Clemmensen reduction is a chemical reaction described as a reduction of ketones (or aldehydes) to alkanes using zinc amalgam and hydrochloric acid. This reaction is named after Erik Christian Clemmensen, a Danish chemist.

\[
\begin{align*}
\text{O} & \quad \text{Zn(Hg)} \\
R_1 & \quad R_2 \\
\text{H} & \quad \text{H} \\
R_1 & \quad R_2 \\
\end{align*}
\]

The Clemmensen reduction is particularly effective at reducing aryl-alkyl ketones, such as those formed in a Friedel-Crafts acylation. With aliphatic or cyclic ketones, zinc metal reduction is much more effective.

The substrate must be unreactive to the strongly acidic conditions of the Clemmensen reduction. Acid-sensitive substrates should be reacted in the Wolff-Kishner reduction, which utilizes strongly basic conditions; a further, milder method is the Mozingo reduction. The oxygen atom is lost in the form of one molecule of water.

However, the reaction is not suitable for substances sensitive to acids. Also, -COOH group can't be reduced by this method. (-COOH group can be reduced by treating it with soda lime and then heating).

In spite of the antiquity of this reaction, the mechanism of the Clemmensen reduction remains obscure. Due to the heterogeneous nature of the reaction, mechanistic studies are difficult, and only a handful of studies have been disclosed. Proposal mechanisms invoke organozinc intermediates, possibly zinc carbenoids, either as discrete species or with the organic fragment bound to the metal surface. However, the corresponding alcohol is not believed to be an intermediate, since subjection of alcohols to Clemmensen conditions generally does not afford the alkane product.