Name _____ Period _____ Date _____

Decomposition Worksheet

When **organic** things **decompose**, that means they break down into more simple matter. We call this process **decomposition**.

What are **organic** things? Something is **organic** if it comes from living organisms. Organic things contain carbon and hydrogen atoms.

Your group has two examples of an item. One is new and one is three weeks old.

1. What is it? _____
2. What is the difference between the new one and the three-week-old one?
   _____.
3. Draw a picture of each:

New

Three weeks old

4. Is your item organic? _____ How do you know? _____.

Watch the video "Fruit and Vegetable Decomposition, Time-lapse." What are some things you observe about how the fruits and vegetables change over time?

5. I observed _____.
6. I also observed _____.
7. What did you observe start to happen at the 1:10 (1 minute, 10 seconds) mark?
   _____.
8. What does this tell you about the stuff that decomposed fruits and vegetables change into? (Hint: What is it useful for?) _____
   _____.

Define the following words:

9. **organic** –

10. **decompose** –

11. **decomposition** –

Complete the graphic organizer below:

Characteristics of things that decompose	**Characteristics of things that do not decompose**
1.	**1.**
2.	**2.**
3.	**3.**

Talk with your group and think of why some things decompose and others do not. Write a short explanation based on what your group discussed.

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Protocol for Isolation of Soil Microorganisms

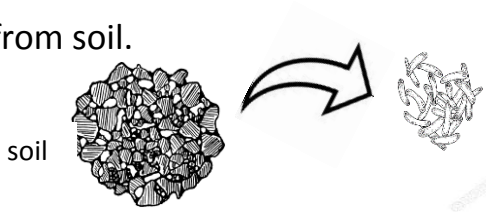
Microorganisms are very small ("micro") living things ("organisms"). We cannot see them without a microscope. Bacteria are examples of microorganisms.

Microorganisms are everywhere, and there are millions of microorganisms in 1 gram of soil. They live by decomposing organic matter to get nutrients and energy.

If we want to see the microorganisms in soil, we have to **isolate** them first. We do this by mixing the soil with nutrient broth, which is a liquid with nutrients in it. This separates the microorganisms from the soil.

Then we **dilute** the liquid containing the microorganisms several times with nutrient broth so that we have a smaller number to look at. We put the solution on **agar** in **Petri dishes** and let the microorganisms reproduce, then look at them under a microscope.

isolate – separate microorganisms from soil.



dilute – decrease the concentration of microorganisms in a liquid by adding it to more liquid.

agar – a solid material that is like jelly and has nutrients to help microorganisms to live.

Petri dish – a small dish with a cover that holds the agar.

Procedure:

1. Each group will get an Erlenmeyer flask with 50 mL of sterile nutrient agar (0.1%). Do not take the cotton out of the top!
2. Measure 0.5 grams of composted soil and quickly remove the cotton, put the soil in the flask and put the cotton back in the top. Swirl the flask vigorously to mix the soil and liquid, then let the soil settle for a few seconds.
3. Use a sterile pipette to take 1 mL of the liquid and put it into a sterile test tube with 9 mL of sterile nutrient agar. Label the test tube "10^{-1}."
4. Gently mix the liquid in the test tube, then take 1 mL of that liquid and put it into another test tube with 9 mL of nutrient agar. Label this test tube "10^{-2}."
5. Do this two more times so that you have four test tubes with liquid that is increasingly diluted (has fewer microorganisms). They should be labeled "10^{-1}," "10^{-2}," "10^{-3}," and "10^{-4}."
6. Take 1 mL of liquid from the last three test tubes ("10^{-2}," "10^{-3}," and "10^{-4}"and put each on a different Petri dish with potato dextrose agar. Label the Petri dishes the same as the test tubes where the liquid came from. Cover the Petri dishes and wait three days.

After three days, examine the Petri dishes. Write your observations for each dish (Does it have spots? How many? What color?).

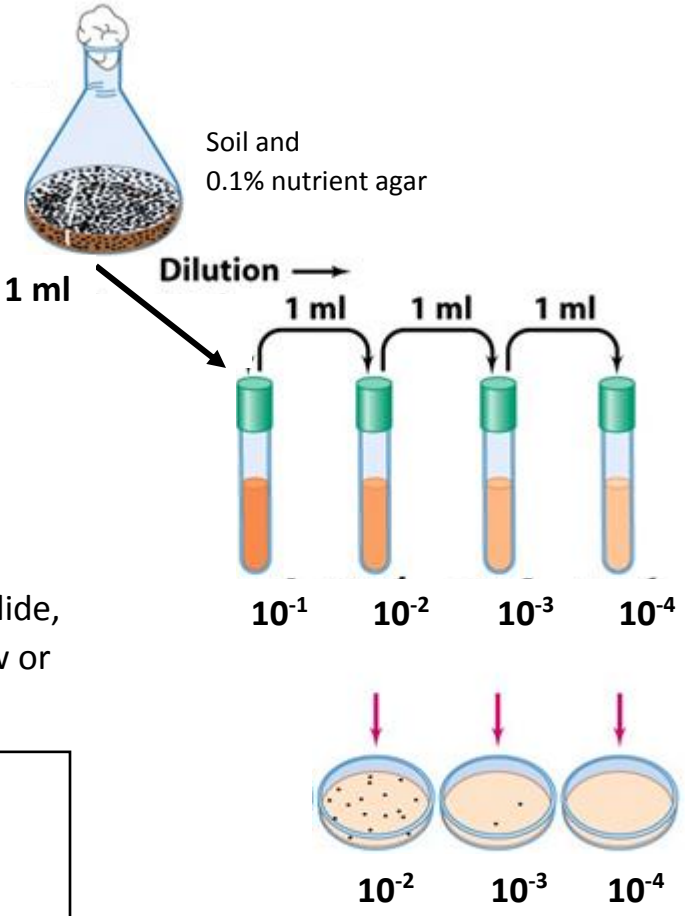
Dish **Observations**

10^{-2}

10^{-3}

10^{-4}

Use a toothpick or wire loop to collect a sample from the spots, put it on a glass slide, and observe it under a microscope. Draw or write your observations:



Name _____ Period _____ Date _____

Worm Box Protocol

In addition to the macroorganisms and microorganisms we've observed in soil, worms are an important part of decomposition.

What do you think worms eat? _____.

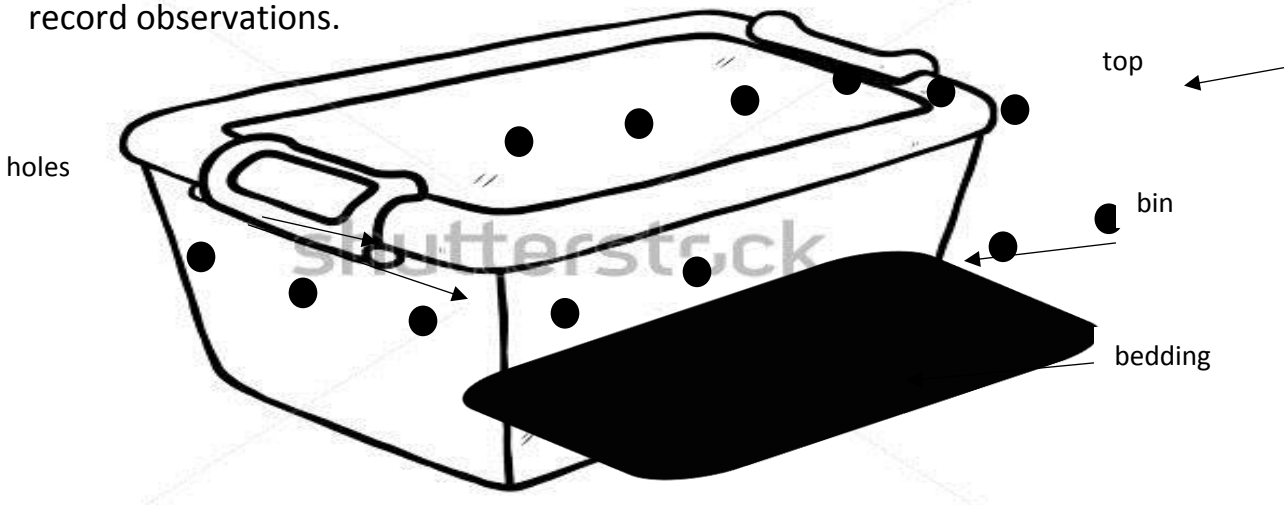
Our class will build a worm box to try to answer that question. In our worm box, we want to make a healthy environment for the worms.

What do you think worms need for a healthy environment?

1. _____
2. _____
3. _____
4. _____

Procedure:

1. Drill holes in a large plastic bin around the top.
2. Add the bedding (peat moss or coconut fiber) so that it is about 3 inches deep.
3. Spray a small amount of water into the bedding (don't soak it!) and let it sit with top off for one day.
4. Add the worms and let them sit for another day with the top on.
5. Add a thin layer of shredded newspaper to the bedding, then add about a cup of chopped fruit and vegetable scraps to the top of the bedding, and add another layer of shredded newspaper.
6. Put the top on the bin and leave it for one week.
7. After one week, check the worm box. Add about another cup of fruit and vegetable scraps if it looks like it's needed.
8. After two to three weeks, the worm box should be established, and we can begin to record observations.



Your first observations will be recorded as "Week 1." Write the date in the table below, measure and record the temperature of the compost, and record your observations. You will do this once a week for four weeks. When writing your observations, remember to include answers to these questions:

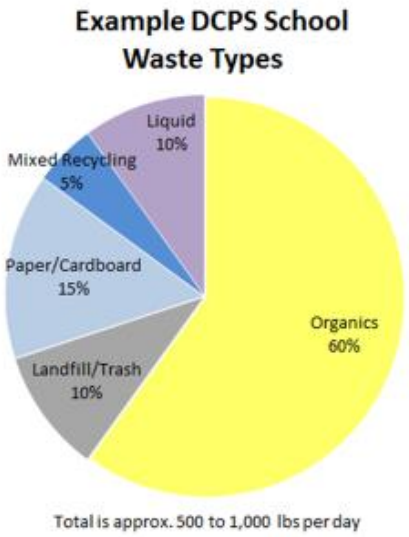
- Do you see many worms? Do they look healthy?
- What happened to the food scraps from last week?
- What does the compost look like? Color? Texture? Odor? Other characteristics?

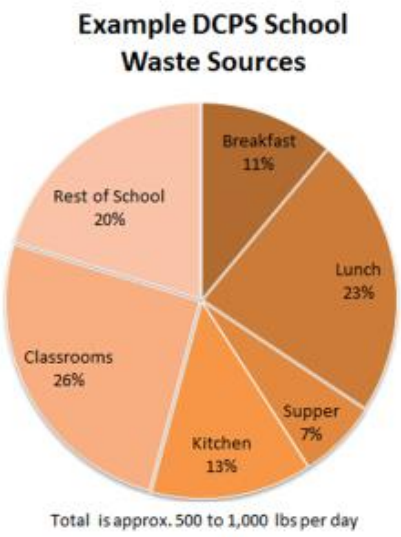
Week 1 Date _____	Temperature _____ Observations:
Week 2 Date _____	Temperature _____ Observations:
Week 3 Date _____	Temperature _____ Observations:
Week 4 Date _____	Temperature _____ Observations:

Name _____ Period _____ Date _____

Taking Action Worksheet

How can we use what we learned about composting to take action in our school to reduce organic waste? As shown below, about 60% of a school's waste is organic waste (left pie chart), and over 50% of a school's waste comes from the kitchen and cafeteria (right pie chart).





Source: D.C. Department of General Services

Each group will choose a project for taking action in the school. Each project has some resources for you to use in your research, but you can also find some resources on your own. Be creative!

If your group has a different idea for a project, talk to me about it and we'll see if you can do it.

Your project must include:

- Research and gathering of information to be organized into a written report and oral presentation by your group.
- Citations for all your sources of information.
- A real or measurable result or product. Remember, we are taking action to improve our school and our environment!

Your group will have to do some work outside of class, such as talking to other students and teachers and asking for their cooperation. Taking action is a community effort!

Project Ideas:

1) **Start a program in the school (or improve our school's program) to collect organics from the cafeteria and kitchen for composting**

   Resources:

   - Organics Recycling Program
     https://dgs.dc.gov/node/1177106
   - Cafeteria Sorting Cheat Sheet
     https://dgs.dc.gov/node/1177235
   - Kitchen Sorting Cheat Sheet
     https://dgs.dc.gov/node/1177236
   - Western Branch Composting Facility
     http://www.menv.com/pages/composting/yardwastecompost.html

2) **Conduct a school cafeteria waste audit**

   Resources:

   - How to Conduct a School Cafeteria Waste Audit
     https://dgs.dc.gov/node/1200797

3) **Do a Reduce First Challenge - Lunch Edition**

   Resources:

   - DC Reduce First Challenge – Lunch Edition Instructions
     https://dgs.dc.gov/node/1188706

4) **Make a demonstration compost bin in the school garden, greenhouse or outside**

   Resources:

   - Composting at Home
     https://doee.dc.gov/publication/composting-home
   - DGS On-Site Compost Request Form
     https://docs.google.com/forms/d/e/1FAIpQLSfKGCdRVIWeY9kn1w3xfUaLRW-ZNYr077mKkeRJOlzZe4PqfA/viewform
   - Classroom Worm Bin How-To Guide
     https://dgs.dc.gov/node/1144516

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Taking Action Rubric

Written Report

	5 (A)	4 (B)	3 (C)	2 (D)	1 (F)
Writing and Organization	• Excellent grammar, punctuation, spelling • Well-organized and clear				• Poor grammar, punctuation, spelling • Not organized and unclear
Content	• Informative • Information is correct • Claims justified by evidence				• Not informative • Incorrect information • Claims not justified by evidence
Citations	• Stated facts and claims have references • Correct format for references				• No references, or • Incorrect format for references

Average = (_____ + _____ + _____) ÷ 3 = _____

Oral Presentation

	5 (A)	4 (B)	3 (C)	2 (D)	1 (F)
Professionalism	• Excellent posture • Serious • Eye contact				• Bad posture • Not serious • No eye contact
Speaking	• Speaks loud • Clear • Confident				• Can't be heard • Not clear • Not confident
Knowledge	• Excellent understanding of content • Answers questions correctly				• Does not understand content • Cannot answer questions

Average = (_____ + _____ + _____) ÷ 3 = _____