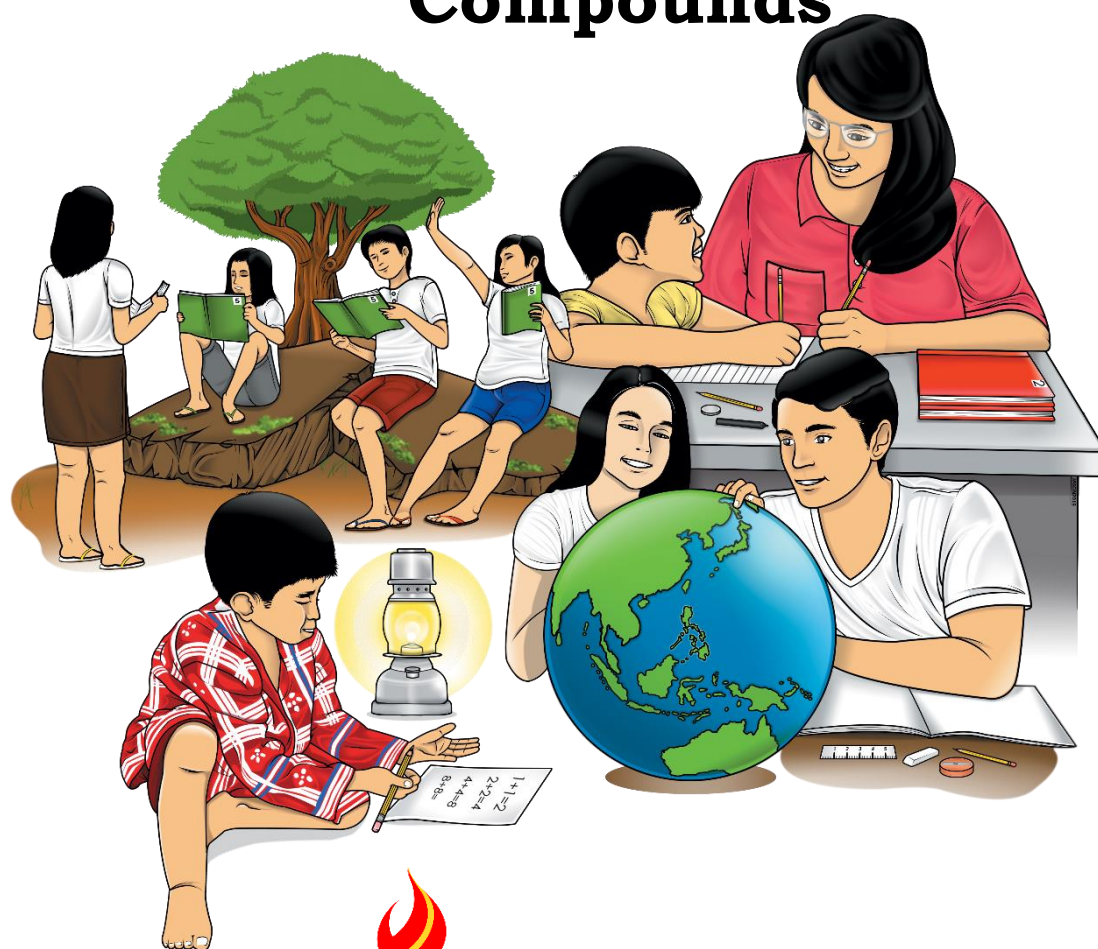


# Science

## Quarter 2 - Module 7: The Variety of Carbon Compounds



**Science- Grade 7**  
**Alternative Delivery Mode**  
**Quarter 2 - Module 7: The Variety of Carbon Compounds**  
**First Edition, 2020**

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<b>Development Team of the Module</b>	
Author/s:	Lyndy C. Arong, Rene R. Ubarco
Members	Neil A. Improgo, EPS-LRMS Bienvenido U. Tagolimot, Jr., EPS-ADM Henry B. Abueva OIC-CID Chief Ann Q. Solijon, EPS-Science Sherlita L. Daguisanan, LRMS Manager Meriam S. Otarra, PDO II Charlotte D. Quidlat, Librarian II

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E-mail Address: [iligan.city@deped.gov.ph](mailto:iligan.city@deped.gov.ph)

# **Science**

## **Quarter 2 - Module 7: The Variety of Carbon 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.

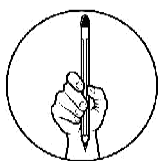
Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer 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.

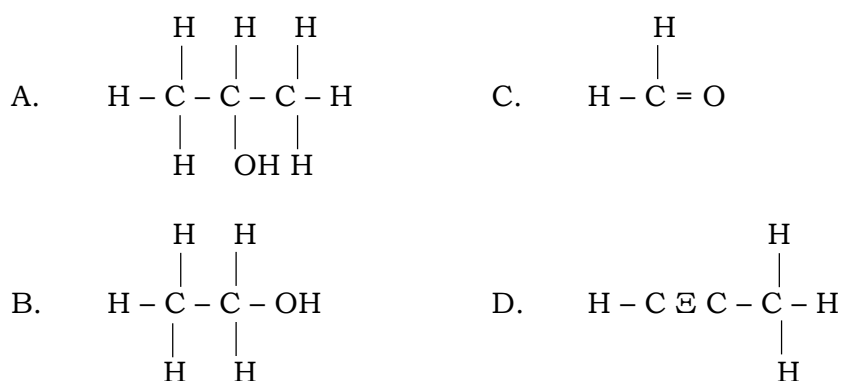


## What I Know (Pretest)

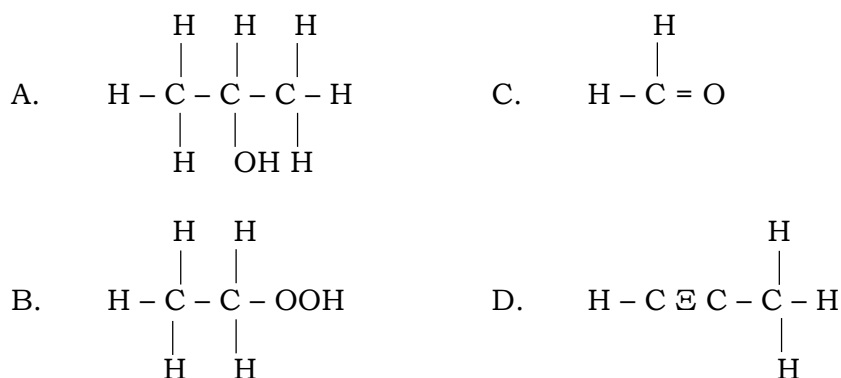
**Multiple Choice:** Read the statements carefully. Choose the BEST answer. Write the letter of your answers on your answer sheet.

- Which of the following statements best describe organic compounds?
  - Organic compounds are composed mainly of carbon and hydrogen.
  - Organic compounds are compounds that contain carbon atoms only.
  - Organic compounds are compounds that are produced by living things.
  - Organic compounds are compounds that contain carbon and oxygen only.
- How do carbon atoms form many organic compounds?
  - by attracting other elements toward themselves to form the bonds
  - by sharing their electrons with other metal and non-metal elements
  - by transferring their electrons to the atoms of surrounding elements
  - by forming many bonds with other carbon atoms and other elements
- What is the maximum number of bonds can a carbon atom form?
  - 2
  - 3
  - 4
  - 5
- Emmanuel Juan, a fisherman, 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?
  - gasoline
  - lubricating oil
  - isopropyl alcohol
  - Liquefied Petroleum Gas (LPG)
- Which of the following pairs of organic compounds is highly flammable?
  - gasoline, acetone
  - water, ethyl alcohol
  - lubricating oil, isopropyl alcohol
  - liquefied petroleum gas, kerosene
- Honey is applying something to the ball bearings of the wheels of her bicycle so that friction will be minimized. Which of the following material do you think she is using?
  - vinegar
  - isopropyl alcohol
  - kerosene
  - lubricating oil
- A gasoline boy was being scolded by his store manager for smoking in the vicinity of the gasoline station. Why do you think the manager scolded his employee?
  - because gasoline is viscous
  - because gasoline has a bad odor
  - because gasoline has a black color
  - because gasoline is volatile and flammable
- Amidst COVID-19, DOH advised everyone to thoroughly disinfect their hands with \_\_\_\_\_.
  - formalin
  - isopropyl alcohol
  - acetone
  - kerosene

9. Ethene is a natural gas produced in plants, which acts as a natural ripening agent of fruits. Which of the following organic compounds has the same ability to ripen fruits?  
 A. butane                      B. propene                      C. acetylene                      D. pentyne
10. What is the common use of methane?  
 A. fertilizer                      C. fuel  
 B. disinfectant                      D. artificial ripening agent
11. Which are TRUE about the use of isopropyl alcohol?  
 I. Cleaner                      II. Fuel                      III. Disinfectant                      IV. Fertilizer  
 A. I, II, and III only    B. II and III only    C. III and IV only    D. I and IV only
12. Salvador has to remove the red paint in the paintbrush so that he could still use it again next time. What organic compound should he use to remove the paint in the paintbrush?  
 A. acetic acid                      B. lubricating oil    C. kerosene                      D. formaldehyde
13. Which of the following compounds is a carbonyl compound?



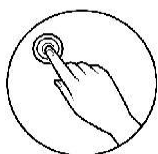
14. What organic compound is used by embalmers in treating human cadavers?  
 A. acetic acid                      B. formaldehyde    C. methyl alcohol    D. acetone
15. Which compound is an alcohol?



## Lesson

# 1

# The Variety of Carbon Compounds



## *What I Need to Know*

At the end of the lesson, you will be able to:

1. recognize the uses of common organic compounds;
2. describe and identify the properties and uses of alcohols; and
3. describe and identify the properties and uses of ketones and aldehydes.



## *What's In*







In the previous module, you have learned how the structure of a carbon atom affects the types of bonds it forms. Carbon forms covalent bonds with atoms of carbon or other elements. When it bonds only with hydrogen, it forms compounds called **hydrocarbons**. You may wonder why you need to study carbon and how it is important in our daily life.

This module is made for you to learn about the uses and properties of common organic compounds like alcohols, ketones, and aldehydes and ketones. Simple activities are provided to help you understand each lesson. Self-tests are also provided to help you check your understanding and progress in each lesson.



## What's New

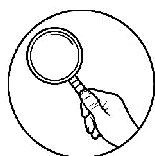
**Matching Type:** Identify the substances in Column A whether it is **organic** or **inorganic**.

Substance	Organic or Inorganic
 <p>1. Starch, <math>(C_6H_{10}O_5)_n</math></p> <p><a href="https://www.publicdomainpictures.net/en/viewimage.php?image=118933&amp;picture=container-of-corn-starch">https://www.publicdomainpictures.net/en/viewimage.php?image=118933&amp;picture=container-of-corn-starch</a></p>	
 <p>2. Steel, Fe</p> <p><a href="https://commons.wikimedia.org/wiki/File:Steel-Dowel-Pins.jpg">https://commons.wikimedia.org/wiki/File:Steel-Dowel-Pins.jpg</a></p>	
 <p>3. Neon, Ne</p> <p><a href="https://www.wallpaperflare.com/teal-and-purple-risk-neon-signage-risk-neon-graffiti-lamp-lights-wallpaper-zmaxd">https://www.wallpaperflare.com/teal-and-purple-risk-neon-signage-risk-neon-graffiti-lamp-lights-wallpaper-zmaxd</a></p>	
 <p>4. Lactose (milk), <math>C_{12}H_{22}O_{11}</math></p> <p><a href="https://pxhere.com/en/photo/1362675">https://pxhere.com/en/photo/1362675</a></p>	
 <p>5. Ethyl alcohol, <math>C_2H_5OH</math></p> <p><a href="https://www.wallpaperflare.com/search?wallpaper=ethyl+alcohol">https://www.wallpaperflare.com/search?wallpaper=ethyl+alcohol</a></p>	
 <p>6. Butane, <math>C_4H_{10}</math></p> <p><a href="https://commons.wikimedia.org/wiki/File:Butane_gas_cylinder.JPG">https://commons.wikimedia.org/wiki/File:Butane_gas_cylinder.JPG</a></p>	



### Guide Questions:

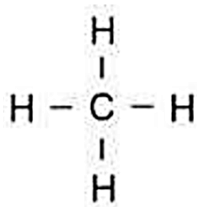
1. Which element is common to all organic compounds? \_\_\_\_\_
2. What is the most common use for most of the lightweight organic compounds (fewer than 10 carbon atoms)? \_\_\_\_\_
3. How does the composition of organic foods compare to the composition of organic fuels? \_\_\_\_\_



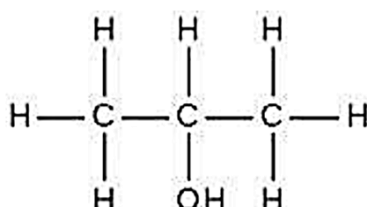
## What Is It

**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 produced from petroleum such as liquefied petroleum gas (LPG), gasoline, lubricating oil, and kerosene. These compounds have different uses in the community such as for fuel, lubrication, cleaner, etc.

Many organic compounds are formed because of the special characteristics of the element carbon. **A carbon atom has four (4) valence electrons**. This kind of atomic structure makes the carbon atom able to form four covalent bonds with atoms of other elements and other carbon atoms. Carbon atoms can also make many types of arrangements: single bond, double bond, and triple bond. With these abilities of the carbon atoms, chemical bonds between carbon atoms and other elements can form different kinds of compounds with a short and long straight and branched chained structures such as the following compounds.



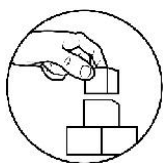
Methane



Isopropyl Alcohol



Acetylene



## What's More

### Activity 1: Organic Compounds – are they useful?

(adapted and modified from Sci9 LRM, pp. 131-132)

#### Objective:

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

#### Materials:

paper and pen

pentel/felt-tip pen

manila paper

Labels or Pictures of the following products: gasoline, ethanol, acetone, LPG , kerosene, acetic acid



(a) gasoline  
<https://freesvg.org/1546205535>



(b) ethanol  
<https://pixabay.com/photos/ethanol-alcohol-protection-covid-19-5058486/>



(c) acetone  
<https://pixabay.com/vectors/brush-bottle-nail-polish-beauty-42823/>



(d) LPG  
<https://www.goodfreephotos.com/vector-images/gas-bottle-vector-clipart.png.php>



(e) kerosene  
<https://en.wikipedia.org/wiki/Kerosene>



(f) acetic acid  
<https://www.needpix.com/photo/1388072/vinegar-bottle-restaurant-food-seasoning-flavoring-flavoursing-flavor-dressing>

#### Procedure:

1. Use the labels/pictures of the materials to answer the following questions:

Q1. What do you think are the characteristics of the materials above which determine their uses?

Q2. Why do you think these kinds of organic compounds are very important?

Complete the table about the uses of the compounds. Using a checkmark, indicate the uses of the compounds. You may have more than one checkmark per sample depending on its use/s.

### Organic compounds and their uses

Organic Compounds							
Products		Gasoline	Ethanol	Acetone	LPG	Kerosene	Acetic Acid
Uses	Beverage						
	Food						
	Antiseptic						
	Fuel						
	Cleaner						

(\*This activity is adapted, with minor modification, from Glencoe Physical Science Texas Edition.(1997). Glencoe/McGraw-Hill Companies Inc., page 369)

You just learned the important uses of common organic compounds available at home and in the community. In the next activity, you will learn about the properties and uses of the carbon compound with functional groups—**alcohols, ketones, and aldehydes**.



## What's New

**Encircle** the word/s from the choices inside the square bracket [ ] that best completes the sentence.

Alcohols are compounds in which one or more hydrogen atoms in an alkane have been replaced by an **[alkyl, hydroxyl]** group. Thus, an alcohol molecule consists of two parts. The first one has the **[alkyl, propyl]** and the other has the hydroxyl group.

The boiling point of alcohol is always significantly **[higher, lower]** than that of the alkane, and the boiling points of the alcohol **[increase, decreases]** as the number of carbon atoms increases. The patterns in the boiling point reflect the patterns in **[intramolecular, intermolecular]** attractions.

As the length of the hydrocarbon chain increases, the solubility in water **[increases, decreases]**. The viscosity of alcohol increases as the size of the molecules **[increases, decreases]**. The flammability of alcohol **[increases, decreases]** as the size and mass of the molecules increases.

Every kind of organic compound has specific properties or characteristics. Although these compounds may show similarities in some properties, these compounds do not have the same properties.

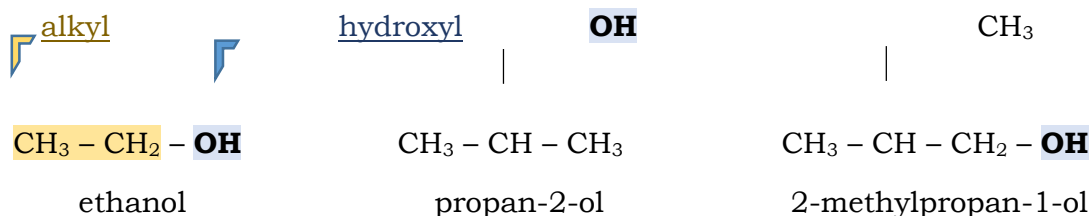
Alcohols are another group of organic compounds. These organic compounds also have very important uses. Some alcohols are used as antiseptic or disinfectant, some are used as cleaning agents, others are used as components of liquors and a few alcohols are used as fuel for portable stoves or other types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



## What Is It

**Alcohols** are compounds in which one or more hydrogen atoms in an alkane have been replaced by an **-OH** group. Thus, an alcohol molecule consists of **two parts**. The first one has the **alkyl group** (-CH) and the other has the **hydroxyl group** (-OH).

For example:

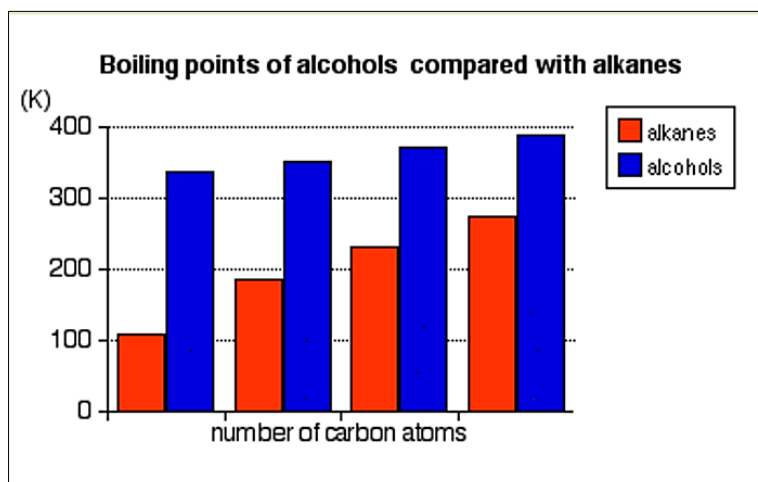


They have a sweet odor and exhibit a unique set of physical and chemical properties. The presence of the hydroxyl group is the main factor in determining the properties of alcohol. Let us now look at the prominent physical properties of alcohol.

### Physical Properties of Alcohol

You may ask why it is important. Well, you need to know the physical properties of these organic compounds to be able to use them for our benefit. Imagine how would it be if alcohol were not miscible in the water? Therefore, you will look at the physical properties of alcohol first.

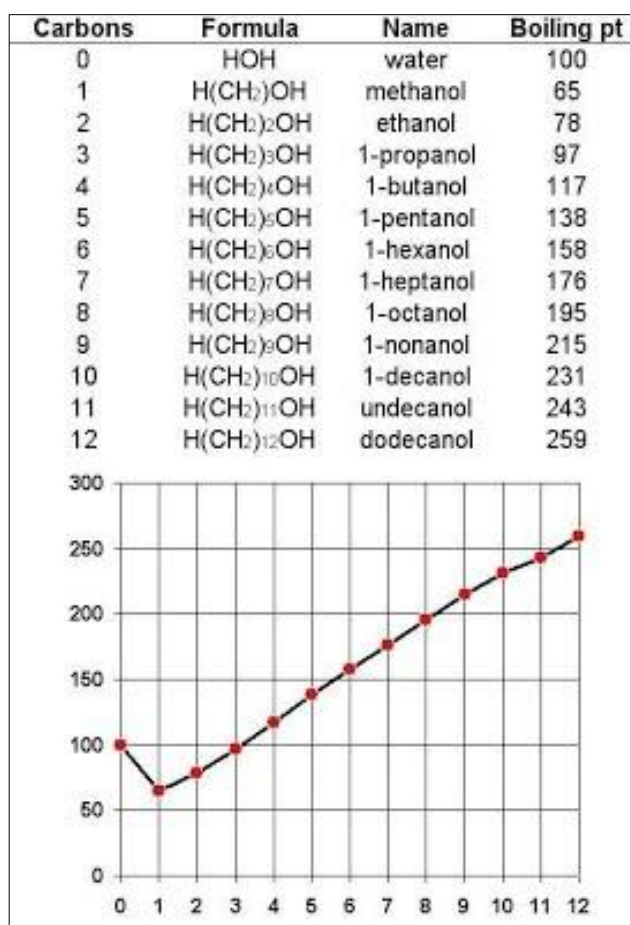
## 1. Boiling Points



<https://sites.google.com/site/chemistryolp/properties-of-alcohols>

The chart above shows the boiling points of the simple primary alcohols with up to 4 carbon atoms. These boiling points are compared with those of the equivalent alkanes (**methane to butane**) with the same number of carbon atoms.

Notice that the boiling point of alcohol is always **significantly higher** than that of the analogous alkane, and the **boiling points of the alcohols increase as the number of carbon atoms increases**. The patterns in the boiling point reflect the patterns in **intermolecular attractions**, that is, **Hydrogen Bonding** between hydroxyl groups of alcohol molecules. Alkanes, however, have van der Waals forces as their intermolecular forces.



Boiling Points of the First 11 Alcohols

<https://sites.google.com/site/chemistryolp/properties-of-alcohols>

## 2. Solubility in Water

**Alcohols are soluble in water.** This is due to the hydroxyl group in the alcohol which can form **hydrogen bonds with water molecules**. Alcohols with a smaller hydrocarbon chain are very soluble. **As the length of the hydrocarbon chain increases, the solubility in water decreases**, because it requires more energy to overcome the hydrogen bonds between the alcohol molecules as the molecules are more tightly packed together as the size and mass increases.

## 3. Viscosity

**Viscosity** is the property of a fluid that resists the force tending to cause the fluid to flow. The **viscosity of alcohol increases as the size of the molecules increases**. This is because the strength of the intermolecular forces increases, holding the molecules more firmly in place.

## 4. Flammability

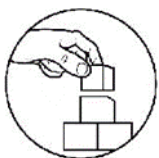
The **flammability of alcohols decreases as the size and mass of the molecules increases**. Combustion breaks the covalent bonds of the molecules, so as the size and mass of the molecules increases, there are more covalent bonds to break in order to burn that alcohol. Hence, more energy is required to break the bonds, therefore the flammability of alcohol decrease as the size and mass of molecules increases.

## Sample Uses of Alcohols

Alcohol	Source	Use/s
1. Methanol ( <i>wood alcohol</i> )	produced by heating wood chips in the absence of air	fuel for automobile engines, polar organic solvent
2. Ethanol ( <i>grain alcohol</i> )	produced through fermentation of fruit juices	motor fuel, gasoline
3. Isopropyl alcohol	made by indirect hydration of propylene	industrial solvent, rubbing alcohol
4. Ethylene glycol	glycol made from ethylene	automotive antifreeze, an ingredient in hydraulic fluids, printing inks and paint solvents, a reagent for explosives, polyesters, etc.
5. Glycerol ( <i>glycerine</i> )	by-product of soap manufacture, through the saponification; obtained by fermentation from molasses and sugar	primary explosive in dynamite, coronary vasodilator, solvent, moisturizer, antifreeze, lubricant, etc.

Alcohols have many uses in our everyday world. They can be found in beverages, antifreeze, antiseptics, and fuels. They can be used as preservatives for specimens in science, and they can be used in industry as reagents and solvents because they display an ability to dissolve both polar and non-polar substances. Alcohols are an important class of molecules with many scientific, medical, and industrial uses.





## What's More

### Activity 2: Alcohols and Their Uses

(adapted and modified from Sci9 LRM)

#### Objective:

In this activity, you will be able to recognize the uses and properties of alcohols.

#### Materials:

paper and pen

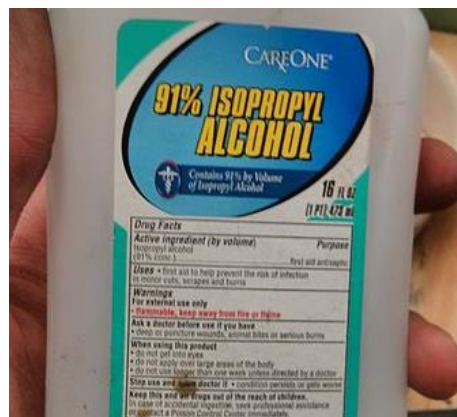
pentel pen/ felt-tip pen

manila paper

Labels or pictures of the following products:



<https://www.flickr.com/photos/fdaphotos/42408980650>



[https://commons.wikimedia.org/wiki/File:Cleaner\\_\(Alcohol\).jpg](https://commons.wikimedia.org/wiki/File:Cleaner_(Alcohol).jpg)



[https://commons.wikimedia.org/wiki/File:Day\\_63\\_-\\_The\\_Hard\\_Stuff...\\_Hand\\_sanitizer.jpg](https://commons.wikimedia.org/wiki/File:Day_63_-_The_Hard_Stuff..._Hand_sanitizer.jpg)



<https://pxhere.com/en/photo/750433>

**Procedure:**

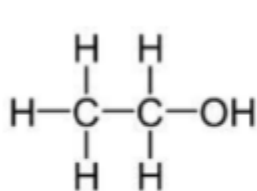
1. Read the labels of the products that contain alcohol.
2. Complete the table below, by writing the names of the products and the alcohol compounds that are present in the labels of the product and their uses.

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

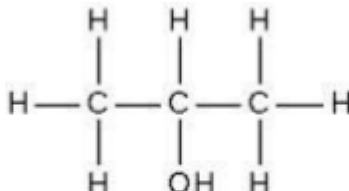
Q1. What are the common products that contain alcohol?

Q2. Why are these alcohols important?

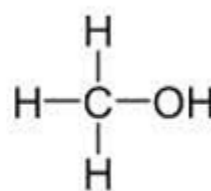
3. Use the following illustrations of the structures of common alcohols to answer the following questions.



Ethyl alcohol



Isopropyl alcohol



Methyl alcohol

Q3. What types of bonds are present in ethyl alcohol, methyl alcohol, and isopropyl alcohol?

Q4. What accounts for the similar physical properties of alcohol?





## What's New

**Word Search:** Find the hidden words in the box. The hidden words are written in all directions, written from left to right or from right to left, horizontally, vertically, and diagonally, but these are always on one straight line.

N	O	M	A	N	N	I	C	H	O	U	S	L
S	I	S	O	L	U	B	I	L	I	T	Y	F
U	A	L	O	G	T	E	R	M	I	N	A	L
N	O	B	L	L	H	Y	K	L	O	E	M	E
E	N	G	N	I	L	I	O	B	Q	G	N	M
T	N	W	T	E	N	I	R	O	W	N	M	U
R	A	O	G	R	R	A	D	I	S	U	A	F
E	N	O	T	E	C	A	V	L	Z	P	G	R
S	A	L	D	E	H	Y	D	E	X	R	E	E
M	U	E	N	A	K	L	A	R	U	X	V	P

acetone

boiling

ketone

solubility

aldehyde

carbonyl

perfume

terminal

alkane

cinnamon

pungent

vanillin

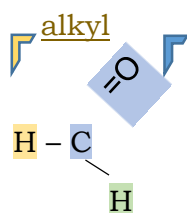
What are the smallest ketone and simplest aldehyde? The simplest aldehyde is **formaldehyde** and the smallest ketone is **acetone**. Aldehydes and ketones in combination with other functional groups are widely available in nature. There are many essential uses of aldehydes and ketones, and they form an inevitable part of many industrial processes. Aldehydes and ketones are widespread in nature including plants, microorganisms, animals, and humans.



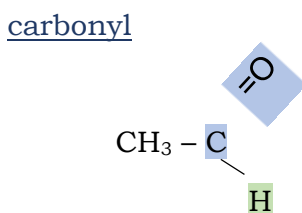
## What Is It

**Aldehydes and ketones** contain the **carbonyl group,  $\text{-C=O-}$** . In aldehydes, the carbonyl group is located at the **terminal end** of the molecule, whereas in ketones, the carbonyl group is located **anywhere between the two terminal ends** of the molecule.

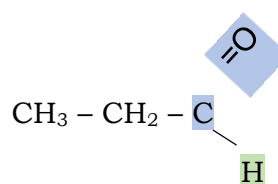
For example (aldehyde):



methanal



ethanal

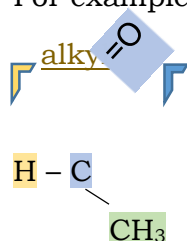


propanal

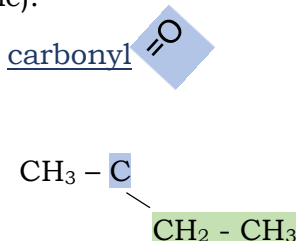
In aldehydes, the carbonyl group has one hydrogen atom attached to it together with either a **2nd hydrogen atom or a hydrogen group** which may be an alkyl group or one containing a benzene ring.

You can notice that all these have the same end to the molecule. The only difference is the complexity of the other attached group.

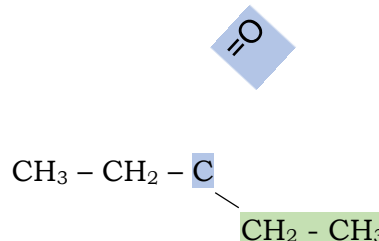
For example (ketone):



propanone



butanone



pentan-3-one

In ketones, the carbonyl group has **2 hydrocarbon groups** attached to it. These can be either the ones containing benzene rings or alkyl groups. Ketone **does not have a hydrogen atom attached to the carbonyl group**.

The simplest aldehyde is formaldehyde which has an irritating and pungent odor and is soluble in water. While the acetone is the simplest and most important ketone - which is colorless with pungent and sweet odor.

## Physical Properties of Aldehydes and Ketones

### 1. Boiling Points

Methanal is a gas (boiling point  $-21^{\circ}\text{C}$ ), and ethanal has a boiling point of  $+21^{\circ}\text{C}$ . That means that **ethanal boils at close to room temperature**. The other aldehydes and the ketones are liquids, with **boiling points rising as the molecules get bigger**. The size of the boiling point is governed by the **strengths of the intermolecular forces**.

Molecule	Type	Boiling Point ( $^{\circ}\text{C}$ )
$\text{CH}_3\text{CH}_2\text{CH}_3$	alkane	-42
$\text{CH}_3\text{CHO}$	aldehyde	+21
$\text{CH}_3\text{CH}_2\text{OH}$	alcohol	+78

Notice that the aldehyde (with dipole-dipole attractions as well as dispersion forces) has a boiling point higher than the similarly sized alkane which only has dispersion forces. However, the aldehyde's boiling point isn't as high as the alcohols. In alcohol, there is hydrogen bonding as well as the other two kinds of intermolecular attraction.

In general, as the **size of the molecules increases, the boiling point of the molecule increases** due to the increase in Van der Waals forces between them. The boiling point of aldehydes and ketones is higher than that of alkanes and ethers of similar molecular mass, however, it is significantly less compared to that of alcohols and carboxylic acids due to the absence of H-bonding in aldehydes and ketones.

### 2. Solubility in Water

The lower members of aldehydes and ketones such as methanal, propanone, etc. are miscible with water in all proportions because they **form a hydrogen bond with water**. As the **length of the alkyl chain increases, the solubility of aldehydes and ketones decreases** rapidly because the number of carbon atoms increases in the chain. All aldehydes and ketones are **fairly soluble in organic solvents** like benzene, ether, methanol, chloroform, etc.

### 3. Odor

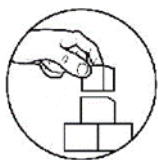
The lower aldehydes have sharp pungent odors. However, as the size of the molecule increases, the odor becomes less pungent and more fragrant.

## Sample Uses of Aldehydes & Ketones

Compounds of plants and microorganisms containing aldehydes and ketones include cinnamaldehyde in cinnamon bark, Citra in lemongrass, vanillin in vanilla bean, carvone in spearmint and caraway, helminthosporal- a fungal toxin, and camphor in camphor trees. Hormones of animal and human origin contain aldehydes and ketones such as muscone in musk deer, female sex hormone- progesterone, male sex hormone-testosterone, and adrenal hormone- cortisone.

A famous ketone “methadone” helps in curing addiction of opiates such as heroin, opium, and morphine. In this topic, we will study the many uses of aldehydes and ketones.

Aldehydes	Source	Use/s
1. Formaldehyde ( <i>formalin</i> )	pressed-wood products containing formaldehyde resins	used for preserving tissue specimens and embalming bodies; used to sterilize soil or other materials; used in the manufacture of Bakelite
Aldehydes	Source	Use/s
2. Acetaldehyde ( <i>ethanal</i> )	occurs naturally in coffee, bread, and ripe fruit, and is produced by plants	used for the production of acetic acid and pyridine derivatives
3. Propionaldehyde ( <i>propanal</i> )	from various plant sources, e.g. banana, melon, pineapple, bread, coffee, cooked rice, and strawberry or apple aroma	flavoring agent
4. Benzaldehyde	extracted from several natural sources	used in perfumes, cosmetic products, and dyes; provide almond flavor to food products; used as a bee repellent
Ketones	Source	Use/s
1. Dimethyl ketone ( <i>acetone</i> )	cumene process	solvent for lacquer, acetylene, plastics, and varnishes; paint and varnish remover; solvent
2. Butanone ( <i>methyl ethyl ketone</i> )	trees and some fruits	Industrial solvent; manufacture of plastics and textiles; paint remover; cleaning agent
3. Cyclohexanone	oxidation of cyclohexane in air	used in the production of nylon



## What's More

Look around your household, find items or substances that you think belongs to aldehydes and ketones. List down at least five (5) of these items in the table and cite their uses.

Substance/Item	Use/s
1.	
2.	
3.	
4.	
5.	



## What I Have Learned

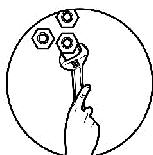
I. Complete the table about the uses of the compounds. Using a checkmark, indicate the uses of the compounds. You may have more than one checkmark per sample depending on its use/s.

Organic Compounds							
Products		Formaldehyde	Diesel	Ethyl alcohol	Butane	Kalburow	Acetic Acid
Uses	Beverage						
	Food						
	Antiseptic						
	Fuel						
	Cleaner						
	Preservative						
	Ripener						

II. Choose the correct statement which completes the sentence. Write your answer on your answer sheet.

- Aldehydes and ketones contain the
  - ☐ carbonyl group
  - ☐ alkyl group
- The smallest ketone is
  - ☐ formalin
  - ☐ acetone
- In aldehydes, the carbonyl group is located
  - ☐ anywhere between the two terminal ends of the molecule
  - ☐ at the terminal end of the molecule

4. Ethanal boils at close to
- room temperature
  - desert temperature
5. As the size of the aldehyde and ketone molecules increases, their boiling point
- increases
  - decreases
6. Methanal and propanone are miscible with water in all proportions because they
- form covalent bond with water
  - form hydrogen bond with water
7. As the length of the alkyl chain increases, the solubility of aldehydes and ketones
- decreases
  - increas



## ***What I Can Do***

Activity 3: Which bananas will ripen faster?

*(adapted and modified from Sci9 LRM)*

**Calcium carbide** ( $\text{CaC}_2$ ) is a compound that is commonly known as **kalburo**. Fruit vendors use this substance to speed up the ripening of fruits like mangoes and bananas in just a couple of days. When calcium carbide reacts with water such as moisture in the air, ethyne gas is produced. **Ethyne** or commonly known as acetylene is a kind of alkyne.

### **Objective:**

In this activity, you will be able to investigate how a common organic compound namely ethyne can ripen fruits faster than the natural way.

### **Materials:**

Calcium carbide (kalburo)	hand gloves
Newspapers	face masks
12 unripe, green bananas of same variety	small plastic cups
2 empty shoe or fruit juice boxes	packaging tape

**Procedure:**

1. Using a sheet of newspaper, wrap  $\frac{1}{4}$  kilo (250g) of crushed calcium carbide (kalburo). Make sure that the wrapped calcium carbide will just be enough to fit the area of the bottom of a shoebox.
2. Put the wrapped calcium carbide at the bottom of the shoebox and cover it with another piece of newspaper.
3. Place 3 unripe (nearing maturity) bananas of the same kind inside the first box with calcium carbide. This will be Setup A.
4. Do not put wrapped calcium carbide in the other shoebox.
5. Place another set of 3 green, unripe bananas of the same kind in the second box. This will be Setup B.
6. After putting all the bananas in both setups, cover both boxes.
7. Leave the shoeboxes for 48 hours.

Q1. What are you going to find out or investigate in the experiment?

Q2. What is/are the independent variable/s?

Q3. What is the dependent variable in the experiment?

Q4. Write your hypothesis or prediction about what might happen in the experiment.

8. Open both setups after 2 or 3 days. Observe what happened to the bananas. Write your observation in the data below.

Group	Observations
	Number of Ripe Bananas and their Appearance
A (with calcium carbide)	
B (without calcium carbide)	

Q5. How many bananas ripened in Setup A and in Setup B?

Q6. Which setup has fully ripened the bananas?

Q7. What conclusion can you draw based on the results of your experiment?

Q8. Look for the properties of ethyne and explain how it can hasten the ripening of fruits?

In this activity, you were able to observe how ethyne or acetylene, which is an alkyne, can make banana ripen faster. This is just one of the many applications of acetylene.

## Summary

- Organic compounds such as gasoline, kerosene, ethyl alcohol, isopropyl alcohol, formaldehyde, acetic acid, acetone, and lubricating oil have important uses. These uses are based on their specific chemical properties
- Ethyne or commonly known as acetylene is an alkyne hydrocarbon with a chemical formula  $C_2H_2$ . This organic compound is commonly used as fuel in an oxy-acetylene welding torch. Ethyne (acetylene) is also produced when Calcium carbide,  $CaC_2$ , reacts with water in the air. It has the ability to hasten the ripening of fruits. That is why fruit vendors use calcium carbide in ripening their fruits in just a few days.
- Ethene is a gaseous organic compound with a chemical formula  $CH_2CH_2$ . It is a plant's compound that is responsible for the ripening of fruits.
- Alcohols are a group of organic compounds that contain a hydroxyl group, -OH, that is chemically bonded to a carbon atom in the compound. They have special uses such as a disinfectant, fuel, and as the main component (ethyl alcohol) of liquor and other alcoholic drinks.
- Carbonyl compounds like acetone and formaldehyde have a carbonyl functional group,  $C=O$ , which is chemically bonded to a carbon atom in the compound. These common carbonyl compounds also have important uses: acetone is used as a cleaning agent like a nail polish remover, and formaldehyde is used in preserving organic materials like an animal specimen. Formaldehyde is also the compound used in embalming human cadavers.



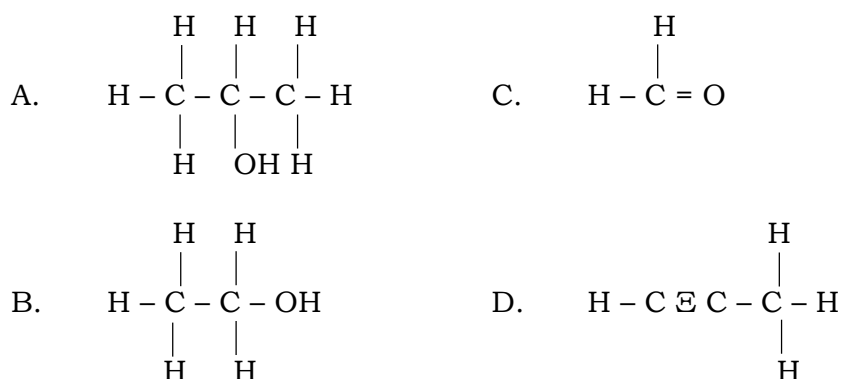
## Assessment: (Post-Test)

**Multiple Choice:** Read the statements carefully. Choose the BEST answer. Write the letter of your answers on your answer sheet.

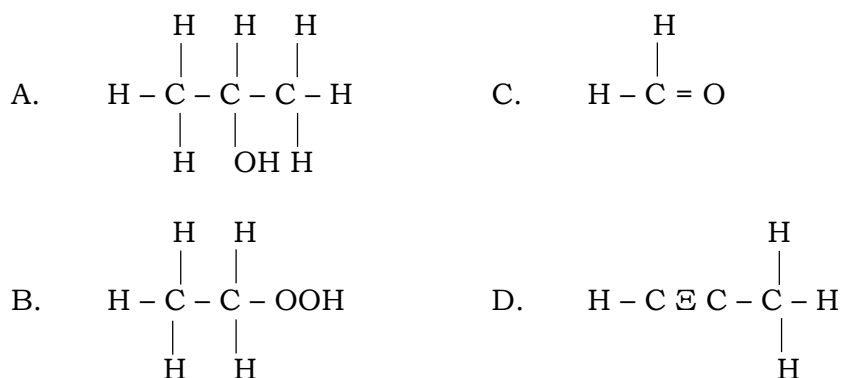
- Honey is applying something to the ball bearings of the wheels of her bicycle so that friction will be minimized. Which of the following material do you think she is using?  
A. vinegar  
B. isopropyl alcohol  
C. kerosene  
D. lubricating oil
- A gasoline boy was being scolded by his store manager for smoking in the vicinity of the gasoline station. Why do you think the manager scolded his employee?  
A. because gasoline is volatile and flammable  
B. because gasoline has a bad odor  
C. because gasoline is viscous  
D. because gasoline has a black color
- Amidst COVID-19, DOH advised everyone to thoroughly disinfect their hands with \_\_\_\_\_.  
A. formalin  
B. isopropyl alcohol  
C. kerosene  
D. acetone



4. Ethene is a natural gas produced in plants, which acts as a natural ripening agent of fruits. Which of the following organic compounds has the same ability to ripen fruits?  
 A. butane                      B. propene                      C. acetylene                      D. pentyne
5. What is the common use of methane?  
 A. disinfectant                      C. artificial ripening agent  
 B. fertilizer                      D. fuel
6. Which are TRUE about the use of isopropyl alcohol?  
 I. Cleaner                      II. Fuel                      III. Disinfectant                      IV. Fertilizer  
 A. I, II, and III only    B. II and III only    C. III and IV only    D. I and IV only
7. Salvador has to remove the red paint in the paintbrush so that he could still use it again next time. What organic compound should he use to remove the paint in the paintbrush?  
 A. acetic acid                      B. lubricating oil    C. kerosene                      D. formaldehyde
8. Which of the following compounds is a carbonyl compound?



9. What organic compound is used by embalmers in treating human cadavers?  
 A. acetic acid                      B. formaldehyde    C. methyl alcohol    D. acetone
10. Which compound is an alcohol?



11. 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.
12. 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
13. What is the maximum number of bonds can a carbon atom form?
- A. 2                                  B. 3                                  C. 4                                  D. 5
14. Emmanuel Juan, a fisherman, 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. Liquefied Petroleum Gas (LPG)
  - B. gasoline
  - C. lubricating oil
  - D. isopropyl alcohol
15. 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



## Answer Key

<p>What I know: Pre-Test</p> <ol style="list-style-type: none"> <li>A</li> <li>D</li> <li>C</li> <li>D</li> <li>D</li> <li>D</li> <li>D</li> <li>B</li> <li>C</li> <li>C</li> <li>A</li> <li>C</li> <li>C</li> <li>B</li> <li>A</li> <li>C</li> <li>B</li> <li>A</li> <li>D</li> </ol>	<p>What's New</p> <ol style="list-style-type: none"> <li>Organic</li> <li>Inorganic</li> <li>Inorganic</li> <li>Organic</li> <li>Organic</li> <li>Organic</li> </ol> <p>Q1. C Q2. Fuel Q3. Tested foods contain C, H, and O; fuels contain only C and H</p>	<p>What's New</p> <ol style="list-style-type: none"> <li>Hydroxyl</li> <li>Alkyl</li> <li>Higher</li> <li>Increases</li> <li>Intermolecular</li> <li>Decreases</li> <li>Increases</li> <li>Decreases</li> </ol>	<p>Assessment: Post-Test</p> <ol style="list-style-type: none"> <li>D</li> <li>A</li> <li>B</li> <li>C</li> <li>D</li> <li>A</li> <li>C</li> <li>C</li> <li>B</li> <li>A</li> <li>C</li> <li>B</li> <li>A</li> <li>C</li> <li>B</li> <li>A</li> <li>D</li> </ol>
<p>What's More</p> <ol style="list-style-type: none"> <li> <p>Formaldehyde – Preservative</p> <p>Diesel – Fuel</p> <p>Ethyl alcohol – Antiseptic, Beverage, Fuel</p> <p>Butane – Fuel</p> <p>Kalburow – Ripener</p> <p>Acetic acid – Food, Antiseptic</p> <p>Butane, alkane</p> <p><math>\text{CH}_3(\text{CH}_2)_5\text{CH}_3</math>, alkane</p> <p>Hexane, alkane</p> <p><math>\text{CH}_3(\text{CH}_2)_8\text{CH}_3</math>, alkane</p> <p>2-butene, alkene</p> <p>Propyne, alkynes</p> <p>Propene, alkene</p> <p>2-pentyne, alkynes</p> </li> <li></li> </ol>			

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**For inquiries or feedback, please write or call:**

Department of Education - Bureau of Learning Resources (DepEd-BLR)

Ground Floor, Bonifacio Bldg., DepEd Complex  
Meralco Avenue, Pasig City, Philippines 1600

Telefax: (632) 8634-1072; 8634-1054; 8631-4985

Email Address: [blr.lrqad@deped.gov.ph](mailto:blr.lrqad@deped.gov.ph) \* [blr.lrpd@deped.gov.ph](mailto:blr.lrpd@deped.gov.ph)