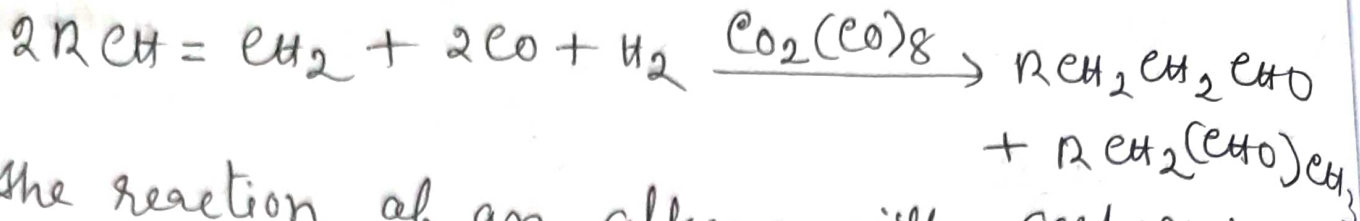
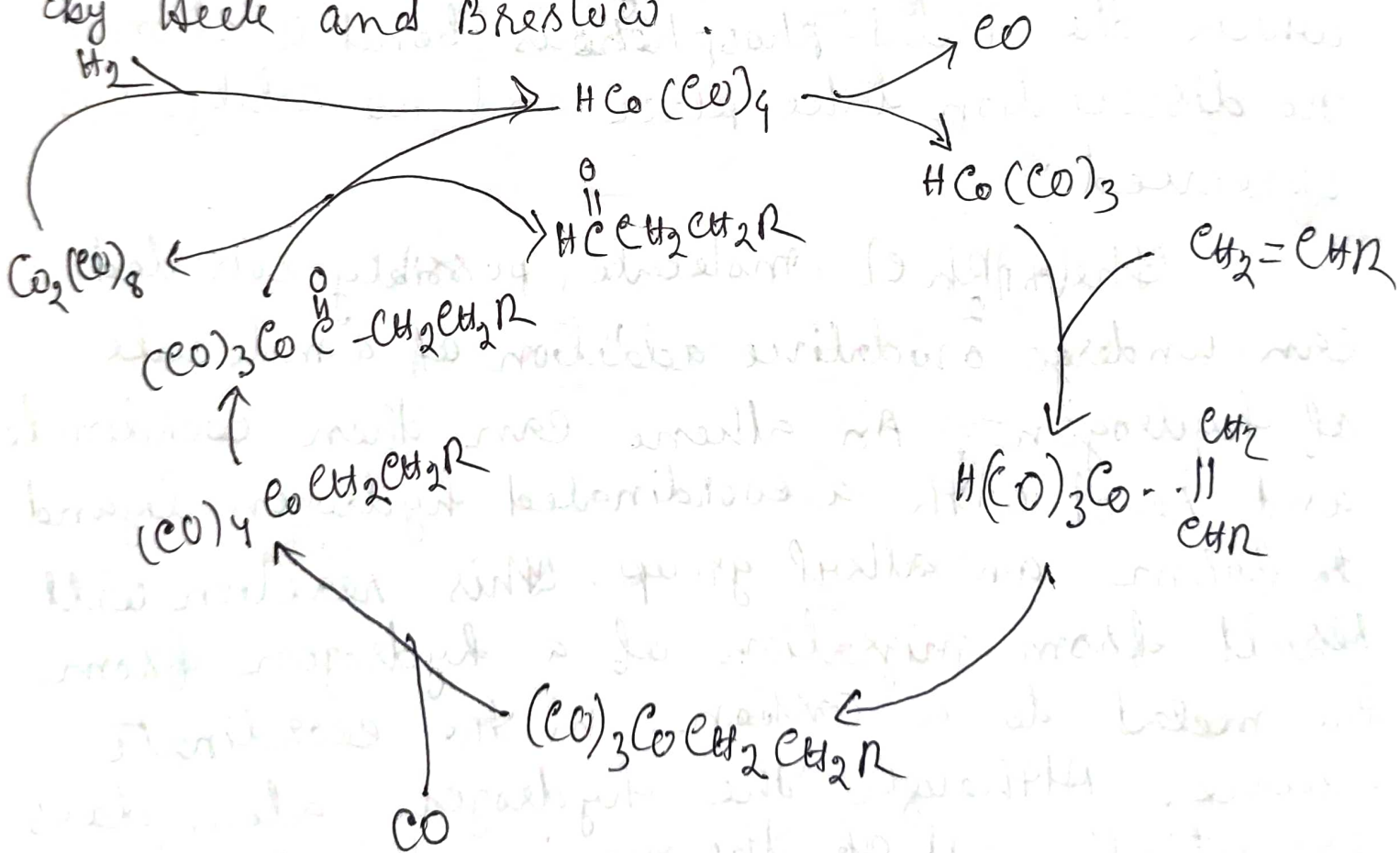


Hydroboration



The reaction of an alkene with carbon monoxide and hydrogen, catalyzed by cobalt or rhodium salts, to form an aldehyde is called hydroboration (or sometimes oxo process). The name hydroboration arises from the fact that in a formal sense a hydrogen atom and a boranyl group are added across double bond. The net result of the process is extension of the carbon chain by one and introduction of oxygen into the molecule.

The most widely accepted mechanism for the catalytic cycle is the following one proposed by Heck and Breslow.



$1 \text{Co}_2(\text{CO})_8$ react with H_2 to give $\text{HCo}(\text{CO})_4$ (an 18-electron species) which loses CO forming $\text{HCo}(\text{CO})_3$ (a 16 electron species) and creating a vacant coordination site. Allene coordination recreates an 18 electron complex which undergoes migratory insertion of the olefin into the Co-H bond thereby creating another 16-electron complex and another vacant coordination site to which CO can become coordinated. A carbon monoxide ligand of $\text{HCo}(\text{CO})_3$ migrates to a position between the cobalt atom and the alkyl group - this is the critical step in the formation of the aldehyde.