

Student sheet: Where's the chemistry?

As leading researchers in the field of alternate fuel chemistry, you and your team have been invited to be guests on the very popular TV show "Where's The Chemistry?" This week's episode will be devoted to the chemistry of alternate energy sources, so you will be competing against other scientists in your field of expertise. As you know, you will be given five minutes to let the audience know the chemistry of your alternate energy source. Since the show airs in two days, you will need to be focused and efficient as you prepare for your debut. Your audience will expect a clear explanation of the chemistry as well as a brief understanding of the potential of this energy source. At the end of the show, the audience will vote for their favorite alternative fuel chemistry team.

Essential question:

- Where is the chemistry in alternate energies?
- Which energy source is most cost effective and readily available?

Product: Students will create a five-minute TV spot that explains the chemistry and its viability as a source of fuel or energy.

Activity:

1. Identify your alternate energy option.
2. Research your fuel (see list of useful websites below) and determine the following.
 - How is it made?
 - Do we have enough resources to produce and distribute this fuel?
 - Show calculations to determine the cost effectiveness of this source?
 - What will it take to make this energy choice a reality?
3. Prepare a list of at least five different references sources used doing your research.
4. Prepare a five-minute segment for the "Where's The Chemistry?" show.
5. Be ready to air your segment live in class on _____.

Useful websites:

Science Daily website: <http://www.sciencedaily.com/news/>

Green Technology: <http://www.greentechnolog.com/>

Alternative Energy Options and appropriate web sites:

- **Nuclear Energy**
 - "Nuclear Power" from the Union of Concerned Scientists: http://www.ucsusa.org/nuclear_power/
- **Solar Energy**
 - "The Solar Bus": <http://www.solarbus.org/solar.shtml>
 - "Chemistry and Solar Power" from ThinkQuest: <http://library.thinkquest.org/17658/sol/solchemht.html>
 - "Reactions in Chemistry: Minidoc Solar Power" from Annenberg Media: http://www.learner.org/channel/workshops/chemistry/workshop3/3_1.html
 - "Solar power can be tapped through chemistry, Nocera says" from MIT News: <http://web.mit.edu/newsoffice/2006/solar-energy.html>

- Solar Energy News from Science Daily:
http://www.sciencedaily.com/news/matter_energy/solar_energy/
- **Hydrogen Fuel Cell**
 - “Crunching the Numbers on Alternative Fuels” from *Popular Mechanics*:
<http://www.popularmechanics.com/science/earth/2690341.html?page=7>
 - “Fuel Cells” from ThinkQuest:
http://library.thinkquest.org/04apr/00215/energy/fuel_cells/fuel_cells.htm
 - “A Boost for Hydrogen Fuel Cell Research” from Science Daily:
<http://www.sciencedaily.com/releases/2007/01/070125122857.htm>
 - “How Fuel Cells Work” from How Stuff Works: <http://www.howstuffworks.com/fuel-cell2.htm#>
 - “Innovative Fuel Cell Project Aimed at Meeting Large Power Needs” from Science Daily:
<http://www.sciencedaily.com/releases/2007/03/070319175943.htm>
 - “Hybrids, Fuel Cells, and EVs” from the Union of Concerned Scientists:
http://www.ucsusa.org/clean_vehicles/technologies_and_fuels/hybrid_fuelcell_and_electric_vehicles/
- **Ethanol from corn**
 - “Crunching the Numbers on Alternative Fuels” from *Popular Mechanics*:
<http://www.popularmechanics.com/science/earth/2690341.html?page=2>
 - “The Future of Ethanol: Looking at the Chemistry”:
http://discovery.kcpc.usyd.edu.au//9.2.3-short/9.2.3_PotentialChemical.html
 - “The Truth About Ethanol” from the Union of Concerned Scientists:
http://www.ucsusa.org/clean_vehicles/technologies_and_fuels/biofuels/the-truth-about-ethanol.html
- **Ethanol from sugar**
 - “The Future for Ethanol: Looking at the Chemistry” from the Key Centre for Polymer Colloids at the University of Sydney: http://discovery.kcpc.usyd.edu.au//9.2.3-short/9.2.3_PotentialChemical.html
- **Ethanol from cellulose (Biofine Process)**
 - “The Future for Ethanol: Looking at the Chemistry” from the Key Centre for Polymer Colloids at the University of Sydney: http://discovery.kcpc.usyd.edu.au//9.2.3-short/9.2.3_PotentialChemical.html
 - “More 1999 Presidential Green Chemistry Awards” in *Green Chemistry*, 1991, G124-G125. **Note:** Click the PDF link for full text.
<http://www.rsc.org/publishing/journals/GC/article.asp?doi=a908573d>
 - “Green chemistry proves it pays: Companies find new ways to show that preventing pollution makes more sense than cleaning up afterward” by Ivan Amato, from CNN Money:
http://money.cnn.com/magazines/fortune/fortune_archive/2000/07/24/284686/index.htm
 - Maine BioProducts:
<http://mainebioproducts.com/default.asp?page=default&topic=Technology>

- “Biorefinery gets ready to deliver the goods: Italian levulinic acid facility is first to make targeted biomass-based chemical feedstocks” by Steve Ritter, from *Chemical & Engineering News*: <http://pubs.acs.org/cen/science/84/8434sci2.html>
- **Biodiesel from algae**
 - “Pond-Powered Biofuels: Turning Algae into America’s New Energy” from *Popular Mechanics*: <http://www.popularmechanics.com/science/earth/4213775.html>
 - “Pond Scum: Fueling our Future?” from Science Daily: <http://www.sciencedaily.com/releases/2007/01/070130090717.htm>
 - “First Algae Biodiesel Plant Goes Online: April 1, 2008” from Gas 2.0: <http://gas2.org/2008/03/29/first-algae-biodiesel-plant-goes-online-april-1-2008/>
- **Ethanol from bacteria**
 - “The Future for Ethanol: Looking at the Chemistry” from the Key Centre for Polymer Colloids at the University of Sydney: http://discovery.kcpc.usyd.edu.au//9.2.3-short/9.2.3_PotentialChemical.html
- **Electric hybrid**
 - “Crunching the Numbers on Alternative Fuels” from *Popular Mechanics*: <http://www.popularmechanics.com/science/earth/2690341.html?page=6>
 - “Plug-in Hybrid Cars and Electric Cars: A Summary” from Chemistry for a Sustainable World: <http://greenchemistry.wordpress.com/2008/04/01/plug-in-hybrid-cars-and-electric-cars-a-summary/>
 - “Hybrid Battery Chemistry” from AutoFixWorld: http://www.autofixworld.com/index.php?option=com_content&task=view&id=150&Itemid=42
 - “Batteries of the Future II: Building Better Batteries Through Advanced Diagnostics” from Science @ Berkeley Lab: <http://www.lbl.gov/Science-Articles/Archive/sabl/2007/Feb/future-batteries-II.html>

Grading rubric:

	4	3	2	1
How is it made?	Clearly explains how energy is derived from this source. Includes the chemistry of the energy source.	Explains how energy is derived from this source, but doesn't show all chemistry involved.	Vague explanation with little chemistry.	Does not address the chemistry involved in this energy source.
Resources available to produce and distribute this fuel	Clearly explains resources required to produce and distribute this fuel.	Explains the resources needed, but lacks some detail.	Vague explanation of the required resources.	No explanation of required resources.
Cost effectiveness	Clearly and quantitatively shows the cost effectiveness of the energy choice.	Some quantitative explanation of cost effectiveness.	Vague explanation of cost effectiveness.	Cost effectiveness is not addressed.
What will it take to make this energy choice a reality?	Clearly and accurately explains obstacles that must be overcome.	Accurately states obstacles, but not clearly explained.	Obstacles mentioned are semi-accurate and poorly explained.	Obstacles are not addressed.
Audience appeal	The presentation was convincing and engaging.	The presentation was engaging, but not necessarily convincing.	The presentation was somewhat engaging and convincing.	The presentation was not engaging or convincing.
References	5 sources neatly typed in MLA format.	4 sources neatly typed in MLA format or 5 sources not typed or not in MLA format.	3 sources neatly typed in MLA format.	Fewer than 3 sources.