What Is Organic Chemistry?

Student worksheet | Name: _____ Class: _____ Date: _____

Learning goals: define organic chemistry; explain carbon bonding; classify compounds; recognise everyday organic substances; describe applications in science, medicine and industry.

A. Foundations of organic chemistry

1. Define organic chemistry in one or two sentences.

2. Explain why most organic compounds contain carbon but not every carbon-containing compound is classified as organic.

3. Carbon normally forms four covalent bonds. Explain how this helps carbon form many different molecules.

4. State what a covalent bond is. Name two other elements commonly bonded to carbon in organic compounds.

B. Organic or inorganic?

Classify each substance as organic or inorganic using the usual introductory chemistry convention. Give a reason for any two choices.

Substance	Formula	Organic / Inorganic
Methane	CH_4	
Carbon dioxide	CO_2	
Ethanol	C_2H_5OH	
Sodium carbonate	Na_2CO_3	
Glucose	$C_6H_{12}O_6$	
Water	H_2O	
Calcium carbonate	$CaCO_3$	
Ethanoic acid	CH_3COOH	

5. Why are carbon dioxide and carbonates normally treated as inorganic compounds?

C. How carbon builds molecules

Each line in a displayed structure represents one covalent bond. Carbon forms four bonds in the examples below.

Methane: CH_4 Ethane: C_2H_6 Ethene: C_2H_4

6. How many covalent bonds does each carbon atom typically form in these molecules?

7. Compare ethane (C_2H_6) and ethene (C_2H_4). What is different about the bond joining their carbon atoms?

8. What is meant by a carbon chain? How is a carbon ring different?

Complete the following simplified structural information:

Molecule	Description to complete
Methane (CH_4)	One carbon joined to _____ hydrogen atoms
Ethane (C_2H_6)	Two carbon atoms joined by a _____ bond
Ethene (C_2H_4)	Two carbon atoms joined by a _____ bond
Propane (C_3H_8)	Number of carbon atoms: _____

D. Organic chemistry in daily life

9. Give one organic compound or material associated with each: food, fuel, medicine, and clothing. Name the substance rather than simply writing "chemicals".

10. Explain why glucose is important in living organisms.

11. Explain why plastics are often described as organic polymers.

12. A label lists water, sugar (sucrose), carbon dioxide, and citric acid. Which ingredients are normally classified as organic compounds?

E. Match the applications

Write the correct letter beside each description.

Field	Example / application
A. Medicine	1. Producing polyethylene for packaging
B. Agriculture	2. Designing medicines such as aspirin
C. Manufacturing	3. Producing fuels and lubricants from petroleum
D. Energy	4. Developing pesticides and plant-growth chemicals

Matches: A → _____ B → _____ C → _____ D → _____

F. Apply your understanding

13. A student says, “Anything containing carbon is organic.” Evaluate this statement with two examples.

14. Diamond and graphite consist of carbon atoms but are not usually studied as organic compounds. Explain why this does not contradict the definition used in introductory organic chemistry.

15. A company wants a lightweight, flexible food container. Explain how organic chemistry contributes to developing suitable materials.

16. Explain how organic chemists contribute to the discovery or improvement of medicines.

17. Some organic chemicals are useful but can also cause pollution. Give one example and suggest one way to reduce its environmental impact.

G. Check your understanding

Circle the best answer for each question.

18. Which feature explains carbon’s wide variety of compounds? A. It makes only ionic bonds B. It can bond to itself and form four covalent bonds C. It is a noble gas D. It cannot form rings

19. Which substance is typically classified as inorganic? A. Ethanol B. Methane C. Calcium carbonate D. Glucose

20. Which application most directly uses organic chemistry? A. Designing a pharmaceutical molecule B. Measuring earthquake magnitude C. Finding the melting point of pure iron D. Calculating orbital speed

Extension challenge

21. Compare the formulas CH_4, C_2H_6 and C_3H_8. Predict the formula of the next saturated straight-chain alkane and explain the pattern.

22. Why is the statement “organic means natural and harmless” scientifically incorrect? Support your answer with examples.

Reflection: Which learning goal do you understand best? Which one needs more practice?

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