany.newenglandwild.org/species/arachis/hypogaea/
and
https://www.timesunion.com/living/article/Gardener-Yes-you-can-grow-peanuts-up-north-3585789.php

1. Give the scientific name for the peanut.
2. Give at least 3 interesting facts about peanuts.
3. Where are peanuts grown (habitat)?
4. What color is the flower on the peanut plant?
5. What type of leaf does a peanut have?
6. What is the leaf arrangement?
7. Describe the leaf blade edges.
8. Describe the symmetry of the flower.
9. How many sepals, petals, or tepals?
10. What is the stamen number?
11. What is the fruit length?

Week 12- Leaves

Materials needed: plant, construction paper, sunny window

Monday:
Do the experiment and write it up.
https://learning-center.homesciencetools.com/article/leaf-chromatography-science-project/

Tuesday:
Define the following words:

- Pigment
- Chlorophyll
- Endothermic
- Decomposition
- Carotenoids
- Anthocyanins

Wednesday:
Read the article. Write a paragraph explaining why leaves change color.
http://scifun.chem.wisc.edu/CHEMWEEK/AutumnColors2017.pdf

Thursday and Friday:

Learn about Leaves http://sciencewithme.com/learn-about-leaves/

Leaves are the plant's f_____ f_____

What are the types of leaves?

What are the parts of a plant?

The plant is made up of three parts:

_____ are basically a food making machine.

_____ are the plant's support system. Stems hold up leaves to the light and keep fruits and flowers attached. They grow straight up, trail along the ground, climb fences and trees or stay underground.

_____ are the plants anchor and hold the plant firmly in the ground. Roots are also absorbers of water and minerals from the soil. They also store minerals.

What are the parts of a leaf?
Draw and label stipule, axil, vein, tip, blade, and petiole.

What are the layers of a leaf?

A leaf is made up of three layers:

_____ This is the outer layer of cells covering the leaf. It is usually transparent and is waxy to prevent water loss.

_____ This is the interior of the leaf between upper and lower epidermis. This is where most of the photosynthesis occurs.

The Mesophyll is divided into two layers

- The upper _____which is tightly packed.
- Beneath the palisade layer is the _____ which is, you've guessed it…spongy!

Draw a CROSS SECTION of a LEAF. Label the upper epidermis, mesophyll (both places), bundle sheath, vein, lower epidermis, guard cells

Week 13-Plant Reproduction-Sexual & Asexual Reproduction in Flowering Plants

Materials needed: a healthy rosemary plant with green stems and leaves

Monday

https://www.youtube.com/watch?v=2ycl2E9r-_o

Watch beginning to 1:29

1. Is the stamen a male or female reproductive part of a plant?
2. What does it consist of?
3. What does the anther produce?
4. Each matured pollen grain contains a t_____ c_____ consisting of a t_____

   n_____ and two m_____ g_____.

Tuesday

https://www.youtube.com/watch?v=2ycl2E9r-_o

Watch 1:30- 2:29

5. What is the female reproductive part of the flower called?
6. What is the top part of the carpel called?
7. What supports the stigma?
8. What part is the ovary?
9. Ovary contains one or more o_____.
10. Each ovule has a f_____ g_____.

Wednesday

https://www.youtube.com/watch?v=2ycl2E9r-_o

Watch 2:30- 3:07

11. Plants that contain both male and female parts are called b_____ f_____.
12. Give two examples of bisexual flowers.
    -
    -

Thursday

https://www.youtube.com/watch?v=2ycl2E9r-_o

Watch 3:08- 7:37

13. Flowers that contain either male or female reproductive parts are called u_____ f_____.
14. Two examples of unisexual flowers are:
    -
    -
15. What has to happen for fertilization to take place?

    For fertilization to take place, p_____ grains have to be transferred from the

    s_____ to the s_____.
16. What is it called if the transfer of pollen grains takes place in the same plant?
17. What is it called if the transfer of pollen grains takes place from one flower to another?
18. What are four ways that cross-pollination can occur (who or what helps it happen)?
    -
    -
    -
    -
19. After the pollen grain lands on the s_____, the t_____ c_____ produces a

    p_____ t_____ through the s_____ of the o_____. The male

    g_____travel along with the t_____ n_____ through the p_____ t_____.
20. After they reach the ovule, one of the m_____ gametes fuses with one of the f _____

    Gametes leading to f_____.
21. Fertilization leads to the forming of z_____.

22. The other male gamete fuses with the p_____ n_____ to eventually form e_____.
23. The z_____ d_____ multiple times to form an e_____ within the o_____.
24. What does the endosperm provide for the embryo?
25. When the ovule eventually develops, it turns into a s_____.

Friday

Asexual Reproduction in Plants

http://www.sqooltube.com/videos/asexual-reproduction-131

1) What is asexual reproduction?
2) Define bulb.

https://growagoodlife.com/propagate-rosemary-plant-from-stem-cuttings/
Explain the steps necessary to asexually reproduce rosemary from cuttings. Try it yourself!

Week 14- Seeds

Materials needed: seeds, tray, paper towels, seeds, water, sunny window, experiment worksheet

https://www.youtube.com/watch?v=TE6xptjgNR0

This week you will watch seeds sprout.

Make a hypothesis about seeds.
Materials needed: seeds, tray, paper towels, seeds, water, sunny window, experiment worksheet
Record your procedure on your experiment worksheet:

- **Line a tray with wet paper towels.**
- **Organize seeds on the tray**
- **Add labels.**
- **Keep the tray of seeds near a sunny window.**
- **Every day, use a pipette or spray bottle to keep the seeds moist.**

Record what you notice each day. (See experiment worksheet).
Draw a conclusion about seeds.

Week 15- Cones and flowers- Materials needed: closed pinecones

Monday
https://www.youtube.com/watch?v=TetsFV4EU68

1) **What does the male cone produce?**
2) **What does the female cone produce?**
3) **What happens when the cone is wet or dry?**
4) **What does the condition of the cone tell us about the forest in general?**
5) **What are some uses for cones (besides reproduction of plants)?**

https://www.youtube.com/watch?v=1ADNse6hHEY

Tuesday and Wednesday:

1) **Explain the steps in drying and cleaning pine cones**
2) **Try it.**

Thursday and Friday:

3) **Choose and make a craft using your pinecones.**

Week 16: Bees and pollen

Here are the resources your need for this weeks activities and lessons:
http://www.smithsonianeducation.org/images/educators/lesson_plan/partners_in_pollination/pollen.pdf

***** If you are able to, try to visit a beekeeper or a farm or museum that raises honeybees. If not, explore some educational videos about honeybees on your own. *****

Monday

Anatomy of a plant and anatomy of a honeybee worksheets (Smithsonian in the Classroom)

Tuesday

Adaptive structures worksheets (Smithsonian in the Classroom)

Wednesday

Bee-Free BBQ (Smithsonian in the Classroom)

Thursday
CLASS TRIP- BEEKEEPER OR MUSEUM OR FARM
Questions:
- How do you know which one is the queen?
- Describe the activities and flight patterns. What are the different jobs of the bees?

Define:
- swarm
- apiarist
- pollinator

If you can't go on the class trip, watch this video:
https://lsc.org/news-and-social/news/watch-our-bees-are-swarming

What is beeswax?
https://sassafrasbeefarm.wordpress.com/category/honey-bee-vocabulary/

Explain why you think people say, "mind your own beeswax."

Friday
https://www.classicsforkids.com/activitysheets/April2017.pdf
Read the tan box on the first page. It is called "A Buzzing Prince."
Read the second page.

What are two ways that Nikolai Rimsky-Korsakov makes his music sound like bees?
https://www.youtube.com/watch?v=aYAJopwEYv8

Week 17- Fruits (You decide how much work you want to complete each day.)

What purpose does fruit serve in terms of the plant as a whole?

Define these words and give examples of each (names and pictures). Explain how that fruit fits the category:

- **Pome**
- **Drupe**
- **Berry**
- **Aggregate fruit**
- **Legumes**
- **Capsules**
- **Nuts**
- **Grains**
- **Multiple fruits**

Week 18- Photosynthesis

Monday:

Place a healthy, growing, leafy plant by the window for several days. Tape some construction paper over some of the leaves. Observe it on Friday. Write up the experiment. Write your conclusion on Friday.

Tuesday

1) Watch the videos

https://www.youtube.com/watch?v=8u_hwwztRqI

https://www.youtube.com/watch?v=yHVhM-pLRXk

2) Take notes on the videos.

Wednesday

Write a paragraph and draw a diagram to explain photosynthesis to someone younger than you.

Thursday

http://www.glencoe.com/sites/common_assets/science/virtual_labs/LS12/LS12.html

1) Complete the online lab activity.
2) Write it up using the worksheet.

Friday

Write the conclusion of the lab from Monday. Remember that chlorophyll is what gives leaves their color and, without sunlight, the leaves will lose that color.

Week 19- Moving Materials through Plants

http://www.rbgusd.k12.ca.us/view/7390.pdf

Monday

How do plants move through plants?

Tuesday

Define:

- **vascular plants**
- **nonvascular plants**
- **veins**

Wednesday:

Remember xylem and phloem? Define them again:

- **xylem**
- **phloem**

Thursday:

What are the three factors in the upward flow of water:

-
-
-

Friday:

Explain the difference between vascular and nonvascular plants. Give an example of each.

Week 20-Regulating Plant Development and Growth

https://www.youtube.com/watch?v=Zu9h7Wf7iBI and https://biologywise.com/plant-hormones-their-functions

Take notes.

What are the 5 major types of phytohormones?

Explain each of the following and give the function of each:

- Auxin
- Gibberellins
- Cytokinins
- Abscisic Acid
- Ethene (Ethylene)

Week 21- Plant Genetics

Monday
https://www.ducksters.com/science/biology/mendel_and_inheritance.php

1. What is heredity?
2. Explain in your own words who Gregor Mendel was.
3. Explain Gregor Mendel's experiments.
4. Explain F1 generation.
5. Explain F2 generation.
6. Define homozygous.
7. Define heterozygous.

Tuesday
Study your notes from yesterday. Create index cards or a quizlet OR have someone quiz you.

Wednesday
https://www.ducksters.com/science/quiz/mendel_and_inheritance_questions.php
Take the Biology: Mendel and Heredity Quiz

If you got some wrong, look over your answers and your notes. Take it again until you score a B or better. Meet with a teacher if you need help. If you got 9 or 10 correct, give yourself 18-20 points. If you got 7-8 correct, give yourself 14-16 points.

Thursday:
Watch this video: https://www.youtube.com/watch?v=Mehz7tCxjSE

Friday:

Read this: https://www.ducksters.com/science/biology/hereditary_patterns.php

Define:

- gene
- allele
- dominant gene
- recessive gene
- punnet square

Week 22- Characteristics of Plants in Different Environments

Monday:

Define:

- **adaptation**
- **environment**

Tuesday:

This is a book which is online as a PDF. Read the section on Plant Adaptation (pages 8-15 of the book which is pages 10-17 in the slide show).

https://schools.smcps.org/gkes/images/Plant_Adaptations.pdf

Wednesday:

Why do plants need to adapt?

Explain an adaptation of:

- a tree
- a cactus plant
- a water lily plant
- a bearberry plant

Thursday:

Look at slides 14-23: http://ecoevodevo.com/pdffiles/OutreachH.pdf

Friday:

Describe plant adaptations to the following climates:

- tropical
- desert
- temperate

Week 23- Mosses and Ferns

Monday
Define:

- moss
- sporophyte
- rhizoids
- ferns
- gametophyte
- fronds

Tuesday
Watch the slide show. http://studyjams.scholastic.com/studyjams/jams/science/plants/mosses-and-ferns.htm **Take notes as you watch.**

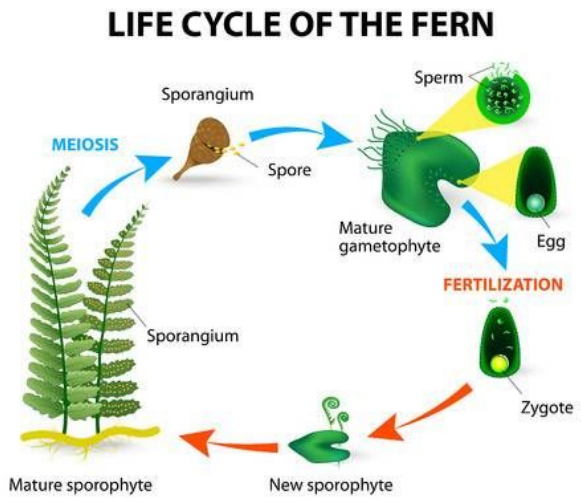
Wednesday
Study your notes from the slide show (from yesterday). Have someone quiz you or make flashcards or a quizlet. You can watch the slideshow again if needed.

Thursday
Take the test. Review your answers. If you are not happy with your score, review your answers and take it again until you score at least 5 out of 7.

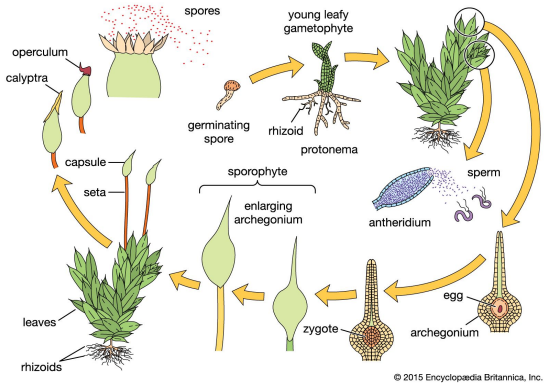
7= A, 6= B, 5= C

Friday

Make a poster of either the moss life cycle OR the fern life cycle. You may use these to help you:



Lifecycle of MOSS



Week 24: Fungi

Materials needed: Large jar with lid, tape, chunk of bread, chunk of cheese, two veggies, two fruits, a food with preservatives, large mushrooms for spore prints, white paper for prints, microscope and a slide, hairspray

This week, you will make a mold terrarium, observe, write and draw, and answer the questions.

Watch this video: https://www.youtube.com/watch?v=qoxY0z8ukUQ

1) Soak and add to a jar:
   - 2 fruits
   - 2 vegetables
   - a chunk of bread
   - a chunk of cheese
   - a packaged snacks (like Hostess)
2) Lay the jar on its side.
3) The foods should be close to each other. They don't need to touch, but they should not be in a heap.
4) Close the lid tightly and tape the lid to the jar.

Mold Terrarium: Observe each day and write and draw what you notice.

Day and Food	Description (texture, color, size of the mold if/when it appears)	Draw What You See
Day 1 - Cheese		
Day 1- Bread		
Day 1- Fruits		
Day 1- Vegetables		
Day 1- Packaged food		
Day 2 - Cheese		
Day 2- Bread		

Day 2- Fruits		
Day 2- Vegetables		
Day 2- Packaged food		
Day 3 - Cheese		
Day 3- Bread		
Day 3- Fruits		
Day 3- Vegetables		
Day 3- Packaged food		

Day 4 - Cheese		
Day 4- Bread		
Day 4- Fruits		
Day 4- Vegetables		
Day 4- Packaged food		
Day 5 - Cheese		
Day 5- Bread		

Day 5- Fruits		
Day 5- Vegetables		
Day 5- Packaged food		
Day 6 - Cheese		
Day 6- Bread		
Day 6- Fruits		
Day 6- Vegetables		
Day 6- Packaged food		

Day 7 - Cheese		
Day 7- Bread		
Day 7- Fruits		
Day 7- Vegetables		
Day 7- Packaged food		

Mushrooms are part of a larger group of plants known as fungi.

Most fungi reproduce by releasing tiny s_____ that then g_____ (sprout) and grow into a new f_____.

Mushroom spores are tiny, and can only be seen individually with a m_____. On a mature mushroom, thousands of s_____ can grow on just one gill!

Different mushrooms have different colored spores. Mushroom spores can be w_____, b_____, b_____, or many shades in between!

Activity: Make spore prints. Make at least two. Preserve one with hairspray and put the other on a slide to look at under a microscope.

https://gosciencegirls.com/mushroom-spore-prints/

Weeks 25- 26 Gymnosperms and Angiosperms

Define:

- gymnosperm
- angiosperm
- cotyledons
- perennial
- annual (in terms of plants)
- kingdom (in terms of plants
- domain (in terms of plants)
- dicots
- Monocots

Watch this video. Tell someone about what you learned. https://www.youtube.com/watch?v=xGZNHGY98ZE

Use this source to help you answer the 11 questions below:
https://www.diffen.com/difference/Angiosperms_vs_Gymnosperms

1. Compare the **seeds** of the gymnosperm to that of the angiosperm.
2. Compare the **life cycle** of the gymnosperm to that of the angiosperm.
3. Compare the **tissue** of the gymnosperm to that of the angiosperm.
4. Compare the **reproductive system** of the gymnosperm to that of the angiosperm.
5. Compare the **leaves** of the gymnosperm to that of the angiosperm.
6. Compare the **cotyledons** of the gymnosperm to that of the angiosperm.
7. Compare the **wood** of the gymnosperm to that of the angiosperm.
8. Compare the **reproduction** of the gymnosperm to that of the angiosperm.
9. What **KINGDOM and DOMAIN** are both the gymnosperm and the angiosperm?
10. Compare the **uses** of the gymnosperm to that of the angiosperm.
11. Compare the **perenniality** of the gymnosperm to that of the angiosperm. (This is misspelled on the link, but you understand that it means.)

For each of these links, play the video (round green button) and then test yourself (rectangular blue button).
http://studyjams.scholastic.com/studyjams/jams/science/plants/angiosperms.htm
http://studyjams.scholastic.com/studyjams/jams/science/plants/gymnosperms.htm

MONOCOT vs DICOT activity:
https://www.lcps.org/cms/lib/VA01000195/Centricity/Domain/4726/plant%20tutorial.pdf

1) View the slide show.
2) Slide 13: Identify whether each picture is an example of a monocot or dicot. Justify your reason.

   Flower A: _____

   Flower B: _____

3) Slide 14: Identify whether each picture is an example of a monocot or dicot. Justify your reason.
   .
   Flower C: _____

   Flower D: _____

4) Slide 14: Identify whether each picture is an example of a monocot or dicot. Justify your reason

   Leaf A: _____

   Leaf B: _____

   Leaf C: _____

   Leaf D: _____

Week 27- Plant Ecology and Biomes

Define:

- **biome**
- **tundra.**
- **taiga (also called boreal forest)**
- **temperate deciduous forest.**
- **scrub forest (called chaparral in California)**
- **grassland.**
- **desert.**
- **tropical rain forest.**
- **temperate rain forest.**

Complete one worksheet for each of FIVE of the seven biomes. (You can choose.)

https://nj.pbslearningmedia.org/resource/tdc02.sci.life.eco.lp_biomes/biomes/#.XIJ38ChKg2w (Click on Biome Worksheet which is under MATERIALS. Print 5 copies.)

YOU DO NOT have to complete the part about animals at the bottom of each worksheet.

Week 28- Symbiosis

http://www.biology4kids.com/files/studies_relationships.html

Explain the following:

- commensalism
- competition
- mutualism
- predator-prey relationship
- parasitism

---

https://kids.kiddle.co/Symbiosis

Take notes using this outline format:

I. Types of Symbiosis

A. Type 1: _____

1.

2.

3.

4.

B. Type 2: _____ (endosymbiosis: _____)

1.

2.

3.

4.

5.

6.

C. Examples of Symbiosis

1. Lichen: _____

2. Herbivores: _____

Week 29- Trees

Play Tree-vial Pursuit. You may open another window to search for answers. If you prefer, you can take an educated guess. The game will tell you the correct answer and explain it.
https://www.arborday.org/kids/carly/treevialpursuit/treevial_pursuit.cfm

---

https://www.kidzone.ws/plants/trees.htm
Take notes using this outline:

I. Types of Trees

A.
B.

II. Parts of a Tree

A.

B.

C.

D.

E.

III. Parts of the Trunk

A.

B.

C.

D.

E.

Tree Meal

1. Plan a meal that consists only of items that come from a tree.
2. Write the menu. Print or write the recipes. Shop for (or harvest) the ingredients.
3. Make and serve the meal.

Week 30- Strange plants

This week you will create a slide show on strange plants. On each slide, include the name of the plant, a picture and/or video of the plant, and a description. Don't forget a title slide and a works cited slide.

https://www.youtube.com/watch?v=Aqj_Wrw2qJg
(Here is a video/slide show. The music is annoying. You can turn the volume off if you want.)

https://themysteriousworld.com/top-10-most-amazing-and-strangest-plants-in-the-world/
(Here are pictures and descriptions.)

Monday:

White Baneberry (Actaea pachypoda)
Baseball Plant (Euphorbia obesa)

Tuesday

Bleeding tooth fungus (Hydnellum Peckii)
Welwitschia Mirabilis

Wednesday

Lithop or Living Stones
Sensitive plant (Mimosa Pudica)

Thursday

Corpse Flower (titan arum)
Rafflesia Arnoldii

Friday

Venus Flytrap
Pitcher Plant

Week 31- Plant diseases

Research the diseases. Explain the cause of the plant disease, the remedy (if any) and draw or copy and paste a picture.

Monday:

1. Anthracnose
2. Apple Scab
3. Bacterial Canker
4. Black Knot
5. Blossom End Rot

Tuesday

6. Brown Rot
7. Cedar Apple Rust
8. Club Root
9. Corn Smut
10. Crown Gall

Wednesday

11. Damping Off
12. Downy Mildew
13. Early Blight
14. Fire Blight
15. Fusarium Wilt

Thursday

16. Gray Mold
17. Late Blight
18. Leaf Curl
19. Leaf Spot
20. Mosaic Virus

Friday

21. Potato Scab
22. Powdery Mildew
23. Rust

Week 32-

Research the Beyond the Seeds tour and the Living with the Land initiatives in WDW.

- **Explain how innovative growing techniques can increase yields.**
- **Explain how hydroponic, aquaponic, and aeroponic systems provide essential nutrients that plants need to grow.**
- **What is sustainability and why is it important? What ways can humans hurt or help?**
- **How can we combat pests without hurting the environment?**
- **What are some interesting or different fruits, vegetables, and grains which can diversify our diets and gardens?**

Week 33-36

Final project. You decide how you will learn.

Ideas:

- **You can volunteer for a farm that raises vegetables for a local food bank.**
- **You can research the history of various plants that interest you.**
- **You can create an experiment/lab with plants. You can create plant-based meals and make them.**
- **Interview a florist.**
- **Interview a beekeeper.**
- **Visit a greenhouse or a botanical garden.**
- **Attend a workshop that uses plants (culinary, crafts, etc.) or find some on Pinterest to do.**
- **(If you want to create 2-4 smaller projects, that is possible, too.)**

How to Plan:

- **Decide what you want to do.**
- **Write your plan.**
- **Determine materials.**
- **Determine how much time it will take. How will you get to places you need to go?**
- **You need to spend 20 hours total on this project.**
- **Create a rubric for how you want to be scored. This will be worth 80 points total.**
- **Meet with your teacher to get your topic and rubric approved.**