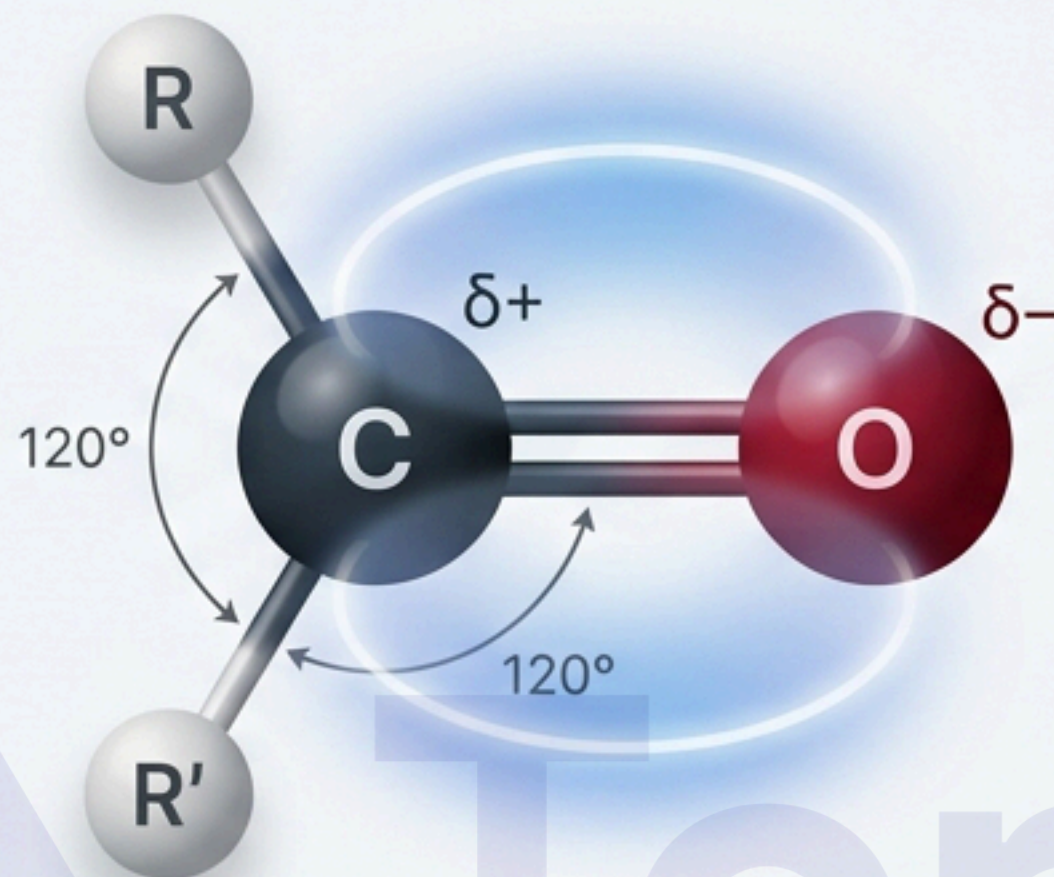




Class 12 Chemistry • Chapter 8

8.1.2 Structure of Carbonyl Group

Orbital architecture, geometry, and the origins of reactivity.

sp^2 Hybridised

Trigonal Planar

Highly Polar

The Core of Organic Chemistry

The Definition

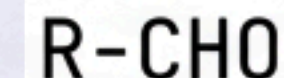
An organic functional group containing a carbon-oxygen double bond.



The Scope

Aldehyde

Carbon bonded to at least one Hydrogen



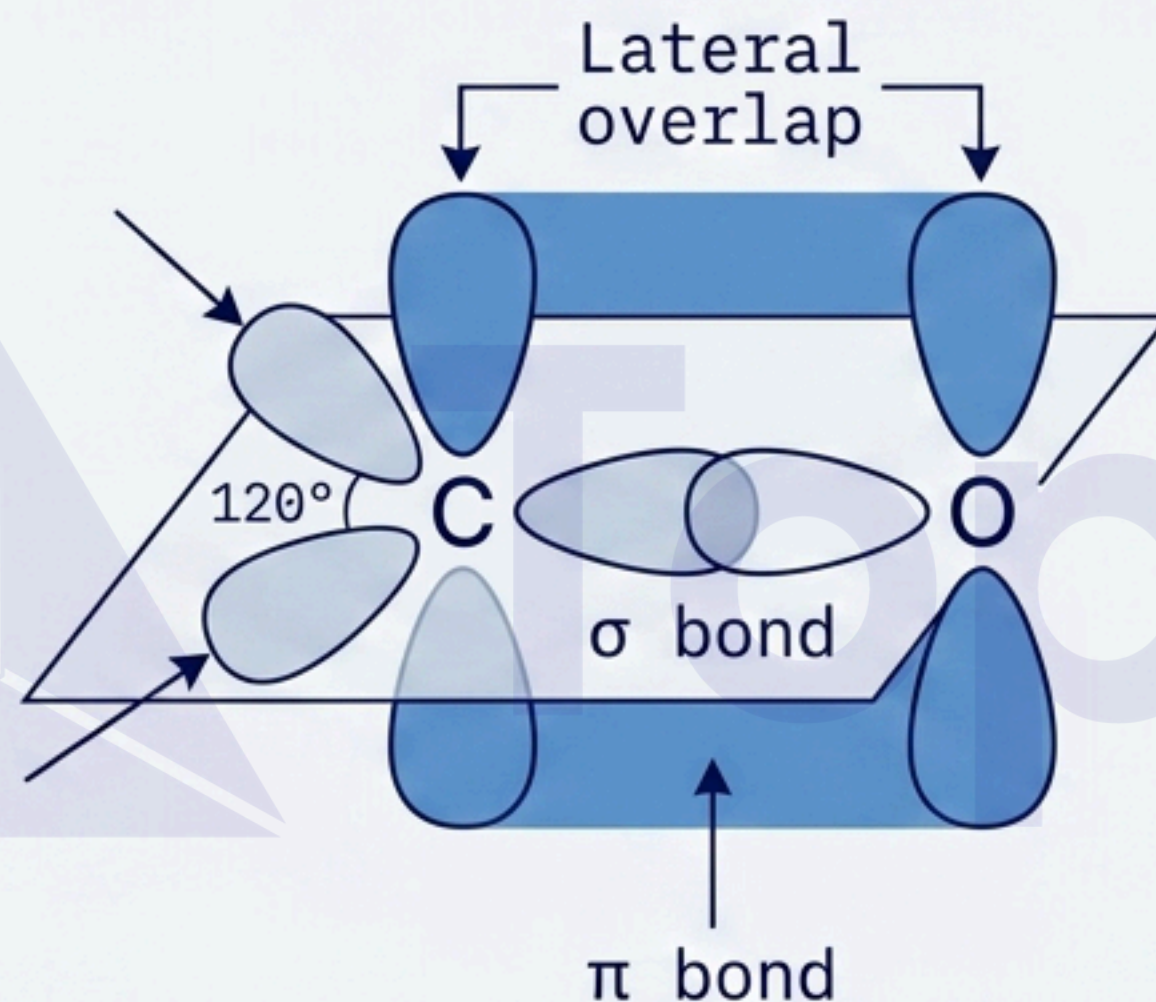
Ketone

Carbon bonded to two Carbon atoms



Carbonyls form the backbone of fabrics, flavorings, plastics, and biochemical processes.

Orbital Construction of the C=O Bond



The σ Framework (Sigma)

sp^2 Hybridised

Carbon forms three σ bonds (one to oxygen, two to adjacent substituents).

The π Cloud (Pi)

Un-hybridised p-orbital

The 4th valence electron forms a π -bond via lateral overlap with oxygen's p-orbital.

Oxygen retains two non-bonding electron pairs (lone pairs) in its valence shell.



You've Learned the Theory. Let's Test Them Now.

$$E=mc^2$$



Turn theory into marks with **unlimited MCQs, smart analysis, and focused revision.**

Practice Now



At prep.topall.app

Key Highlights

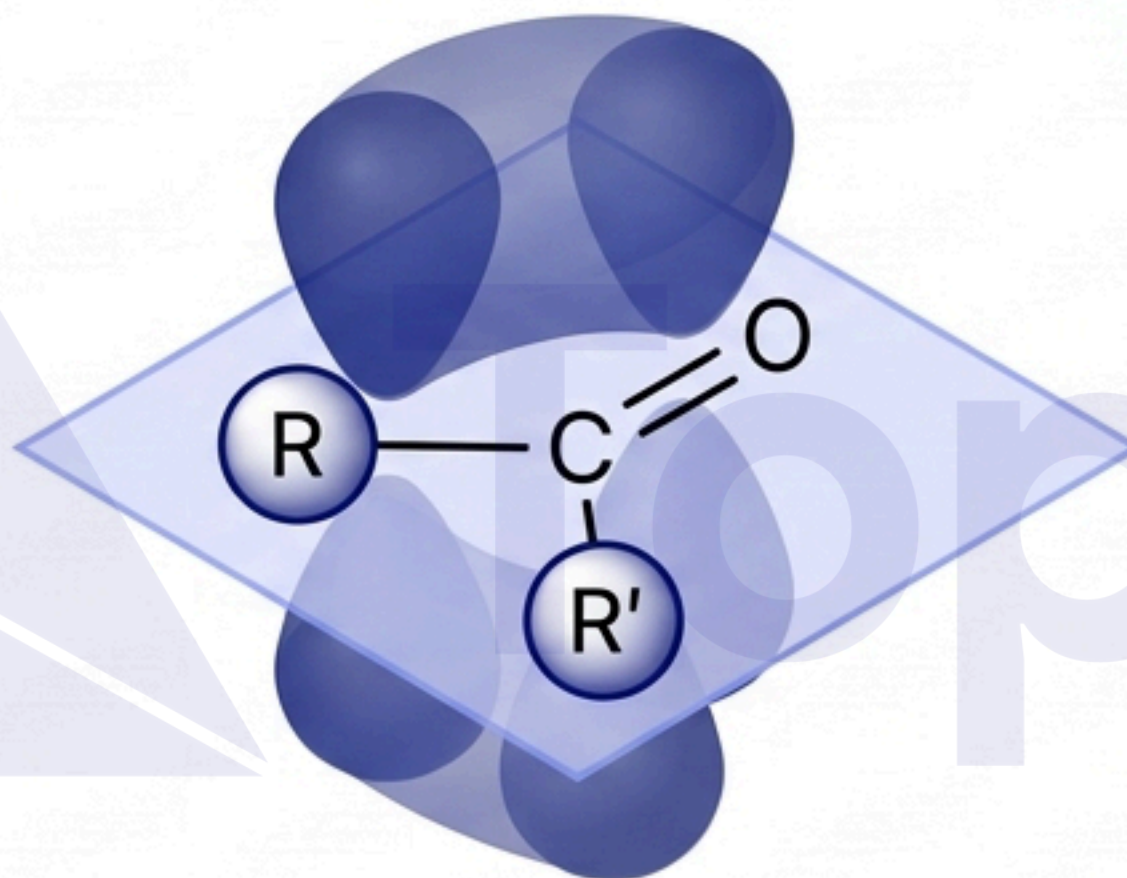
- » Free Study Material, Videos & Infographics
- » Push Your Limits with Level-Based Challenges
- » Climb the Leaderboard Among Fellow Aspirants
- » Practice Unlimited MCQs for NEET & JEE
- » Get Clear Explanations, Not Just Marks
- » Track Your Performance Smarter



Planarity and 120° Bond Angles

Geometry

The central carbon and its three attached atoms are perfectly locked in the same plane.



Angles

Bond angles are approximately 120°, minimizing electron repulsion in a trigonal coplanar structure.

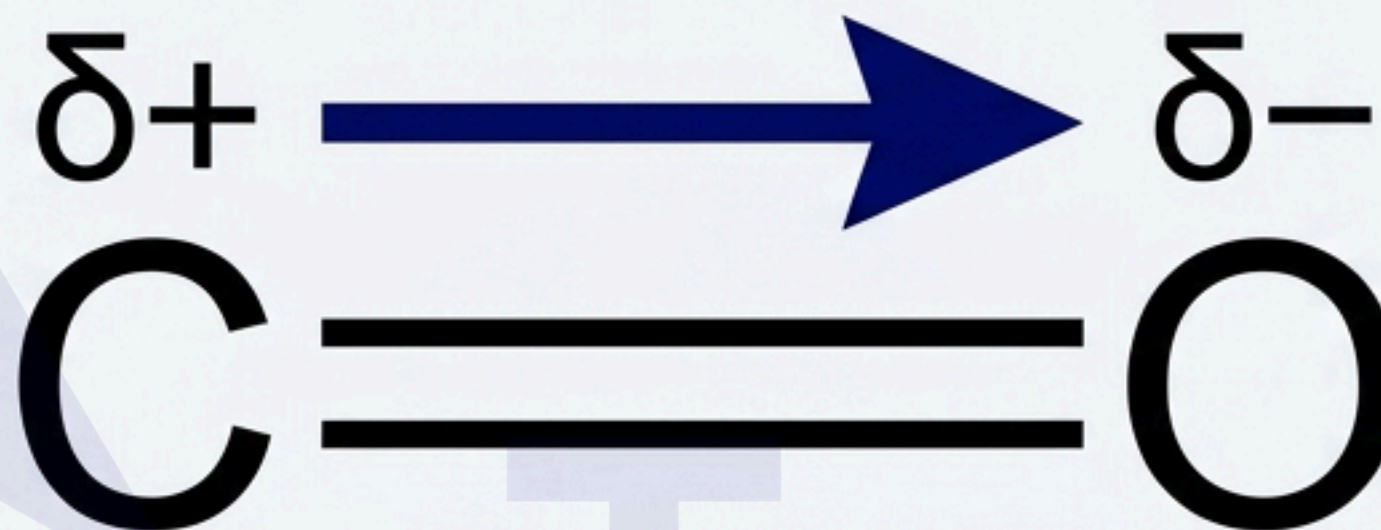
2D Flat

Planar σ -bond framework

3D Above/Below

Perpendicular π -electron cloud

The Push and Pull of Electronegativity



Electrophilic Carbon

Lewis Acid

Due to lower electronegativity, Carbon loses electron density, making it an electron-seeking center.

Nucleophilic Oxygen

Lewis Base

Due to higher electronegativity, Oxygen hoards electron density, making it a nucleus-seeking center.

Result: Carbonyl compounds possess substantial dipole moments, making them significantly more polar than ethers.

Neutral and Dipolar Resonance Forms

Neutral Structure (A)



Dipolar Structure (B)



Why does this matter?

The high polarity and reactivity of the carbonyl group are best explained by the heavy contribution of this dipolar resonance structure (B).

The π -electrons are highly mobile. Their shift toward oxygen creates a permanent structural vulnerability, making the carbonyl carbon highly susceptible to nucleophilic attack.



You've Learned the Theory.

Now Let's Test It.

Reading notes gets you knowledge.

Practicing MCQs gets you marks.

That's exactly what TopAll Pro is built for.

Try TopAll Pro Now

What TopAll Pro Does Differently

-  **Stuck? Snap it. Solve it. — Doubts AI**
Photo → step-by-step solution in seconds, 24/7
-  **Your AI Coach finds your blind spots**
Concept-level weakness detection — not just chapter-level
-  **4.5 Lakh+ questions. Never run out.**
13× more content than any other prep app in India
-  **Build your own test in 60 seconds**
Pick a chapter, set difficulty — AI does the rest instantly.
-  **AI Recommendation that helps you improve**
AI Recommendation Analysis your Tests and tell you where you need to improve.



Practice the moment you finish studying
Jump in while the concept is still fresh in your head

4.5L+
MCQs

1.5L+
Students

AI Powered
In-Depth Analysis