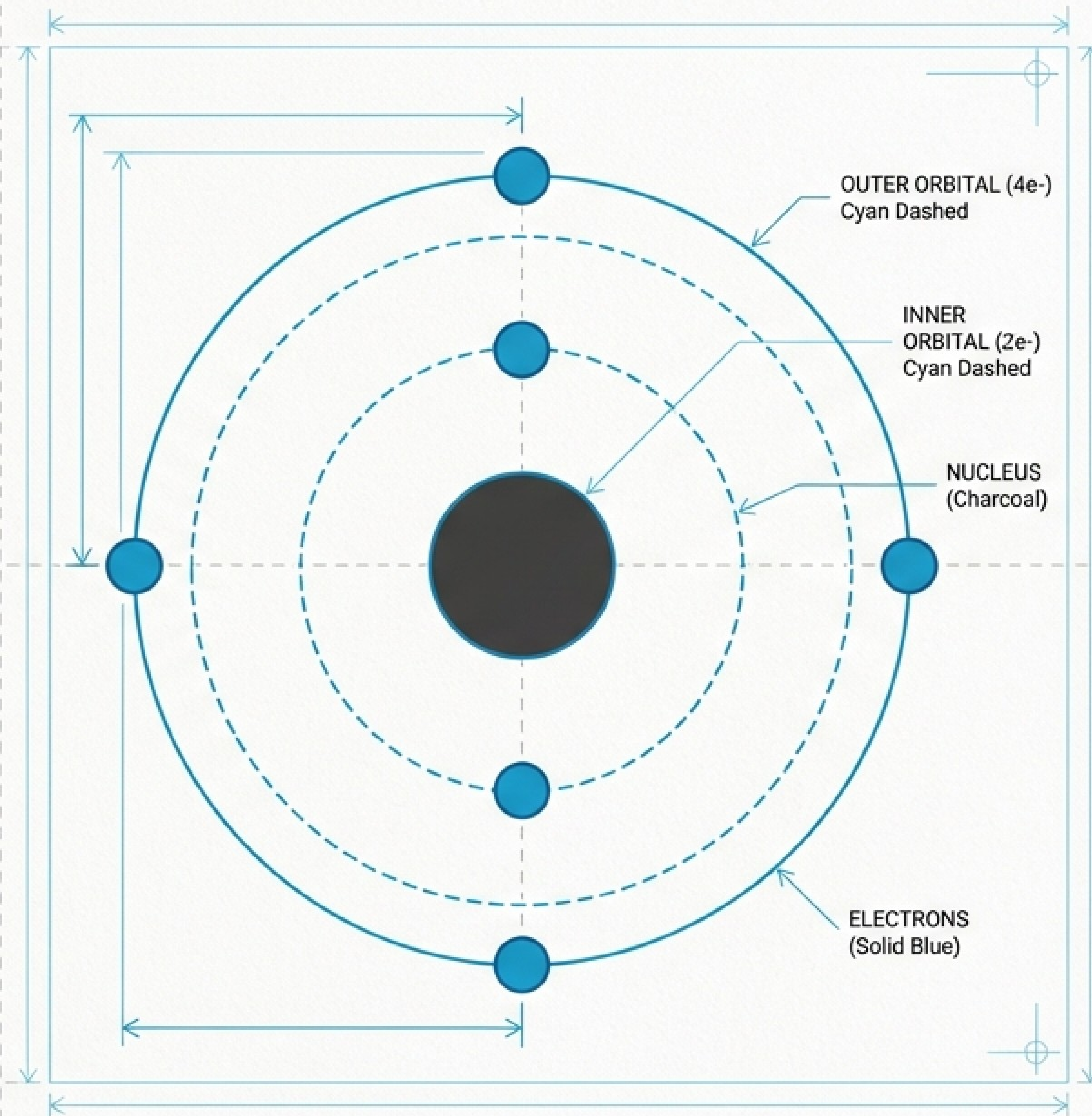


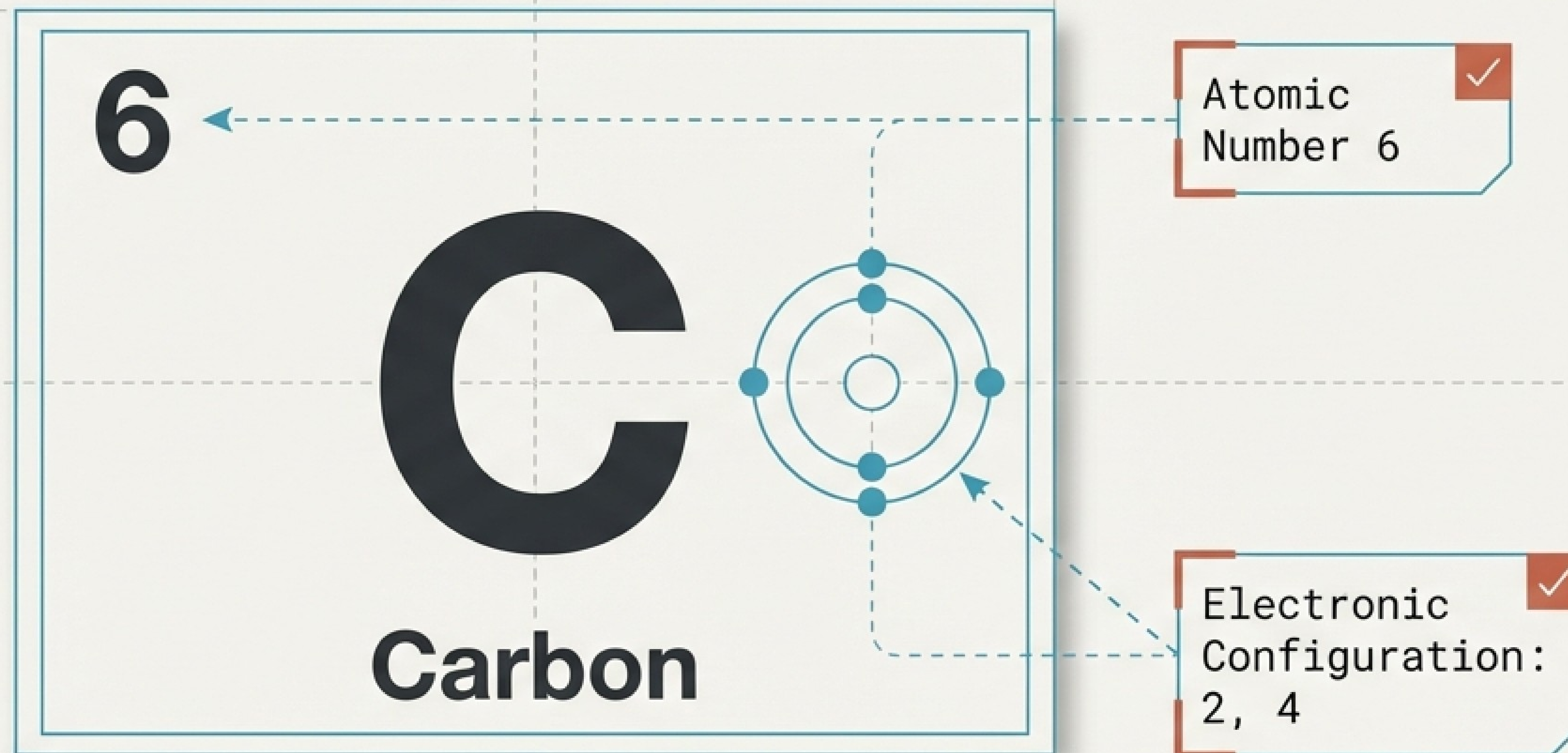
# Mastering Carbon and Its Compounds

## A Visual Study Guide

Essential notes on atomic structure, covalent bonds, catenation, and real-world compounds.

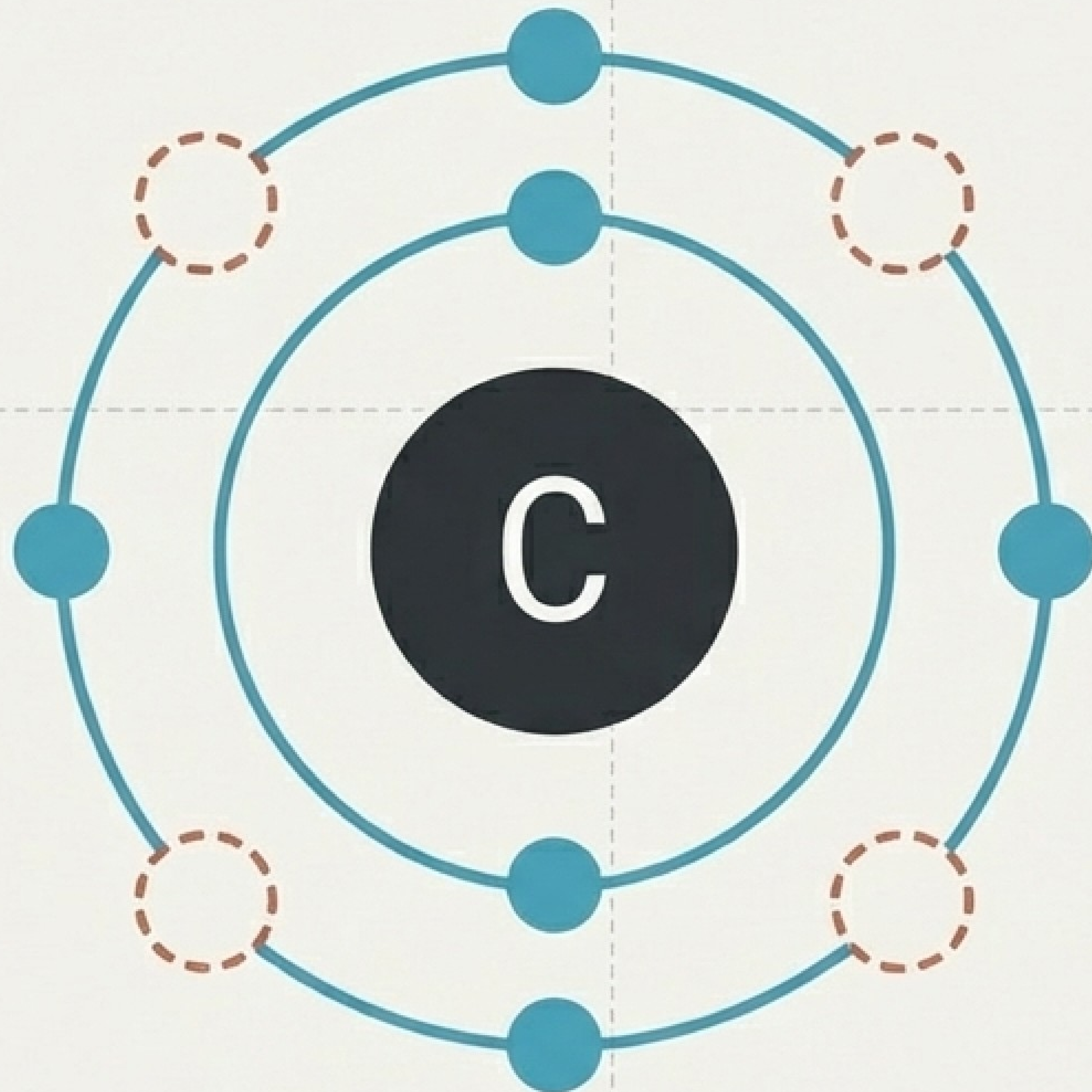


# Carbon is the basic element present in all organic compounds



- - Carbon forms a massive number of compounds.
- - It has the unique ability to bond with many elements, including other carbon atoms.

# Carbon requires four more electrons to complete its octet



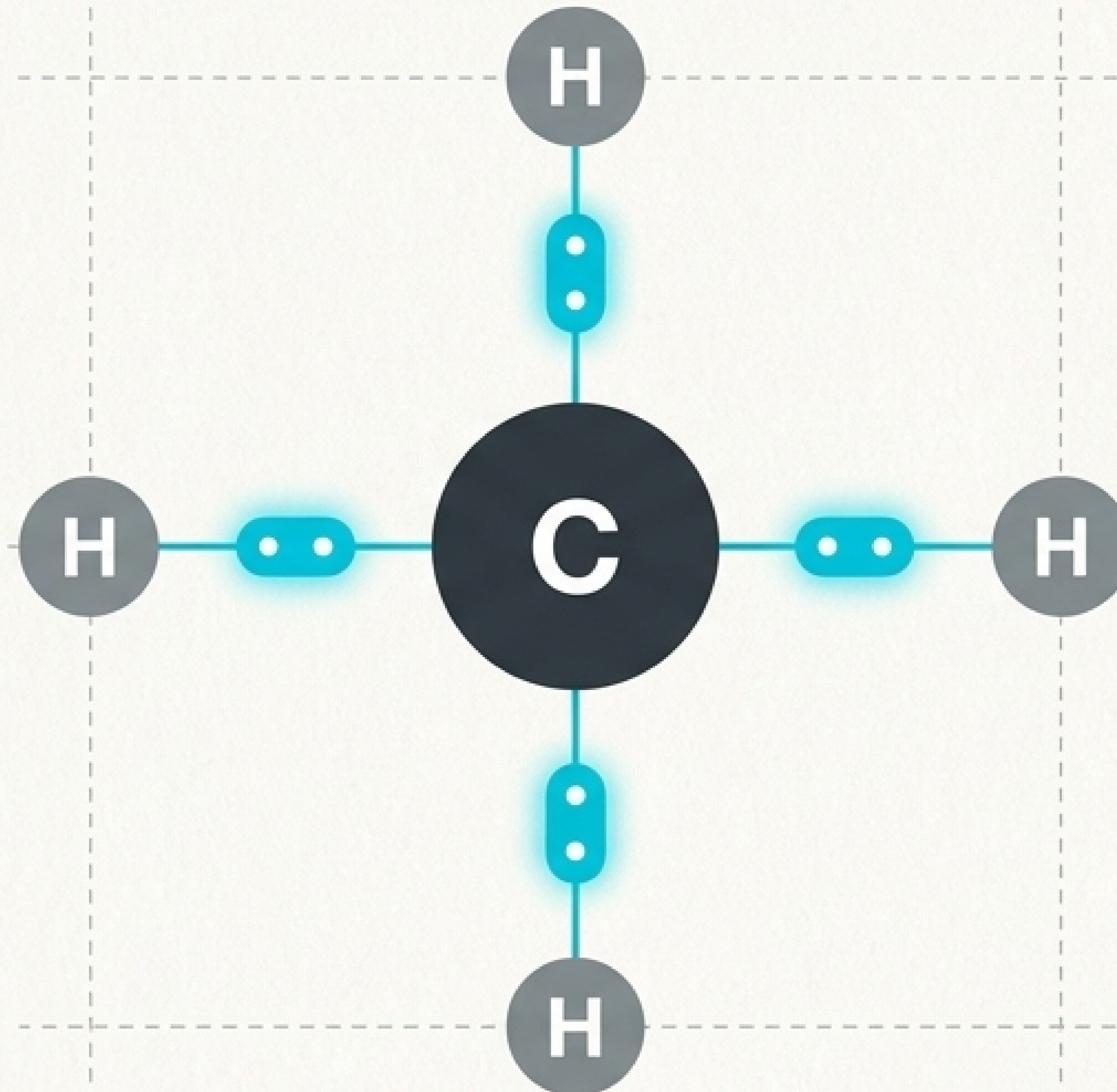
Because the electronic configuration is 2,4, Carbon has exactly four valence electrons.

To achieve stability (a full octet), it needs four more.

**Consequence:** Carbon forms exactly four covalent bonds with other atoms.

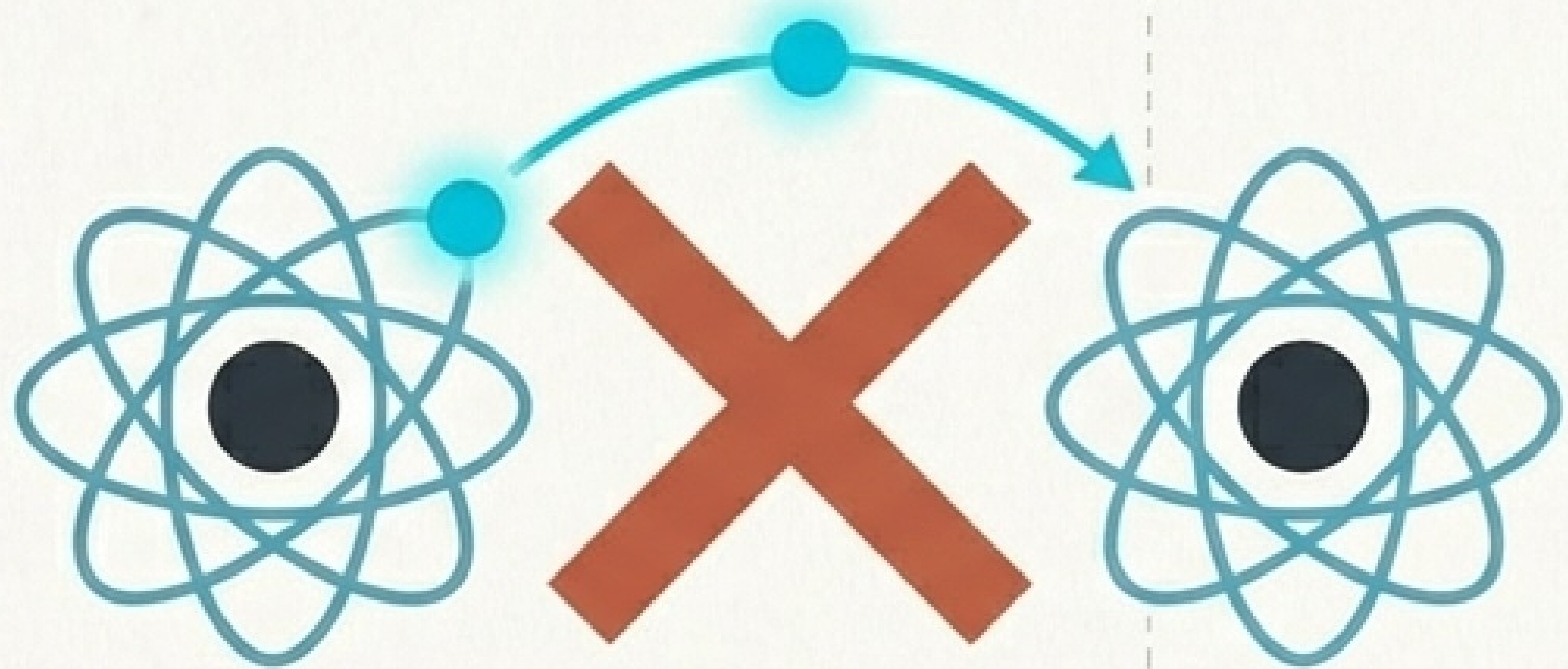
# Methane perfectly demonstrates carbon's four covalent bonds

Compound: Methane  
Formula: CH<sub>4</sub>



One central carbon atom bonds with four surrounding hydrogen atoms to complete its octet.

# Covalent bonds form when atoms share pairs of electrons



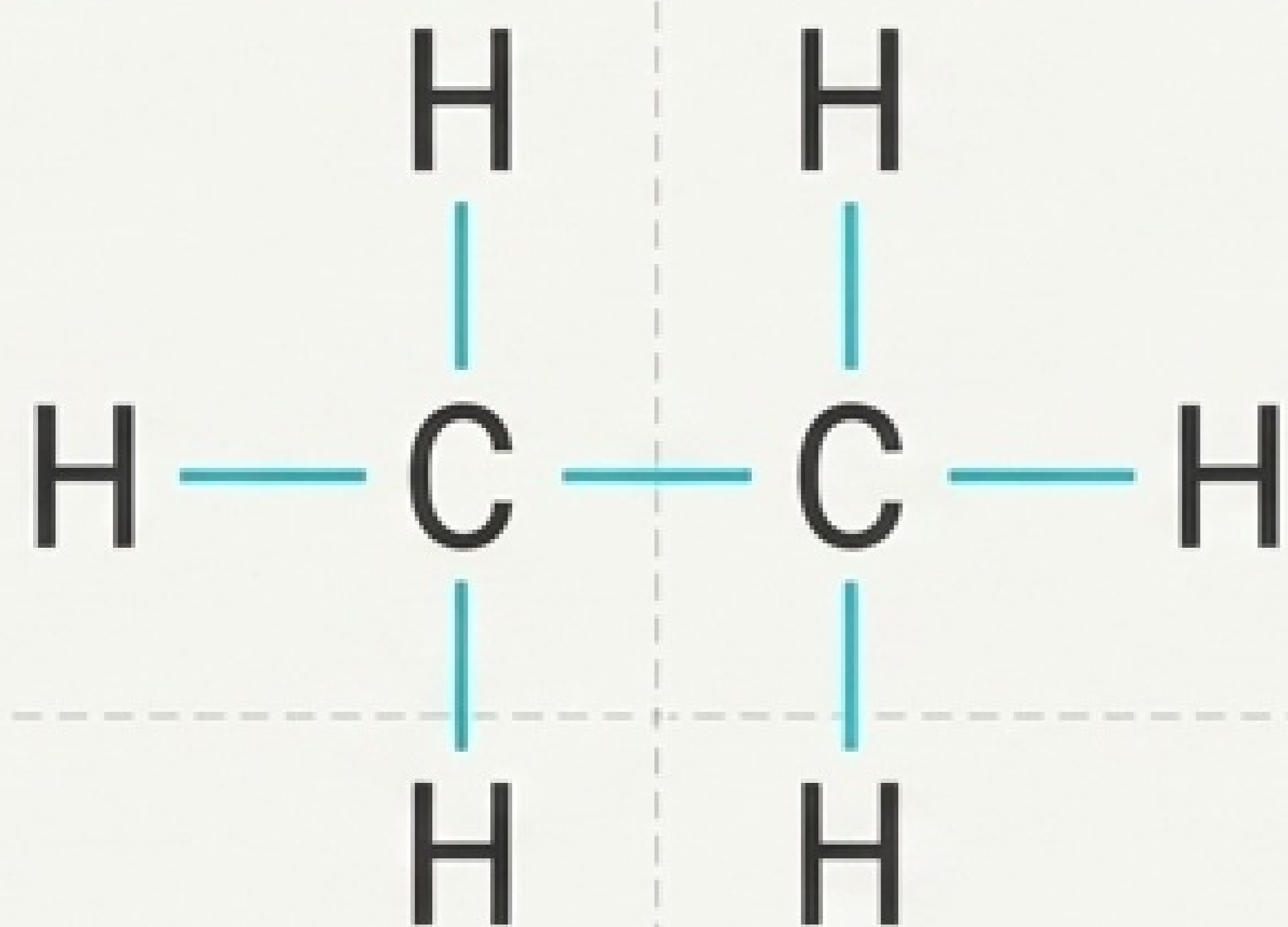
Carbon does not transfer electrons to form ionic bonds.



Instead, carbon forms covalent bonds by sharing electrons with other atoms.

This sharing allows both atoms involved to reach a stable state.

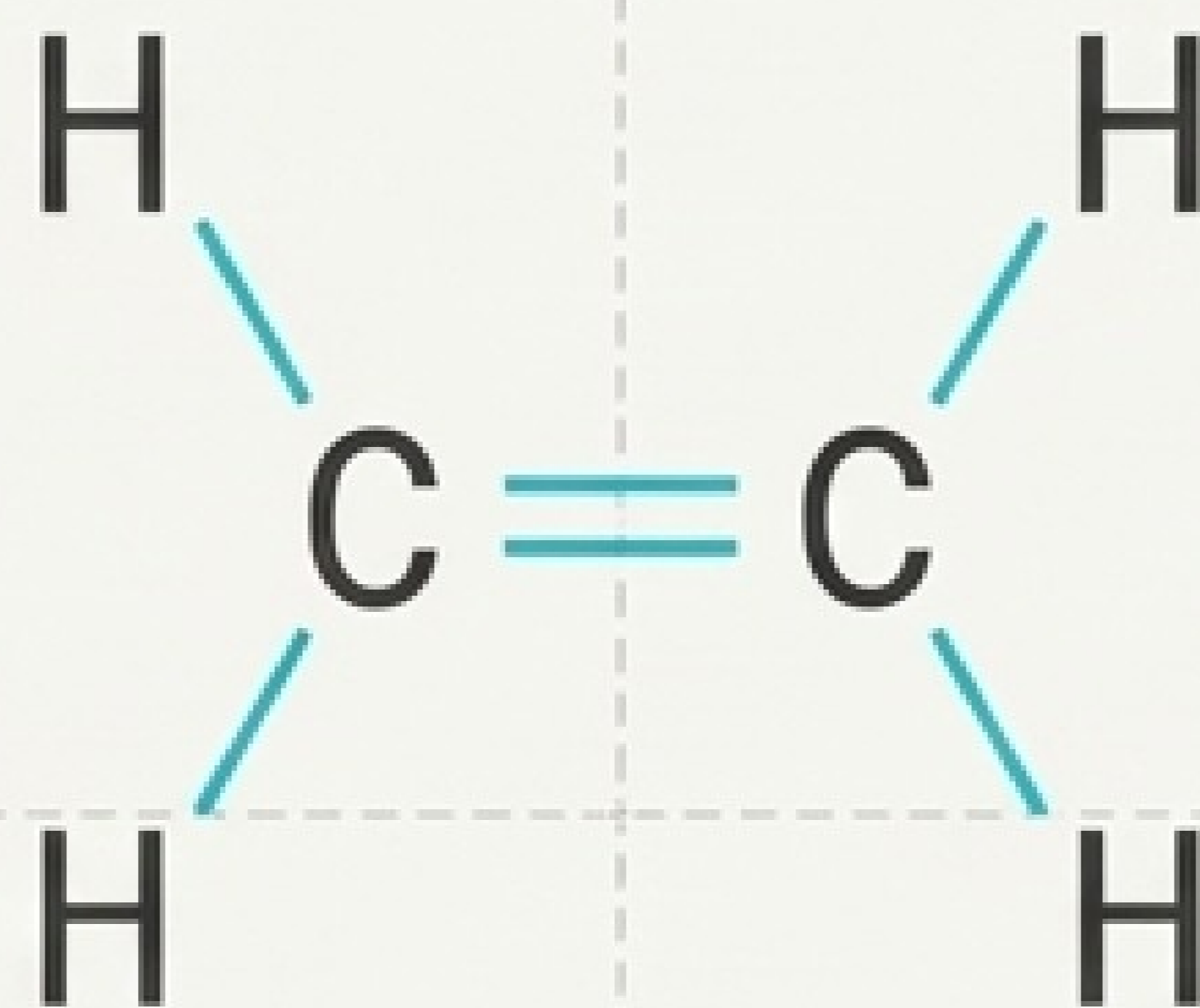
# Carbon pairs can share one, two, or three sets of electrons



## Single Bond

Sharing of one pair of electrons.

Example: Ethane (C<sub>2</sub>H<sub>6</sub>)



## Double Bond

Sharing of two pairs of electrons.

Example: Ethene (C<sub>2</sub>H<sub>4</sub>)

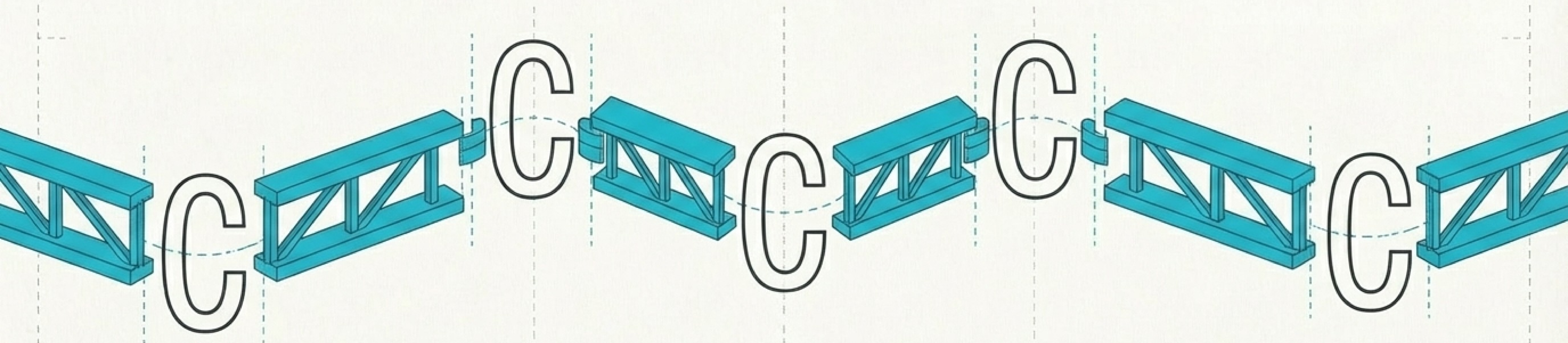


## Triple Bond

Sharing of three pairs of electrons.

Example: Ethyne (C<sub>2</sub>H<sub>2</sub>)

# Catenation is carbon's unique ability to form continuous chains



## The Property:

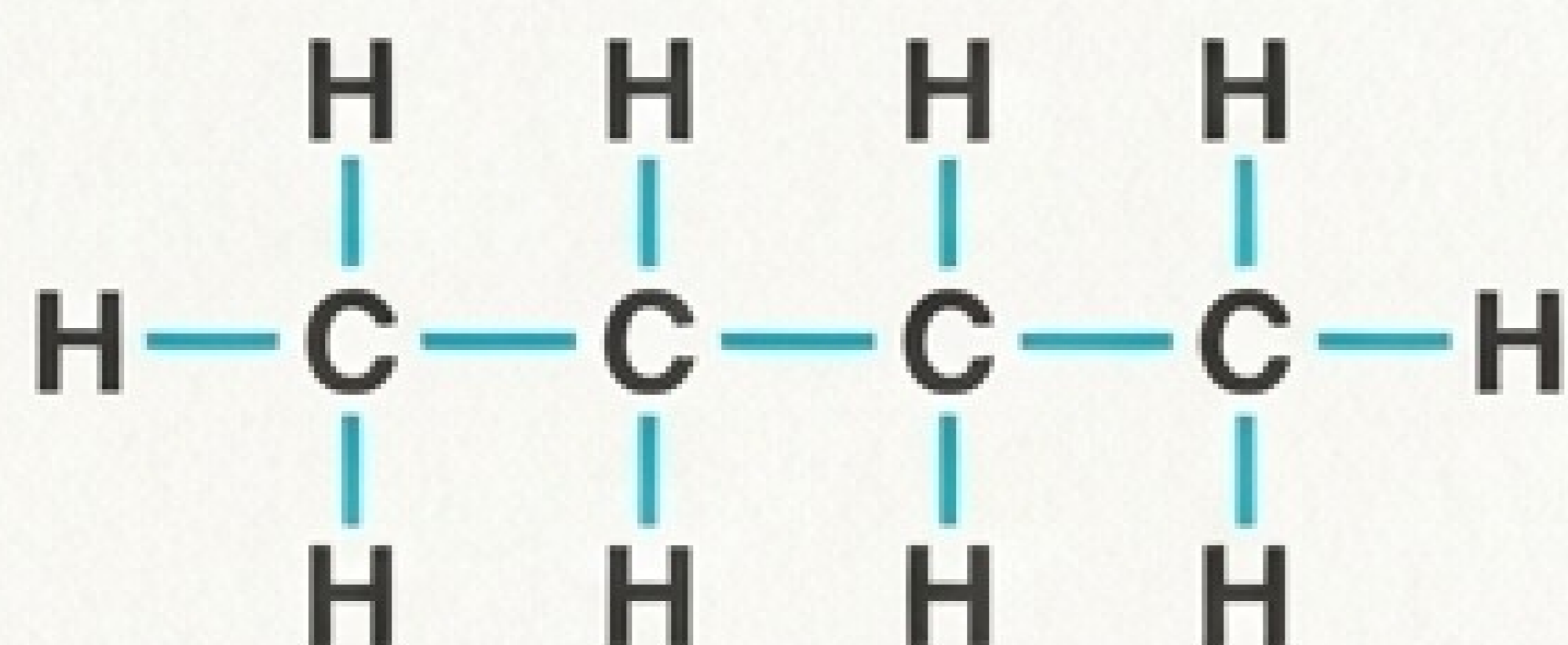
Carbon atoms can join together directly with other carbon atoms.

## The Result:

This self-linking allows carbon to construct massive frameworks, creating the basis for complex organic chemistry.

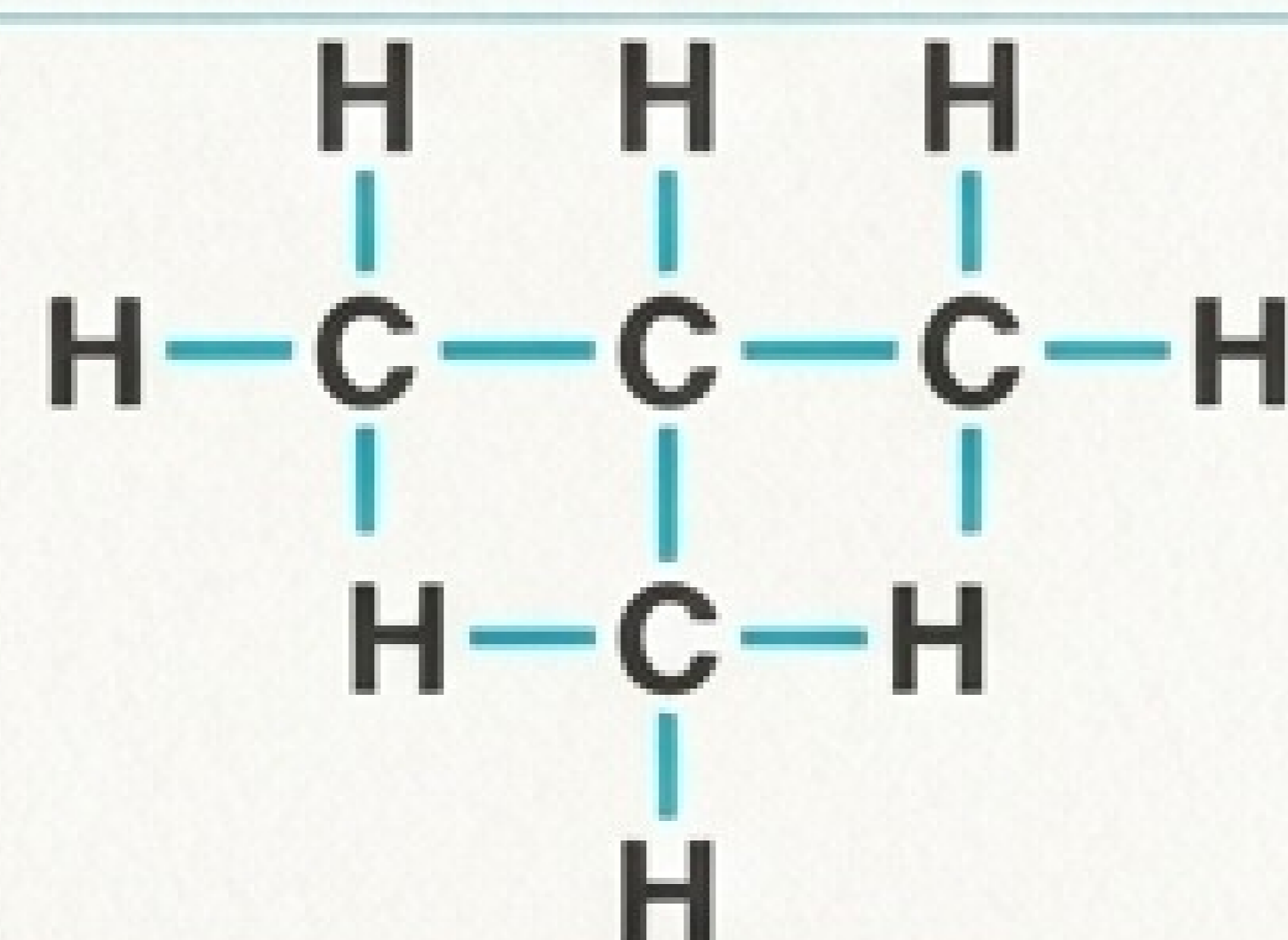
# These self-linking carbon chains take three primary architectural shapes

Carbon frameworks adapt into straight lines, branching pathways, or closed rings.



## Straight Chain

Butane ( $C_4H_{10}$ )



## Branched Chain

Isobutane

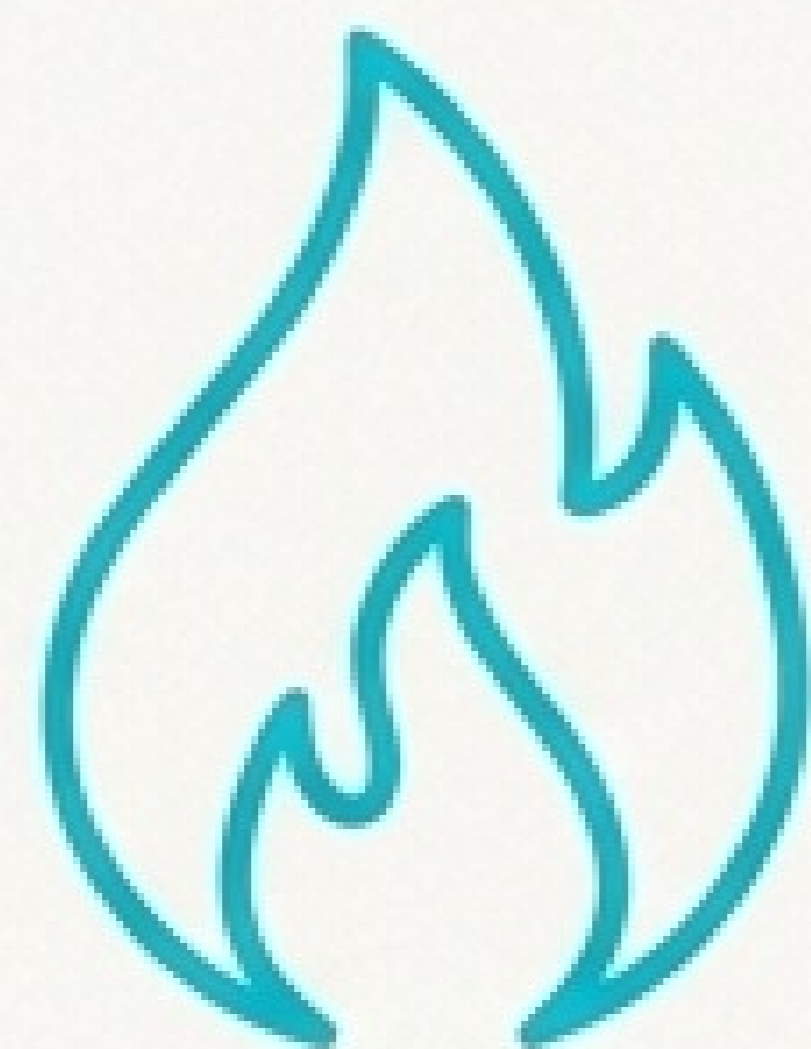


## Ring Structure

Benzene ( $C_6H_6$ )

# Everyday products rely on specific carbon compounds

From the kitchen to the pharmacy, carbon compounds are essential to daily life.



**Methane**  
( $\text{CH}_4$ )

Used as fuel.



**Ethanol**  
( $\text{C}_2\text{H}_5\text{OH}$ )

Used in medicines  
and fuel.



**Acetic acid**  
( $\text{CH}_3\text{COOH}$ )

Present in vinegar.

# Knowledge Check: Question 1

**What is the atomic number of carbon?**

A) 4

B) 6

C) 8

D) 12

Answer: B) 6

*Note: This dictates its electronic configuration of 2,4.*

## Knowledge Check: Question 2

**Carbon forms how many covalent bonds?**

- A) 2
- B) 3
- C) 4
- D) 6

**Answer: C) 4**

*Note: It requires four electrons to complete its octet.*

## Knowledge Check: Question 3

**The property by which carbon forms long chains is called:**

- A) Combustion
- B) Catenation
- C) Reduction
- D) Neutralization

**Answer:** B) Catenation

# Knowledge Check: Question 4

## Flashcard

**Which compound contains a double bond?**

**A) Ethane**

**B) Methane**

**✓ C) Ethene =**

**D) Propane**

**Answer: C) Ethene**

*Note: Ethene ( $C_2H_4$ ) shares two pairs of electrons.*

# Knowledge Check: Question 5

## Flashcard

**Which compound is present in vinegar?**

**A) Methane**

**B) Ethanol**

**C) Acetic acid**



**D) Propane**

**Answer: C) Acetic acid**

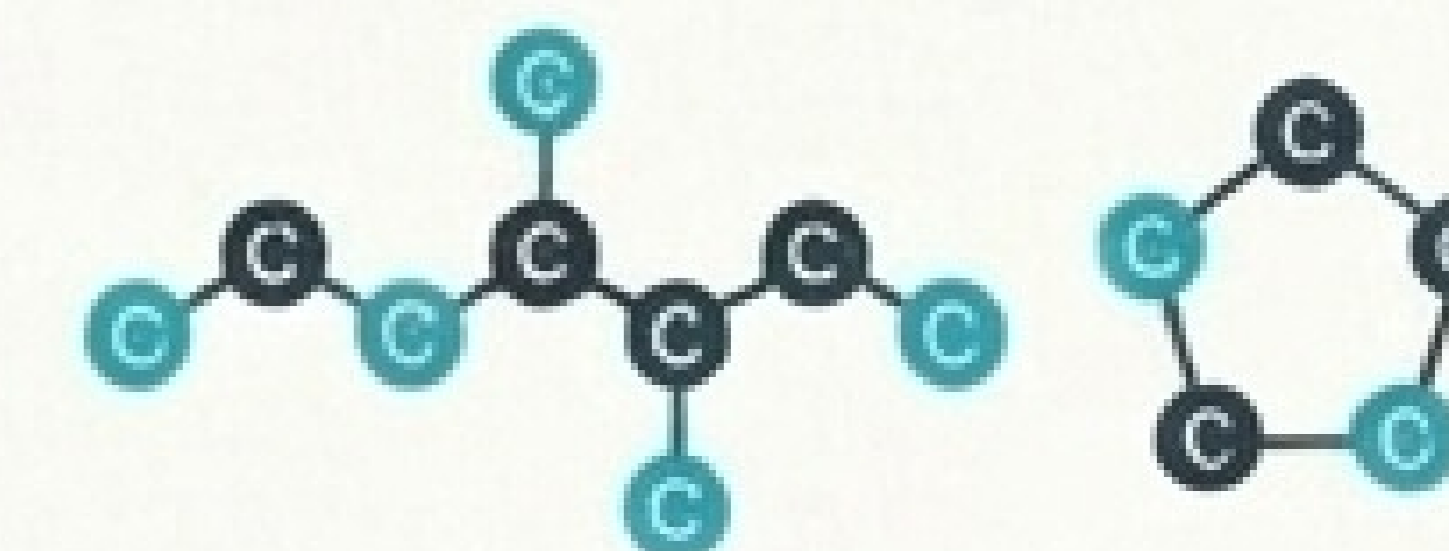
*Note: Formula is  $\text{CH}_3\text{COOH}$ .*

# Essential takeaways for carbon and its compounds

## Atomic Profile

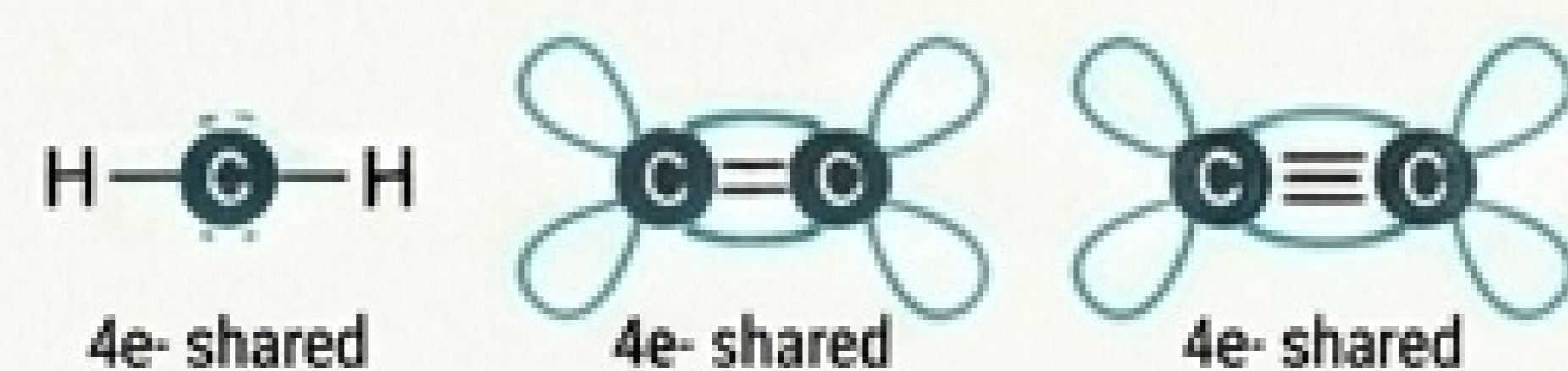
- Atomic Number 6. Configuration 2,4. Needs 4 electrons for an octet.

## Catenation





- The unique property to form straight chains, branched chains, or rings with itself.

## Bonding



- Forms exactly 4 covalent bonds by sharing electrons (Single, Double, or Triple).

## Key Compounds

- Methane ( $\text{CH}_4$ ): Fuel 
- Ethanol ( $\text{C}_2\text{H}_5\text{OH}$ ): Medicines/Fuel 
- Acetic Acid ( $\text{CH}_3\text{COOH}$ ): Vinegar 