Mushroom Lessons

C4GTS

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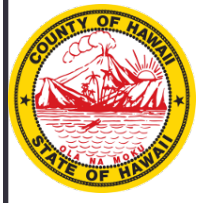
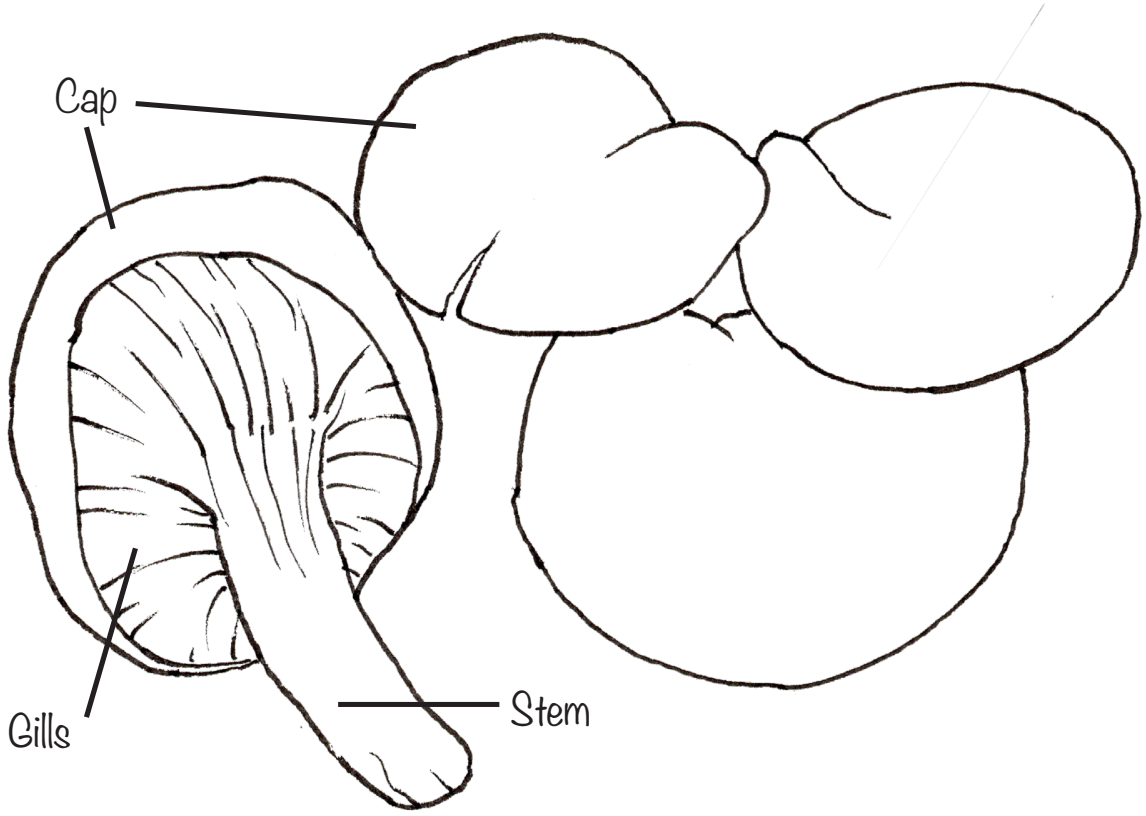


Opala Foods

Parts of an Oyster Mushroom

Color in the different parts of the Oyster Mushroom.



Oyster Mushroom Fun Facts

- Oyster mushrooms are one of the most popular edible mushrooms across the world!
- Oyster mushrooms get their name becuase of their resemblence to a freshly shucked oyster. They have a oyster-shaped cap and very short (or absent) stem.
- Oyster mushrooms come in many differnt colors. This includes yellow, pink and even blue.
- Oyster mushrooms have decurrent gills. This means the gills are connected to the stem, and run most of the way down it.

Mushroom Observation Log

Grade level: K-6
Duration: 10 minutes

Essential Question

What are the growth stages of a mushroom?

Summary

Students observe, track, and collect data on the developmental stages of an oyster mushroom.

Activity

- Prepare the mushroom growing kit provided by ʻOpala Foods. Follow the instructions on how to set up the mushroom kit.
- Instruct the student to observe the mushroom every day for about 2 minutes. Remind the student to use all their senses in observation. This includes the sense of smell, touch, sound, and sight. Eventually, the sense of taste can come into play after the mushrooms are harvested!
- Have students collect data on what they observe happening to the mushrooms. This can be in the form of a drawing, written notes, or even a photograph.
- Continue to fill out the mushroom observation log until the mushroom growing kit is finished.
- Have students share their log and use their data to create a story in either picture or words about the different stages of an oyster mushroom and their growing experience.

Mushroom Observation Log

Record the daily growth of an oyster mushroom!
Use all your senses to collect data about an oyster mushroom's developmental stages.

Date:	Date:
Date:	Date:
Date:	Date:

Mushroom Symmetry

Grade level: K-6
Duration: 10 minutes

Essential Question

What is symmetry and where is it found?

Summary

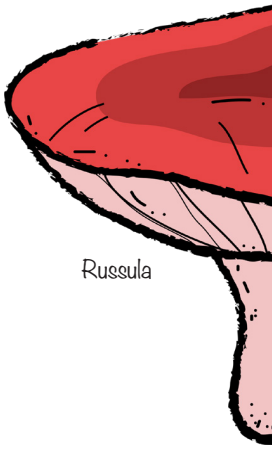
Students observe nature's design of symmetry in mushrooms.

Activity

- Students define the word symmetry. **Symmetry**: a state in which both sides of an object are balanced in size, form or arrangement.
- Give examples of symmetry found in nature. For example, a butterfly's wings, a human face, flowers.
- Explain that many mushrooms are symmetrical as well. This means that if they were caught in half each side would look close to identical.
- Have students use the worksheet provided to draw the missing half of the mushroom. Have them keep in mind the idea of symmetry when completing the worksheet.

Mushroom Symmetry

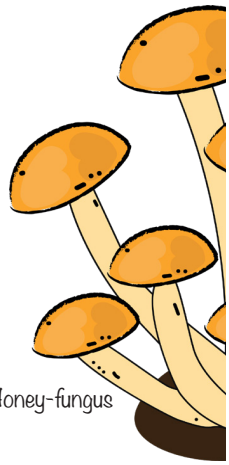
In nature's design, many plants, animals, and fungi are symmterical. This means they look the same from left to right. Can you draw the other matching side of each mushroom?



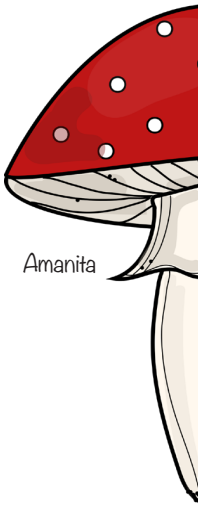
Russula

Morel

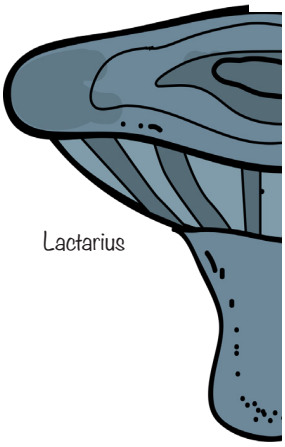
Shiitake



Honey-fungus

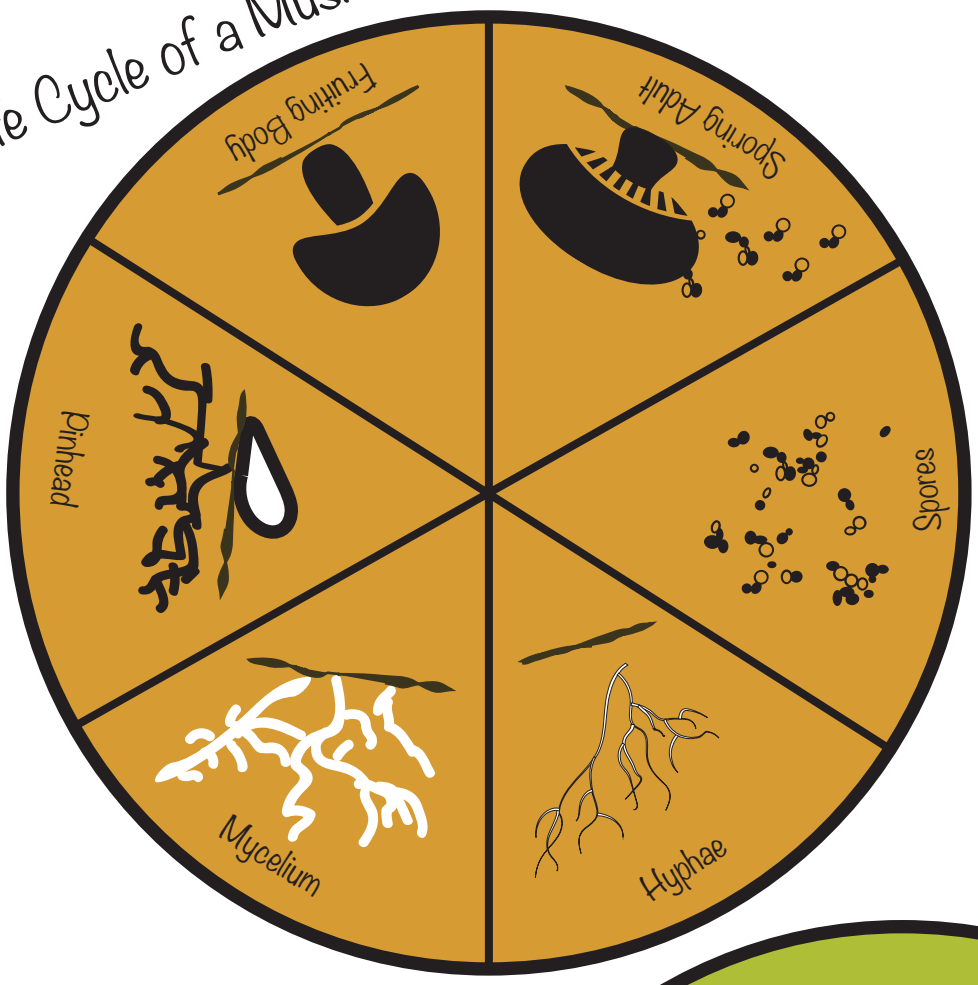


Amanita



Lactarius

Life Cycle of a Mushroom



Information Card

Life of a Mushroom

- Mushrooms grow from spores not seeds. Spores look like microscopic specks of dust and range in color.
- A single mushroom can release 16 million spores. The spores float away and try to find a new place to grow.
- Different spores meet and grow underground forming white fibers called
- When male and female hyphae join they create web-like roots called mycelium under the soil.
- The mycelium forms knots. These knots pop above the ground and are called pinheads or baby mushrooms.
- Eventually, the mycelium pushes the mushroom open to reveal the fruiting body shape above ground.
- The adult mushroom releases its spores found on the mushroom gills resting under the cap. This starts the cycle of life for the mushroom again

Instructions

1. Cut out the brown and green circle.

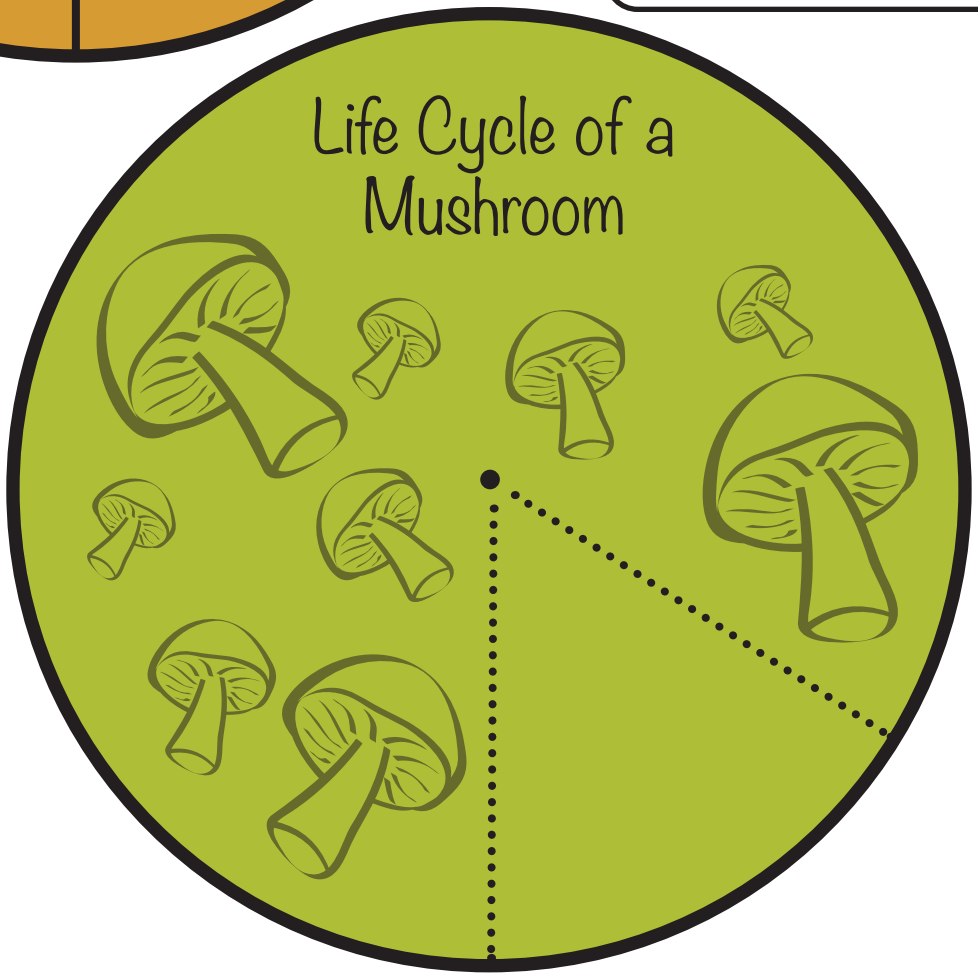
2. Cut out the wedge on the green circle along the dotted lines.

3. Place the green circle on top of the brown circle.

4. Make a pilot hole by pressing a push pin through the black dot on the middle of the green circle. It should make a hole in the brown circle beneath also.

5. Press a brad through the pilot hole to connect the two circles, with the green on top.

6. Spin the green circle to view the life cycle of a mushroom.



Mycelium Running

Grade level: 6-8

Duration: 45-60 minutes

Essential Question

How do mycelium help exchange nutrients in plants?

Summary

After conducting a kilo on mycelium in their area, students begin to see how
Mycelium connects with each other and adjacent plants to communicate and help share nutrients or other beneficial compounds. This is conducted through a short reading and data analysis.

Activity

- Begin by going outside and finding a fallen log, mass of leaf litter or other space where things are growing. Carefully move, flip, brush living matter aside and try to find some mycelium (refer to example image below)
- If you find mycelium, use caution and try to follow the fibers for a distance, see how they connect and what they reach for/towards, try to disturb them as little as possible
- On the sheet provided write out some descriptions of the mycelium you found. If possible, use multiple senses to describe Do not tase. If you were unable to find any mycelium use the example image to help with your descriptions
- Read the article provided. As you read, think about how mycelium are underground connections for plants and other fungi. Highlight or underline anything that you find interesting
- Using the data in the table provided, prove that biologists understand that this process of communication and nutrient transfer takes place. Share your findings with a friend/parent/guardian.

Photo credit: © TAVIPHOTO/ ADOBE STOCK

Observation Sheet

Follow the example to describe any mycelium you find around your home. Add more rows if necessary.

Location Found	See	Smell	Feel	Sketch/
Example: *Under moss in the yard between the house and garden bed*	*White strands that get thinner and thinner the further out they go, mixed with soil and roots of other plants*	*Sweet, earthy*	*Mostly smooth, some fuzzy parts, damp*	

Data Activity

Kids will read this article before conducting the data portion of the activity: https://kidsdiscover.com/teacherresources/fungi/#:~:text=The%20hypha%20secretes%20enzymes%20that,takes%20place%20outside%20the%20fungus.&text=Eventually%20these%20hyphae%20form%20a,mat%20is%20called%20a%20mycelium

Background

Plants produce their energy through a process called **photosynthesis**. This process takes water, carbon dioxide, and light, and changes their molecules into sugars that the plant can use as food. **Carbon** is one of the main building blocks of life and is necessary for all living things.

Birch Tree (Betula papyrifera)

Ecologist Suzanne Simard had heard theories about mycelium helping trees and other plants transfer essential nutrients from stronger to weaker plants and wanted to learn more herself. In 1997, she and her team looked at birch and Douglas Fir trees as their test subjects to try and answer the question - Can mycelium help transfer nutrients between plants?
They used seedlings of these two types of trees in three different lighting environments 1.) Deep Shade 2.) Partial Shade 3.) Full Sunlight.

The research team then gave the trees two different types of carbon dioxide which can be measured separately later on. One type of measurable carbon dioxide was given to the birch trees the other was given to the fir. However, at the end of their experiment they found BOTH types of carbon in BOTH of the trees. How can this be possible?

Douglas Fir (Pseudotsuga menziesii)

Use this data table to help prove that mycelium transfers nutrients to plants in need.

	Deep Shade	Partial Shade	Full Sunlight
Average transfer of Carbon in mg (approx.)	20	8	5

Response Questions:

Why would the trees in deep shade receive a higher amount of carbon from surrounding trees?

Without the transfer of carbon from surrounding trees, do you think the seedlings would have survived? Why or why not?

Based on what you've learned today, how can mycelium play a role in this transfer of carbon?

Too Good To Waste - It's a Fungal Jungle Out There!

Lesson Objective

Students will:

- Learn that trash is composed of two types of waste organic and inorganic
- Learn what a full-loop life cycle and a linear life cycle is
- learn what a decomposer is and why they are important in the decomposition of organic waste.
- Learn to design an experiment to answer a hypothesis.

Materials Needed

- Six clear jars
- Six of the following objects:
  - piece of plastic
  - piece of paper
  - apple core, guava, waiawi, etc
  - piece of aluminum foil
  - a piece of bread
- Note sheets (see attached)
- Soil to fill six jars (from your yard or outdoors somewhere, not store-bought)
- Teacher supplied Data Sheets

VOCABULARY WORDS

Compost: a mixture of decayed or decaying organic matter used to fertilize soil

Decompose: make or become rotten; decay or cause to decay

Decomposer: an organism, usually a bacterium or fungus, that breaks down the cells of dead plants and animals into simpler substances

Full-loop life cycle: a life cycle for a material that never comes to an end. Ie. organic waste like food scraps or lawn trimmings that are composted and turned back into the soil from which they came

Inorganic waste: waste not from organisms, or from organisms that existed millions of years ago, that cannot be easily broken down

Linear life cycle: a life cycle for a material that comes to an end. ie. plastic is made from fossil fuels but its life cycle will end in a landfill.

Microorganism: Micro = small, Organism = living thing. A living thing so small that it can only be seen with a microscope. Includes bacteria, protozoans, and certain algae and fungi.

Organic waste: any material that is biodegradable and comes from either a plant or an animal

Introduction

- Present objects. Have students carefully observe, touch and handle the objects. Students will discuss in groups as they answer the following:

  1. Describe the objects. Note size (length, width and height), color and shape. Sketch each object.
  2. Is there anything that 2 or more of the objects have in common?
  3. Is there anything that makes the objects differ from each other?

- Explain that scientists conduct experiments and investigations to understand how things work or function. Explain that the students will be conducting an investigation to see how the 5 objects change over time. Explain to students that **we will be answering the following question:**

How do you think these objects will change over time when placed in the soil?

- Explain to students that they will use the same procedure for the study but each person will create their own hypothesis.

Method/ Procedure

1. Place each object in the glass jar with the object against the glass for best observation / monitoring.
2. Fill soil into jars leaving an inch at the top.
3. Explain that the objects will be in the soil covered up for 6 weeks. Ask again, How do you think these objects will change over time when placed in the soil?
4. Have students write a hypothesis around their predictions on how they think each object will change over the 6 week period.
5. Add water to the open jar over the 6 week period making sure it stays moist but not soaked.
6. Students will make weekly observations and record them on their formatted note sheets provided by the teacher. Note color, shape and size of the objects. Sketch them also. Note doen initial observations.
7. Looking at data, students will either accept or reject their hypothesis. Note final observations.
8. Have students summarize what happened over time to each trash piece. Encourage them to draw conclusions about the types of trash.
9. Summary Questions:
    - Which piece of trash changed the most? Why do you think this?
    - Which didn't decompose? Why do you think this?
    - What made each piece different ?

Extension

1. Introduce the word decompose. Anyone heard this term before? Know the meaning? Go over definition. Ask students if any of their objects decomposed.
2. Note not all of the objects decomposed. Introduce the terms organic and inorganic waste. Ask students for other examples of each. Ask what is the difference between organic and inorganic waste?
3. Discuss what causes decomposition to occur (fungi, bacteria, bugs) These critters eat decaying plant and animal matter. Return nutrients to the soil. We cannot see most of these decomposers. Without them dead matter would pile up and the nutrient cycle would not occur.
4. What took longer to breakdown, organic or inorganic waste? Organic was once alive, inorganic is not alive or alive long ago...petroleum products (broken down by the sun and water over years
5. Organic = Full Loop Life Cycle Inorganic= Linear Life Cycle
6. Organic waste can be composted to help complete its life cycle
7. Keep inorganics out of the landfills by recycling and using less of those types of products

Experiment Extensions

Secondary experiments with the jars could included these variables:

- Does temperature matter? What if it's warmer or colder?
- Does the substrate matter? What if we tried soils from different places?
- What if we moistened the soil with something other than water? Ideas include ?
- Do different types of organic matter decompose faster? Slower?

This would be a good time to introduce the terms "control" and "variable"

Do the Rot Thing!
Log Sheet

You, Your kupuna or your child will collect all their leftovers for 2 days and separate them in buckets labeled REUSE, RECYCLE, COMPOST, and LANDFILL. List the things you or they throw away each day and write each item below in the column you see fit.

Item Tossed	Reuse	Recycle	Compost	Landfill	Could Replace With:

Do the Rot Thing!

1. Discuss with your family why you placed each item in the column you did.

2. Not all of the items you listed must go into the trash can and then to the landfill. Some can be recycled, reused, or composted. Ever heard of a compost pile ?

3. Did you know recycling occurs in nature every day ? Composting is a way to recycle organic (plant or animal material that decays/rots). Items that can be composted include food waste such as orange peels, banana peels, potato peelings, bread crusts, eggshells, coffee grounds, and other non-food items such as shredded newspaper, teabags, leaves, grass, and sticks.

4. We call dry leaves and twigs "browns" and stuff like fresh grass, clippings, fresh fallen leaves and food scraps, "greens".

5. These "greens" and "browns" that fall to the ground or are added to soil, then decompose (decay or rot) and turn into compost (a nutrient rich mixture of decayed or decaying organic matter used to fertilize soil)

6. "Greens" are a source of protein and nitrogen that attract the bacteria, fungi and other bugs to your compost pile to break down the material you put in it. "Browns" are a source of carbohydrates that provide carbon to the compost pile.

7. The organic material is food for our fungi (your mushroom kit !!!) and soil bacteria which serves as food for earthworms, which then serve as food for beetles, ants, myna birds etc....

8. So let's rake up our yardwaste, and other organic materials and make a compost pile !

On the following page is reference sheet on how to build your own Compost Pile Home.

Compost Pile Reference Sheet

In order to maintain a backyard compost pile remember the following tips:

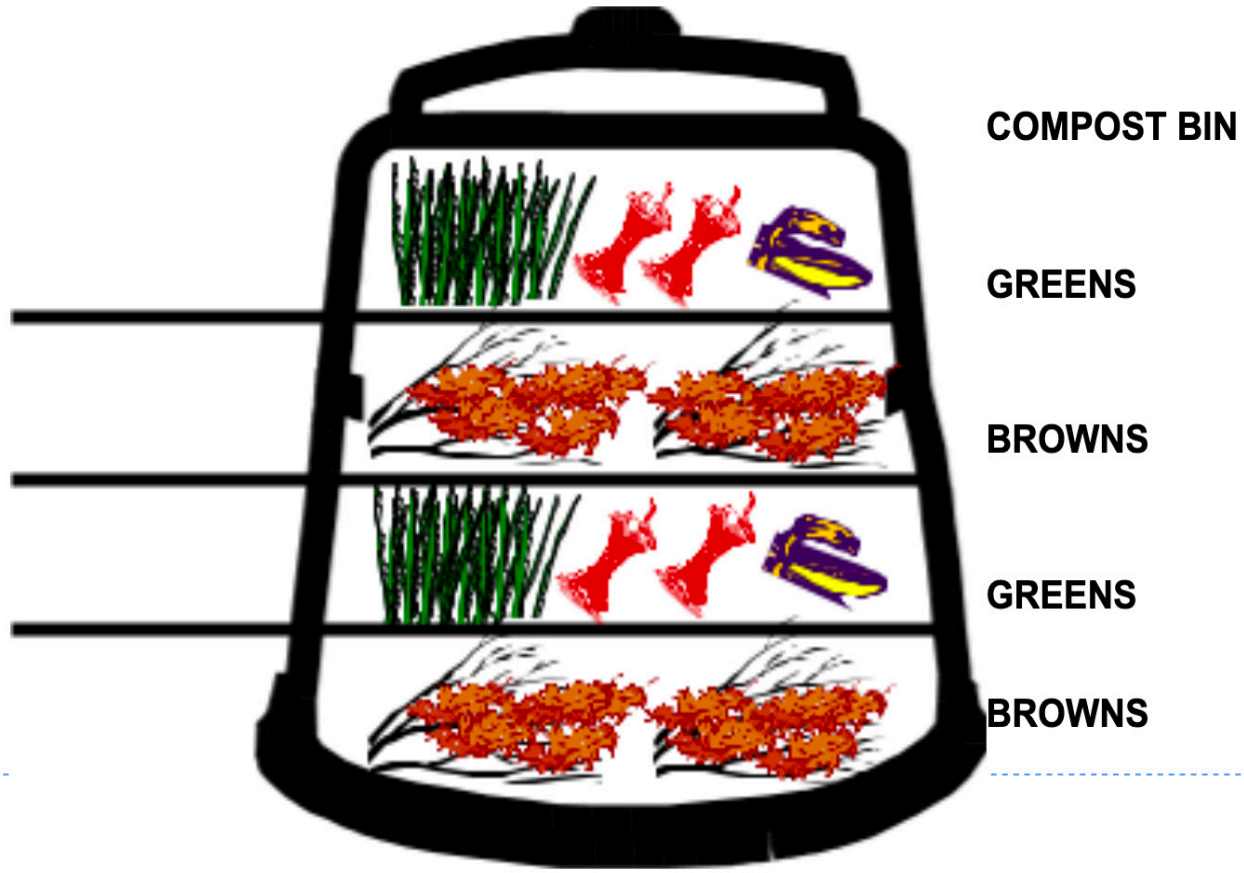
Add a layer of browns (dry leaves or twigs) then a layer of greens (fresh grass clippings, leaves and food scraps), then a layer of browns and continue to alternate the type of material you add to the pile.

Keep the pile moist, but not soggy because the material will not decompose as rapidly if it is too wet.

Do not add meat, bones or dairy products because these items will attract animals to the pile.

Trim tree branches to 1/4" in diameter or smaller because they will decompose faster.

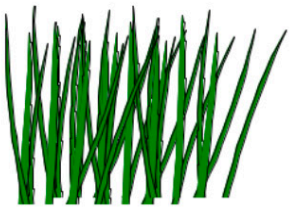
Mix the material in the pile regularly (the more you mix the pile, the faster it will decompose) to allow aeration.



Compost Activity Sheet

1. Read the items below. Circle the ones that are organic and can be composted.

styrofoam cup	twigs	glass bottle	leaves
newspaper	notebook	celery stalks	tree branch
grass clippings	computer	avocado peel	lettuce
peaches	crayon	television	paper clip
plastic bag	banana peel	adhesive tape	tangerine peel
orange peel	pine needles	aluminum can	envelope



2. Write an item that can be compostable for each of the letters in the word "Compost".

C _____

O _____

M _____

P _____

O _____

S _____

T _____

3. Write the names of seven vegetables and seven fruits.

Vegetables	Fruits
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Compost Word Find

In the puzzle below, find these words related to composting:

BACTERIA FUNGI COMPOST WORMS DECOMPOSE

What Can We Compost?

Make an "X" on things that do not go in a compost pile.
Circle the things that can go in a compost pile.


leaves


oil


branches

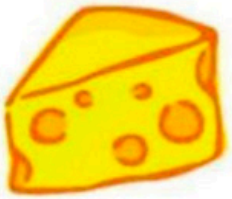

banana peel


can


vegetables


boots


books


cheese


bones


grass


hay


sticks


turkey


apple core


paint

Creamy Mushroom Dip

Ingredients:

3-4 cups chopped mushrooms
4 tablespoons unsalted butter
6 tablespoons all-purpose flour
2 cups vegetable or chicken broth
8 oz. sour cream
Salt & pepper to taste

Instructions:

Melt butter in small saucepan over medium heat, add flour and cook until a paste is formed..1-2 minutes, remove from heat...this is called a 'roux'
Cook chopped mushrooms in large skillet with ½ of the broth, until mushrooms are soft but still hold their shape, and most of the liquid is evaporated
Add remaining broth (1 cup) and bring to a boil
Add roux (paste), stir in and cook until it's thick enough to coat the back of a spoon, remove from heat and let cool for 15 minutes
Stir in sour cream
Taste and add salt & pepper
Will keep refrigerated for 4 days