

ARE HOUSEHOLD CHEMICALS EARTH-FRIENDLY?

Performance Standards 12E/12C/11A.H

Students will apply the processes of scientific inquiry to explore the chemical and physical characteristics, including biodegradability, of various household chemicals.

- *Knowledge:* understand household chemicals from the context of their chemical concepts and relationships to the environment.
- *Application:* research specific examples of household chemicals to compare their ‘earth-friendliness.’
- *Communication:* compare findings of research on household chemicals for common and unique factors and personal or group preferences.

Procedures

1. ***In order to know and apply concepts that explain the composition and structure of the universe and Earth’s place in it (12E); concepts that describe properties of matter and energy and the interactions between them (12C); and the concepts, principles and processes of scientific inquiry (11A),*** students should experience sufficient learning opportunities to develop the following:

- Generate inquiry questions about the ‘earth-friendliness’ of various chemicals commonly found or used in home settings.
- Distinguish between qualitative and quantitative data fields about these chemicals and the applicability to determining ‘earth-friendliness.’
- Preview existing research about the chemical composition of common household chemicals and how they affect the environment.
- Design an issue investigation focusing on household chemicals and their impact on the environment.
- Collect, record and analyze data about the impact of these chemicals.
- Report findings for group discussion to compare common and unique factors and personal or group consumer preferences.
- Generate further questions about how chemicals affect the environment and how consumers can make more informed choices about their purchase and use.

Note to teacher: This assessment is adapted from two lesson plans from Texas Natural Resource Conservation Commission (TNRCC) Office of Pollution Prevention and Recycling. The lessons are “Environmental Impact of Household Chemicals” by Peggy Matthews and “Are You Living in a Toxic Waste Dump?” by Sandy Cherniss. This assessment addresses the National Family and Consumer Sciences Standard #5.0 (Facilities Management and Maintenance/Apply hazardous materials and waste management procedures – 5.4). This assessment could be used to address the Family, Career and Community Leaders of America (FCCLA) Community Service project (recycling projects, waste management education and hazardous materials education) and the Illustrated Talk STAR Event.

2. Have students review and discuss the assessment task and how the rubric will be used to evaluate their work.
3. Begin this activity with brainstorming about chemicals and where they are. Direct discussion to the variety of chemicals used as household cleansers or common cleaning processes. Pose questions about how consumers choose, use and dispose of cleaning products. Ask students about any recent news items about chemicals and their earth-friendliness, as noted in marketing labels, etc. Students could bring up questions about what ‘earth-friendly’ means and how could it be measured or questions about warning labels on different products. They may have also heard of examples of substitutions of more natural chemical combinations for commercial preparations such as baking soda. This activity is designed to help students become more informed consumers, based on factors important at the personal and public levels. The following activity will require students (individually or in groups) to research particular common chemicals/products, determine the earth-friendliness of that chemical/product and report their findings for further discussion. If necessary, narrow down the category (or categories) of chemicals or products to be considered. Such categories could be cleaning products for interior or exterior use, etc. As a class, they will also need to determine class criteria for judging earth-friendliness for these chemicals. (Narrow to three or four criteria, initially.) They could suggest safety to humans, plants or the environment in general (but they will realize that the terminology needs to be fairly specific). The issue of safety in its actual use or its storage and disposal could be considered. For instance, if the product is rinsed down water drains, could there be a problem as it is diluted or decomposes? If the product

is 'thrown away,' how well does it decompose in a landfill; how long does it take; etc. They may consider cost, shelf life or effectiveness (which would need further discussion and definitions). For each criterion, they will need to create a 'rubric' to quantify their judgments. They could consider finding natural alternatives for their chemical/product. They could compare warning labels found on the products themselves. They could contact the Customer Hot-lines listed on most products to get answers to some of their questions. Determine the questions that all 'researchers' will ask about their products and create a class reporting form. After sufficient time (2-3 days), student should report their findings (3-4 minutes per product may be sufficient) about their chemicals and rate their products as earth-friendly, based on their research. Class discussion should continue to determine additional questions that consumers could ask about the purchase, use or disposal of the common chemicals chosen. Students should submit a listing of questions that an earth-friendly consumer should ask when purchasing household chemicals or chemical products.

4. Evaluate each student's work using the Science Rubric as follows, and add the scores to determine the performance level:
 - *Knowledge*: Accurate terminology about the chemical concepts and environmental relationships associated with cleaning products is correct and thorough.
 - *Application*: Individual or group research about assigned product is thorough, and the evaluating rubric is clear and complete.
 - *Communication*: The research findings are presented clearly for group discussion, and the individual consumer questions are clear and insightful.

Examples of Student Work

- [Meets](#)
- [Exceeds](#)

Time Requirements

- One class period to set the stage for choices and criteria and ensuing research
- Two days for product evaluation and research
- One-to-two days for class presentations and discussions

Resources

- Access to variety of household cleaning products
- Access to internet or Consumer Hotlines, etc.
- Science Rubric

SCIENCE RUBRIC

Exceeds - must receive no more than one 3 and the rest 4s in the other areas of the rubric.

Meets - may receive no more than one 2 and a combination of 3s and 4s in the other areas of the rubric.

Approaches - may receive no more than one 1 and a combination of 2s, 3s or 4s, in the other areas of the rubric.

Begins - must receive at least a 1 in all 3 areas of the rubric.

	KNOWLEDGE	APPLICATION	COMMUNICATION
	Knows and understands scientific terms, facts, concepts, principles, theories and methods.	Applies scientific knowledge, skills and methods to manipulate, analyze, synthesize, create and evaluate.	Communicates scientific knowledge and applications through writing, speech and visual displays.
4	<ul style="list-style-type: none"> • Descriptions of scientific terms, facts, concepts, principles, theories and methods are complete and correct. 	<ul style="list-style-type: none"> • Applications are thorough, appropriate and accurate. 	<ul style="list-style-type: none"> • Written, oral and/or visual communication is well organized and effective.
3	<ul style="list-style-type: none"> • Descriptions of scientific terms, facts, concepts, principles, theories and methods are mostly complete and correct. 	<ul style="list-style-type: none"> • Applications are mostly thorough, appropriate and accurate. 	<ul style="list-style-type: none"> • Most of the written, oral and/or visual communication is well organized and effective.
2	<ul style="list-style-type: none"> • Descriptions of scientific terms, facts, concepts, principles, theories and methods are somewhat complete and correct. 	<ul style="list-style-type: none"> • Applications are somewhat appropriate and accurate. 	<ul style="list-style-type: none"> • Some of the written, oral and/or visual communication is organized and effective.
1	<ul style="list-style-type: none"> • Descriptions of scientific terms, facts, concepts, principles, theories and methods are minimally present or correct. 	<ul style="list-style-type: none"> • Applications are minimally appropriate and accurate. 	<ul style="list-style-type: none"> • Little of the written, oral and/or visual communication is organized and effective.
0	<ul style="list-style-type: none"> • All descriptions of scientific terms, facts, concepts, principles, theories and methods are missing and/or incorrect. 	<ul style="list-style-type: none"> • All applications are missing and/or incorrect. 	<ul style="list-style-type: none"> • All of the written, oral or visual communication is missing and/or lacks organization.
Score			