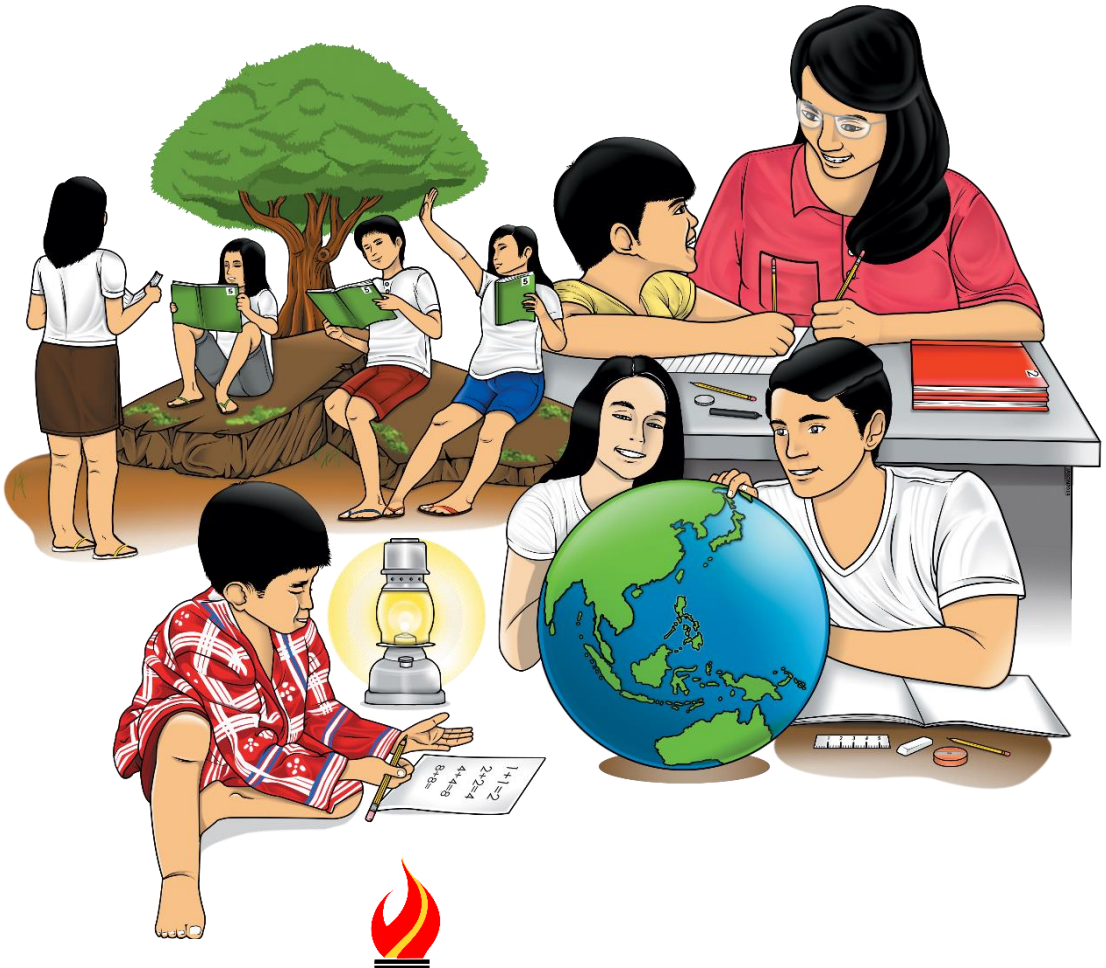
Senior High School

DepED
DEPARTMENT OF EDUCATION

Physical Science

Quarter 1 – Module 12:
Active Ingredient(s) of Cleaning Products Used at Home



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Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

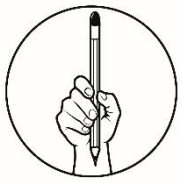
Thank you.

What I Need to Know

This module was designed and written with you in mind. It is here to help you master the active ingredients of cleaning products used at home. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

Knowledge of chemicals used on the different household cleaning products is very important. On this module, it focuses on the identification of the active ingredient(s) of cleaning products used at home.

After going through this module, you are expected to identify the active ingredient(s) of cleaning products at home.



What I Know

Pre-test. Write the chosen letter on a separate sheet of paper.

1.This is the type of cleaning products which many of the ingredients can be manufactured from plants.

A. astringent
B. bleaches
C. detergent products
D. dishwashing liquid

2. Most of the cleaning materials have active ingredients but different materials, what bleaching agent contains active ingredient that can remove stains?

A. chlorine
B. magnesium
C. potassium
D. sulfur

3. This cleaning product provides the chemical energy to help clean and remove food soil from different types of cooking and serving items.
   A. astringent
   B. bleaches
   C. detergent products
   D. dishwashing liquid
4. A cleaning agent that helps to disinfect and sanitize the materials and furniture in our home.
   A. astringent
   B. bleaches
   C. detergent products
   D. dishwashing liquid
5. To keep us healthy, the main function of this item is to prevent the spread of infectious diseases and control allergens.
   A. cleaning product
   B. cooking utensils
   C. electrical appliances
   D. vehicles
6. What kind of household cleaning product that is used for cleaning dishes, plastics, and many other surfaces?
   A. astringent
   B. bleaches
   C. detergent products
   D. dishwashing liquid
7. Sodium hydroxide and _____ are the most commonly used alkali in soap and detergents.
   A. calcium hydroxide
   B. carbon hydroxide
   C. magnesium hydroxide
   D. potassium hydroxide
8. A kind of cleaning material that that is used for hand washing of glasses, plate, cutlery, and cooking utensils in a sink or bowl.
   A. astringent
   B. dishwashing liquid
   C. bleach
   D. detergent products
9. Mixing chlorine bleach with ammonia or vinegar can release what kind of poisonous gas?
   A. carbon
   B. chlorine
   C. potassium
   D. sodium

10.This is a reducing bleach that works by changing the double bonds of a chromosphere into single bonds.

A. increasing bleach
B. non-oxidizing bleach
C. oxidizing bleach
D. reducing bleach

11.Cleaning your home is very important. It includes scrubbing, removing of dust, grease, and _____.

A. clothes
B. furniture
C. food waste
D. shoes

12.In using cleaning products, one must remember some precautionary measures. Choose the best answer.

A. Read the instructions carefully before using the product.
B. Wear appropriate protective equipment when using the product.
C. A and B only.
D. B only

13.Active ingredient in a cleaning product is the strong mineral acid and chalant. Which of the following is not a mineral acid?

A. hydrochloric acid
B. nitric acid
C. sulphuric acid
D. carbonic acid

14. In order to attain a better and healthy living, one must practice proper hygiene and one of it is the handwashing. What will you use to perform a good handwashing?

A. detergent
B. dishwashing liquid
C. bacterial soap
D. wax

15.In order to prevent any harm in using the cleaning products at home, one must:

A. Buy one product only.
B. Read carefully the product information.
C. Patronize the most popular name of a product.
D. Check the cheapest product available in the market.

Lesson 1 Active Ingredient(s) of Cleaning Materials Used at Home

Home is our haven especially when we are so tired in our whole day work in school or office. In this time of pandemic, the cleanliness of our home is very important. Good housekeeping requires high standard of cleanliness or the absence of dirt and its sanitation as well, or the absence of disease-causing organisms like bacteria. All housekeeping tasks need the use of the right tool for the right job.

No single product can provide optimum performance on all surfaces and all soils. It is not surprising that many different household cleaners are available in the market. They are formulated to clean efficiently and conveniently in many different situations found at home.

What's In

Activity 1.1

Chemical reaction occurs when there is enough energy between reactants and creates products. The reaction can increase or decrease temperature which is one of the reasons that cleaning household products can burn skin or cause irritation.

1. What are the things you already know about the following concepts?
2. In what way will the following concepts be useful in understanding how chemical household cleaning products works effectively. Give a possible explanation.

a. Energy

b. Chemical reactions

Let us see how these concepts occur in our lesson.

Note: Be careful on handling household cleaning products.

Notes to the Teacher

Let the learner look for the cleaning products available in their home that will be used in the activity. Instruct the learner to be very careful in handling the household cleaning products.

What's New

Activity 1.2 Fruity Agents

Direction: Aside from being our food, give the other use of these fruits/vegetables. Explain why these fruits/vegetables could be useful as cleaning materials or agents.

"Fruits/ Vegetables as Cleaning Agents"

Fruits/vegetables	Use
1. calamansi	
2.lemons	
3. papaya	
4. tomatoes	
5. potatoes	

What is It

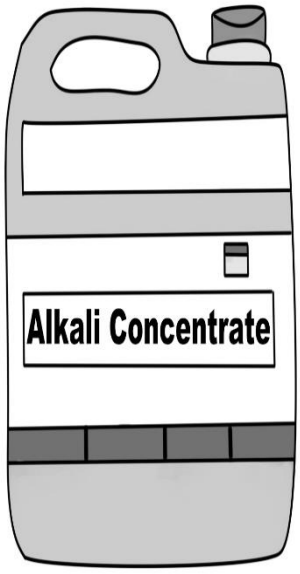
Active Ingredients of Cleaning Products Used at Home

There are lots of cleaning products we use daily in our home, office, or school. These cleaning products play an important vital role in order to make our home spick and span. They also help in safely and effectively removing dirt, germs and other contaminants. They can also prevent the spread of infectious diseases and control allergens, such as dust and mold, in order to keep us healthy. Cleaning products also enable us to care for our homes and possessions.

There are different kinds of cleaning products. These are laundry detergents, bleaches, dishwashing products and other household cleaners. Active ingredients are found in different household cleaning products. They may give different side effects to human. They can give either positive or negative side effects to us. So before using these cleaning materials be sure to read first the instructions. Don't forget to follow all precautionary and safety measures before using them. Here are some of the active ingredients found in different cleaning materials we use at home.

1. Alcohol Ethoxylate (AE)

Alcohol ethoxylates are a class of compounds that are commonly used throughout many industrial practices and commercial markets. These compounds are synthesized via the reaction of a fatty alcohol and ethylene oxide, resulting in a molecule that consists of two main components, (1) the oleophilic, carbon-rich, fatty alcohol and (2) the hydrophilic, polyoxymethylene chain.



Alcohol ethoxylate surfactants enhance the mixing and solubilization of oil and water by having these contrasting sections within the same compound. With this unique structure, a single molecule can inhabit the interface of two immiscible phases (i.e. oil and water), effectively bringing them closer together and lowering the interfacial energy associated between them.

Because these compounds are surfactants, they can be used whenever oily substances encounter water or a surface. It can be used as detergents, wetting agents, emulsifiers, degreasers and emollients in many lines of commercially available products and industrial practices.

2. Sodium Alkyl Sulfates

Sodium alkyl sulfate are members of alkyl sulfates. They are water-soluble and can form soap bubbles. The chemical formula is $C_nH_{2n+1}OSO_2ONa$.

It can be used in detergents, dish washing liquids, shower gels, shampoos, hair conditioners and fabric softeners. It can also be used as fire extinguishing agent, because it is not flammable. In the cosmetic industry it is used as an emulsifier to mix oily and water-soluble compounds for toothpaste or moisturizing products.
It can produce irritating vapors when heated, consisting of carbon dioxide, carbon monoxide, sulfur dioxide and others. As all detergents it can irritate skin and eyes. If swallowed, it will cause nausea or vomiting.

3. Amine Oxide
An amine oxide, also known as amine-N-oxide and N-oxide, is a chemical compound that contains the functional group R3N+–O−, an N–O bond with three additional hydrogen and/or hydrocarbon side chains attached to Long-chain alkyl amine oxides are used as nonionic surfactants and foam stabilizers.

Amine oxides are highly polar molecules and have a polarity close to that of quaternary ammonium salts. Small amine oxides are very hydrophilic and have an excellent water solubility and a very poor solubility in most organic solvents.

4. Ammonia
Ammonia is a colorless, *soluble alkali gas* that occurs naturally in the environment. It is a chemical containing *one nitrogen and three hydrogen* atoms bonded together. It was traditionally used in many household cleaners, though today it's still found in glass cleaner, all-purpose cleaners, and smelling salts. When used in cleaning compounds, it's called *"household ammonia."*

Ammonia fumes are powerful irritant, potentially harming your skin, eyes, nose, lungs and throat. When found in oven cleaners and window cleaning formulations, it is an irritant to the mucous membranes. When working with ammonia, wearing heavy-duty gloves, goggles, and a face mask are smart precautions to protect your health.

5. Sodium hypochlorite
Sodium hypochlorite also known as bleach is another *alkali disinfectant*. Bleach works by oxidizing or breaking down the molecular bonds of stains and germs.

Another useful but dangerous cleaner it also has strong corrosive properties that may do serious damage to the human body. Ammonia and bleach are a particularly dangerous combination, creating potentially deadly gases when mixed. Never store these two chemicals in the same place.

Bleach in the bottle is generally a five percent solution. Toxic chlorine gas can be formed if bleach is mixed with acids, such as bowl cleaners.

6. Ethanol
Ethanol is a natural byproduct of plant fermentation and can be produced through the hydration of ethylene. It mixes easily with water and many organic compounds, and makes an effective solvent for use in paints, lacquers and varnish, as well as personal care and household cleaning products.

Ethanol is highly flammable and should not be used near open flames. Ethanol inhalation can cause coughing or headaches.

7. Phenol

Phenol, any of a family of organic compounds characterized by a hydroxyl (—OH) group attached to a carbon atom that is part of an aromatic ring. Besides serving as the generic name for the entire family, the term *phenol* is also the specific name for its simplest member, monohydroxybenzene (C_6H_5OH), also known as benzenol, or carbolic acid.

Phenols are similar to alcohols but form stronger hydrogen bonds. They are more soluble in water than are alcohols and have higher boiling points. Phenols occur either as colorless liquids or white solids at room temperature and may be highly toxic and caustic.

Phenols are widely used in household products and as intermediates for industrial synthesis. For example, phenol itself is used (in low concentrations) as a disinfectant in household cleaners and in mouthwash. Phenol may have been the first surgical antiseptic. In 1865 the British surgeon *Joseph Lister* used phenol as an antiseptic to sterilize his operating field.

8. Quaternary ammonium

The quaternary ammonium compounds (or quats) are a family of low-level disinfectants (according to Spaulding) with most quats being derived from benzalkonium. Quats are reacted to provide a variety of chain lengths and molecular structures so that the mix of quats used in the disinfectant provide a wider range of efficacy than a single chain.

Quats are generally used to disinfect countertops, toilets and other high touch environmental surfaces and floors. Quaternary ammonium compounds are cationic disinfectants. This means the quats chain carries a positive (plus) charge on one end of the molecule; many soils and soaps/detergents carry an anionic or negative (minus) charge.

Quats can also bind with, or be absorbed by, materials and fibers including cotton (e.g., cleaning rags and mops). Quats generally take 3-10 minutes to disinfect and should be used with cleaning tools that are tested to be compatible.

9. Sodium percarbonate.

Sodium percarbonate is a powder that releases hydrogen peroxide, and very concentrated. It is a granulated powder which can be nice for scrubbing stains and stuck-on-gunk off dishes. Scouring powder is made from hydrogen peroxide. It can be made into a paste, too, and used on tile grout and tough stains.

In using this product, follow and read the instructions carefully. Be very careful in handling all household cleaning products.

What's More

Activity 1.3 Product Exploration

Direction:
With your cleaning products available at hand, read the product information on the packaging. Fill out what is ask on the table below using the product information. During the activity, observe the products with caution, particularly in smelling and touching as they may have harmful effects upon contact. Write your answer on a separate sheet.

Product	Product Description	Active/Major Ingredient	Guidelines in using the product	Precautions in using the product
Bleach (DO NOT TOUCH with BARE HANDS)				
Detergent soap				
Dishwashing liquid				
Toilet bowl cleaner (DO NOT TEACH with BARE HANDS)				

After filling up the table, check the common active ingredients present in all cleaning products.

What I Have Learned

Activity 1.4 Product Discovery

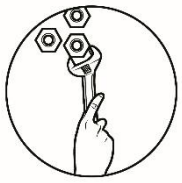
Direction:

1.With the following ingredients, specify their use as household cleaning materials.
   a. garlic
   b. onion
   c. salt
   d. vinegar
2. What properties they possessed to be considered as cleaning products.

"Ingredients as Household Cleaning Products"

Ingredients	Uses	Properties
garlic		
onion		
salt		
vinegar		

3. Explain why these are useful not only as ingredients but also as household cleaning products.
4. Take all the necessary care in doing the activity.
5. Wear necessary gears in performing the activity.
6. Write your output in a separate sheet of paper.



What I Can Do

Activity 1.5

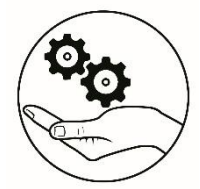
Direction:

1.What are the alternative natural materials can be used in cleaning the following:
   a. food stain on clothes
   b. kitchen sink
   c. bad smell/odor inside refrigerator
2. Give your opinion why these alternative materials can be used as household cleaning material.
3. Write your answer on a separate sheet of paper.

Assessment

Modified True or False. Read each statement carefully. Write **True** if the statement Direction: Write T if statement is *true* and F if the statement is *false* and choose the word or set of words that make it incorrect. Write your answers on a separate sheet of paper.

1.Sodium percarbonate is a granulated powder that can be used in scrubbing stains.
2. Alcohol Ethoxylate are being synthesized through the reaction of a fatty alcohol and ethylene oxide.
3. Quaternary ammonium are compounds that belong to the family of high-level disinfectants.
4. Sodium alkyl sulfate are water-soluble sulfates that can form soap bubbles.
5. Phenols form stronger hydrogen bonds and more soluble in water than alcohols.
6. Small amine oxides are very hydrophilic and have an excellent water solubility.
7. Bleach is the other name for sodium hypochlorite.
8. Alcohol ethoxylate is an alkyl sulfate that enhances the mixing and solubilization of oil and water.
9. Quat is a powder that releases hydrogen peroxide which can be used for scrubbing stains.
10. Ethanol is a byproduct of plant fermentation and produced through the hydration of ethylene.
11. All cleaning agents can irritate skin and eyes and can cause nausea or vomiting if swallowed.
12. Ethanol is non-flammable, but inhalation can cause coughing or headaches.
13. Ammonia is a soluble alkali gas which contains one nitrogen and three hydrogen atoms bonded together.
14. Ethoxylate surfactants enhance the mixing and solubilization of oil and water.
15. Ammonia fumes are powerful irritants that can cause harm to your skin, eyes, nose, lungs and throat.



Additional Activities

Activity 1.6

Direction:

Compose a jingle related to the topic active ingredients of cleaning agents. Write your output in a separate sheet of paper.

Rubrics

Criteria	Excellent (4pts)	Merit (3pts)	Achieved (2pts)	Needs Improvement (1pt)	Score
Content	Information are clearly presented and ordered in such a way that it brings a full picture of the material	Information are clearly presented and ordered	Information is clear Order of information does not clearly show	Information is unclear and written in random order	
Creativity	It is visually inviting and easy to read	Visually inviting and easy to read	Visually pleasing and readable	Readable	
Spelling and Grammar	All spelling and grammar are correct	Some spelling and grammar error	Some spelling and grammar error	Notable spelling and grammar error	
Punctuality	Submitted on time	Submitted on time	Submitted on time	Submitted after the deadline	
				TOTAL	

Highest possible score: (4x4)/4= 4 components

Answer Key

What I Know

1. C
2. A
3. D
4. C
5. A
6. D
7. D
8. B
9. B
10. D
11. C
12. C
13. D
14. C
15. D

What I Can Do

Answers may vary depending on the insight of the learner.

Assessment

1. T
2. T
3. F- low
4. T
5. T
6. T
7. T
8. F-alkyl sulfate
9. F- Quat
10. T
11. T
12. F- non-flammable
13. T
14. T
15. T

What's In

Use:

Calamansi- bleach, removes stain and odor

Lemon- antiseptic; natural bleach; removes odor

Papaya- stain remover

Tomatoes- clean metal

Potato- removes rust

Answers may vary.

What's New

Answers may vary depending on the available fruits and vegetables.

What's More

Answers may vary depending on the available cleaning products.

What I Have Learned

Use:

Garlic- disinfectant, cleaning tops

Onion- removes rust

Salt- scouring agent

Vinegar- disinfectant, removes dirt and grease

Properties:

Garlic- allicin

Onion- Sulphasillic acid

Salt- ionic in nature

Vinegar- acetic acid

Additional Activities

Answer may vary depending on the available cleaning products

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