



ESA21

Environmental Science Activities for the 21st Century

Resources/Waste: Home Chemicals

Introduction

Chemical Connections

Chemicals are everywhere, in the air you breathe, in the food you eat, and in the chair you're sitting on. Moreover, you're mostly chemicals. Ninety nine percent of the human body is composed of just six chemical elements: oxygen, carbon, hydrogen, nitrogen, calcium, and phosphorus. After you die, you'll decompose into hydrogen, nitrogen, water, ammonia, carbon dioxide, phosphoric acid, and sulfuric acid. So, from chemicals we come and to chemicals we go.

The image shows a standard periodic table of elements with a blue background. The title "Periodic Table of Elements" is at the top. The table is color-coded by groups: IA (red), IIA (orange), IIIA (yellow), IVA (green), VA (light green), VIA (light blue), VIIA (blue), and VIII (purple). The lanthanide and actinide series are shown at the bottom. The table includes element symbols and atomic numbers.

Fig. 1: Periodic Table (NASA)

Chemical elements are substances that contain one kind of atom and cannot be separated into simpler substances. There are 116 known chemical elements, of which 91 occur naturally. The other 25 are man-made. These elements are listed in the periodic table. Go to <https://iupac.org/what-we-do/periodic-table-of-elements/>. Many of these elements will be familiar to you.

Chemical compounds are formed by the combination of two or more elements. The one you're probably most familiar with is H_2O , two parts hydrogen and one part oxygen, also known as water. Other common compounds include sodium chloride ($NaCl$) or salt, and glucose ($C_6H_{12}O_6$) or sugar. Chemicals are used in a wide range of industrial and commercial applications including plastics, adhesives, absorbents, fertilizers, detergents,

dyes, explosives, oils, inks, lubricants, metals, paper, insecticides, pharmaceuticals, solvents, waxes, photography, food additives and on and on. So, you see, chemicals are everywhere.

There are several ways to classify chemicals. Organic chemicals are those chemicals that contain the element carbon, C. Organic chemicals can be broken down by micro-organisms and reactions with other chemicals, as well as photo-chemically by ultraviolet or visible light. The rate at which a chemical degrades is expressed as half-life, the amount of time it takes for half of the chemical to be converted into some other chemical or element. Generally, organic chemicals biodegrade or decompose more rapidly than inorganic chemicals, which do not contain carbon. Inorganic chemicals include salt, asbestos, and silicates as well as minerals such as iron, aluminum, and phosphorus, among others.

Chemicals can also be either natural or synthetic. Natural chemicals are those which are found occurring in the environment which are not introduced by humans. Synthetic chemicals are those which are developed by humans and do not exist in nature. It might be easy to assume that natural, organic chemicals are less harmful to humans. This is not the case as many poisons come from plants and animals.

Chemicals in Your Home

This exercise involves conducting an inventory of the types of chemicals in your home. As this is a multi-part exercise, it might be wise to save the exercise to disk or your hard drive and then use the saved file for completing your answer. This way you won't lose any of the work you've completed if your machine freezes or crashes.

Activity – Household Chemical Inventory and Assessment

Identify one product that you use for each of the categories on the Activity Sheet. If you do not use a particular category of product, simply enter the phrase "do not use" and explain why. For example, if you do not use pet care products, enter "do not use" in the "Product Name" column and "do not have a pet" in the "What the Warning Says" column.

For each product indicate the following:

1. The product name
2. What the product does, also known as the product "service"
3. Whether there is some type of warning about using the product.
4. What the warning says.

Answer questions 1 & 2 on the Activity Sheet when you have completed the inventory.

After doing this, select three products from your household product list which you think may be "hazardous" based on the warnings listed on the products. The U.S. Environmental Protection Agency defines hazardous as any material that is ignitable, corrosive, explosive, or toxic to humans, plants or animals. List the three products on the Activity Sheet.

The [Consumer Product Information Database](#) maintains contains a wide variety of information on over 5,000 consumer products. Information contained in the data base includes the chemical ingredients, the manufacturer and contact information, as well as any possible acute and chronic effects associated with the chemicals that make up the products.

Go to the site to look up information about your chosen products. In the Quick Search box look up the first potentially hazardous product you have listed. Scroll down the page and view safety information about the product, clicking on the Safety Data Sheet (SDS) button for additional information, if needed. Follow the directions on the remainder of the Activity Sheet and answer the questions.

References

<http://chemistry.about.com/cs/5/f/blpoison.htm>
<http://jama.ama-assn.org/cgi/content/full/285/8/1059>
[http://dl.clackamas.cc.or.us/ch104-10/\(1\).htm](http://dl.clackamas.cc.or.us/ch104-10/(1).htm)
<http://www.cleaningpro.com/toxic.cfm>
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<http://www.healthychildrenproject.org/exposures/chemicals.html>
<http://www.safe2use.com/ca-ipm/01-11-14a.htm>
<http://www.scorecard.org/>
<http://www.chennaionline.com/science/Environment/harm.asp>
<http://www.worldwildlife.org/toxics/basic.cfm>
http://www.wwf.pl/0406281352_newsens.php
<http://chemistry.about.com/cs/5/f/blpoison.htm>
<http://www.mamashealth.com/doc/cleanprod.asp>
<http://www.touregypt.net/chemicals.htm>
<http://es.epa.gov/techinfo/facts/safe-fs.html>
<http://www.chemicalindustryarchives.org/factfiction/testing.asp>
<http://www.scorecard.org/chemical-profiles/def/hpv.html>

ESA21: Environmental Science Activities

Activity Sheet
Home Chemicals

Name:

Product Category	Product Name	What Product Does	Warning (yes/no)	What the Warning Says
Auto Products				
Pesticides				
Personal Care				
Arts & Crafts				
Inside the Home				
Landscape & Yard				
Home Maintenance				
Pet Care				

1. Was this inventory difficult to complete? Why or why not?
2. Are you surprised by the results of the inventory? If so, in what way?

Potentially Hazardous Products

1.	2.	3.
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MSDS

1. In general, what does the Safety Data Sheet (SDS) describe?
2. Does the SDS provide any health effects or first aid information?
3. Who do you think is the primary audience for the SDS?
4. Are SDS relevant to consumers?

Scroll down the site until you see the HMIS Rating information (rollover the title for a description of the rating system).

5. What does HMIS mean?
6. What kind of information does the HMIS convey?
7. What are the three types of hazard information provided by the HMIS?
8. What is the scale that is used to communicate the level of severity for acute exposures and what does each rating mean?

For the first of your three chosen products, answer the following questions:

12. What is the health rating for your product?
13. What does that rating mean?
14. What is the flammability rating for your product?
15. What does that rating mean?
16. What is the reactivity rating for your product?
17. What does that rating mean?

Now scroll until you come to the section marked acute health effects and chronic health effects. Answer the following questions:

18. What does the site say about any acute health effects from the product?
19. What does the site say about any chronic health effects from the product?
20. Do you know the difference between an acute and chronic health effect? If so, what is it?
21. Based on your research/analysis, how hazardous is the product?

Research your other two products. If a product you selected is not listed, pick another product from your original list of eight. At the conclusion of this step in the exercise, you should have looked up and found results for all three products.

22. Rank order your three products based on your assessment of how hazardous they are and list below from most to least hazardous.

Hazardous Ranking

1.
2.
3.

23. Explain your answer. Why did you choose the ranking that you did?

24. How comprehensive do you feel the information provided by the website is regarding the hazardous nature of household products?