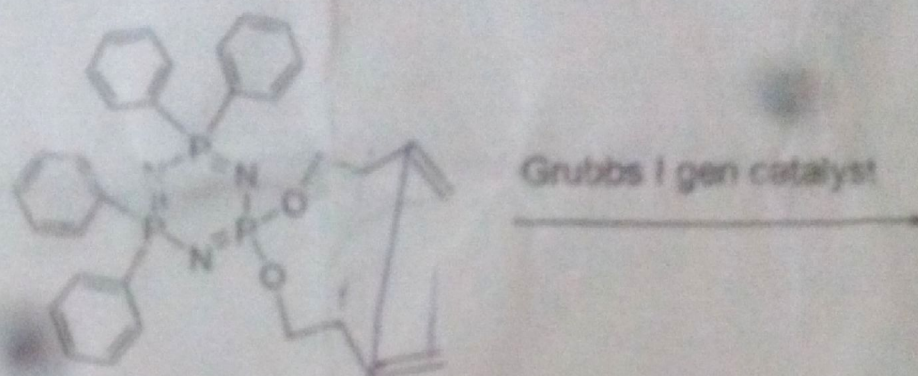
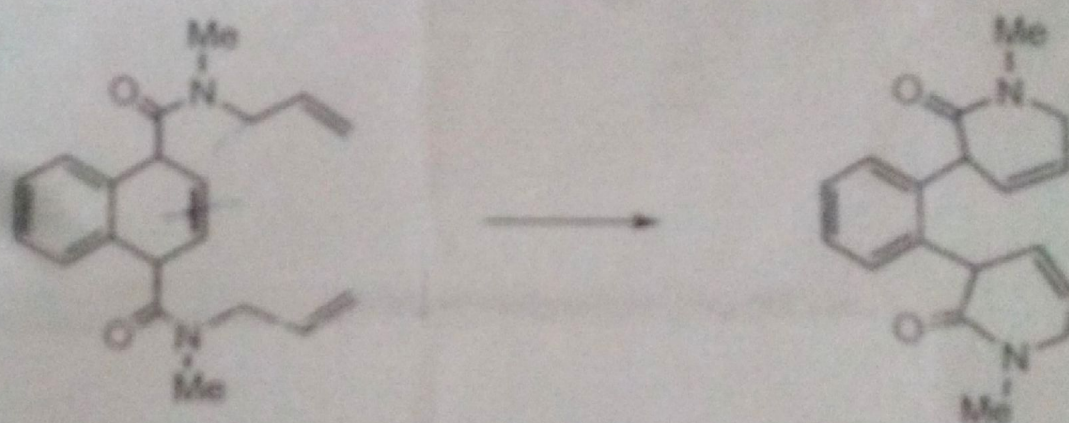


1. (a) The following reaction gives compounds A and B excluding the byproduct(s). Draw clearly the structures of these compounds. (Hint: There is no polymerization in this reaction) 15.5 (marks)



- (b) The following conversion occurs in the presence of Grubbs' 1st generation catalyst. Sketch neatly the steps involved in the mechanism of this conversion.



- (c) (i) Draw the structures of the following complexes:

(A) Grubbs' 1st generation catalyst

(B) Grela's catalyst

(C) Schrock catalyst

(D) Hoveyda-Grubbs' catalyst II

(E) Grubbs' 2nd generation catalyst

- (c) (ii) Mention, which of these complexes obey 18-electron rule? For the complex(es) that does/do not obey this rule, provide the correct electron count.

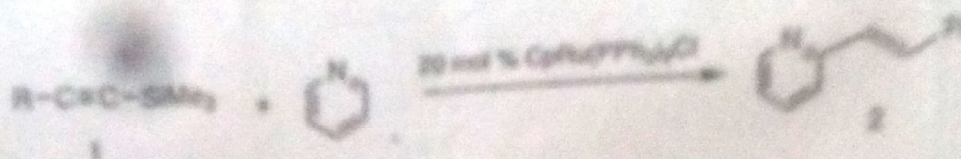
- (c) (iii) Through schemes, show the reported syntheses of these compounds from suitable metal precursors.

2. The reaction of RX and $R'SnBu_3$ to give $R-R'$ and $XSnBu_3$ is catalyzed by $L_2Pd(0)$ and is called as Stille coupling. Propose a suitable catalytic loop/cycle for this reaction by taking into account the following hint. Hint: Apart from the other reaction(s) that does/do not include β -hydrogen transfer, the catalytic loop/cycle has

cross/misomerization and transmetalation (an organometallic reaction that involves the transfer of ligands from one metal to another, which in this case is the reaction of Pd-X bond with R-Sn bond to give Pd-R bond and X-Sn bond) reactions (4.5 marks)

1. (a) Sketch the established mechanisms/catalytic cycles for the hydrogenation of 1-hexene using $\text{RuH}(\text{Cl})(\text{PPh}_3)_3$ and Marks' catalyst. Among these two catalysts, which catalyst will give a higher value of TOF at ambient conditions?

(b) Alkenylation of pyridine using alkynyl silanes was carried out using a ruthenium catalyst and the following results are obtained. For each entry, calculate TON and TOF. Also mention, which R substituent gives the best TON and TOF. (8 marks)



Entry	R=	Time(h)	Product	Yield(%)
1	Ph (1a)	7	2a	87
2	p-Me-C ₆ H ₄ (1b)	9	2b	92
3	n-C ₆ H ₁₃ (1c)	6	2c	90
4	1-cyclohexenyl (1d)	11	2d	75

4. Draw a catalytic cycle for the oxidation of ethylene using Wacker process. Instead of water, use D₂O. Hint: Though, D₂O is used, the main product of oxidation does not have any deuterium. (6 marks)

5. (a) Show, (a) the synthesis of Tebbe's reagent and (b) the detailed reactivity of Tebbe's reagent with benzophenone (5 marks)

(b) Simply, through orbital pictures, show clearly the differences in the bonding between Fischer carbene and Schrock alkylidene

(c) What is Pauson-Khand reaction?

6. Very clearly, draw a catalytic cycle for the British Petroleum's Cativa Process. (6 marks)

21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn
39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd
57 La	71 Hf	72 Ta	73 W	74 Re	75 Os	76 Ir	77 Pt	78 Au	79 Hg

4s² 3d² →