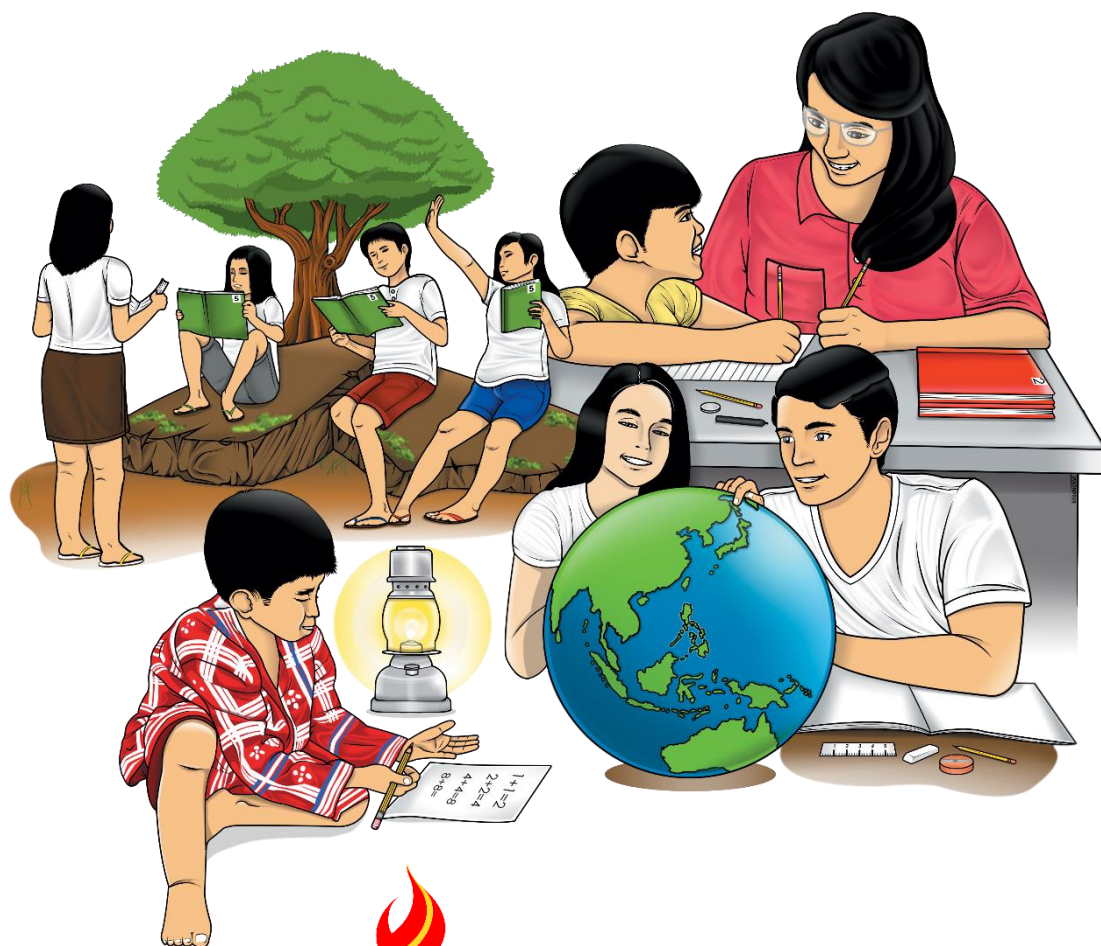


Science

Quarter 2- Matter

Module 6: Organic Compounds



ALTERNATIVE DELIVERY MODE
ADM

Science – Grade 9
Alternative Delivery Mode
Quarter 2: Matter - Module 6: Organic Compounds
First Edition, 2020

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Published by the Department of Education
Secretary: Leonor Magtolis Briones
Undersecretary: Diosdado M. San Antonio

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Printed in the Philippines by _____

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Science
Quarter 2- Matter
Module 6: Organic Compounds

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

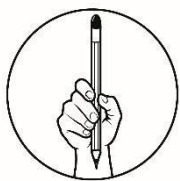
This module was designed and written with you in mind. It is here to help you master Organic Compounds. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard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

The module focuses on achieving this learning competency:

Recognize the general classes and uses of organic compounds (S9MT-IIh-18)

After going through this module, you are expected to:

- differentiate molecular, empirical, and structural (expanded and condensed) formulas;
- differentiate alkanes, alkenes and alkynes based on the presence of bonds and their physical properties;
- name different structures of hydrocarbons (alkanes, alkenes, alkynes, alcohol, aldehydes, ester, carboxylic acid, ether, amines, amides, etc.); and,
- identify different functional groups and their uses in organic compounds.



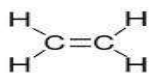
What I Know

Choose the letter of the best answer. Write your answer on a separate sheet of paper.

1. Which hydrocarbon compound incorporates a triple bond within the molecule?

A. Ethene
B. Ethyne
C. Methane
D. Octane

2. To which group of hydrocarbon does the given structured molecules belong?



A. Alkane
B. Alkene
C. Alkyne
D. None of the above.

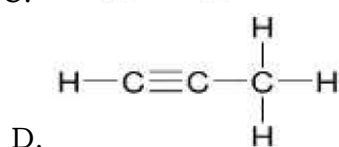
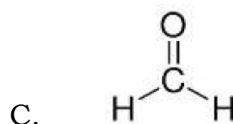
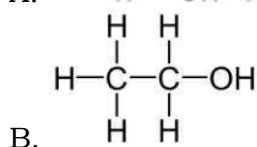
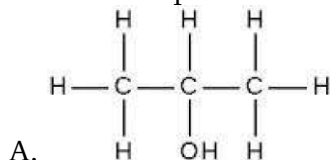
3. Ethene is a gas produced in plants that acts as a natural ripening agent of fruits. Which organic compound has the identical ability to ripen fruits like ethene?

A. Acetylene
B. Butane
C. Pentyne
D. Propene

4. What is the molecular formula of methane?

A. CH_4
B. CH_3CH_3
C. $\text{H}_2\text{C} = \text{CH}_2$
D. $\text{CH}_3\text{CH}_2\text{CH}_3$

5. Which is an expanded structural formula of an alcohol?



6. Which of the following statements best describe organic compounds?
- A. Organic compounds are compounds that contain carbon and oxygen only.
 - B. Organic compounds are compounds that are produced by living things
 - C. Organic compounds are composed mainly of carbon and hydrogen
 - D. Organic compounds are compounds that contain carbon atoms only
7. How do carbon atoms form many organic compounds?
- A. By attracting other elements toward themselves to form the bonds
 - B. By forming many bonds with other carbon atoms and other elements
 - C. By sharing their electrons with other metal and non-metal elements
 - D. By transferring their electrons to the atoms of surrounding elements
8. Mang Lowel, a fisher man, went home with some of his catch and told his son to cook the fish. But his son said, "Father the stove ran out of fuel already". Then his father told him to buy some so that they could start cooking the fish. Which organic compound do you think the boy will buy?
- A. kerosene
 - B. gasoline
 - C. lubricating oil
 - D. isopropyl alcohol
9. Which of the following pairs of organic compounds is highly flammable?
- A. gasoline, acetone
 - B. water, ethyl alcohol
 - C. lubricating oil, isopropyl alcohol
 - D. liquefied petroleum gas, kerosene
10. Christian is applying something to the ball bearings of the wheels of his bicycle so that friction will be minimized. Which of the following material do you think he is using?
- A. vinegar
 - B. isopropyl alcohol
 - C. kerosene
 - D. lubricating oil

Lesson

1

Organic Compounds

In the previous module you have learned how the structure of the carbon atom affects the type of bonds it forms. In this module you will learn to write the molecular, empirical, and structural formulas of some organic compounds. Alkanes, alkenes, alkynes and functional groups will also be discussed in this module.

In this lesson you will learn to differentiate molecular, empirical, and structural (expanded and condensed) formulas. You will also learn how to differentiate alkanes, alkenes and alkynes based on the presence of bonds and their physical properties. Then name different structures of hydrocarbons (alkanes, alkenes, alkynes, alcohol, aldehydes, ester, carboxylic acid, ether, amines, amides and etc. Identify different functional groups and their uses in organic compounds.

Here are some key questions for you to ponder after finishing this module:

1. What are organic compounds?
2. What are the important uses of organic compounds?
3. How are the carbon atoms able to form many organic compounds?
4. In what ways are the properties of organic compounds related to their uses?



What's In

Word Up!

Arrange the scrambled letters to form the term that is being described in each statement. Write your answer on a separate sheet of paper.

1. Carbon-based compounds

G O R N C A I

2. An outer shell electron that is associated with an atom

A V L E N E C

E E T O N S L C R

3. Type of chemical bond formed by sharing of electrons between atoms of non-metallic elements

T E A O C V L N

D N O B

4. Specific group of organic compounds which contain carbon and hydrogen only.

O C H Y B R R A O N D

5. States that an atom either loses or gains electrons to achieve the eight electrons in the outermost orbital

E T T O C

R L U E



What's New?

Organic Compounds: Are they Useful?

Organic compounds are group of compounds that contain the element carbon. Organic compounds contain carbon and hydrogen combined with other elements namely oxygen, nitrogen, phosphorous, sulfur, and halogens (fluorine, chlorine, bromine, and iodine) Ethyl alcohol, acetone, gasoline, naphthalene, acetic acid, vanillin, acetylene, and esters are just a few examples of many useful organic compounds. These kinds of compounds are produced by plants and animals. However, these carbon-containing compounds can also be produced artificially. There are also organic compounds that are produced from petroleum: liquefied petroleum gas (LPG), gasoline, lubricating oil and kerosene. These compounds have different uses in the community.

Objective:

In this activity, you will be able to recognize the uses of common organic compounds.

Materials:

paper and pen pentel pen manila paper

Labels or Pictures of the following products:

gasoline acetone kerosene acetic acid LPG ethanol

Procedure:

1. Copy the table below on a manila paper using your pentel pen
2. Paste the picture/ label of the products under proper headings
3. Place a check mark where appropriate to indicate the use/s of each compound
4. You may check more than one usage per sample

Table 1: Organic Compounds and their uses

		Organic Compounds					
		Gasoline	Ethyl Alcohol	Acetone	LPG	Kerosene	Acetic Acid
Uses	Beverage						
	Food						
	Antiseptic						
	Fuel						
	Cleaner						

Guide Question:

1. What do you think are the characteristics of the materials which give their uses?
2. Which do you think are the characteristics of the materials based from their uses in the given Table?
3. What is the importance of these kinds of organic compounds?

***What is It*****Writing Chemical Formulas**

The three types of chemical formulas are empirical, molecular, and structural formulas.

1. Empirical Formula - “simplest type of chemical formula”

An empirical formula shows the primary basic type of a compound. Its formulas show the number of atoms of each element in a compound within the primary simplified state using whole numbers. It also tends to tell us very little about the compound because we cannot determine the structure, shape, or properties of the compound without knowing the formula. Value of the statement is decreased because many chemical compounds can have the identical formula.

Example:

Molecular Formula of Glucose: $C_6H_{12}O_6$

Empirical Formula of Glucose: CH_2O

*Divide all subscripts by 6 to get the smallest, whole number ratio.

2. Molecular Formula

Molecular formulas describe the precise number and kind of atoms contained one molecule of a compound. The constituent elements are represented by their chemical symbols, and also the quantity of atoms of each element present in each molecule is shown as a subscript following that element's symbol. The formula expresses information about the proportions of atoms that make up a specific compound, employing one line of element symbols and numbers. It may also include other symbols, like parentheses, dashes, brackets, plus (+) and minus (-) signs.

For organic compounds, carbon and hydrogen are listed because the primary elements within the statement, which they're followed by the remaining elements in alphabetical order.

A formula is not a chemical name, and it has no words. Although a formula may involve specific simple chemical structures, it's not identical to a full formula. Molecular formulas are more restraining than chemical names and structural formulas.

Example:

Molecular Formula of Glucose: $C_6H_{12}O_6$

3. Structural Formula

A chemical formula displays the atoms of the molecule according the order they are bonded. It also depicts how the atoms are bonded together in single, double or triple bond. Covalent bonds are shown using lines. The number of dashes indicates whether the bond would be one, double, or triple attraction. Structural formulas are very useful because they can explain the properties and structure of the compound which empirical and molecular formulas cannot always represent.

a. Expanded Structural Formula- shows all the bonds connected to all of the atoms within the compound.

b. Condensed Structural Formula- shows all the atoms but omits some or all the vertical and horizontal bonds, thus, making it easier to write in a single line.

Guidelines in writing the structural formula of organic compound in expanded and condensed form

1. Carbon can only accommodate four bonds. For example, if all the bonds to carbon are single bonds, then one should draw four single lines around carbon to designate the bonds which are available to link with carbon or other selected elements.
2. Following the octet rule, a carbon atom with multiple bonds can form links with other groups as the remaining bonds will allow:

$C = C$ A carbon-carbon double bond allows for only two groups to be bonded to each carbon involved in the formation of the double bond.

$C \equiv C$ A carbon-carbon triple bond allows for only one group to be bonded to each of the carbons involved in the formation of the triple bond.

Example:

Expanded Structural Formula of Glucose:

Condensed Structural Formula of Glucose: CH_2OH

Alkanes. Alkanes are hydrocarbon compounds where atoms only form single bonds with other carbon atoms.

Alkenes. Alkenes are hydrocarbon compounds which have double bonds between carbon atoms.

Alkynes. Alkynes are hydrocarbon compounds which have triple bonds between carbon atoms.

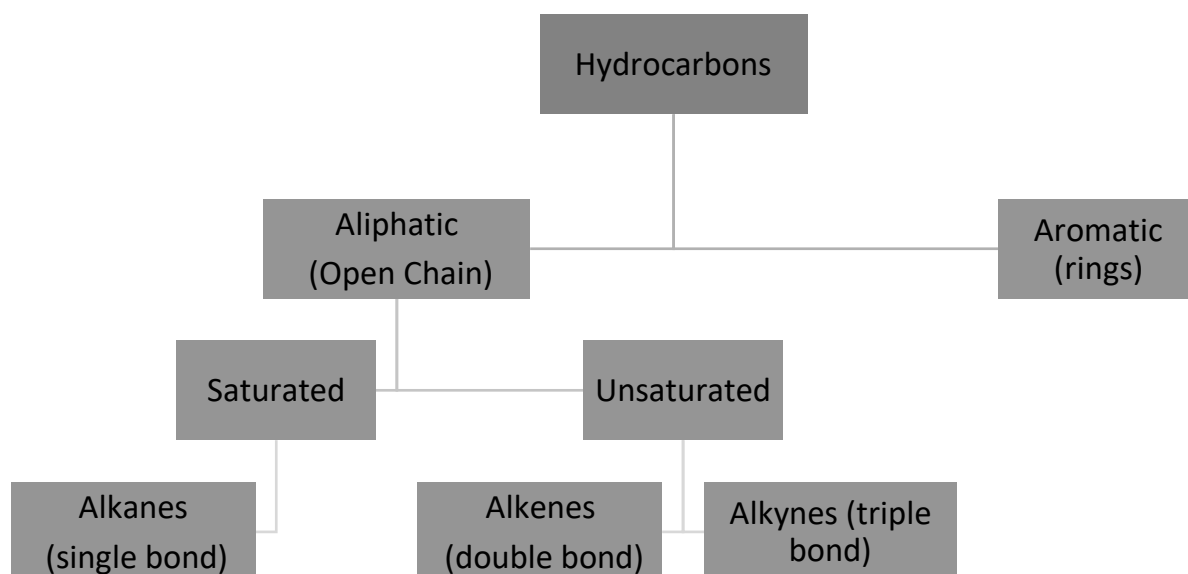
Hydrocarbons. Hydrocarbons are organic compounds consisting primarily of carbon and hydrogen atoms.

Organic compound. Organic compound is any chemical compounds that mainly contain carbon that is chemically bonded with hydrogen and other non-metal elements like oxygen, sulfur, and nitrogen.

Hydrocarbons

Hydrocarbons are organic compounds that consists only two elements, carbon and hydrogen. They build up the sole class of organic compounds.

Hydrocarbons can be classified according to their structure which can be aliphatic or aromatic. **Aliphatic hydrocarbons** do not have rings; instead, they form chains of carbon and hydrogen. They may be saturated or unsaturated. **Aromatic hydrocarbons** have rings which will contain single bonds and double bonds. It has *benzene rings*, which are cyclic chains with six carbon atoms that form hexagons shape.



Classifications of Hydrocarbons

Saturated Hydrocarbons: Alkanes

Alkanes are hydrocarbon compounds that only have single bonds within the compounds. Alkanes are referred to as saturated hydrocarbons because additional hydrogen atoms cannot bond within the compound. The primary alkane is methane, CH_4 , and the second member is ethane, CH_3CH_3 , which are common alkane compounds. The name of the compounds during this group all end with -ane.

Unsaturated Hydrocarbons: Alkenes and Alkynes

Alkenes are hydrocarbons that have one or more carbon-carbon double bonds in their structures. The name of alkene compounds end in -ene. The best alkenes are ethene, CH_2CH_2 , and propene, CH_2CHCH_3 .

Alkynes contain a minimum of one carbon-carbon triple bond. The foremost common alkyne compound is ethyne or acetylene. The name of Alkyne compound end in -yne.

Table 2: General Formula of Hydrocarbons

Class of Hydrocarbon	General Formula	Example
Alkane	C_nH_{2n+2}	CH ₄ , methane
Alkene	C_nH_{2n}	C ₂ H ₄ , ethane
Alkyne	C_nH_{2n-2}	C ₂ H ₂ , ethyne

Chemistry of Functional Groups

Aside from hydrocarbons, there are other organic compounds that are equally significant. They're called hydrocarbon derivatives. These compounds are still made of hydrogen and carbon, but they need other elements like oxygen, nitrogen, and therefore the halogens. Hydrocarbon derivatives are classified supported the functional group they contain.

Functional group may be a group of atoms that's largely answerable for the chemical behaviour of a given compound.

Alcohols

Alcohols are hydrocarbon derivatives with a general structure of R-OH where R stands for hydrocarbon chain or the rest of the molecule and -OH is the functional group called hydroxyl.

Ethers

Ethers are compounds in which two hydrocarbon groups are bonded to one oxygen atom. They are usually represented by R-O-R', where R and R' can be the same or different hydrocarbon units.

Carboxylic Acids

They are also called organic acids. They need a more complex functional group, a mix of the C=O of aldehydes and ketones, and therefore the -OH of alcohols. Carboxylic acids may have quite one group.

Aldehydes

They are formed when an oxygen atom is double bonded to the carbon atom at the end of the chain. The functional group is the carbonyl group (-C=O).

Ketones

They have the same functional group as aldehydes. However, C=O occurs somewhere along the chain rather than on the end of the carbon chain.

Esters

Esters are made by reacting carboxylic acid with an alcohol, producing ester and water. This process is called esterification.

Amine

Amines have the general for formula $R-NH_2$, $R-NH-R'$, and $R-NR-R''$. Aniline is an example of an amine.

Amides

Amides have an amino acids (-NH₂) attached directly to a carboxyl group. They have the general formula for R-CONH₂. Acetamide is an amide.

Alkyl halides

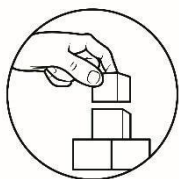
Alkyl halides are halogen-containing organic compounds with the general formula R-X, where X is a halogen.

Table 3: Functional groups and their general formula

Name	Functional Group	General Formula	Example
Alcohols	$\begin{array}{c} \\ -\text{C}-\ddot{\text{O}}-\text{H} \\ \end{array}$	R-OH	methanol
Ethers	$\begin{array}{c} \quad \\ -\text{C}-\ddot{\text{O}}-\text{C}- \\ \quad \end{array}$	R- $\ddot{\text{O}}$ -R'	ethylmethylether
Carboxylic Acids	$\begin{array}{c} \text{O} \\ \\ -\text{C}-\text{C}-\ddot{\text{O}}-\text{H} \\ \end{array}$	$\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\ddot{\text{O}}-\text{H} \end{array}$	acetic acid or ethanoic acid
Aldehydes	$\begin{array}{c} \text{:O:} \\ \\ -\text{C}-\text{C}-\text{H}- \\ \end{array}$	$\begin{array}{c} \text{:O:} \\ \\ \text{R}-\text{C}-\text{H}- \end{array}$	ethanal or acetaldehyde
Amide	$\begin{array}{c} \text{O} \\ \\ -\text{C}-\text{C}-\ddot{\text{N}}- \\ \end{array}$	$\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\ddot{\text{N}}-\text{H} \\ \\ \text{H} \end{array}$	acetamide
Alkyl halide	$\begin{array}{c} \\ -\text{C}-\text{X} \\ \end{array}$	R-X	methylchloride
Ketones	$\begin{array}{c} \text{:O:} \\ \\ -\text{C}-\text{C}-\text{C}- \\ \quad \end{array}$	$\begin{array}{c} \text{:O:} \\ \\ \text{R}-\text{C}-\text{R}' \end{array}$	ethylmethylketone
Esters	$\begin{array}{c} \text{O} \\ \\ -\text{C}-\text{C}-\ddot{\text{O}}:-\text{C}- \\ \quad \end{array}$	$\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\ddot{\text{O}}:-\text{R}' \end{array}$	ethylethanoate
Amine	$\begin{array}{c} \\ -\text{C}-\ddot{\text{N}}- \\ \end{array}$	$\begin{array}{c} \text{R}-\ddot{\text{N}}\text{H}_2 \\ \text{R}-\ddot{\text{N}}-\text{H} \\ \\ \text{R}' \\ \text{R}-\ddot{\text{N}}-\text{R}'' \\ \\ \text{R}' \end{array}$	Methylamine Ethylmethylamine Ethylmethyl-Propylamine

Table 4 shows the different functional groups and their uses in organic compounds.

NAME/CLASS (FUNCTIONAL GROUPS)	USES IN ORGANIC COMPOUNDS
Alcohols	Alcohols Glycerol is added to skin products as moisturizer.
Ethers	It is used as an anaesthetic and is a valuable solvent of gums, fats and essential oils.
Carboxylic Acids	Citric acid, found in fruits, contain three carboxylic acids group.
Aldehydes	Formalin that commonly used in embalming and preserving tissues of specimens.
Ketones	Acetone is used as solvent in the manufacture of drugs, cellulose acetate, cellulose nitrate, acetylene, plastics, and varnishes. It is also used to remove paint, varnish, and nail polish.
Esters	They are sweet-smelling compounds; the distinctive odors and flavors of many flowers and ripe fruits such as mango and pineapple are due to the presence of esters. Olive oil are natural esters.
Amine	Amines have peculiar, unpleasant odors. Example, the smell of rotting fish is due to the presence of Trimethylamine. Putrescine, also known as cadaverine, is a foul-smelling gas given off by decaying flesh.
Amide	Organic compounds present in nylon, silk, and wool contain hundreds of amides groups.
Alkyl halide	The non-stick coating of pan is made of Teflon, an alkyl halide.



What's More

Activity 1. Types of Chemical Formulas

Complete the table below. Write your answer on a separate sheet of paper.

Name	Molecular Formula	Empirical Formula	Expanded Structural Formula	Condensed Structural Formula
Methane	CH ₄	CH ₄	(1)	CH ₄
Ethane	C ₂ H ₆	(2)	<pre> H H H-C---C-H H H </pre>	(3)
Butane	C ₄ H ₁₀	(4)	<pre> H H H H H-C---C---C---C-H H H H H </pre>	(5)

Activity 2. The Hydrocarbons

Use the data in Tables 1 to 3 to answer the following questions. Write your answer on a separate sheet of paper.

Table 1. Alkanes

Name	Phase	Condensed Structural Formula	Boiling Point
Methane	Gas	CH ₄	-162
Ethane	Gas	CH ₃ CH ₃	- 89
Propane	Gas	CH ₃ CH ₂ CH ₃	- 42
Butane	Gas	CH ₃ CH ₂ CH ₂ CH ₃	-0.5
Pentane	Liquid	CH ₃ CH ₂ CH ₂ CH ₂ CH ₃	36
Hexane	Liquid	CH ₃ CH ₂ CH ₂ CH ₂ CH ₂ CH ₃	69
Heptane	Liquid	CH ₃ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CH ₃	98
Octane	Liquid	CH ₃ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CH ₃	126

Table 2. Alkanes

Name	Phase	Condensed Structural Formula	Boiling Point
Ethene	Gas	$\text{CH}_2=\text{CH}_2$	-104
Propene	Gas	$\text{CH}_2=\text{CHCH}_3$	-47
1-Butene	Gas	$\text{CH}_2=\text{CHCH}_2\text{CH}_3$	-6
1-Pentene	Liquid	$\text{CH}_2=\text{CHCH}_2\text{CH}_2\text{CH}_3$	30
1-Hexene	Liquid	$\text{CH}_2=\text{CHCH}_2\text{CH}_2\text{CH}_3$	63

Table 3. Alkynes

Name	Phase	Condensed Structural Formula	Boiling Point
Ethyne	Gas	C_2H_2	-84
Propyne	Gas	$\text{CH}\equiv\text{C}-\text{CH}_3$	-47
2-Butyne	Gas	$\text{CH}_3\text{C}\equiv\text{CCH}_3$	8.08
Pentyne	Liquid	$\text{HC}\equiv\text{CCH}_2\text{CH}_2\text{CH}_3$	40.2

1. What are the types of bonds present in the following?

- a. alkanes _____
 b. alkenes _____
 c. alkynes _____

2. Using Tables 1 to 3, what pattern do you observe in terms of the

Alkanes

- a. phase _____
 b. number of carbon atoms _____
 c. structure _____
 d. boiling point _____

Alkenes

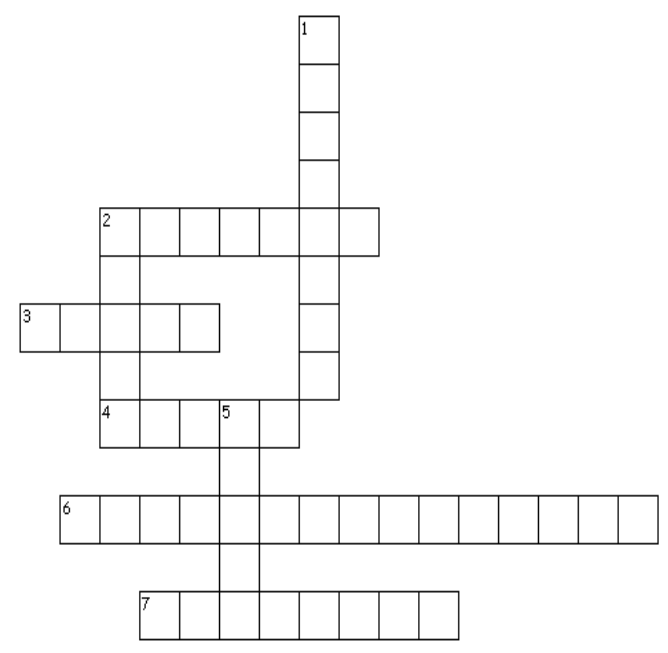
- e. phase _____
 f. number of carbon atoms _____
 g. structure _____
 h. boiling point _____

Alkynes

- i. phase _____
 j. number of carbon atoms _____
 k. structure _____
 l. boiling point _____

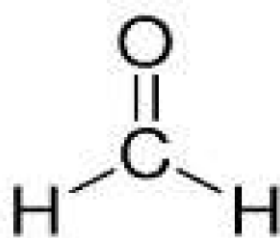
Activity 3: Word Up!

Complete the crossword puzzle. Write your answer on a separate sheet of paper.

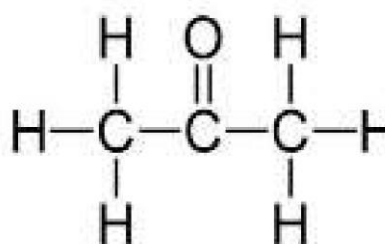
<p>Across</p> <p>2. contains the hydroxyl group</p> <p>3. derived from ammonia that contains both carbonyl and amino groups</p> <p>4. contains an oxygen bonded to two hydrocarbons</p> <p>6. an atom or group of atoms that defines the reactivity of an organic molecule</p> <p>7. functional group present in organic acids</p> <p>Down</p> <p>1. functional group in alcohols</p> <p>2. contains nitrogen in its functional group</p> <p>5. made by the reaction of carboxylic acid and an alcohol; generally has pleasant odor</p>	
---	---

Activity 4: What is common between acetone and formalin?

Use the illustrations of the structures of acetone and formaldehyde (formalin) to answer the questions below. Write your answer on a separate sheet of paper.



Formaldehyde



acetone

1. What are the common uses of acetone and formalin?
2. What types of bonds do acetone and formalin have in their structures?
3. Formalin and acetone are common carbonyl containing compounds. Explain why they belong in the group of carbonyl containing compounds?

Activity 5: Alcohols and Their Uses

Alcohols are another group of organic compounds. These organic compounds also have very important uses. Some alcohols are used as antiseptic or disinfectant, some are used as cleaning agents, others are used as components of liquors and a few alcohols are used as fuel for portable stoves or other types of burners.

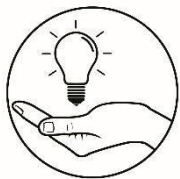
Objectives:

- recognize the uses of common alcohols;
- identify similarities in the structures of different kinds of alcohols; and
- relate these similarities to the common properties they have

Procedure:

- Write in the table below, the names, amount and uses of alcohol/s present in the product.

Name of Products	Name of Alcohol/s Present in the Product	Percent (%) or amount of alcohol in the Product	Uses
Rubbing Alcohol			
Denatured Alcohol			



What I Have Learned

Determine the word that correctly completes the statement. Write your answer on a separate sheet of paper.

1. _____ that contain the carbonyl group (C=O) are aldehydes, ketones, carboxylic acids and esters
2. Those that contain oxygen but not in a _____ group are alcohol and ethers.
3. Amine and _____ are nitrogen-containing compounds.
4. Organic compounds that contain halogen are called _____.
5. _____ are group of organic compounds that contain a hydroxyl group, -OH, that is chemically bonded to a carbon atom within the compound. Commonly use as a disinfectant, fuel, and as a main component (ethyl alcohol) of liquor and other alcoholic drinks.
6. The carbonyl compound examples are _____ and formaldehyde. And they have a carbonyl functional group, C=O, which is chemically bonded to a carbon atom in the compound.
7. The use of acetone is for cleaning agent like a nail polish remover. _____ is used in preserving organic materials like an animal specimen and embalming human cadavers.
8. _____ shows the number of each type of atom in a molecule.
9. _____ shows the simplest whole-number ratio of atoms in a compound
10. _____ a graphic representation of a molecule showing the arrangement of the different atoms and how they are bonded to each other
11. _____ are a specific group of organic compounds which contain carbon and hydrogen only.
12. Alkanes, Alkenes, and _____ are the three (3) basic groups of hydrocarbon compounds.
13. Alkanes are hydrocarbons that have _____ between carbon atoms.
14. Alkenes are hydrocarbons that have _____ between carbon atoms.
15. Alkynes have _____ between carbon atoms.



What I Can Do

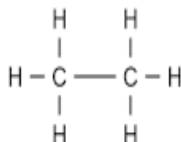
Drawing the Formulas

Example of Alkane is the butane gas that commonly used in gas stove. Write the 2 types of chemical formula for butane.

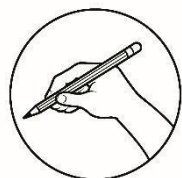
Chemical Formulas

Identify the types of chemical formulas of the following:

1. $C_6H_{12}O_6$ = _____
2. CH_2O = _____
3. C_6H_6 = _____



4. = _____
5. C_2H_6 = _____



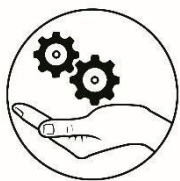
Assessment

Choose the letter of the best answer. Write your answers on a separate sheet of paper.

1. Which of the following is used to express the structure of atoms?
 - A. Scientific name
 - B. Chemical name
 - C. Chemical formula
 - D. Scientific notation
2. What is the empirical formula for $C_8H_{16}O_2$?
 - A. C_4H_8O
 - B. $C_4H_{12}O$
 - C. $C_2H_8O_2$
 - D. $C_{16}H_8O$
3. What is the structural formula of covalent bond?
 - A. Circles
 - B. Dots
 - C. Lines
 - D. Squares

4. Which of these shows the simplest whole-number ratio of atoms in a compound?
- Molecular Formula
 - Empirical Formula
 - Expanded Structural Formula
 - Condensed Structural Formula
5. Which alkene will most likely have the highest boiling point?
- ethene
 - hexane
 - pentene
 - propene
6. Which of the following compounds that contain only carbon and hydrogen?
- Carcinogens
 - Halides
 - Hydrocarbons
 - Organic elements
7. Which hydrocarbon has a double bond in the molecule?
- Ethane
 - Methane
 - Propene
 - Propyne
8. To which group of hydrocarbon does the molecule with the structure $\text{H}-\text{C}\equiv\text{C}-\text{H}$ belong?
- Alkane
 - Alkene
 - Alkyne
 - none of the above
9. Which alkane will most likely have the highest boiling point?
- Ethane
 - Hexane
 - Pentane
 - Propane
10. Why is it important to know the properties of common liquid materials?
- To know the uses of the liquids
 - To know how these liquids affect people
 - To know possible danger from these kinds of material
 - All of the above
11. It is a compound that has a hydroxyl group bonded to a carbon atom.
- Alcohol
 - Ester
 - Ether
 - Halides

12. It contains the carbonyl group and the substituents are R and R.
A. Aldehyde
B. Alkyl
C. Carboxylic acids
D. Ketone
13. It contains the carbonyl group and the substituents are R and H.
A. Aldehyde
B. Alkyl
C. Carboxylic acids
D. Ketone
14. It is formed by the reaction of acids and amines.
A. Acetone
B. Alkyl acid
C. Amides
D. Ammonia
15. Aside from carboxylic acid, what is the other material that can be added on it in making Esters?
A. Acetate
B. Alcohol
C. Oil
D. Water



Additional Activities

Situation: You are an IT Specialist at the DENR. You were tasked by your supervisor to create a database about organic compounds found as natural resources in the country. The database should have the following columns:

Column 1 – Common name and scientific name of the organic compound

Column 2 – Structural formula of the organic compound

Column 3 – Physical and chemical properties of the organic compound

Column 4 – Uses of the organic compound

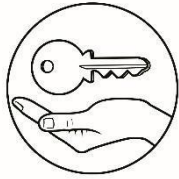
Your supervisor will evaluate your output based on content and organization.

Use the rubrics below as a guide for making the activity.

Rubric for Science Experiments				
	Score = 4	Score = 3	Score = 2	Score = 1
Experimental design	Design shows student has analyzed the problem and has independently designed and conducted a thoughtful experiment.	Design shows student grasps the basic idea of the scientific process by conducting experiment that controlled obvious variables.	Design shows student grasps basic idea of scientific process but needs some help in controlling obvious variables.	Design shows student can conduct an experiment when given considerable help by the teacher.
Scientific results	Pamphlet explained with convincing clarity the solution to the problem. Information from other sources or other experiments was used in explaining.	Pamphlet showed that student understands the results and knows how to explain them.	Pamphlet showed results of experiment. Conclusions reached were incomplete or were explained only after questioning.	Pamphlet showed results of the experiment. Conclusions drawn were lacking, incomplete, or confused.
Data collection	Data was collected and recorded in an orderly manner that accurately reflects the results of the experiment.	Data was recorded in a manner that probably represents the results of the experiment.	Data was recorded in a disorganized manner or only with teacher assistance.	Data was recorded in an incomplete, haphazard manner or only after considerable teacher assistance.
Verbal expression	Speech presented a clearly defined point of view that can be supported by research. Audience interest was considered as were gestures, voice and eye contact.	Speech was prepared with some instructor help but uses experiment's result. Speech was logical and used gestures, voice and eye contact to clarify meaning.	Speech was given after active instruction. Some consideration was given to gestures, voice and eye contact.	Speech was given only after active instruction.

Reference:
Wiggins, G. (1998). *Educative Assessment*. San Francisco, CA: Jossey-Bass Publishers.

<http://3.bp.blogspot.com/-jXuB3qPHF8c/TvV3cEh7V4I/AAAAAAAAAFU/sehBgowgM7g/s1600/RUBRIC>.



Answer Key

WHAT I KNOW	WHAT'S IN WORD UP!
1.B	1. ORGANIC
2.B	2. VALENCE
3.A	ELECTRON
4.A	3. COVALENT
5.B	BOND
6.C	4. HYDROCARBON
7.B	5. OCTET
8.A	RULE
9.D	
10.D	

WHAT'S NEW		ORGANIC COMPOUNDS AND THEIR USES	
Table 1: Organic Compounds and their uses			
Organic Compounds			
	Gasoline	Ethyl alcohol	Acetone
	LPG	Kerosene	Acetic Acid
Uses	Beverage	/	
	Food		
	Antiseptic	/	
	Fuel	/	
	Cleaner		/

GUIDE QUESTIONS:

1.

COMPOUNDS	USES	COMPOUNDS	USES
Gasoline	Fuel for vehicles	Ethanol	Disinfectant; and used as main ingredient in liquors
Kerosene	Fuel for lamps (gasera) and portable cooking stove (kustinila)	Acetone	Used to remove nail polish
LPG (liquefied petroleum gas)	Can be used to remove paints	Acetic Acid	Used as component of vinegar (4% by volume)
	Fuel for gas stove and cars		Can be used to treat fungal infection

2. They have the characteristics of a compound.
3. These common organic compounds are very important because they have many uses at home and in the industry.

WHAT'S MORE
ACTIVITY 1: TYPES OF CHEMICAL FORMULAS



1.

2. CH_4

3. $\text{CH}_2\text{-CH}_2$

4. C_2H_6

5. $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_3$

ACTIVITY 2: THE HYDROCARBONS

1. a. Single Bond

b. Double Bond

c. Triple Bond

2. ALKANES

a. Gas and liquid

b. Increasing

c. Bigger or Longer

d. Increasing

ALKENES

e. Gas and liquid

f. Increasing

g. Bigger or Longer

h. Increasing

ALKYNES

i. Gas and liquid

j. Increasing

k. Bigger or Longer

l. Increasing

WHAT I HAVE LEARNED

1. Organic Compound
2. Carbonyl
3. Amides
4. Halides
5. Alcohol
6. Acetone

ACTIVITY 3: WORD UP!

Across:

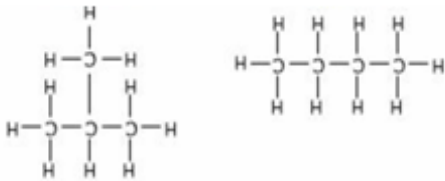
1. Alcohol
2. Amide
3. Ether
4. Functional Group
5. Carboxyl
6. Down:
1. Hydroxyl
2. Amine
3. Ester

ACTIVITY 4: WHAT IS COMMON BETWEEN ACETONE AND FORMALIN?

1. Acetone is commonly used as solvent and nail polish remover. Formaldehyde is used as a preserving agent and disinfectant.
2. The structure of acetone and formaldehyde all have single and double bonds.
3. The structure of acetone and formaldehyde both have carbonyl functional group. These make them carbonyl containing compounds.

ACTIVITY 5: ALCOHOLS AND THEIR USES

Name of Alcohol's Present in the Product	Name of Alcohol Present in the Product	Name of Alcohol Present in the Product	Name of Alcohol Present in the Product
Denatured Alcohol	Balming Alcohol	Products	Denatured Alcohol
Ethyl alcohol and Methyl alcohol	Isopropyl alcohol	Products Present in the alcohol in the	Ethyl alcohol and Methyl alcohol
95% ethyl and 5% methyl alcohol	70%	Percent (%) or amount of alcohol in the Product	95% ethyl and 5% methyl alcohol
Part for lamps and portable stoves	Disinfectant/antiseptics	Uses	Part for lamps and portable stoves

<p>The structures of the alcohols in this activity only have single bonds.</p> <p>Alcohols have the same hydroxyl group as their functional group that is why they have some similar properties or characteristics.</p>	<p>ASSESSMENT</p> <p>1.C 2.A 3.D 4.B 5.B 6.C 7.C 8.C 9.B 10.D 11.A 12.D 13.A 14.C 15.B</p>
<p>7. Formaldehyde 8. Molecular Formula 9. Empirical Formula 10. Structural Formula 11. Hydrocarbons 12. Alkynes 13. Single Bonds 14. Double Bonds 15. Triple Bonds</p>	<p>WHAT I CAN DO</p> <p>DRAWING FORMULAS</p>  <p>Butane C_4H_{10}</p> <p>Iso-Butane C_4H_{10}</p> <p>CHEMICAL FORMULAS</p> <p>1. Molecular 2. Empirical 3. Condensed Structural Formula 4. Expanded Structural Formula 5. Molecular Formula</p>

References

Books:

Alvarez, Liza A., Dave G. Angeles, Hernan L. Apurada, Ma. Pillar P. Carmona, Oliver A., Lahorra, Judith f. Marcaida, Ma. Regaele A. Olarte. Science 9 - Learner'sModule. DepEd - Instructional Materials Council Secretariat (DepEd-IMCS). Pasig city: FEP Printing Corporation, 2014.

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<http://3.bp.blogspot.com/-jXuB3qPHF8c/TvV3cEh7V4I/AAAAAAAAAFU/sehBgowgM7g/s1600/RUBRI>
C.P

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