

DDQ (2,3-Dichloro-5,6-dicyano-1,4-benzoquinone)

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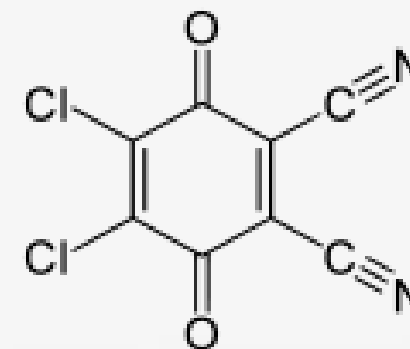
TOPICS COVERED

- What is DDQ?
- Preparation of DDQ
- Mechanism of Reaction of DDQ
- Applications of DDQ

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What is DDQ

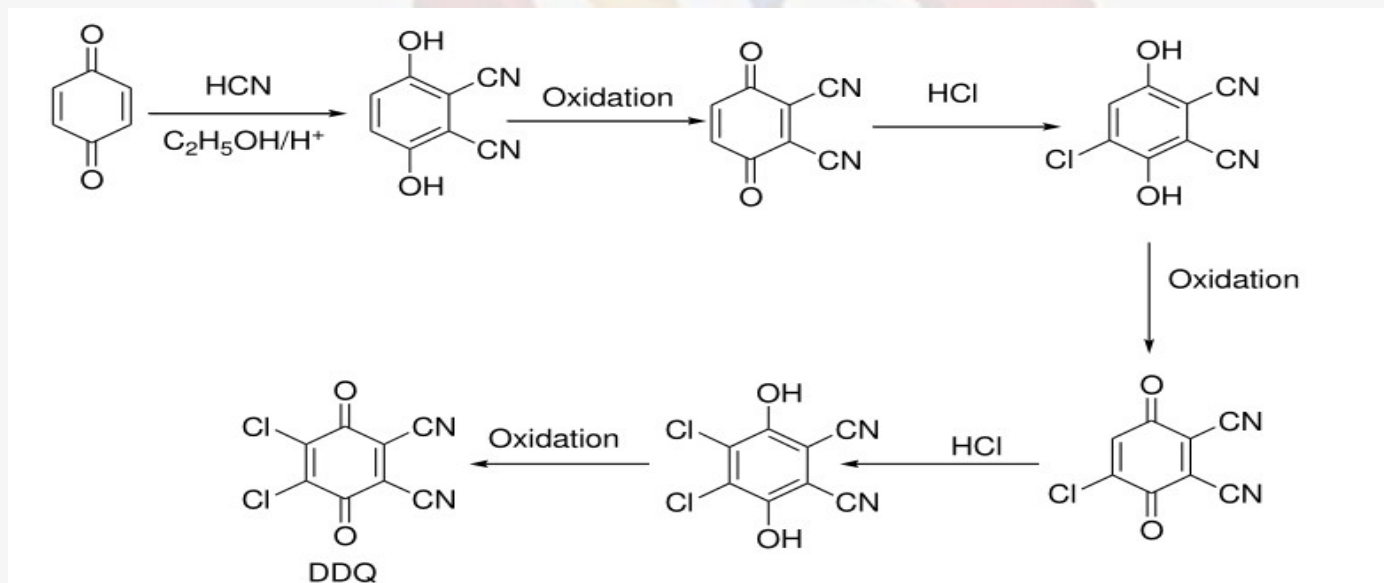
- Quinones are used for dehydrogenation reactions. Among them, 2,3-dichloro-5,6-dicyano-1,4-benzoquinone (DDQ) is an important reagent. DDQ is very reactive and used under anhydrous conditions because it decomposes in the presence of water.
- The reaction is carried out in inert solvents such as benzene, THF and dioxane. Solution of DDQ in benzene is red in color because of the formation of charge transfer complex. After dehydrogenation, DDQ is reduced to hydroquinone, that is a yellow solid and insoluble in benzene.
- It is used as a reagent in organic chemistry, a mild oxidizing agent as well as a radical receptor.



2,3-Dichloro-5,6-dicyano-1,4-benzoquinone

Preparation of DDQ

Its Synthesis has been described by Thiele and Ganther. It is synthesized from benzoquinone by HCN/HCl followed by oxidation.

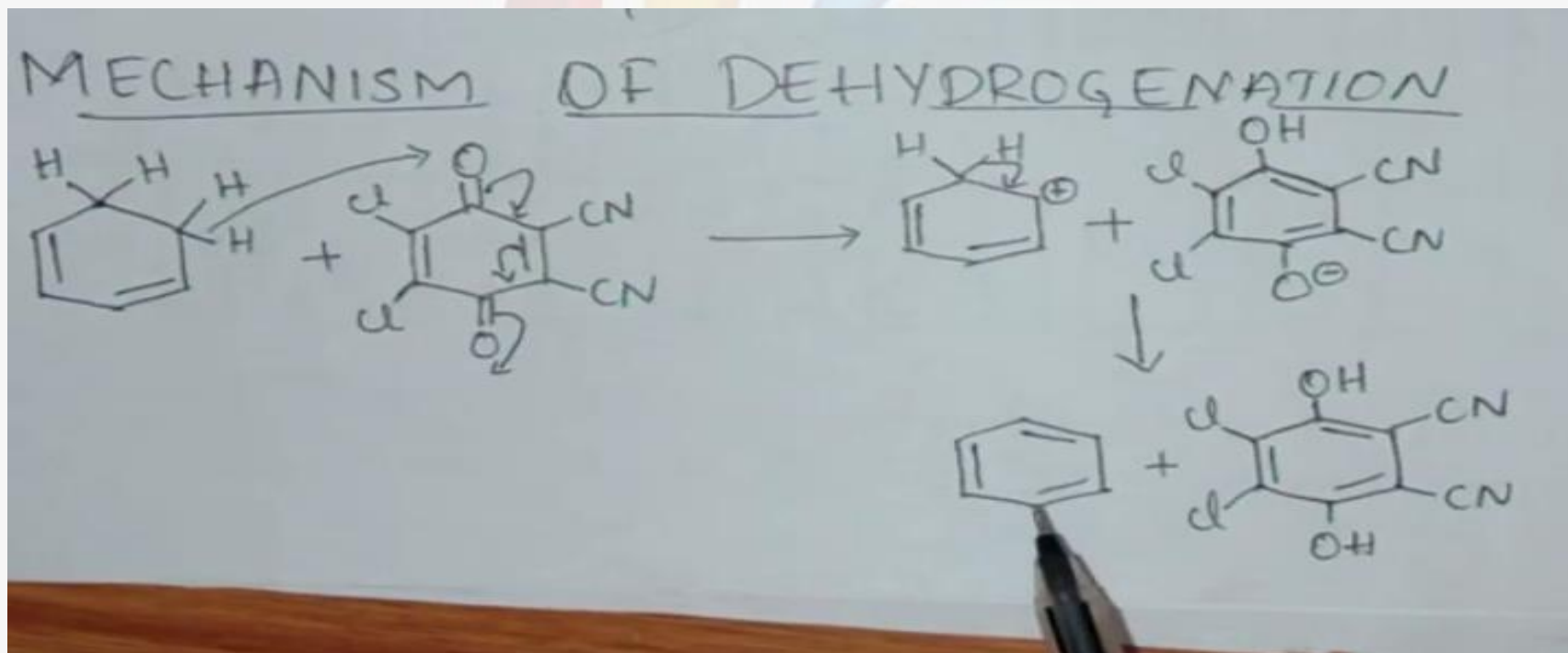


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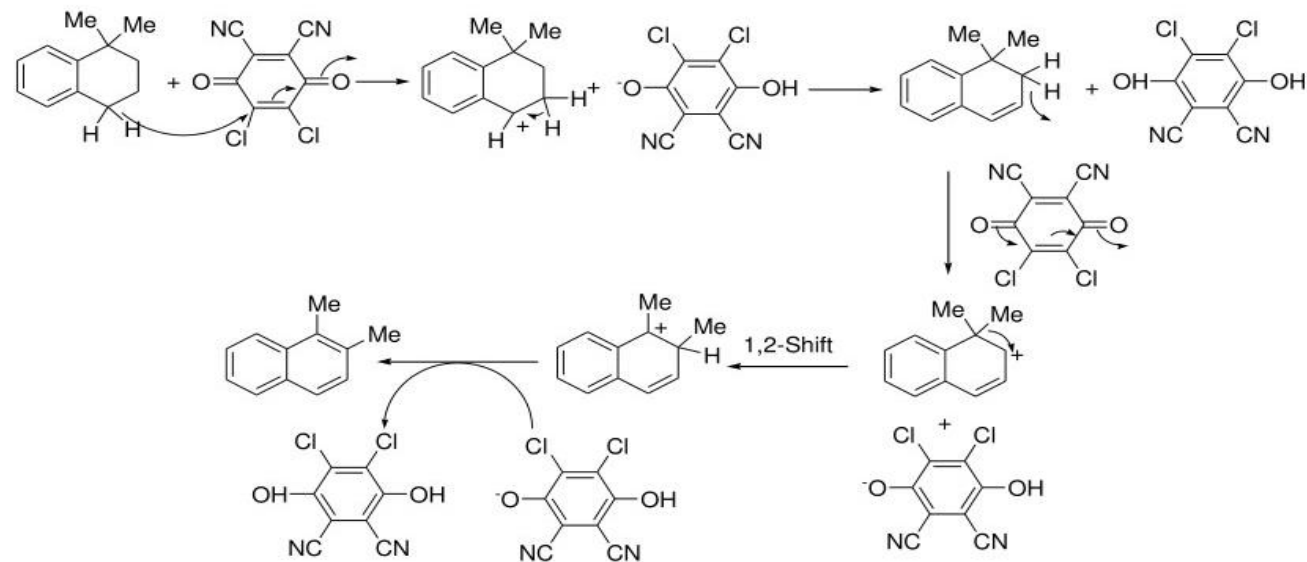
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Course Name: Reagents and Heterocyclic Chemistry

Mechanism-The mechanism of dehydrogenation with DDQ involves the transfer of hydride ion from the substrate to the quinone oxygen followed by the transfer of a proton to the phenolate ion. Thus DDQ is reduced to dichlorodicyano hydroquinone of DDQH₂.



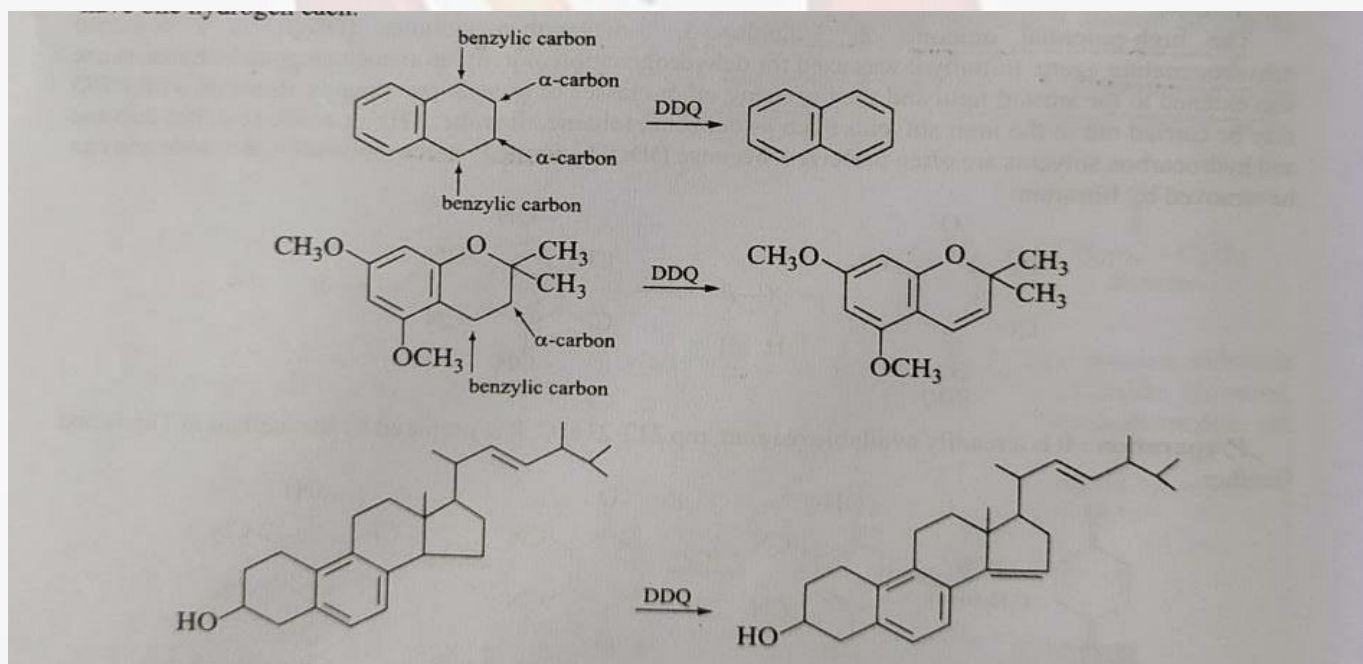
Mechanism with substituted compound followed by rearrangement.



Scheme 6

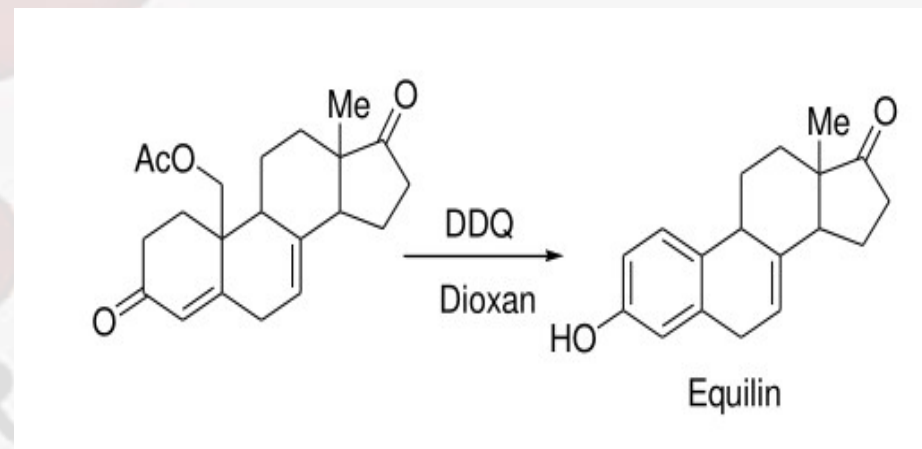
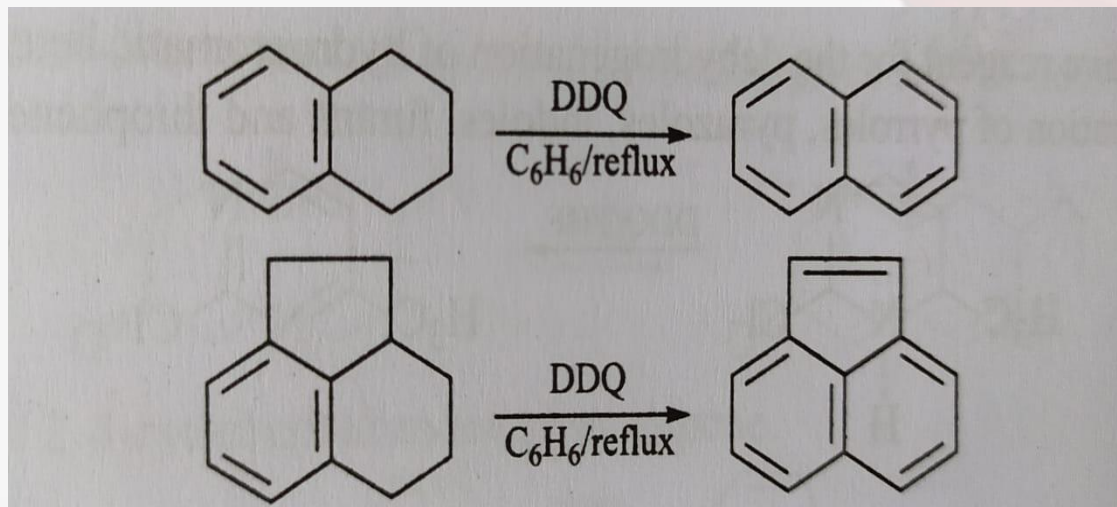
Reactions- Benzylic oxidation

Dehydrogenation by DDQ can only be possible if benzylic carbon or allylic carbon and its alpha carbon have one hydrogen each.

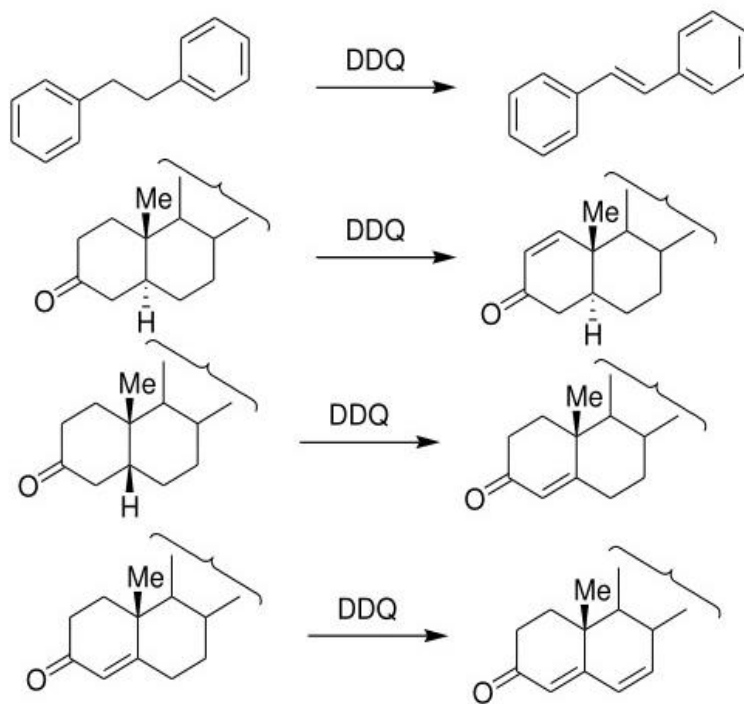


Aromatisation

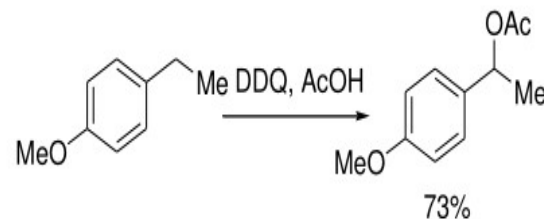
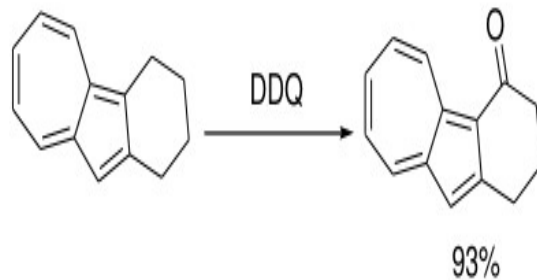
Aromatisation is accomplished most easily if there are already one or two double bonds in the ring or if the ring is fused to an aromatic ring DDQ is an effective reagent for the dehydrogenation of hydro aromatic compound.



Formation of Conjugate double bonds



Allylic oxidation



References

- W. Carruthers, Some Modern Methods of Organic Synthesis, 3rd edition, Cambridge University Press, New York, 1998.
- J. Clayden, N. Greeves and S. Warren, Organic Chemistry, Oxford University Press, 2nd edition, 2012.
- T.L. Gilchrist, Heterocyclic Chemistry, 3rd edition, Addison-Wesley Longman Ltd., England, 1997.
- https://www.google.com/search?q=DDQ&tbm=isch&ved=2ahUKEwjU8-2r-qTsAhVx5nMBHeR2DToQ2cCegQIABAA&oq=DDQ&gs_lcp=CgNpbWcQAzICCAAyAggAMgIIADICCAAyAggAMgIIADICCAAyAggAMgIIADICCAA6BQgAELEDOgQIABBDOgcIABCxAxBDUO-YzQFYw5zNAWDJps0BaABwAHgAgAGkAYgBxgOSAQMwLjOYAQCgAQQGqAQtnD3Mtd2l6LWltZ8ABAQ&sclient=img&ei=gQB_X5SvLPHMz7sP5O210AM&bih=576&biw=1366&rlz=1C1CHBD_enIN920IN920

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The logo of Galgotias University is a stylized 'G' composed of three overlapping, curved bands in shades of yellow, blue, and red. The text 'THANK YOU' is written in a bold, blue, serif font with a slight 3D effect, positioned diagonally across the center of the logo.

THANK YOU

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