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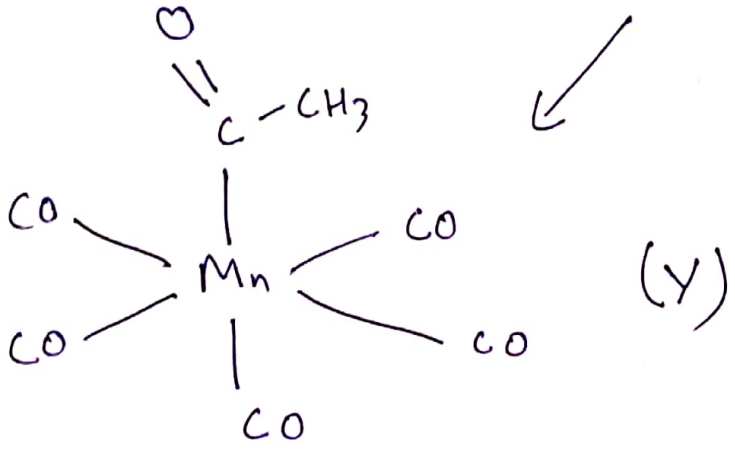
Q1)

$$Mn_2(CO)_{10} \xrightarrow{Na} Na^+[Mn(CO)_5]^- \quad (X)$$

$$\downarrow CH_3COCl$$

$$NaCl + [Mn(CO)_5(CH_3CO)]$$



(Y)

Q2) $[Fe(H_2O)_6]^{3+} + K^+(SCN)^- \longrightarrow [Fe(H_2O)_3SCN_3] + K^+$ (blood red)

The intense colour of the thiocyanate complex is due to unpaired electron and formation of charge transfer complex.

Iron(III) is a d^5 system. Water is a weak field ligand Hence Iron(III) is high spin. Both spin-selection and Laporte is forbidden, hence very weak colour.

However Fe^{3+} is an oxidant and SCN^- is reductant.

So a charge transfer occurs. LMC---T - transition is now favourable hence the intense colour

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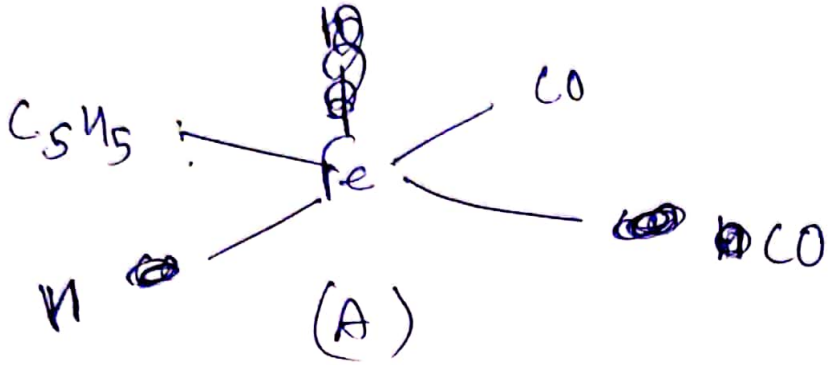
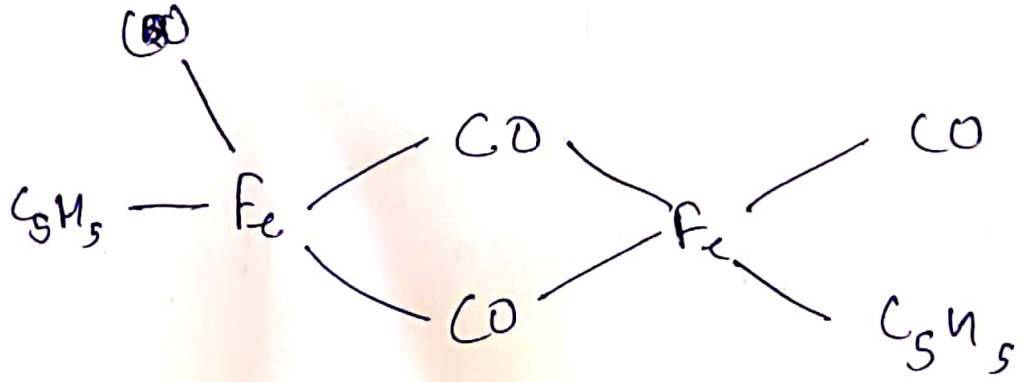
Q3) $[(\eta^5 - C_5H_5)\cdot Fe(CO)_2]^+ + NaH \longrightarrow$



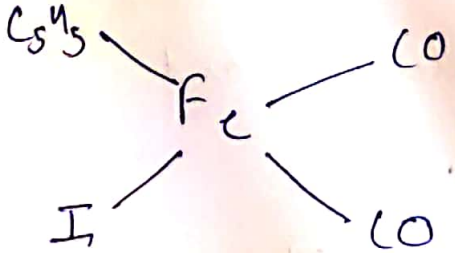
(A)

B → H_2

C →



D →



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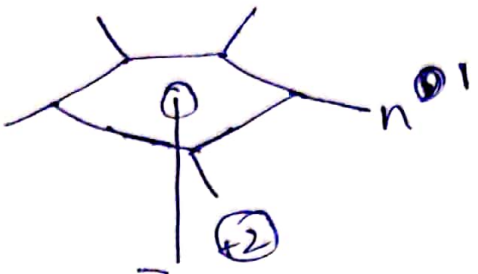
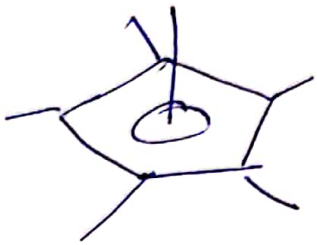
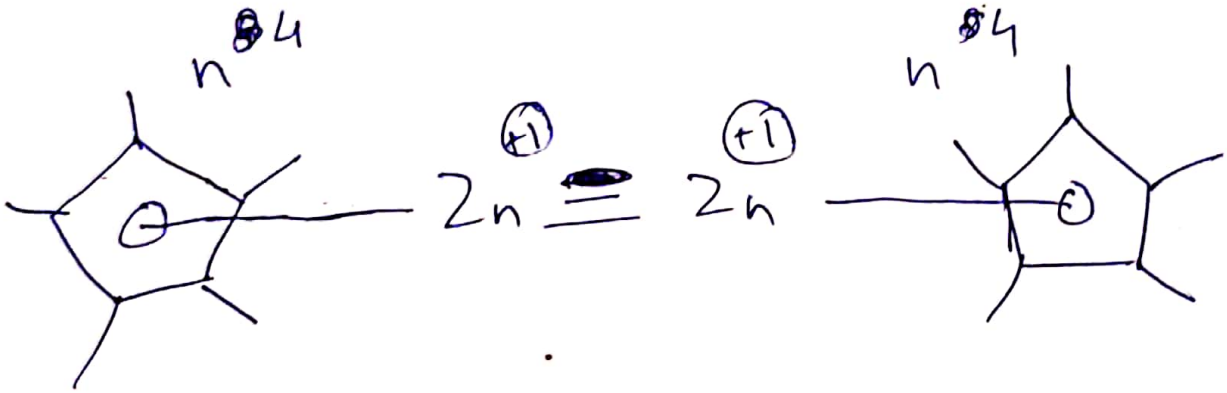
Q4)

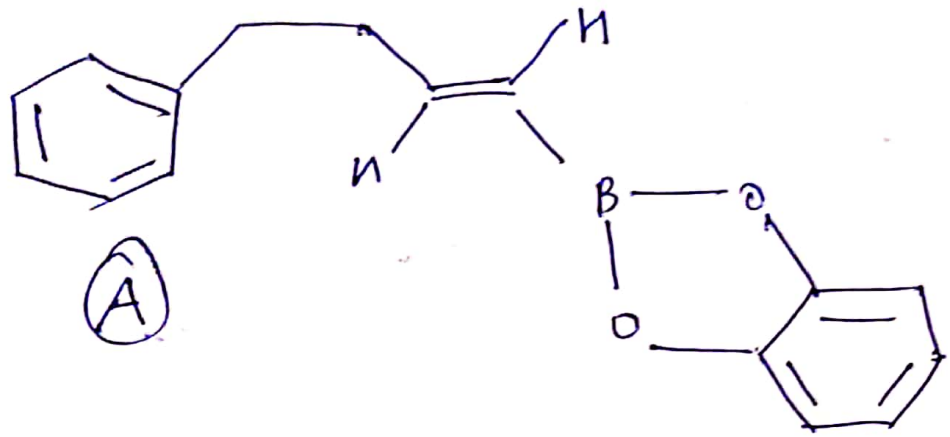


(A)

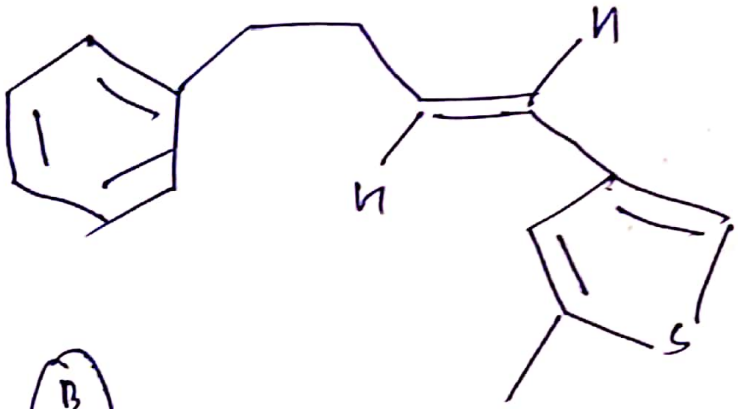




Q 5) Harshit Marwaha 2020CS10348



A



B

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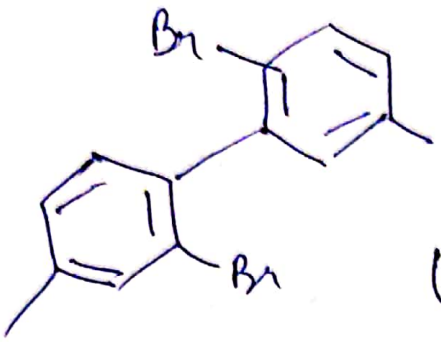
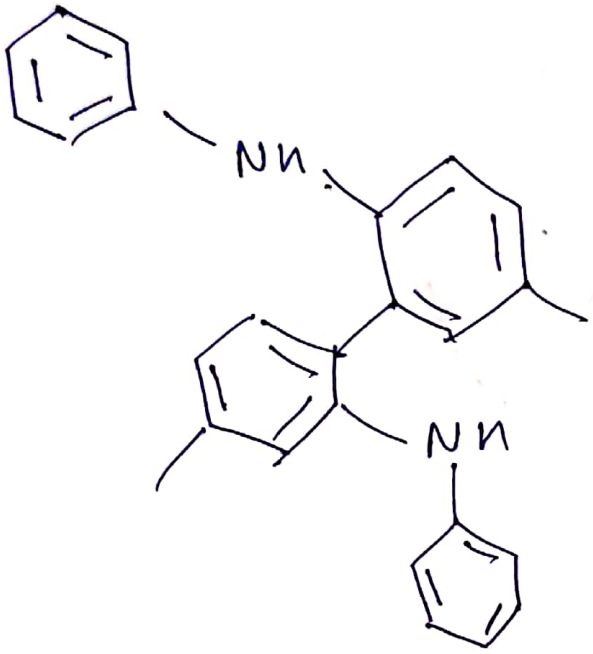
Q6)



(A)



(B)

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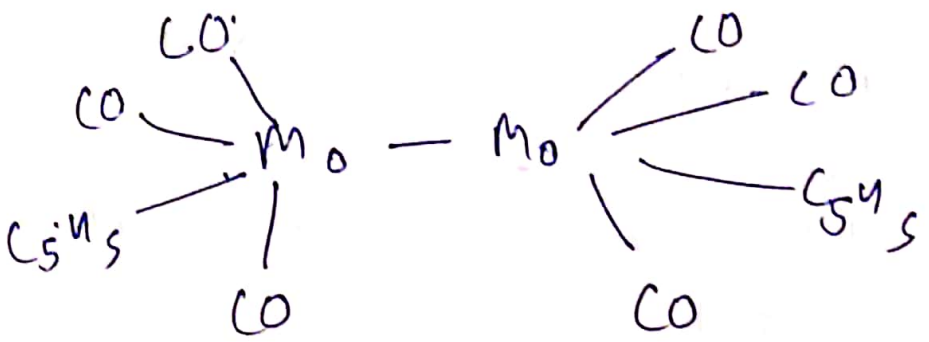
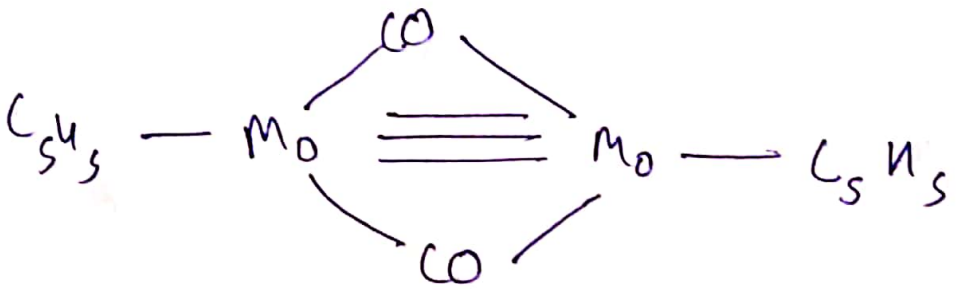
Q7)

A)





b) i) 1-2 migratory insertion

ii) Migratory insertion

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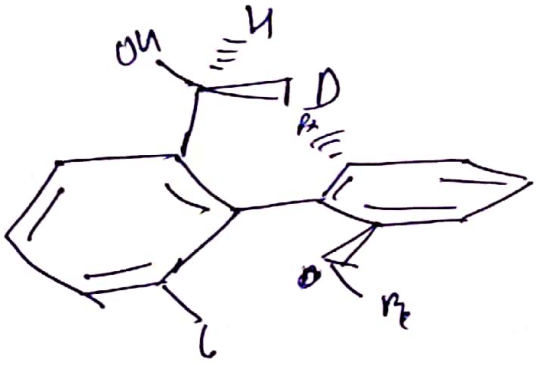
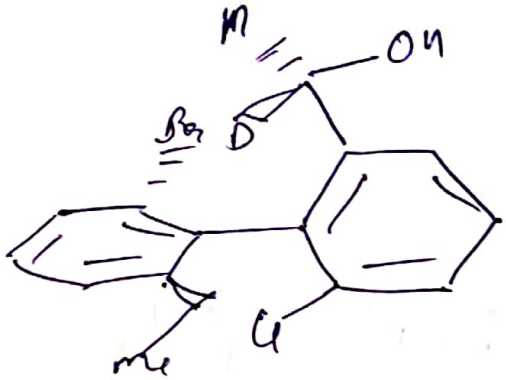
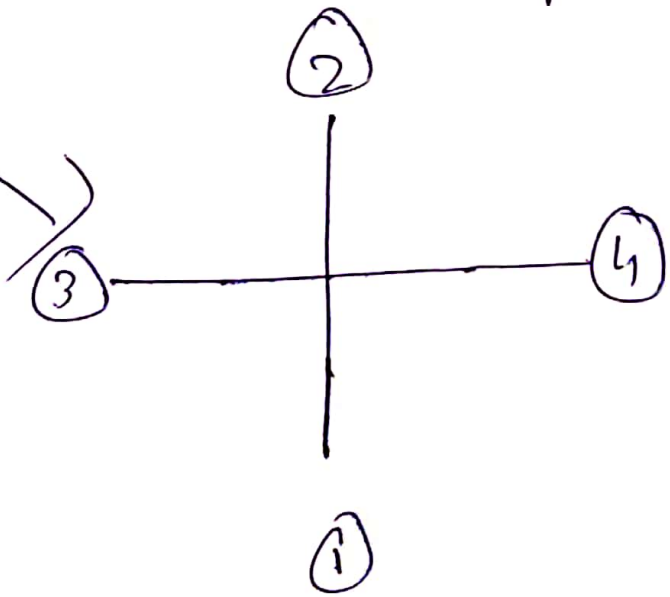
Q8)

The configuration is 'S'

The stereochemical relation between H (red) and H (blue) is diastereotropic since the mirror images would be non superimposable if we replace one 'H' with 'D'







Viewing from right side

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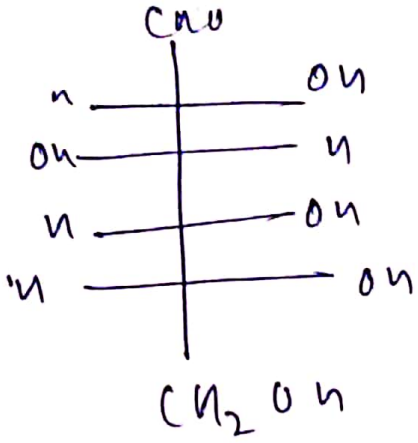
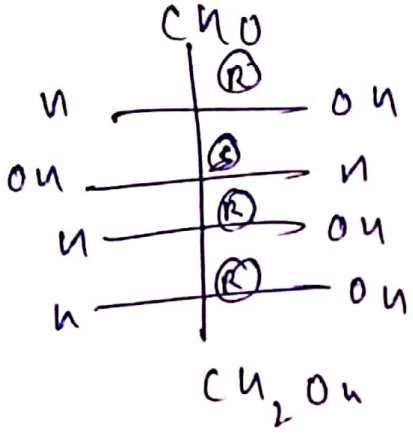
q)

a)



b)



c) Lyxose isomer is D- isomer

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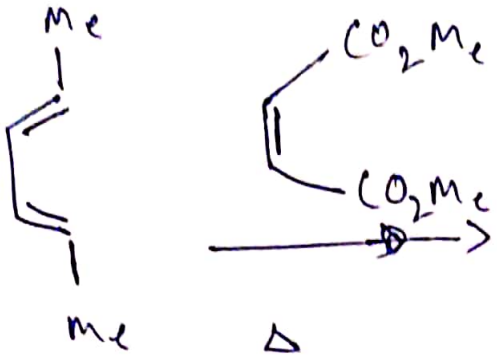
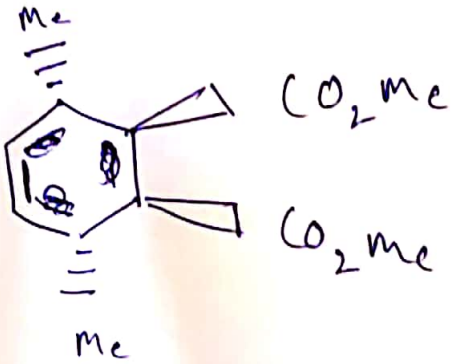
10)



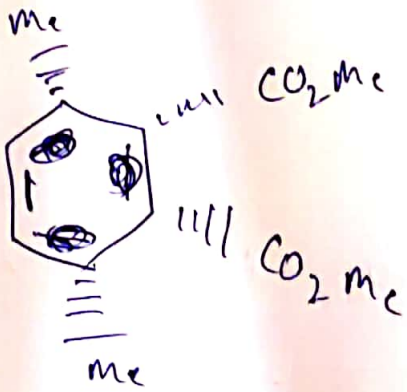
A + B

exo endo

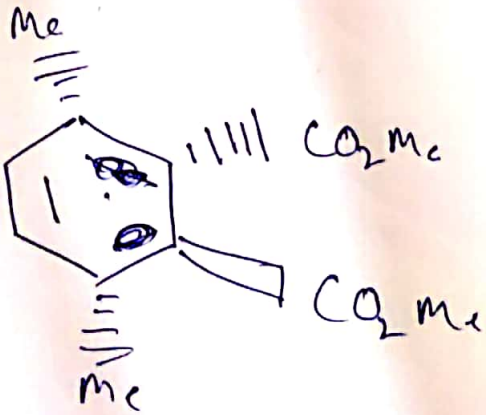
A :



B :



C :



b) A : Thermodynamic

B : Kinetic

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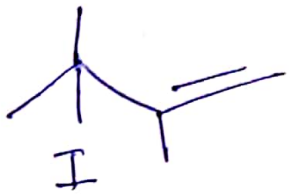
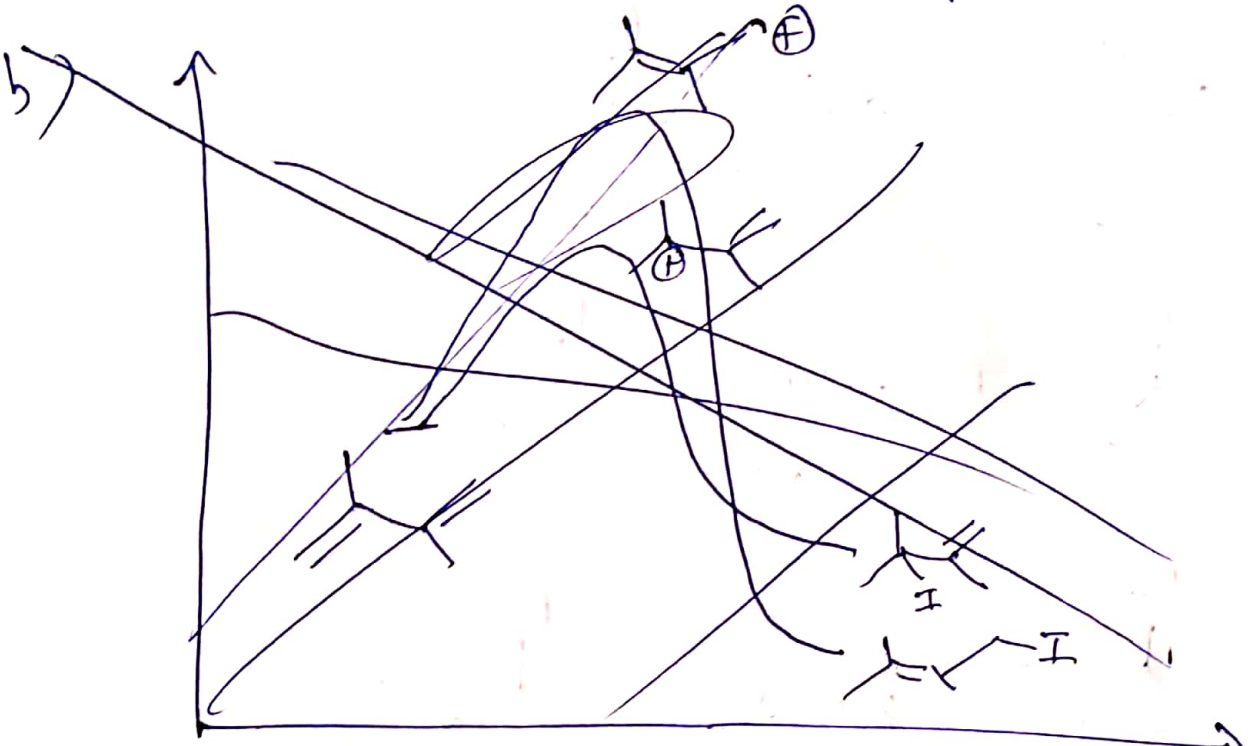
11) a)

Kinetic ⇒

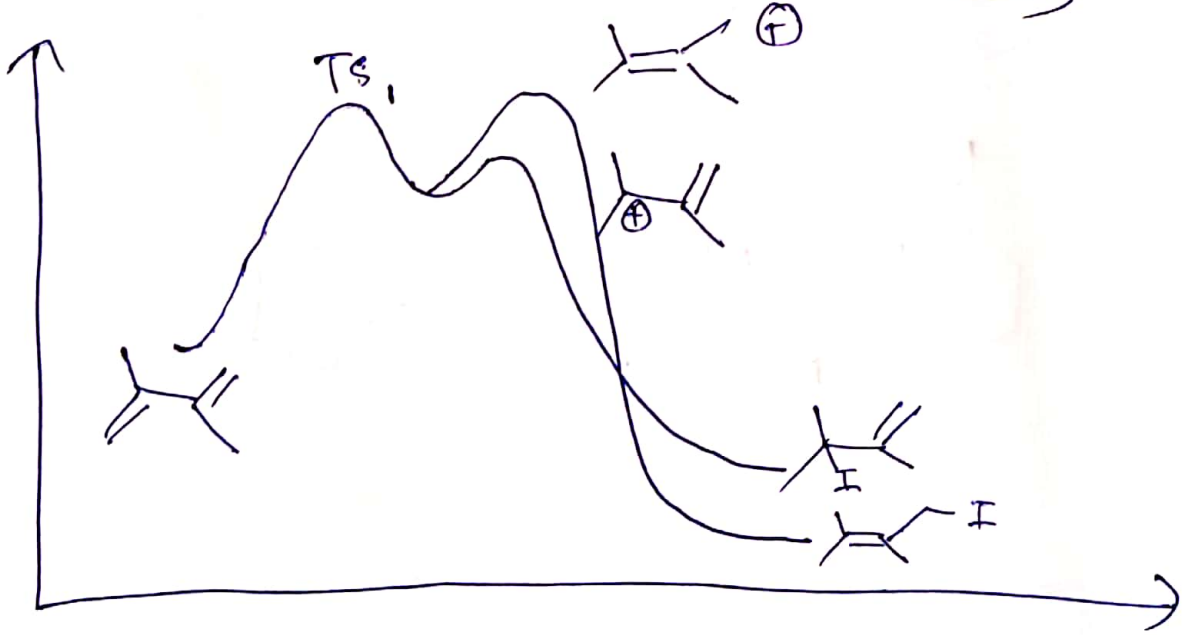


Thermodynamic ⇒

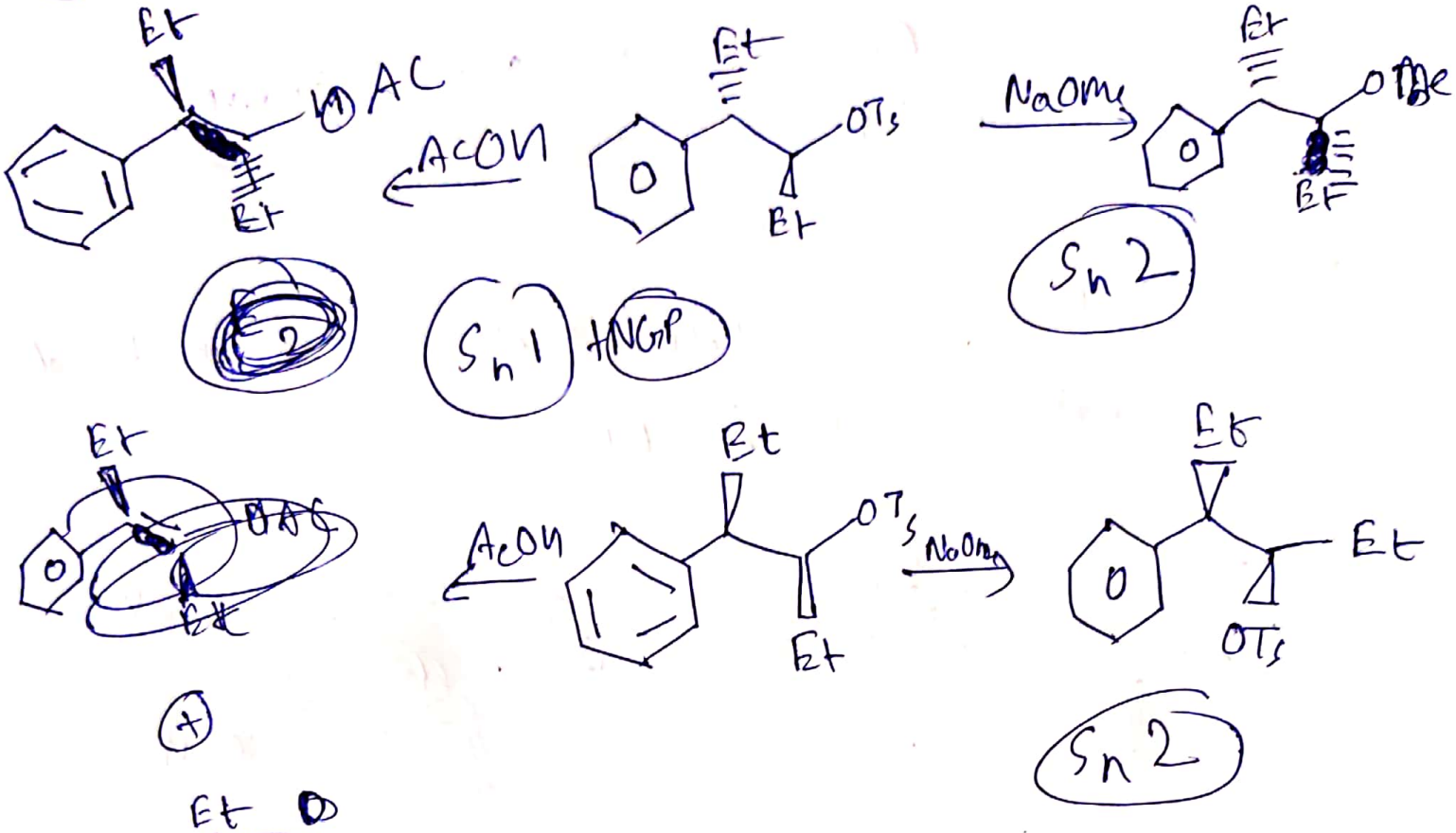
b)



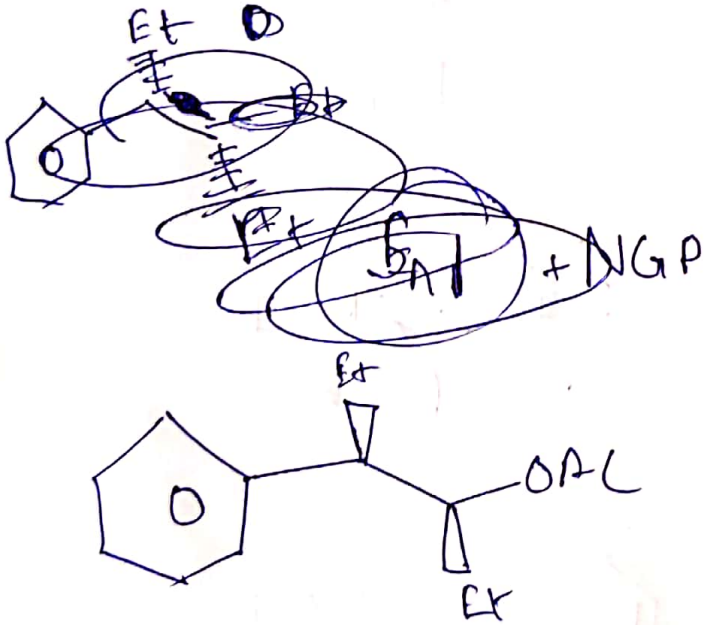
b)



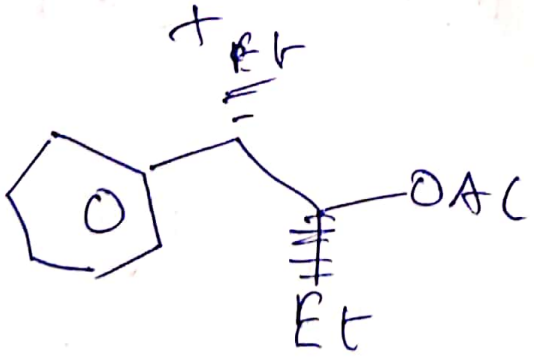
(13) 2020CS10348 Navneet Marwaha



(+)



M + N



NGE + S_N1

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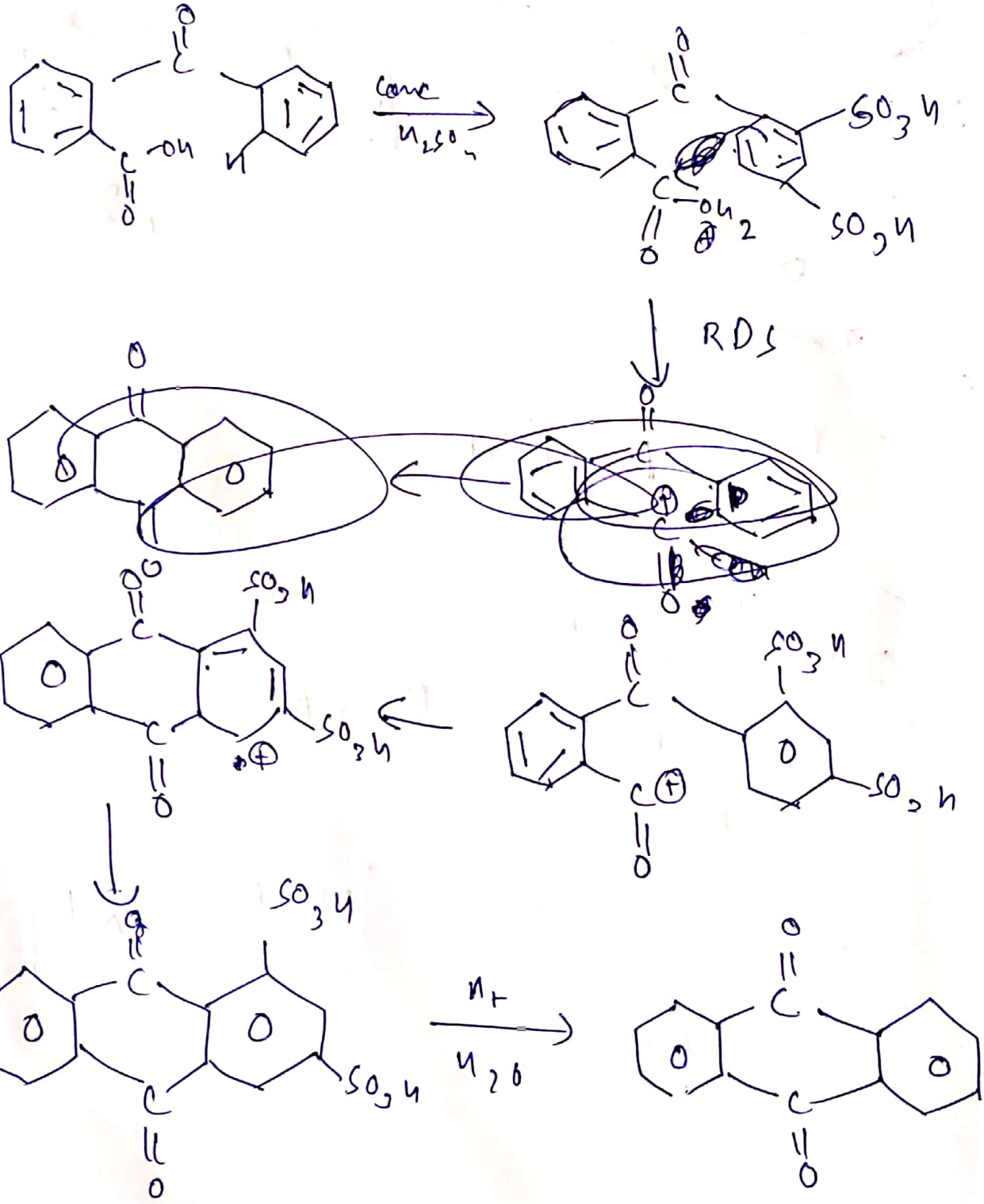
14) a) $KIE = \frac{K_H}{K_D} = \frac{1.56 \times 10^{-4}}{1.34 \times 10^{-4}} = 1.16$

b) KIE value tells that the C–H bond does not break in RDS.



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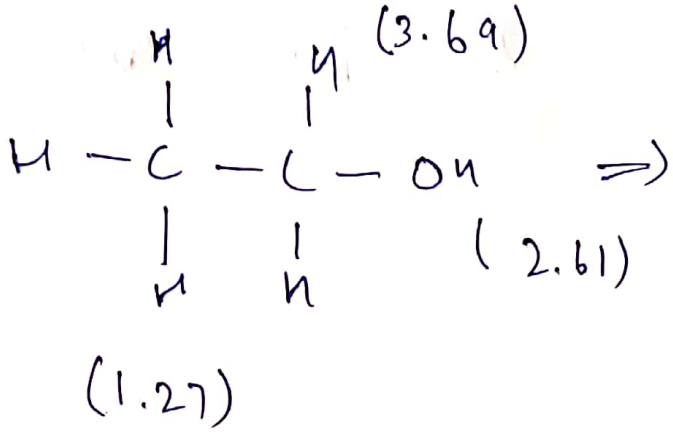
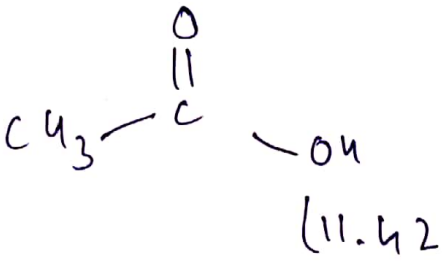
15) O + P $\xrightarrow{H^+}$ Q

a) P ⇒ Alcohol as IR has peak on 3300 cm^{-1}

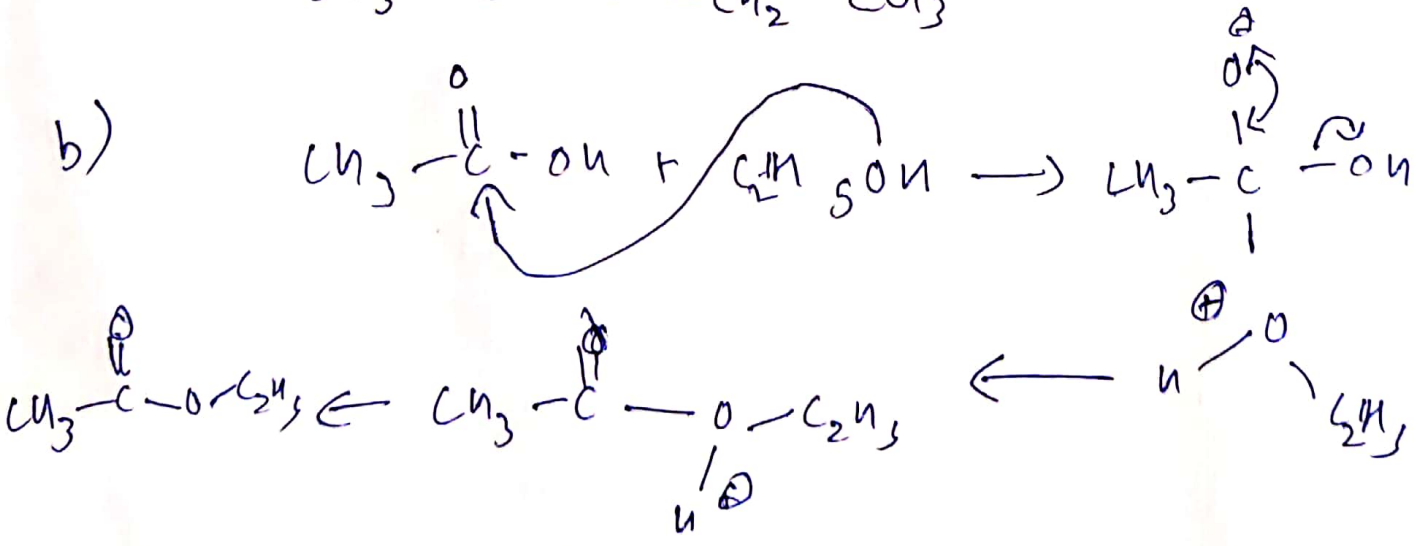
P ⇒ 

⇒ CH_3CH_2OH

O ⇒ 

IR suggests C–H and =O bonds

Q ⇒ $CH_3-C(=O)-O-CH_2-CH_3$

b) 

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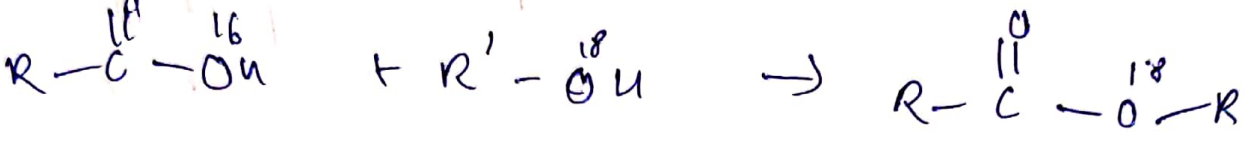
Using labelled oxygen we can determine which Oxygen attacks on the other species

→ 

So $R-O^{18}H$ lone pair attacks.

(E) 2020[S(O)]48 Harshit Marwadia

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