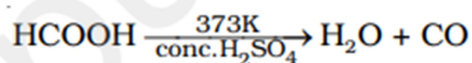


11.8.1 Carbon Monoxide

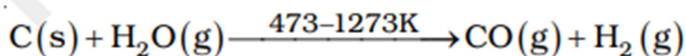
Direct oxidation of C in limited supply of oxygen or air yields carbon monoxide.



On small scale pure CO is prepared by dehydration of formic acid with concentrated H_2SO_4 at 373 K

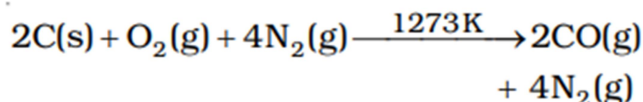


On commercial scale it is prepared by the passage of steam over hot coke. The mixture of CO and H_2 thus produced is known as **water gas** or **synthesis gas**.



Water gas

When air is used instead of steam, a mixture of CO and N_2 is produced, which is called **producer gas**.

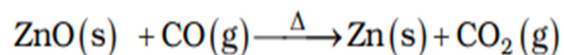
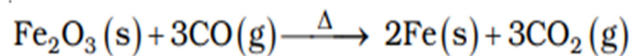


Producer gas

Water gas and producer gas are very important industrial fuels. Carbon monoxide in water gas or producer gas can undergo further combustion forming carbon dioxide with the liberation of heat.

Carbon monoxide is a colourless, odourless and almost water insoluble gas. It is a powerful reducing agent and reduces almost all metal oxides other than those of the alkali and alkaline earth metals, aluminium and a few transition metals. This property of

CO is used in the extraction of many metals from their oxides ores.



In CO molecule, there are one sigma and two π bonds between carbon and oxygen, $:\text{C} \equiv \text{O}:$. Because of the presence of a lone pair on carbon, CO molecule acts as a donor and reacts with certain metals when heated to form **metal carbonyls**. The highly poisonous nature of CO arises because of its ability to form a **complex with haemoglobin**, which is about 300 times more stable than the oxygen-haemoglobin complex. This prevents haemoglobin in the red blood corpuscles from carrying oxygen round the body and ultimately resulting in death.