

Electricity from Biogas

Unit Lesson Plans

Class: Chemistry, Physics and Physical Science

Coverage: Biology, Chemistry, Math, Physics and Engineering.

Unit Outline:

Objectives:

Students will be able to describe how bacteria can use the methane produced as a biogas from wastes to produce electricity.

Students will be able to construct an MFC and change different attributes looking for changes in efficiency of output.

Students will be able to measure the power, voltage and amperage of their cells.

Older students will relate their MFC in the chemistry setting describing the redox reactions taking place.

Students will be able to analyze data and create a chart generated by Excel and put together a report for the overall project.

Day 1: Overview of biomass converted to biogas

Video from ASC of Dr. Gadheshetty electricity from tomatoes.

<https://www.youtube.com/watch?v=dxnV6FAWNLk>

Students will use computers to research and write in their journals a description of tMFC's keeping track of the different new terms and acronyms used.

Day 2 to 4: Go through the Mudwatt kits describing the parts and functions. Have the students assemble some MFC's either using the Mudwatt kits for the younger and allowing the older students to come up with their own plans for homemade cells.

Day 5 to 20: Measure the electricity generated in their cells.

Day 21 through 30: Allow the students to change their setups in order to maximize their electricity generation.

Day 18: Presentations

Each of the students will present their findings to the class.

State Standards covered:

HS-PS3-3 Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

HS-LS1-7 Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.

HS-LS2-4 Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in a ecosystem.

HS-ESS3-4 Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

9-12.G.MG.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost).

9-12.S.IC.6 Evaluate reports based on data.

National Standards covered:

HS-ESS3-4 Earth and Human Activity

Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.*

HS-PS3-3. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.*

The NGSS do not include specific names of chemical reactions and instead focus on conceptual understanding of how chemical reactions occur. This ensures that students have a conceptual understanding that they can apply to any type of chemical reaction. Classes of chemical reactions such as oxidation and reduction, acid and base, or decomposition and synthesis can be used in instruction depending on the context, but instruction should ensure that students have an understanding of the underlying concepts.

Related Terms: redox

Related PEs and Bundles:

MS-PS1-2 Matter and its Interactions

HS-PS1-2 Matter and its Interactions

HS-PS1-4 Matter and its Interactions

HS-PS1-5 Matter and its Interactions

HS-PS1-6 Matter and its Interactions

HS-PS1-7 Matter and its Interactions

MS-PS1 Matter and its Interactions

HS-PS1 Matter and its Interactions

MS.Chemical Reactions

HS.Chemical Reactions

Disciplinary Core Idea:

PS1A: Structure and Properties of Matter

PS1B: Chemical Reactions

Grade:

Middle School (6-8)

High School (9-12)

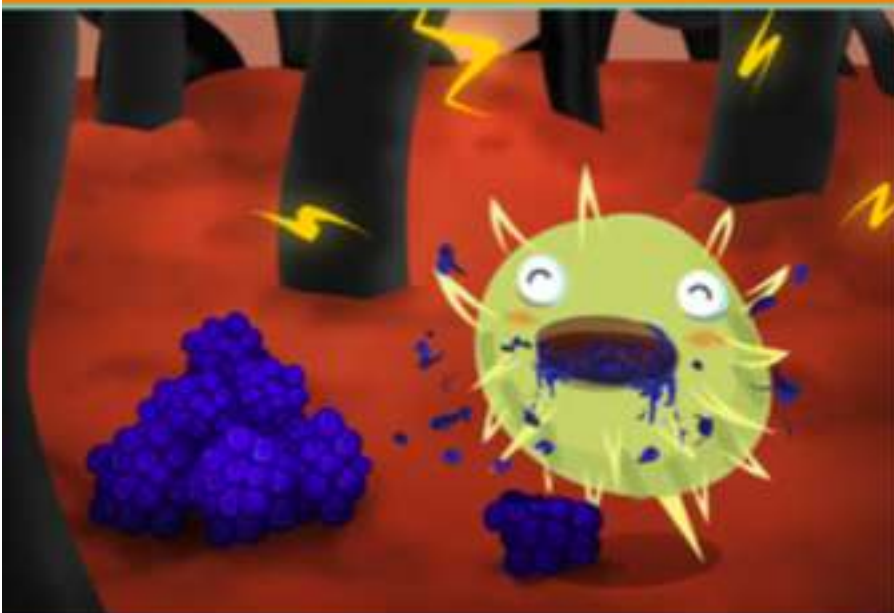
The Physical Science classes will use the Mudwatt MFCs kits along with the included lessons. (Starting Day 2)

The Physics and Chemistry classes will get orientated to the Mudwatt MFCs but will on the mission to innovate their own setups and variables to be tested. (Starting Day 3 or 4)



MudWatt

NGSS TEACHER'S GUIDE



MudWatt

GUIDE TO DISCOVERING MUD POWER!





<https://www.instructables.com/id/Make-a-Microbial-Fuel-Cell-MFC-Part-II/>