

“Burning Biomass” Teacher Guide

Teachers, thank you for choosing to educate your students about the benefits of using renewable resources for energy. This activity is appropriate for middle and high school level students. Please use the following instructions as a guide to the Burning Biomass activity. Feel free to omit or alter this experiment to tailor to the needs of your class. If you have any questions, or if we can assist you in any other way, please contact us at 859-622-7316 or craft@eku.edu.

Warm Up (Engage)

1. Begin the class with the lights turned off.
2. Ask the students to pull out a sheet of paper and a pencil and quickly jot down the vocabulary words after you list them on the board on the board. You can find these words in ‘Get with the Lingo’ section. All this should be a struggle in the dark.
3. When students seem to struggle while reading the words on the board or ask why the lights are off, turn the lights back on and ask “Does anyone know where the energy came from to turn that light on?”
4. What other things do you use in your daily lives that require power?
5. Allow for discussion.
6. Bridge into the ‘Why Do I Care?’ section by saying, “If we want to keep our lights on, along with other things in our daily lives that require energy, it’s important to understand the source of our energy and make sure we’re utilizing our resources in the best way possible.”

Did You Know? (Explain)

1. Have students take turns reading this background information.
2. Instruct them to pay special attention to the highlighted vocabulary words
3. Allow for questions about the background.
4. *(Optional:)* In order to confirm that the students are following the subject matter, allow a few minutes for students to fill out the crossword puzzle based on what they’ve learned about the vocabulary words in the reading. Also, the word find can be an extra fun activity.

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Experiment (Explore)

In this experiment, students will burn different types of biomass underneath beakers of water and then measure the change in temperature to determine which form of biomass gives off the most energy.

All items under the “Materials Not Included” list must be obtained by the teacher.

Middle school: At the middle school level, we suggest that this experiment be demonstrated by the teacher as it involves open flames.

High school: We recommend that with intermediate high school level students, they be given the opportunity to do this experiment on their own, but that you talk them through it step by step. At more advanced high school levels, they should be able to follow these instructions with minimal assistance.

Divide students up into groups of 3.

This experiment comes with enough supplies to accommodate 30 groups of 3 students.

Follow as instructed on experiment sheet and answer discussion questions.

1.	Gather Materials and set to the side
2.	Place beaker upside down on flat surface and place aluminum tray on top, letting the tray hang off the edge enough to gain access to the bottom.
3.	Fill test tube with 5 mL H ₂ O and hold it off to the side.
4.	Measure and Record the initial temperature of the H ₂ O in the table on page 3 of the experiment worksheet. Then add 1g of biomass to the aluminum tray.
5.	Use lighter to heat the bottom of the aluminum tray for 20 seconds.
6.	Place flame to biomass until it ignites, then place test tube back in the stand.
7.	Adjust test tube 1” above flame. (Note: if the fire dies before biomass is completely burned, relight as quickly as possible and continue to hold water above flames in order to transfer maximum amount of energy).
8.	Use metal stirring stick to stir sample until contents are consumed by fire. Measure and record final temperature of H ₂ O. Then, weigh and record the final weight of what is left of the biomass.
9.	Repeat steps 1-8 using the pine shavings and the shredded paper, then complete the chart (on activity sheet).

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Addendum Activities

These are just a few ideas for extra activities that might correlate well with this module.

1. The day before the experiment, have students research what makes one form of biomass burn better than another. Then, ask students to bring in an extra source of biomass from home (grass clippings, apple peels, etc.) to burn. Maybe even have a competition to see whose source of biomass changes the temperature of the water the fastest. (Obviously, make sure students aren't trying to burn anything illegal or dangerous).
2. At the end of the experiment, have students graph their results on a bigger sheet of paper, then have a "Graph Gallery" where students hang their graphs around the room and everyone can go around and look at them. Discuss how/ why some student's graphs might look different. (This would be even better if combined with the above activity).
3. Talk with your class about energy released verses energy gained.

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