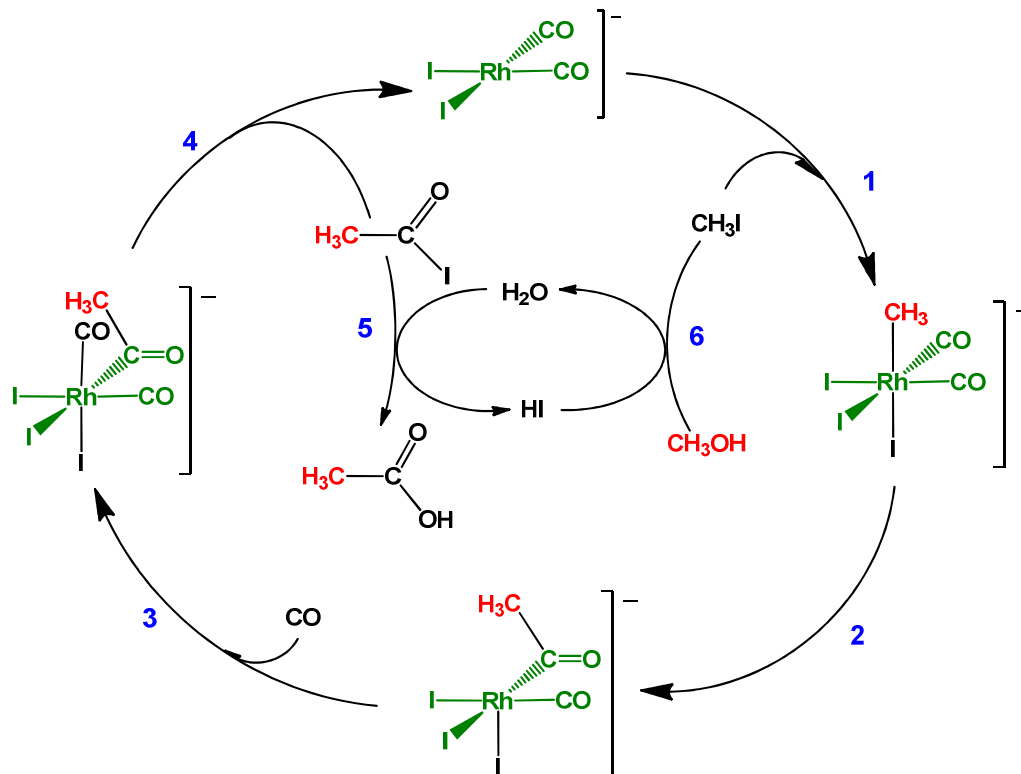


## T8. OMCh Problems

1 Label the reaction steps for the Monsanto process:



Describe the molecular structure of the catalyst.

2 Comment the following data relative to hydroformylation processes

Process	Co	Co/P	Rh/P	Rh/P (biphasic)
Catalyst precursor	$\text{Co}_2(\text{CO})_8$	$\text{Co}_2(\text{CO})_8/\text{PR}_3$	$\text{RhH}(\text{CO})(\text{PPh}_3)_3$	$\text{RhH}(\text{CO})(\text{PR}_3)_3$ R = m-C <sub>6</sub> H <sub>4</sub> SO <sub>3</sub> Na
Phosphine:metal ratio	-	2:1	50-100:1	50-100:1
Pressure (bar)	200-300	50-100	15-25	40-40
Temperature (°C)	110-160	160-200	80-120	110-130
Catalyst concentration (% metal/olefin)	0.1-1	0.6	0.01-0.05	0.001-1
normal/iso product ratio	4:1	7:1	8-16:1	7-19:1
Olefin hydrogenation (%)	<2	15	5	<2
Catalyst recovery and recycle	Difficult	Simpler	Simple for C <sub>3</sub> and C <sub>4</sub> olefins	facile

### Additional problems

Butler, Harrod, *Inorganic Chemistry. Principles and applications*, Benjamin Cummings, Redwood City, 1989. 23.1 – 23.5.

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Spessard, Miessler, *Organometallic Chemistry*, Prentice Hall, Saddle River, 1997. 9.1 – 9.8.