

## CHEMISTRY DAILY PLAN

**Class:**

**Date:**

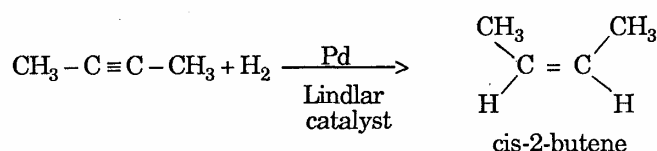
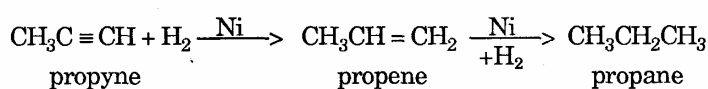
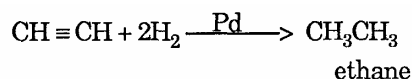
**Subject: Reactions of Alkynes**

**Time:**

Many chemical reactions of alkynes are similar to the reactions of alkenes. The carbon-carbon triple bond in alkynes contains one sigma and two pi bonds. The characteristic reactions of alkynes are also addition reactions. Alkynes form addition products with hydrogen (in the presence of a catalyst), halogens, and hydrogen halides.

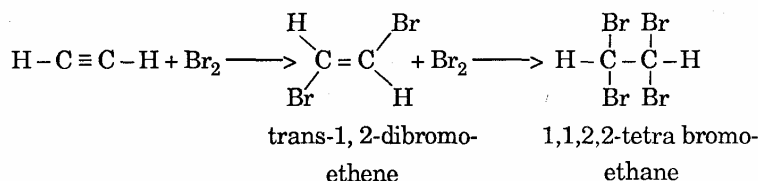
### Hydrogenation

Alkynes are hydrogenated all the way to alkanes in the presence of an ordinary nickel or platinum catalyst. With a special palladium catalyst (Lindlar catalyst) it is possible to stop the re-action at the alkene,



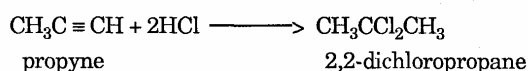
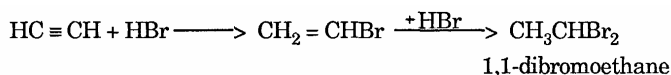
### Halogenation

Chlorine and bromine add easily to a triple bond. Fluorine is generally too vigorous, and iodine, does not give stable addition products. The reaction may be carried out stepwise, as follows:



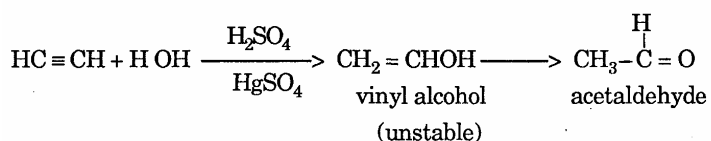
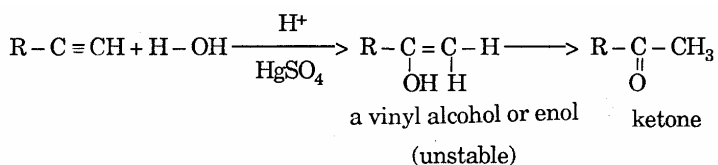
### Addition of Hydrogen Halides

Addition of unsymmetrical reagents to the triple bond is follow Markovnikov's rule.



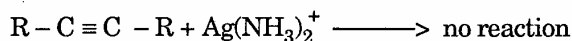
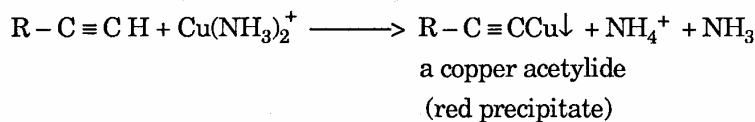
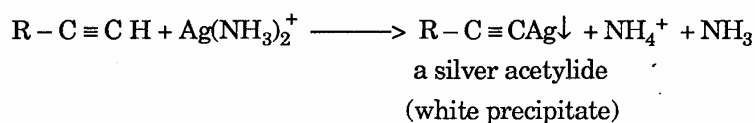
### Addition of Water (Hydration)

In the presence of the catalysts, dilute sulfuric acid and mercuric sulfate, water adds to alkynes to give ketone or, in the case of acetylene itself, acetaldehyde.



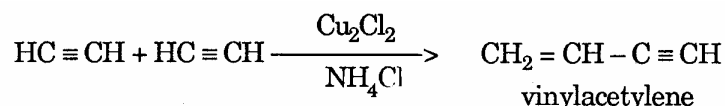
## Formation of Metal Acetylides

As noted earlier in the formation of sodium acetylides, alkynes form metallic derivatives by replacement of hydrogen atoms by metal. This reaction is the basis of a laboratory test for compounds with an acetylenic hydrogen. They react with aqueous ammoniacal silver nitrate or cuprous chloride to give water-insoluble precipitate.

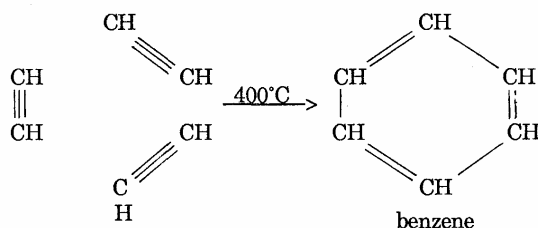


## Polymerization

- a) When acetylene is passed into a solution of cuprous chloride and ammonium chloride in hydrochloric acid, it adds to itself to form vinylacetylene, which is used for the preparation of synthetic rubber.



- b) Three molecules of acetylene join together to form benzene when passed through a red-hot tube.



**Exercise:** Write equations for the following reactions.

- 3-hexyne +  $\text{Cl}_2$  (excess)  $\Rightarrow$
- 2-pentyne +  $\text{H}_2$  (Lindlar's)  $\Rightarrow$
- propyne +  $\text{H}_2\text{O}$  ( $\text{H}^+$ ,  $\text{H}_2\text{SO}_4$ )  $\Rightarrow$
- 2-pentyne +  $\text{HCl}$  (excess)  $\Rightarrow$

**Exercise:** Answer the following questions for 120 g of 80% pure calcium carbide ( $\text{CaC}_2$ ).

- How many liters of acetylene can be prepared at STP?
- How many grams of acetylene can be obtained from this sample?
- How many liters of hydrogen at STP are required to saturate the sample of acetylene produced from this sample?
- How many grams of aldehyde can be obtained if water is added to the sample of acetylene obtained?
- How many grams of silver acetylide are precipitated by the reaction of acetylene produced with ammoniacal silver nitrate?