ये भूले तो गये

IIT-JEE Target 2022
Chemistry

Organic Chemistry

Organic Reagents

S. No	reagent	Function
1	PCl_3, PBr_3, PI_3	Alcohols into Alkyl halides
2	$SoCl_2$, PCl_5	Alcohols into Alkyl chlorides & Carboxylic acids into Acid Chlorides
3	HCl/$ZnCl_2$,HBr,HI	Alcohols into alkyl halides
4	Cl_2/Fe or $FeCl_3$	Cl group substituting on Benzene
5	$NaNO_2$ /HCl 0-5°C	Diazotisation
6	CuCl,CuBr,CuCN,Kl,H_2O, H_3PO_2	DiazoniumCholride into ChloroBenzene, BromoBenzene, Benzo nitrile, Iodo Benzene, Phenol, Benzene respectively
7	HBF_4 or $NaBF_4$	Diazonium Chloride into FloroBenzene
8	AgF or Hg_2F_2 or SbF_3 or CoF_2	Alkyl halides into alkyl florides
9	Na/dry ether	Alkyl halides into alkanes
10	NaOH 623/443/368K	Chloro benzene to phenol
11	Br_2/$FeBr_3$	Bromination of Benzene
12	Cl_2/$FeCl_3$	Chlorinationof Benzene
13	CH_3Cl/$AlCl_3$	alkylation of benzene and its derivatives
14	CH-CO-Cl/$AlCl_3$	Acylation on benzene
15	H_2SO_4/HNO_3	Nitration of benzene
16	$(CHCO)_2O$/$AlCl_3$	O Acylation of Phenol
17	H_2SO_4	Sulphonation on Benzene
18	H_2O/H_2SO_4	alkenes into alcohols
	Aq KOH	Alkyl halide into alcohol
19	BH_3/H_2O_2/OH^-	Alkenes into alcohols (Antimarkownikoff product)
20	$NaBH_4$/$LiAlH_4$(LAH)	Aldehydes, ketones, acids into alcohols, Nitro & Cynides, Isocyanides into amines
21	H_2/Ni or H_2/Pd	reduction of aldehydes,ketones and cynides
22	RMgX/H_3O^+	Aldehydes, ketones into alcohls
23	O_2 /H^+	Cumene to phenol
24	Na	Alcohol or phenol into Sodium alkoxide/Phenoxide
25	$(CHCO)_2O$/CH-CO-Cl	O acylation on phenol or N acylation on Aneline or amine
26	Conc.H_2SO_4/443K	Conversion of primary alcohols into Alkenes
27	Conc.H_2SO_4/410K	Conversion of alcohols into Ethers
28	85% H_3PO_4/440K	Secondary alcohol into alkene
29	20% H_3PO_4/358K	Tertiary alcohol into alkene
	Alcoholic KOH	Alkyl halide into alkene

30	$Cro_3/KMnO_4$ or $K_2Cr_2O_7$ in acidic medium	oxidation of alcohols into acids
31	Cu/573k	Dehydrogenation of alcohols gives 1° alcohols into aldehydes and 2° alcohols into ketones & 3° alcohols into alkenes
32	Dil. HNO_3	Mono nitration of Phenol
33	Conc.HNO_3	tri nitration of phenol
34	Br_2/H_2O	tri bromination of phenol
35	Br_2/Cs_2	mono bromination of phenol
36	$NaOH/CO_2$	Phenol to salicylic acid
37	$CHCl_3/NaOH$	Phenol to salicylaldehyde
38	Zn dust	Phenol to Benzene
39	$Na_2Cr_2O_7/H_2SO_4$ or air	Phenol to Benzo quinone
40	Zn/Cr_2O_3 200 to 300 atm 573 673K	CO & H into methanol
41	Invertase	Sucrose into Glucose or Fructose
42	Zymase	Glucose or Fructose into ethanol
43	HI	Ether into alcohol & alkyl halide
44	PCC	alcohol to aldehyde
45	$Pd/BaSO_4,H_2$	acid chloride into aldehyde
46	$SnCl_2/HCl/H_3O^+$	Cyanides into aldehydes
47	$AlH(i\text{-}Bu)_2/H_2O$	Cyanides into aldehydes
48	DIBAL-H/H_2O	Esters into aldehydes
49	CrO_2Cl_2/H_2O	Toluene to aldehydes
50	$CrO_3/(CH_3CO)_2O$	Toluene into benzaldehydes
51	Cl_2/hv	Chlorination on alkyl group of Benzene or alkane
52	CO, HCl anhydrous $AlCl_3$	Benzene to benzaldehyde
53	$(CH_3)_2Cd$	acid chloride into ketones
54	$RMgX/H_3O^+$	Cyanide into ketones
55	HCN	Carbonyl compound into cyanohydrin
56	$NaHSO_3$	addition in aldehyde and ketone
57	H_2NOH	carbonyl compound into oxime
58	$H_2N\text{-}NH_2$	carbonyl compound into hydrazone
59	$H_2N\text{-}NH\text{-}Ph$	carbonyl compound into Phenyl hydrazone
60	2, 4DNP	carbonyl compound into 2,4 dinitrophynyl hydrazone
61	$H_2N\text{-}NH\text{-}CO\text{-}CH_3$	carbonyl compound into semi carbazide
62	ROH/HCl	Aldehydes& ketones into hemiacetal and acetal
63	$HO\text{-}CH_2\text{-}CH_2\text{-}OH/HCl$	Aldehyde or ketone into ethelene glycol
		ketone
64	Zn-Hg/HCl	carbonyl compound into alkane
65	$H_2N\text{-}NH_2/KOH$	carbonyl compound into alkane
66	$KMnO_4/OH^+/K_2Cr_2O_7/H_2SO_4$ or HNO_3	Ketones into mixture of carboxylic acids on prolonged oxidation

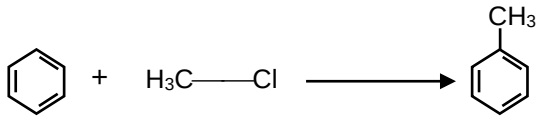
67	$(Ag(NH_3)_2)NO_3$ + NaOH	Tollen's test
68	$Cu(OH)_2$	Fehiling's test
69	NaOH+I_2	Iodoform
70	NaOH or $Ba(OH)_2$	aldol condensation
71	Conc KOH or NaOH	Cannizaro s reaction
72	$KMnO_4$/KOH	Toluene/alkyl Benzene into Benzoic Acid
73	H_2O/H^+	Cyanides into carboxylic acids, amidesinto carboxylic acids. esters into, carboxylic acis and alcohols, acidchlorides or anhydrides into carboxylicacids
74	NaOH	Saponification of ester, acid into salt of acid
75	Na_2CO_3 or $NaHCO_3$	Carboxylic acid test
76	P_4O_{10} or P_2O_5	Dehydration of acids into anhydride, amides into nitrites
77	ROH/conc H_2SO_4	Carboxylic acids into esters
78	PCl_3, $SoCl_2$, PCl_5	Carboxylic acid into acid chlorides
79	NH_3 heating	Carboxylic acids into amides
80	NaOH/CaO	Decarboxylation (acids into alkanes)
81	$LiAlH_4$	Carboxylic acids into alcohols, amides into amines
82	Cl_2/red.P_4	HVZ reaction
83	Sn/HCl or Fe/HCl, H_2/Pd	Reduction of nitro compounds into amines
84	NH_3	Alkyl halides into amines
85	H_2/Ni or H_2/Pd $LiAlH_4$	Amides into cyanides
86	KOH/R-X	Phthalimide into amine
87	NaOH/Br_2	Hoffman bromamide amide into amine with one C less
88	KOH, $CHCl_3$	Amines into Carbyl amines
89	$NaNO_2$/HCl	1° aliphatic amines into alcohols
90	$NaNO_2$/HCl 0°C to 5°C	Aniline into diazonium chloride
91	$C_6H_5SO_2Cl$	Distinguishing 1°, 2° & 3°amines
92	Br_2/H_2O	Aneline into tri bromo aniline
93	Br_2/CH-CO-Cl/$(CHCO)_2O$	Aniline into Bromo Aniline
94	HNO_3/CH-CO-Cl/$(CHCO)_2O$	Nitro anilne
95	H_2SO_4	Sulphonation on aniline
96	CuCl, CuBr, CuCN, Kl, H_2O, H_3PO_2 or CH_3-CH_2-OH	Diazonium Cholride into Chloro Benzene, Bromo Benzene, Benzo nitrile, Iodo Benzene, Phenol, Benzene respectively

Name Reactions

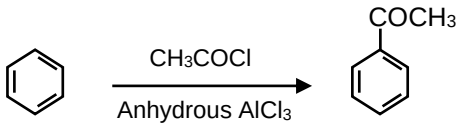
1. Finkelstein $CH_3Br + NaI \xrightarrow{\text{Acetone}} CH_3 - I + NaBr$

2. Swarts $CH_3Br + Agf \longrightarrow CH_3F + AgBr$

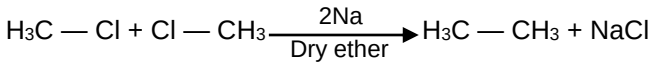
3. Friedel – Crafts Alkylation



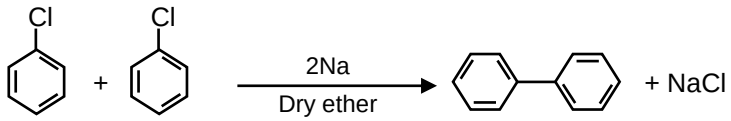
4. Friedel-Crafts Acylation



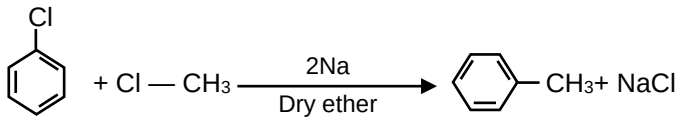
5. Wurtz



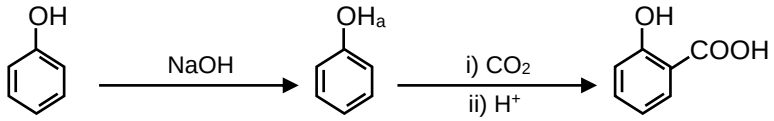
6. Fitting



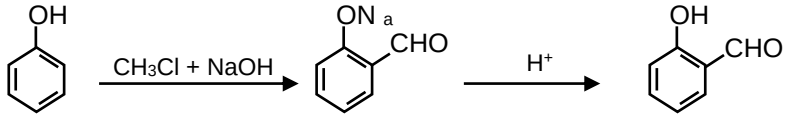
7. Wurtz-Fitting



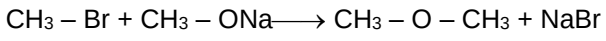
8. Kolbe



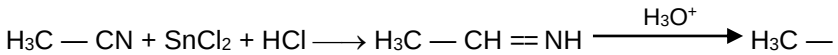
9. Reimer-Tiemann



10. Willamson

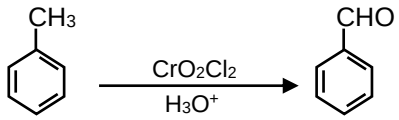


11. Stephen

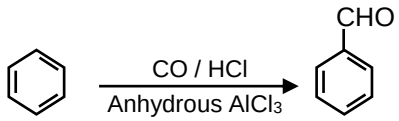


CHO

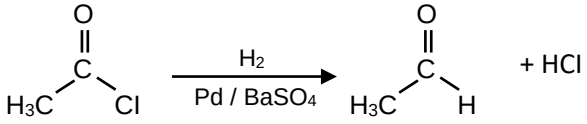
12. Etard



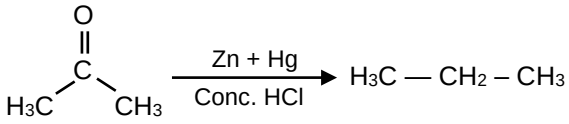
13. Gatterman – Koch



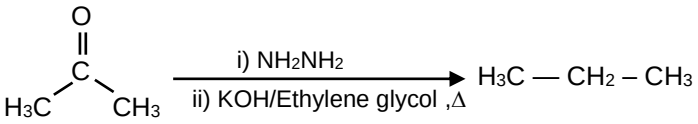
14. Rosenmund reduction



15. Clemmensen reduction



16. Wolff-Kishner reduction



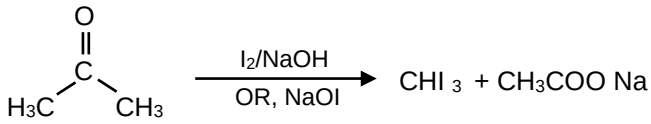
17. Tollen's test

$R - CHO + 2\,(Ag(NH_2)_2)^4 + 3\,OH^- \longrightarrow R - COO^- + 2Ag \downarrow + 2H_2O + 4$ NH_3

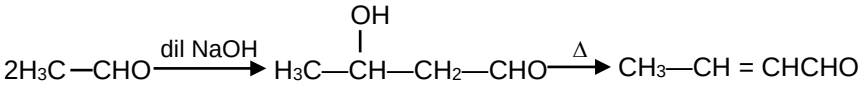
18. Fehling's test

$R - CHO + 2Cu^{2+} + 5\,OH^- \longrightarrow R - COO- + Cu_2O \downarrow + 3H_2O$

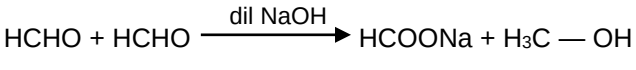
19. Iodoform



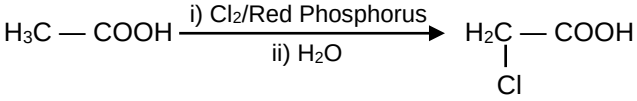
20. Aldal condensation



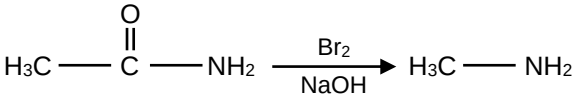
21. Cannizzaro



22. Hell-Volhard-Zelinsky (HVZ)



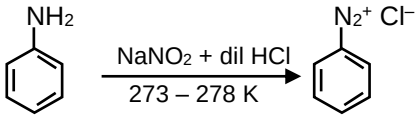
23. Heffronbromamide Degradation



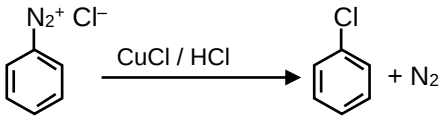
24. Carbylamine

$R - NH_2 + CHCl_3 + 3\,KOH \xrightarrow{\Delta} R - NC + 3\,KCl + 3\,H_2O$

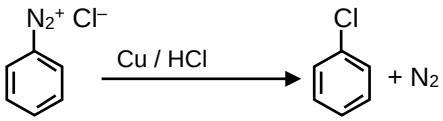
25. Diaza



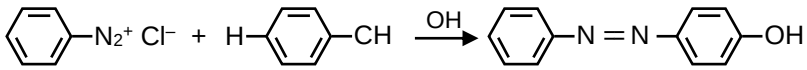
26. Sandmeyer



27. Gatterman



28. Coupling



Distinguish By a Single Chemical Test

1. All aldehydes (R-CHO) give Tollens' Test and produce silver mirror.

$RCHO + 2\,[Ag(NH_3)_2]^+ + 3OH^- \rightarrow 2Ag\downarrow + 2H_2O + 4\,NH_3$
Tollens' Reagent silver ppt

Note :HCOOH (methanolic acid) also gives this test, ketones (RCOR) do not give this test

2. All aldehydes (R-CHO) and ketones (RCOR) give 2, 4-DNP test
RCOR + 2, 4–DNP → Orange ppt
R-CHO + 2, 4–DNP → Orange ppt

3. Aldehydes and ketones having CH_2CO– (keto methyl) group give lodoform test. Alcohols having CH_3CH–OH group also give lodoform test.

$CH_3CHO + 3I_2 + 4\,NaOH \rightarrow CHI_3\downarrow + HCOONa + 3\,NaI + 3H_2O$
Yellow ppt

4. The following compounds give lodoformtest : ethanol (C_2H_3OH), propan-2-ol ($CH_3CH(OH)CH_3$), ethanal(CH_2CHO), propanone(CH_2COCH_3), butanone ($CH_3COCH_3CH_3$), pentan-2-one ($CH_3COCH_3CH_2CH_2$), acetophenone ($PhCOCH_3$)

5. All carboxylic acids (R-COOH) give Bicarbonate Test

$RCOOH + NaHCO_3 \rightarrow RCOONa + CO_2\uparrow + H_2O$
effervescence

6. Phenol gives $FeCl_3$ Test

$C_6H_5OH + FeCl_2 \rightarrow (C_6H_5O)_3Fe + 3\,HCl$
(neutral) (violet colour)

7. All primary amines (R/Ar -NH_2) give carbyl Amine Test
$R\text{-}NH_2 + CHCl_2 + KOH(alc) \rightarrow R\text{–}NC + KCl + H_2O$
offensive smell

8. Aniline gives Azo Dye Test (Only for aromatic amines)
$C_6H_5NH_2 + NaNO_2 + HCl \rightarrow C_2H_3N_2^+Cl$; then add β-naphthol orange dye

9. All alcohols (ROH) give Na-metal test
$R\text{-}OH + Na \rightarrow R\text{–}ONa + H_2$
bubbles

10. For esters (RCOOR) : Hydrolyses first. Then see the products (acid & alcohol) and give a testto Identify them.

11. All alkenes (C = C) and alkynes (C ≡C) decolorizes Br_2 -water from red to colourless

12. Lucas Test to distinguish primary, secondary and tertiary alcohols
Lucas reagent: $ZnCl_2$/HCl
3°-alcohol + Lucas reagent→ Immediate turbidity
2°-alcohol +Lucas reagent→ turbidityafter sometime
1°-alcohol + Lucas reagent → no turbidity