CHEM 669

Organic Synthesis — C–C
Bond formation — C–C
Bond disconnection — (Retrosynthesis)

C–C
C–N
C–O
C–X (X = S, Se, halogens etc)

Stereoselectivity
protecting group chemistry
Modern trends in Organic chemistry

C–C bond formation:-

Bond formation occur through electrons

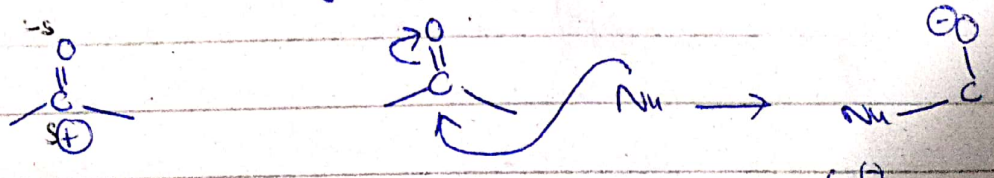
A–B

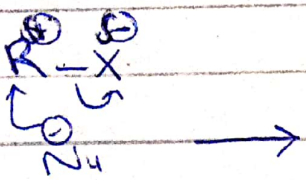
e⁻ deficient A^{+} $A^{\ominus}$ e⁻ enrich
Electrophile Nucleophile
free radical $A^{\cdot}$ $B^{\cdot}$

for heteroatom we know that C^{+} $X^{\ominus}$

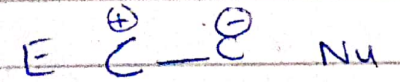
C–X

$R^{\delta+}$—$X^{\delta\ominus}$ alkylhalides are good electrophile



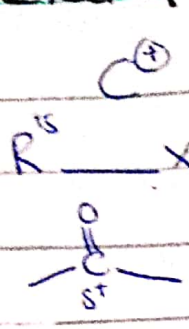


$R-Nu$



Carbene → 6e⁻ deficient
react at that were e⁻ density high e.g = in — bond it undergoes insertion

Electrophile Nucleophile



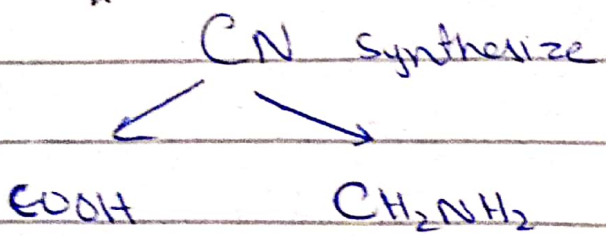
alkylehalide

carbonyle

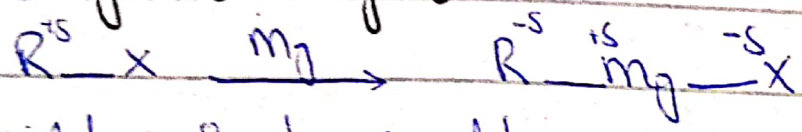
available

all other $R^{\ominus}$ we have to generate grignard reagent need to synthesize

★



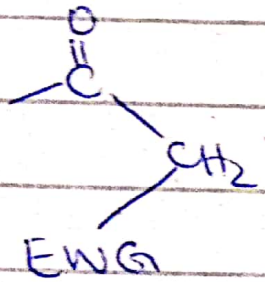
Grignard reagent:-



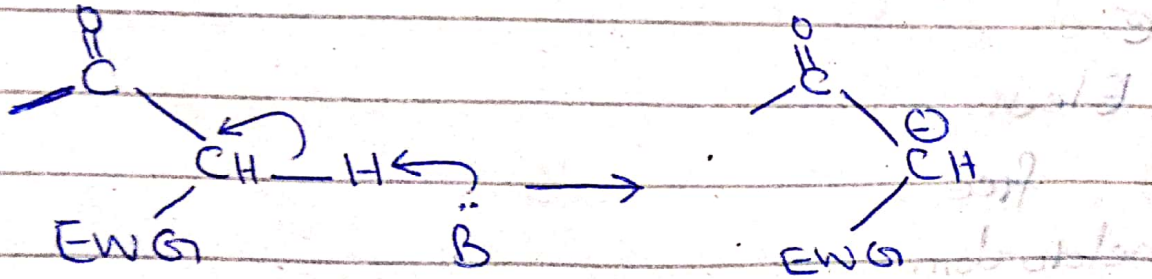
highly inert conditions require

Condition:- dry ether, dry THF

Et_2O



active methylene



C-C bond formation:-

we must be Nu & E^+ carbon for any reaction.

$\overset{\ominus}{C}N$ $R-\overset{\delta+}{C}-\overset{\delta-}{X}$ $R-\overset{\delta+}{C}=\overset{\delta-}{O}$

due to electronegative X & O carbon adjacent to them is electron deficient.

Generation of Carbanion ($\overset{\ominus}{C}$) (or Nucleophilic carbon)

after generation their reactivity & selectivity is imp.
highly reactive things are not selective.

Grignard Reagent:-

$R-X \xrightarrow[Et_2O / THF]{Mg} R-\overset{\delta+}{Mg}-\overset{\delta-}{X}$ insertion of Mg

when C have -ve charge means it is attach to metal.
if metal is hard then C is hard.
means charge on metal is localized.
hard prefer to attract hard.
if metal is soft then C is soft
it prefer to react soft sight.

S good Nu but week base
O strong B but week Nu

By increasing size softness increase bcz delocalization of charge.

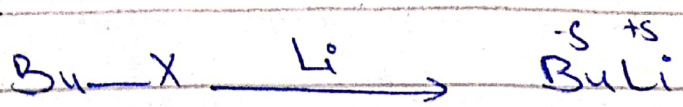
P → soft
Mg → hard
Cu →

↑ Hardness upward

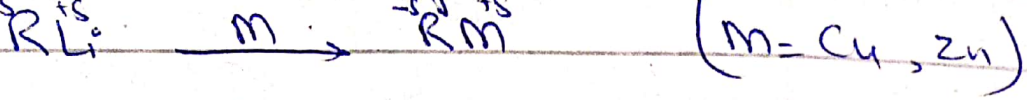
F
Cl
Br
I

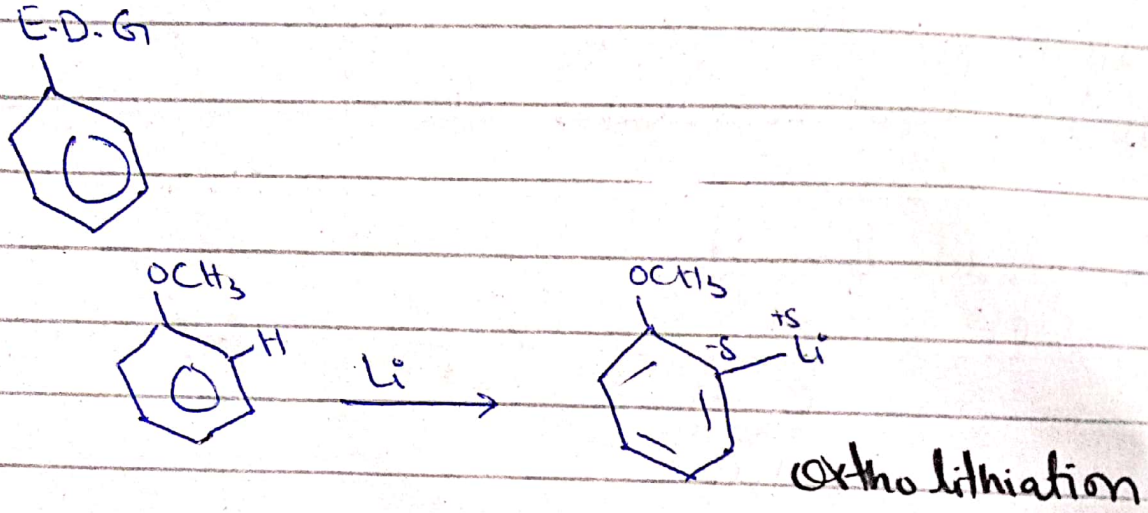
↓ downward softness ↑

example



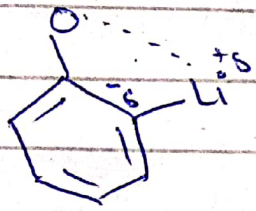
-then metal exchange reaction.





ortho lithiation

it is ortho bcz Li coordinate bitw EDG



Li, Mg, Na soft (they can easily cut)

their hardness & softness according to bending & cutting

Mg → turning form Li → ribbon form

we prefer Mg & Li bcz we can easily used it