LOGIC BLOOM · ORGANIC CHEMISTRY · NEET & JEE

Reagents and Their Roles

How to remember what a reagent does, without memorising a list

2 PAGES

THE WHOLE NOTE IN ONE LINE

A reagent is a verb, not a noun.

You are not confusing the reagents. You are skipping the conditions. Read the word *before* the formula, because that word is usually the answer.

01 The letter match you will never forget

ALCoholic KOH → ALKene

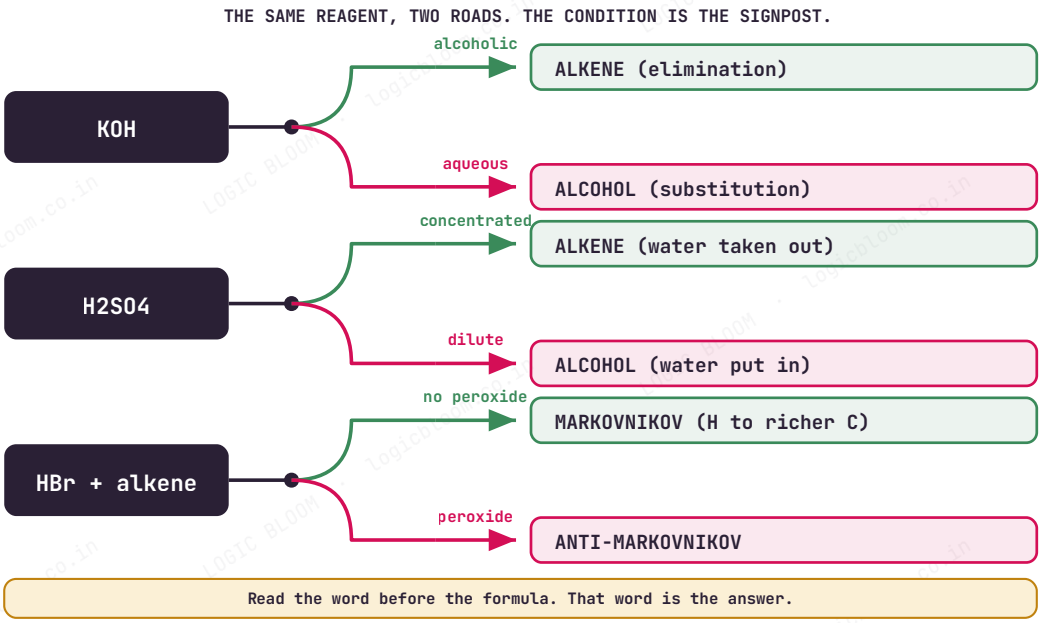
Alcohol is a poor nucleophile, so KOH acts as a **base** and pulls off an H. Elimination.

AQUeous KOH → Alcohol

Water is a good nucleophile, so it attacks the carbon and swaps out the halide. Substitution.

The first three letters match the product. This is not a mnemonic somebody invented, it is a coincidence in the spelling that happens to be true, which is exactly why it sticks.

02 The condition switches



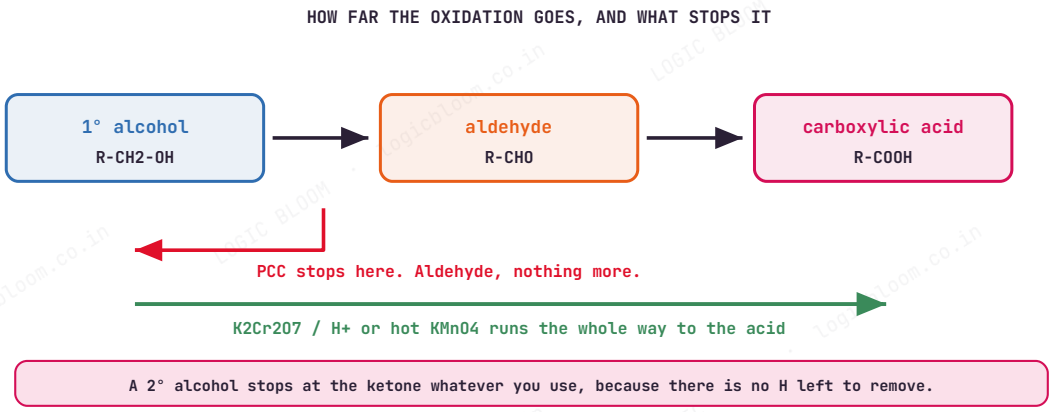
Three reagents, six outcomes. In each case only one word changed.

REAGENT	CONDITION	WHAT IT DOES	PRODUCT
$KMnO_4$	cold, dilute, alkaline	adds two OH across C=C	syn diol (Baeyer's test)
$KMnO_4$	hot, concentrated	cleaves the C=C entirely	acids or ketones
Br_2	in CCl_4, dry	adds across C=C, colour dies	test for unsaturation
Br_2	in water	with phenol	white 2,4,6-tribromophenol
Br_2	with Fe or $FeBr_3$, dry	substitutes on the ring	bromobenzene

THE TRAP EXAMINERS SET EVERY YEAR

The peroxide effect works for **HBr only**, never HCl or HI. H-Cl is too strong to break; H-I gives a radical too unreactive to carry the chain.

03 How far it goes: strength decides the product



The same starting alcohol. The reagent decides where the journey stops.

REAGENT	STRENGTH	REDUCES OR OXIDISES
$NaBH_4$	mild reducer	aldehyde, ketone, acid chloride only
$LiAlH_4$	strong reducer	all of the above, plus acid, ester, amide, nitrile
PCC	mild oxidiser	1° alcohol to aldehyde, and stops there
$K_2Cr_2O_7$ / H^+	strong oxidiser	1° alcohol all the way to carboxylic acid
H_2 / Lindlar	poisoned catalyst	alkyne to **cis** alkene. *Lindlar lets them lie together.*
Na / liquid NH_3	dissolving metal	alkyne to **trans** alkene. *Sodium sends them opposite ways.*

READ THE JOB OFF THE FORMULA

- Ends in **H_4** (BH_4^-, AlH_4^-): it is carrying hydride, so it is a **reducer**.
- Rich in **oxygen** (MnO_4^-, $Cr_2O_7^{2-}$, O_3): it is an **oxidiser**.
- A **metal with an acid** (Zn/HCl, Sn/HCl): nascent hydrogen, so again a **reducer**.
- **Anhydrous** $AlCl_3$ or $FeBr_3$: a Lewis acid **catalyst**. Water destroys it, which is why the word anhydrous is always written.

04 Say it once, keep it forever

BROMINE'S THREE FACES

In CCl_4 the colour dies, a double bond was there.
In water, phenol drops white: two, four, six.
With iron and dry, the ring stays whole, one H just changed its role.

HOW FAR THE OXIDATION GOES

PCC knocks and stops at the door: aldehyde, nothing more.
Dichromate kicks it clean off its hinge, and the acid walks out.

THE TWO ALDEHYDE TESTS

Tollens shines silver for every aldehyde it meets.
Fehling turns red, but the benzene ring is refused.

Benzaldehyde gives no red precipitate. That difference is how a question tells two aldehydes apart.

THE SIXTY SECOND DRILL

1. Cover the right-hand column above. Read a reagent and its condition, and say the product out loud.
2. Any you miss, say the matching rhyme once, out loud. Rhythm survives exam stress; a list does not.
3. Then reverse it: name a product, and give the reagent *and* the condition.