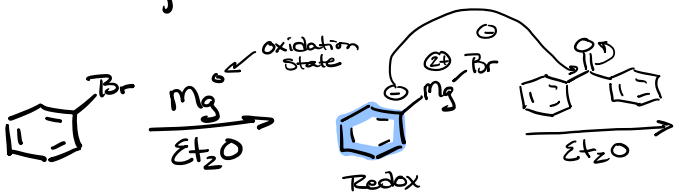
Grignard Experiment Exp 33A Pavia

Synthesis of Triphenylmethanol by Grignard Reaction

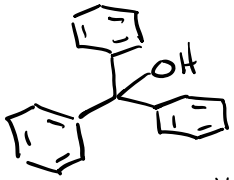


Et_2O = diethyl ether

Et-O-Et

Adduct = Combination of 2 molecules

6 M HCl



Triphenylmethanol or Triphenylcarbinol

Grignard

Barbier

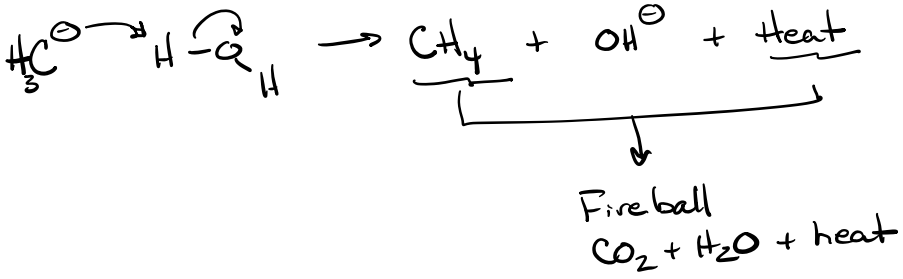
$R-Br \xrightarrow{2Na} R^{\ominus}-Na^{\oplus} + Na^{\oplus}Br^{\ominus}$

organometalic

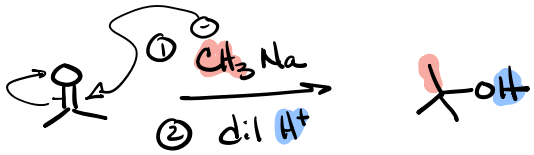
$Na^{\oplus}CH_3^{\ominus}$ = $CH_3^{\ominus}$ Carbon nucleophile

weak acid → stronger Acid

	H_3C-H	H_2N-H	$HO-H$	$F-H$
pka	60	40	16	3
			acidity of water	strong acid
Strong Base	$H_3C^{\ominus}$	$H_2N^{\ominus}$	$OH^{\ominus}$	$F^{\ominus}$ weak base



$NaCH_3$ Pyrophoric ⇒ Explodes in air



Grignard

Very mild conditions

Oxidative insertion

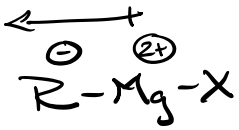
R = Carbon

X = Halogen

Umpolung ⇒ Reversal of polarity

Carbon electrophile

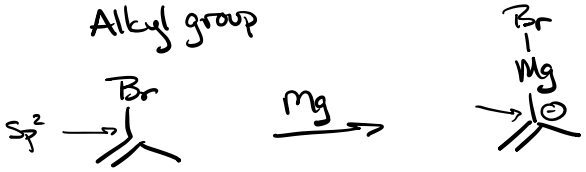
S_N2 Rxn Substrate



Carbon nucleophile allows for new C-C bond formation

Grignard Reaction is "General" = Works on many Substrates

Alkyl group



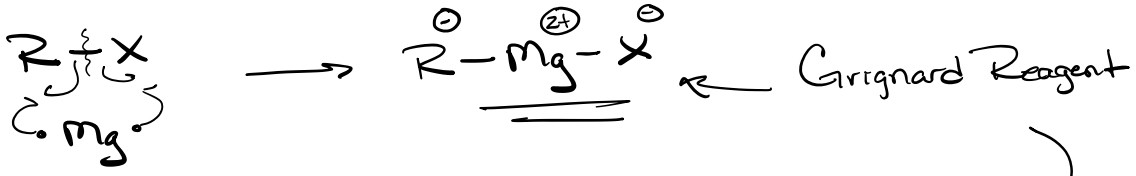
Vinyl

Papargyl

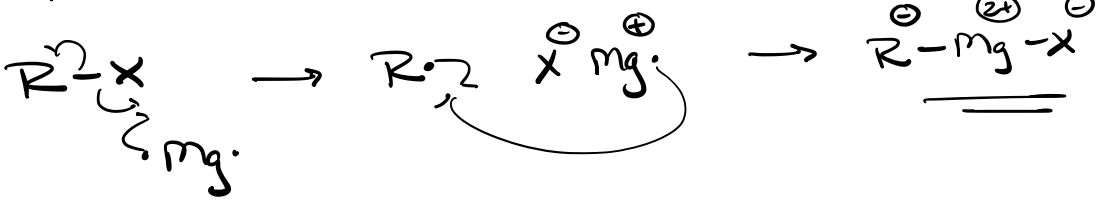
Aromatic

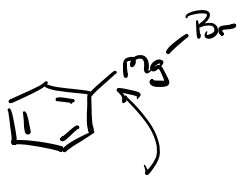
$$R\text{-}X \xrightarrow{Mg} R\text{-}Mg\text{-}X$$

Concerted



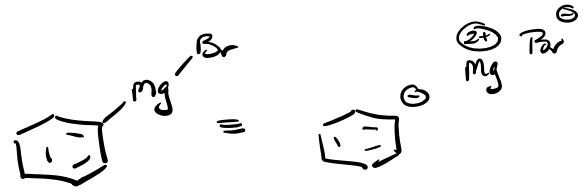
Stepwise





σ Bond ?

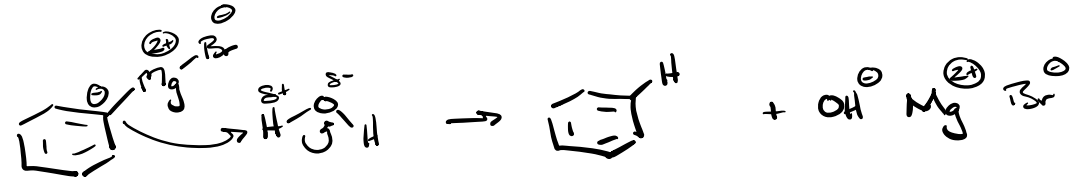
What type of bond is this ?



Covalent ——— Ionic

Dative or Coordinative

Inbetween Covalent & Ionic



Carbanion
good nucleophile
also Strong base

Water is problematic
it destroys the Grignard

Solvents – Et_2O Ether Solvent

Must have an aprotic polar & non-electrophilic Solvent

aprotic ⇒ no $\overset{\delta+}{O}\text{-}H$, $\overset{\delta+}{N}\text{-}H$, $\overset{\delta+}{S}\text{-}H$ acidic protons

electrophilic ⇒ 

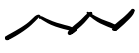
non-electrophilic ⇒ no Carbonyls, no R-X

Remaining Ethers — polar

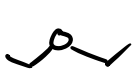
Et_2O

THF

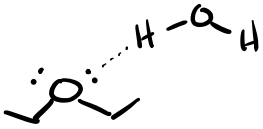
Hydrocarbons – non-polar



not supportive of ions

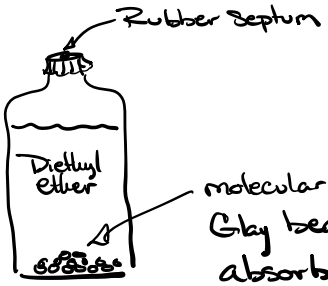


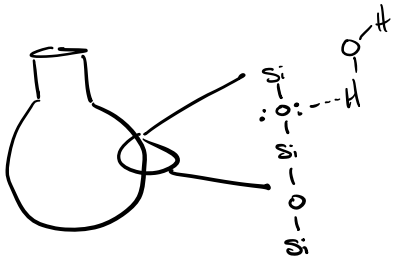
Diethyl ether hygroscopic = absorbs H_2O



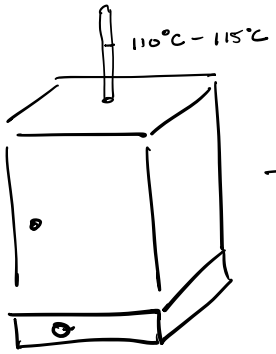
H-bonding

Anhydrous diethyl ether



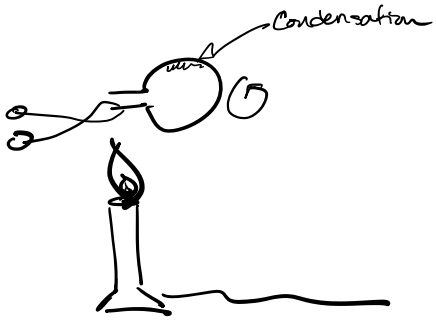


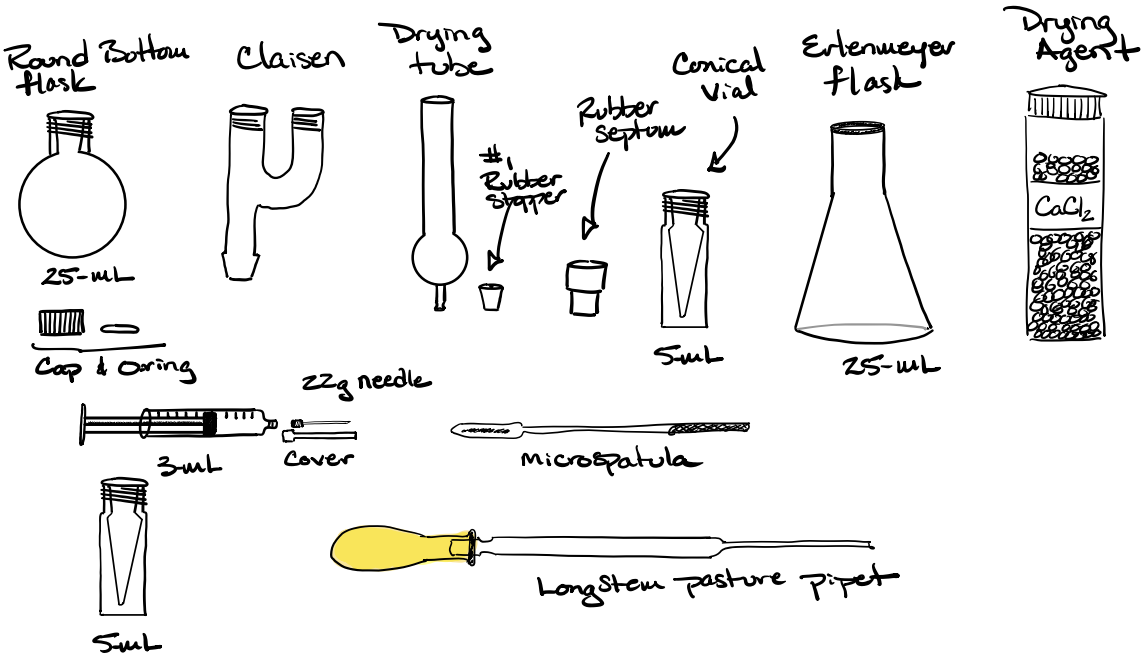
H-bonds w/ H_2O



Put glassware in oven over night
~ 12-24 hrs @ 110°C - 115°C
Dry's the glassware before use.

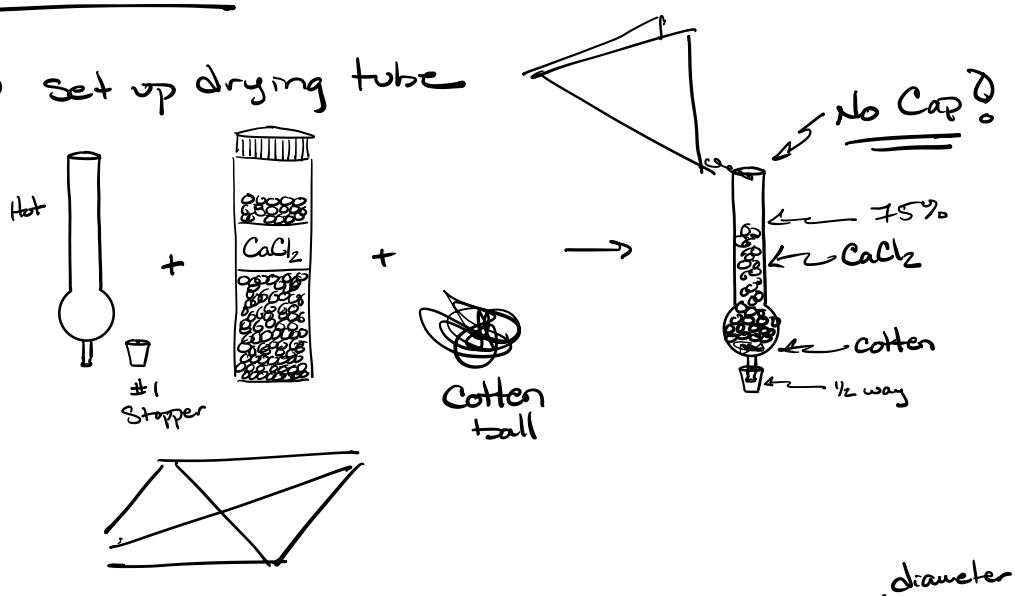
Another drying Methode - Flame dry



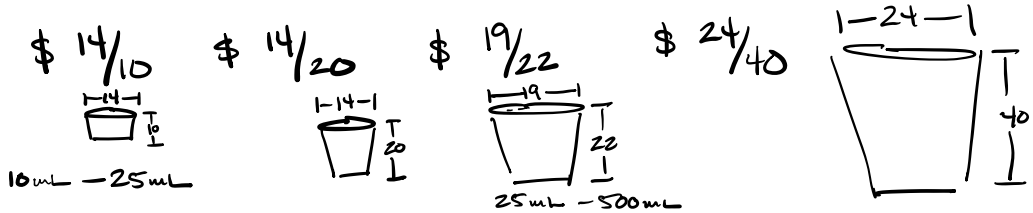


Procedure

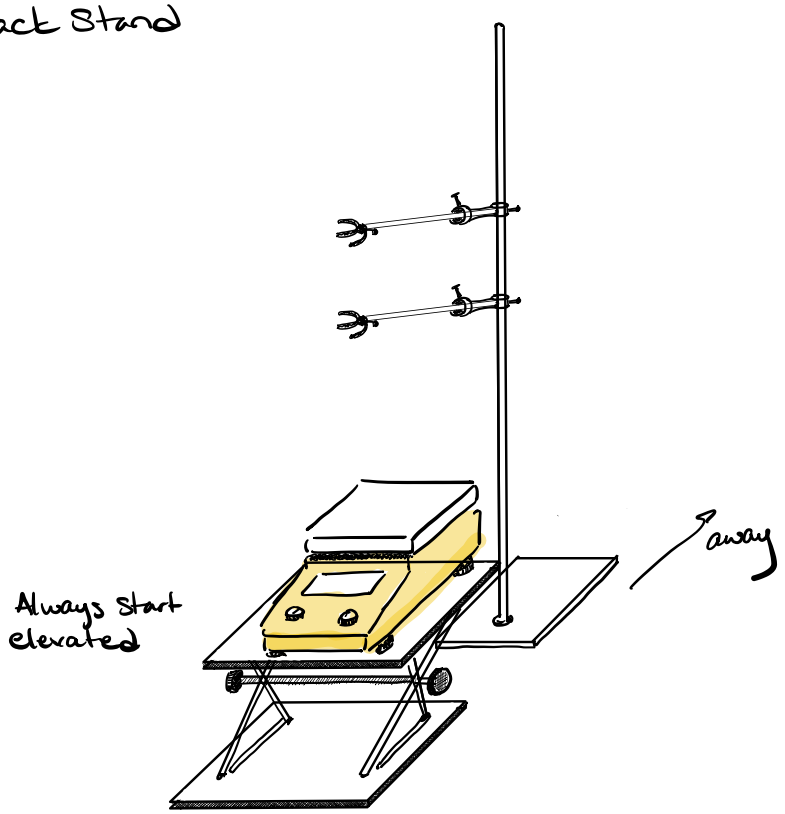
① Set up drying tube



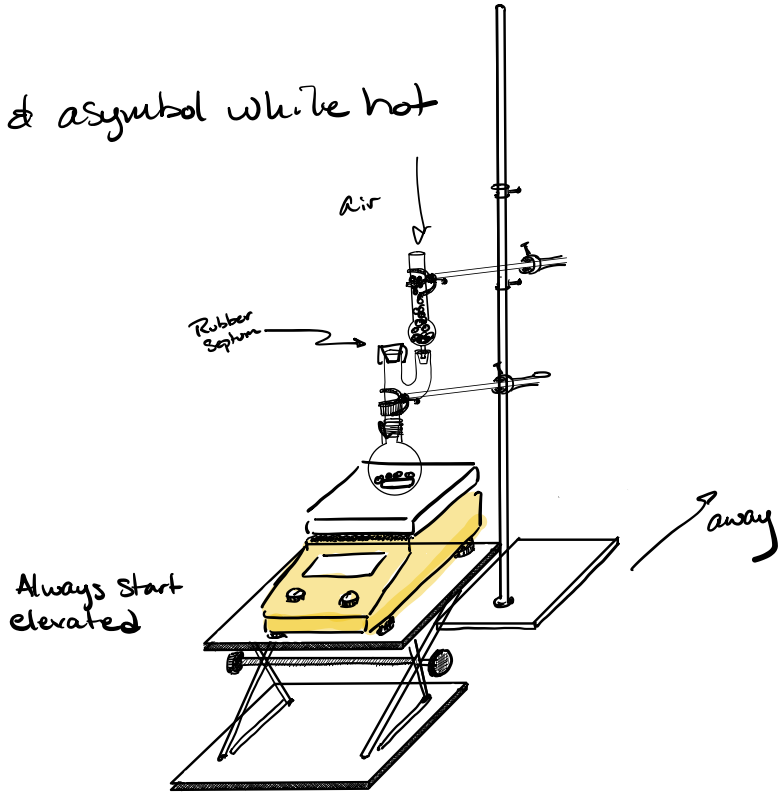
* Glassware Joint Size Standard Taper $ #/# ← diameter, depth

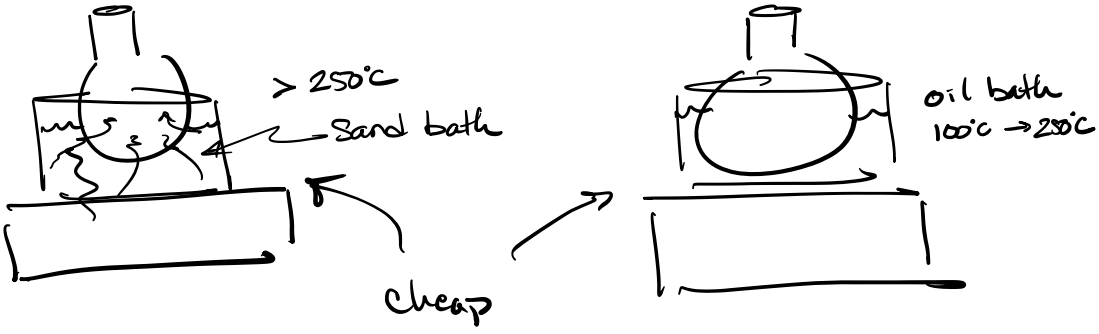


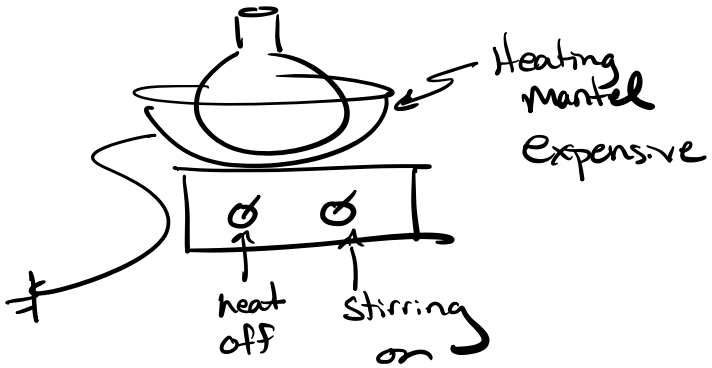
② Jack Stand



③ Bring out glassware & asymbol while hot




> 250°C
Sand bath
Cheap
oil bath
100°C → 250°C


Heating mantel
Expensive
heat off
Stirring on