

Department of Education

Science 9

Uses and Properties of Organic Compounds

Second Quarter – Week 5



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EXPECTATION

Hello Learner! In this module, you should be able to demonstrate understanding on the structures, properties, and uses of organic compounds.

Explain how the structure of the carbon atom affects the type of bonds it forms; (S9MT-IIg-h-17)

Specifically, you will be able to:

- Determine the different uses of organic compounds and cite examples of each organic compound; and
- Find the properties of common organic compounds through experimentation (from Grade 9 Module).



PRE-TEST

Directions: Choose the letter of the correct answer.

1. Which of the following statements best describe organic compounds?
A. They contain carbon atoms only
B. They are produced by living things
C. They contain carbon and oxygen only
D. They composed mainly of carbon and hydrogen
2. How do carbon atoms form many organic compounds?
A. By attracting other elements toward themselves to form the bonds
B. By sharing their electrons with other metal and non-metal elements
C. By transferring their electrons to the atoms of surrounding elements
D. By forming many bonds with other carbon atoms and other elements
3. What is the maximum number of bonds can a carbon atom form?
A. 2 B. 3 C. 4 D. 5
4. Which organic compound is used as fuel for cooking enclosed in tanks?
A. gasoline B. LPG C. kerosene D. oil
5. Which of the following pairs of organic compounds is highly flammable?
A. gasoline, acetone C. liquefied petroleum gas, kerosene
B. oil, isopropyl alcohol D. water, ethyl alcohol
6. 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. isopropyl alcohol B. kerosene C. lubricating oil D. vinegar
7. 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 C. because gasoline is viscous
B. because gasoline is flammable D. because gasoline is missible
8. Which of the following is used as disinfectant?
A. acetone B. formalin C. isopropyl alcohol D. water

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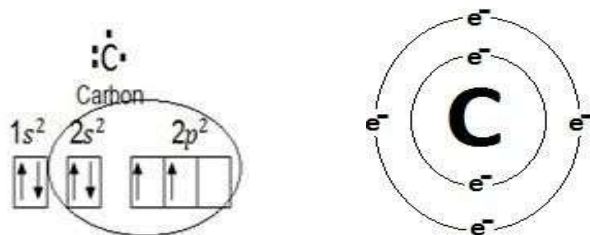
Directions: List down five examples of organic compounds and inorganic compounds.

Organic Compounds	Inorganic Compounds

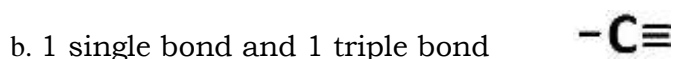
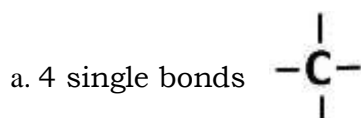


BRIEF INTRODUCTION

Organic compounds are made up primarily of Carbon (C) which is a non-metal element with atomic number of 6, which means it has 6 protons. With an electron configuration of $1s^2 2s^2 2p^2$, it has 2 electrons in its inner shell (K-shell) and 4 electrons in its outermost shell or valence shell (L-shell). This 4 valence electrons makes carbon capable of forming up to 4 covalent bonds with other elements, which is based on the Octet Rule.



The possible combinations of covalent bonds the carbon atom can form with other elements are:



c. 2 single bonds and 1 double bond $\begin{array}{c} | \\ -\text{C}= \end{array}$

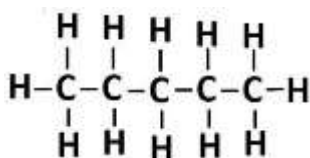
d. 2 double bonds $=\text{C}=$

*Note – carbon can only form a maximum of 4 covalent bonds (4 lines).

Unlike silicon or other elements that share similar chemical property of having 4 valence electrons, carbon has the “right size” and “stability” to form larger molecules.

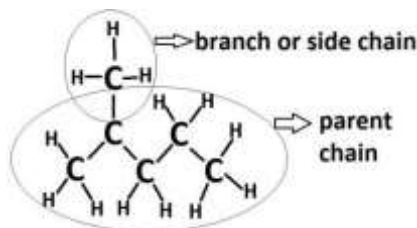
Since each carbon atom can accommodate up to 4 covalent bonds, it can form interconnecting carbon-carbon bonds (through catenation – the bonding of atoms of same element into a series called “chain”).

Example: pentane (5-carbon chain)



Aside from forming “single chain” like the one shown above, carbon is also capable of forming side-chain or “branch.”

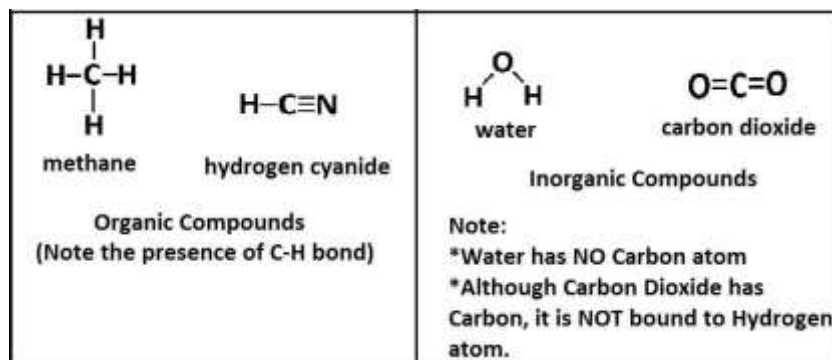
Example: 2-methylpentane (5-carbon parent chain with 1-carbon branch)



This is the reason why “countless” numbers of organic compounds (an estimate of more than 9 million are known) exist in nature.

The definition of organic compound varies depending on different authors. However, the current general consensus states that a compound is classified as organic if it contains **carbon-hydrogen bond**. Any compound that DOES NOT have carbon-hydrogen bond is considered inorganic, though with some exceptions.

Example:



Many organic compounds are commonly used at home or in the community. These compounds have their specific uses and properties. Some of these compounds are used to fuel vehicles, light lamps, cook food, disinfect wounds, flavor beverages, and lubricate machines. Every kind of organic compound has specific properties or characteristics. Although these compounds may show similarities in some properties, these compounds do not have exactly the same properties. There are some examples of organic compounds like gasoline, kerosene, diesel oil, lubricating oil, vanillin, acetic acid, and ethyl alcohol are organic compounds with different properties. Gasoline, for example, has a strong odor, volatile, and highly flammable.

In this module, you will find out about the properties of some common organic compounds -namely, *odor*, *viscosity*, *volatility*, and *flammability*- **Odor** is the smell of the compound. Every compound has its own specific odor. **Viscosity** is the measure of a liquid's resistance to flow. **Volatility** is the measure of the tendency of a compound to evaporate or turn into gaseous state. **Flammability** is the measure of how easily material burns.



ACTIVITIES

Activity 1: Write it, Name it!

Objectives: To write the structure and name of organic compounds

Structure	Name
	Propane
$\begin{array}{c} \text{CH}_3 \\ \\ \text{H}_2\text{C}=\text{CH}-\text{CH}-\text{CH}_2 \\ \\ \text{CH}_3 \end{array}$	
	Hexyne
$\begin{array}{c} \text{H}_2\text{C}-\text{CH}_3 \\ \\ \text{H}_3\text{C}-\text{CH}-\text{CH}-\text{O}-\text{CH}_2\text{CH}_3 \\ \\ \text{CH}_3 \end{array}$	

Activity 2: Organic Compounds—Are They Useful?**Objective:** Recognize the uses of common organic compounds.**Materials:**

- paper and pen
- Labels of the following products:
Milk acetone kerosene acetic acid liquid soap ethanol

Procedure:

- 1) Read and examine the labels of the following products. Use the labels of the materials to answer the questions:
- 2) Complete the table below. Using a check mark, indicate the uses of the compounds. You may have more than one check mark per sample depending on its use/s.

Table 1: Organic compounds and their uses.

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

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

Guide Questions.

Q1. Given the uses of each compound, what do you think are their distinct characteristics/properties?

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

You just learned the important uses of common organic compounds that are commonly used. In the next activity, you will learn about the properties of these common compounds that will help you to appreciate their specific uses.

Activity 3: Properties of Common Organic Compounds.**Objectives:**

- Observe the properties of common organic compounds; and
- Relate these properties to their uses.

Materials:

- | | |
|--|-------------------------------------|
| paper and pen | ethyl alcohol |
| 4 medicine droppers | 4 bottle crowns (tansan) |
| liquid soap | matches |
| stop watch | calculator |
| lubricating oil | 4 pieces of half inch-plastic beads |
| 4 pieces of $\frac{1}{4}$ sheet of long bond papers | |
| 25 mL transparent container/ bottle acetone | |
| 4 identical transparent containers/ bottles (about 5 inches) | |

WARNING: Follow procedures carefully in dealing with flammable substances. Prepare sand or wet rags to be used in case of fire.

Procedure

- 1) a. Use the table below to record your data from this activity.

Table1.Properties of Common Organic Compounds.

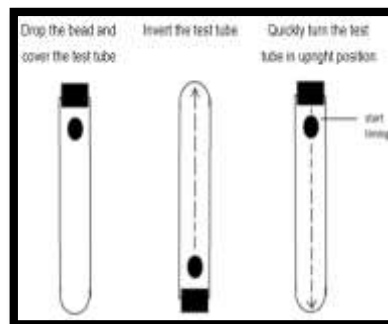
Materials	Odor	Phase	Viscosity (average time it takes the marble to reach the bottom)	Volatility (the time it takes the liquid to evaporate)	Flammability (average time it takes the material to burn completely)
Liquid soap					
Lubricati-ng oil					
Acetone					
Ethyl alcohol					

**This activity is adapted, with minor modification, from the Teaching Resource Package S & T IIIChemistry. (1992) of The Philippine-Australian Science and Mathematics Education Project (PASMEP), University of the Philippines Institute of Science and Mathematics Education Development, and The Department of Education Culture and Sports (DECS)*

- b. Place 15 ml of each liquid in the four (4) identical transparent container and label each container according to the liquid it contains.
c. Observe the materials and write the phase and odor of the materials on the table.

2) Testing the viscosity of the materials

- Fill the transparent container/ bottle with the first liquid, drop one plastic bead, and then cover it tightly with a cork or rubber stopper.
- Invert the transparent container/ bottle so that the bead falls and touches the cork as shown in the illustration.
- Quickly turn the transparent container/ bottle in an upright position. Determine the time it takes the bead to fall or reach the bottom of the transparent container/ bottle.
- Do the same for other samples.



<https://dochub.com/eveliasadullo/Gd71aZOw4ro8o2K2Q9AP3g/organic-compounds-activities>

3) Testing the Volatility of the Materials

- Using a medicine dropper, put two drops of each liquid material on the separate pieces of bond papers. You should do this at the same time and place it on the armrest.

- b. Record the time it takes the papers to get dry. This is equivalent to the time it takes the liquid to completely evaporate.

3) Testing for Flammability of the Materials

(This part of the activity should be done under direct adult supervision to avoid any circumstances of accident using fire).

- a. Prepare four bottle crowns (tansan) and then place a cotton bud in each crown.
- a. Wet the cotton buds with 10 drops of the liquid materials.
- b. Ignite each wet cotton bud using a lighted match stick.
- c. Record the time it takes each cotton bud to burn completely.
- d. Repeat steps a, b, c and d four (4) more times so that you will have five (5) trials per liquid material.
- e. Compute for the average time it takes each cotton bud to burn completely.

Guide Questions.

Directions: Based on the experiment done, answer the following questions.

Q1. Which is the most viscous material? What are the common uses of viscous materials?

Q2. Which materials are flammable? In what ways are these materials used?

Q3. Which liquid materials have strong odor and weak odor?

Q4. Why is it important to know the properties of these organic compounds?



REMEMBER

Directions: Using the word bank, complete the sentences below.

WORD BANK

Oxygen	hydrogen	carbon
inorganic	low	high
		organic

1. Organic compounds have _____ melting point and boiling points.
2. Since organic compound burn easily the main components are carbon and _____?
3. Our bodies digest different _____ foods that supply us energy.

4. Some _____ compounds found in nature have been synthesized by chemists in laboratory for use like synthetic plastic and medicine.
5. Carbon dioxide is an example of _____ compound.



CHECK UNDERSTANDING

Directions: Briefly explain the following questions.

1. Cite (5) five examples (besides in our activity) of organic compound found in your home and explain their uses

2. The Philippines imports crude oil from Saudi Arabia and Russia. What advantage would it give if our country will use our own natural gas to produce oil?



POST TEST

Directions: Choose the letter of the best answer

1. Why are carbon atoms able to form many organic compounds?
 - A. They can form many types of bonds with other carbon
 - B. They have strong attraction to other elements
 - C. They attract electrons from other atoms
 - D. They transfer electron to attain utmost stability of the element
2. How many types of bonds can a carbon atom form?
 - A. 1
 - B. 2
 - C. 3
 - D. 4
3. The fractions obtained by fractional distillation of petroleum have different uses. Which fraction and use are correct?

A. Bitumen -used for asphalt roads	C. Petrol - making waxes
B. Kerosene - aircraft fuel	D. Asphalt – for food
4. Acetic acid is found in which of the following substances?

A. gasoline	C. vinegar
B. liquefied petroleum gas (LPG)	D. water
5. Why is the study of carbon compounds important?

- A. Without carbon the Sun would run out of energy
 B. It is the substituent element to all living organisms
 C. It is the key element in producing electricity
 D. It is used primarily on inorganic materials
6. Which substance is commonly use as bleaching and cleaning agent?
 A. acetone B. formalin C. oxalic acid D.kerosene
7. How many types of bonds are there in hydrocarbon compound?
 A. 1 B. 2 C. 3 D. 4
8. 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 should she use?
 A. isopropyl alcohol B. kerosene C. lubricating oil D. vinegar
- 9.Methane is a component of natural gas.
 What is the common use of methane?
 A. cleaning agent B. disinfectant C. fuel D. medicine
10. Which of the following statements best describe organic compounds?
 A. They contain carbon atoms only
 B. They are produced by living things
 C. They contain carbon and oxygen only
 D. They composed mainly of carbon and hydrogen

References:

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- Janir Datukan, Genelita Garcia, Marie Paz Morales, Crisanta Ocampo, *Mixploring Science Grade 9*, (Published by *Vibal Group Inc.*) Lesson 19 Carbon Compounds, pages 115-116.

Answer Key:

Pre Test: 1D, 2D, 3B, 4C, 5C, 6C, 7B, 8C, 9A, 10C, 11D, 12B, 13D, 14C, 15D
Post Test: 1D, 2A, 3C, 4D, 5C, 6B, 7C, 8C, 9D, 10C, 11C, 12C, 13C, 14B, 15D