

Chemistry 35: Organic Preparations, Autumn Q, 1909,
Professor John U. Nef

Notes taken by Parke H. Watkins, S.B., 1910

Add to John U. Nef Papers?

1. The first of these is the fact that the

the second is the fact that the

the third is the fact that the

the fourth is the fact that the

the fifth is the fact that the

the sixth is the fact that the

the seventh is the fact that the

the eighth is the fact that the

the ninth is the fact that the

the tenth is the fact that the

the eleventh is the fact that the

the twelfth is the fact that the

the thirteenth is the fact that the

the fourteenth is the fact that the

the fifteenth is the fact that the

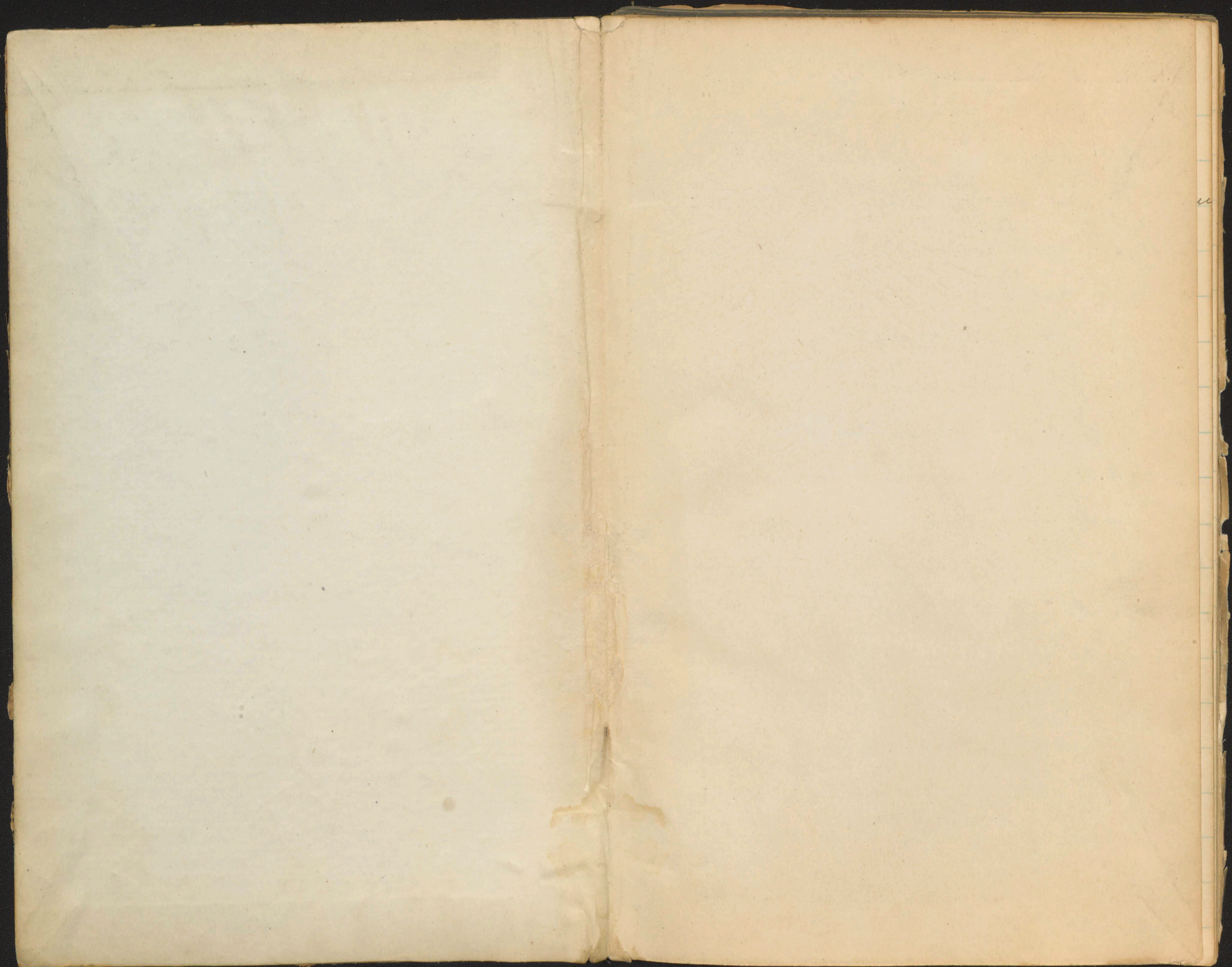


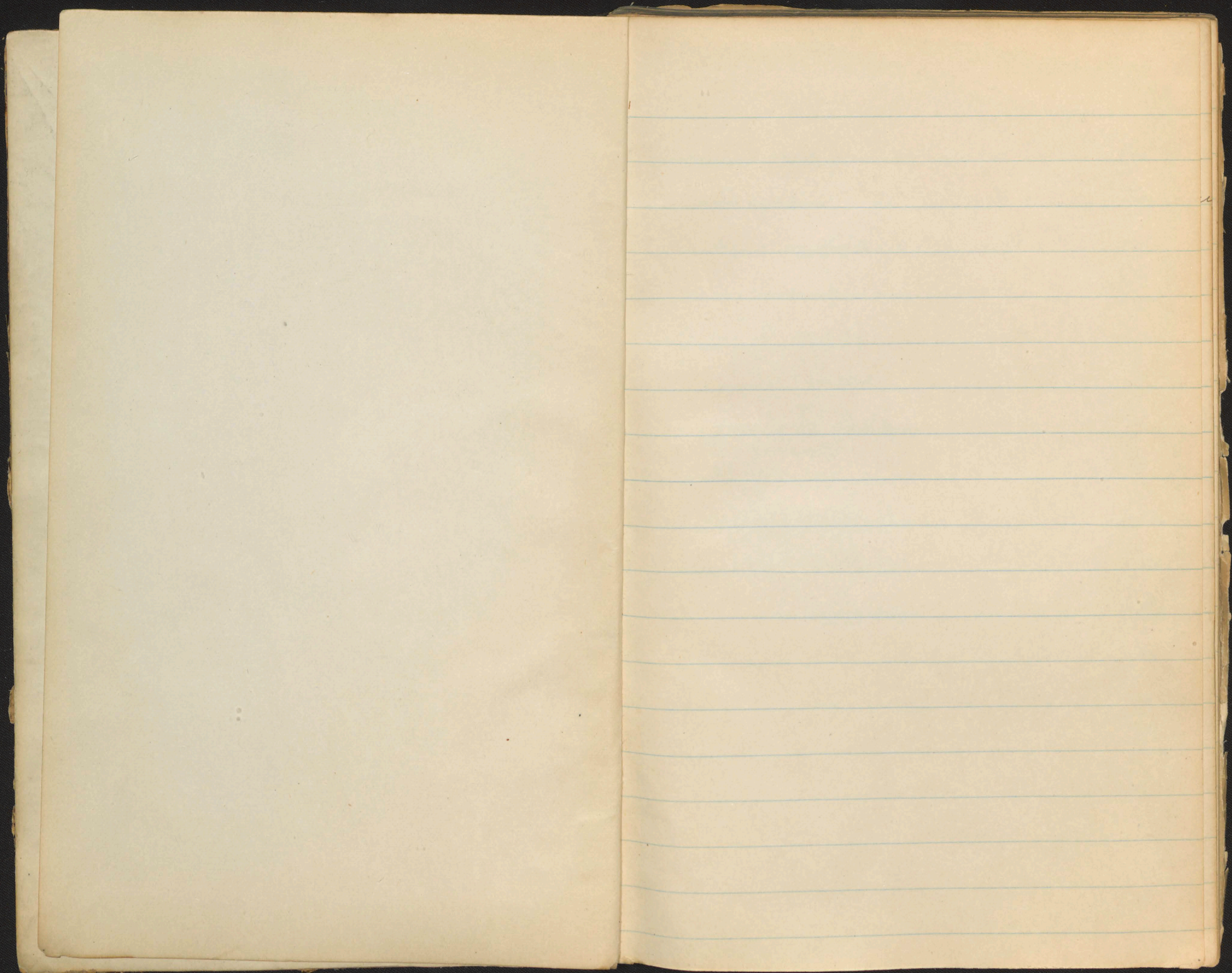
Organic Lectures



P. H. Watkins

Roll 09.





Beq. Oct. 6 '09.

Lavoisier's work formed classification by the dualistic system. All compounds contained oxygen.
M. = non-metathic elements.

M =
 $\begin{matrix} + & - \\ M & O \end{matrix}$ = acids
 $\begin{matrix} + & - \\ M & O \end{matrix}$ = bases.

$\begin{matrix} - & + \\ O & M \end{matrix}$ Salts.

elec. current
[1824] K_2SO_4 K_2O / SO_3 .

Electro chemical Henry Berzelius. In his system is most chem. neg. of all elements.

Gay Lussac discovered $\text{C}^\bullet$ organic radical.
1832. 1838-42. Bunsen discovery.

Shaller disc. HNC. Prussic Acid. But + 27.

Gay Lussac analyzed it 1st. He disc. this to be free from oxygen. Replaced H. by Cl. Got Cl [rc] Br [rc] I [rc]

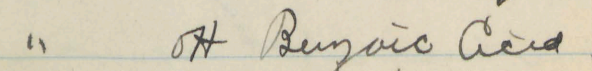
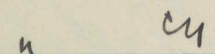
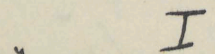
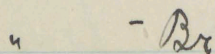
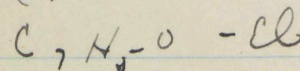
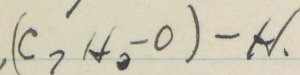
Hg [rc] heat gives $[CN]_2$.

Ag [rc] iso cyanide. CN is cyanogen

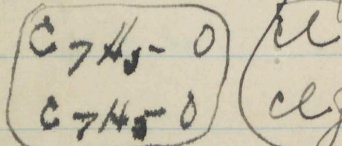
$(CN)_2$ is similar to the halides in its reactions. Prussic acid is very weak as compared with HCl etc.

Discovered by Gay Lussac 1815 when he sep. this $(CN)_2$ radical.

Friedrich & Höppler 1832. Buttersäure and Benzaldehyde



Neutral to acid properties.

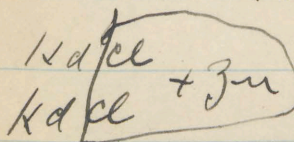
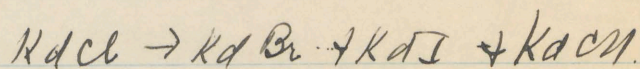
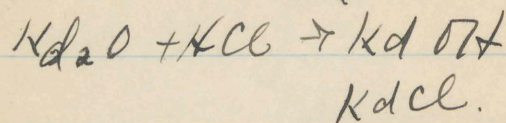
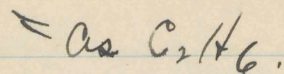
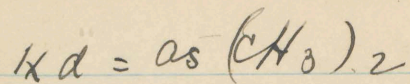
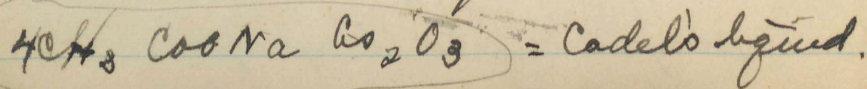


Bulls off Cl.

Dis benzole. Radical.

Det. char. grad. became important

Bunsen disc. Kd radical.

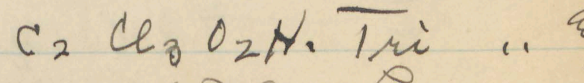
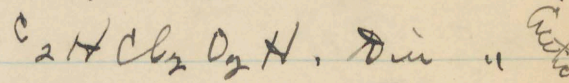
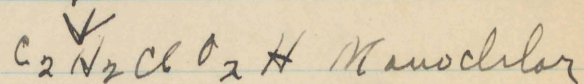


Kd_2 is spontaneously combustible liquid

B.P. 150° Burns to Kd_2O

and is basic. Strong elec positive Kd plays role of elec positive element in all changes.

Thomas developed substitution or metaphors



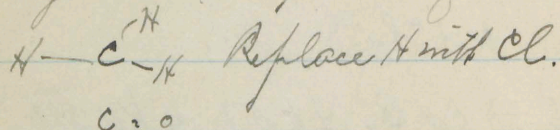
Thomas was student of Gay Lussac.

We have taken out + + + put in elec neg. Cl.

Monday Oct. 11. '09.

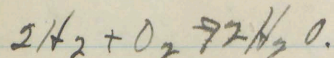
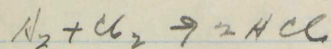
Dumas introduced metalipsis theory.

Bergelius had only 1 kind of fl.



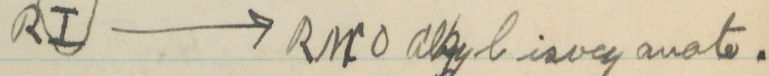
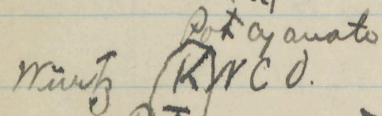
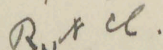
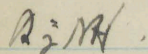
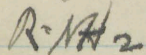
1848-1852. $\text{H}_2\text{O} + \text{NH}_3$

Water was written H_2O till '52.

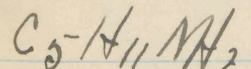
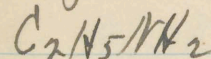
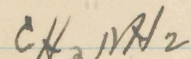


Gerhardt & Thomsen French chemists.

Müritz & Hoffmann (Liebig 1840 NH_3 .)

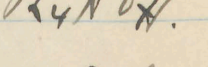
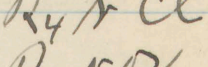
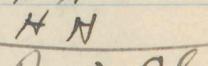
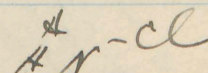
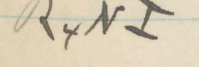
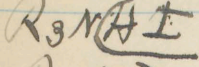
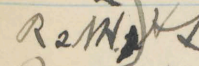
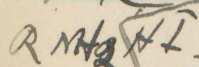
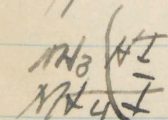


Substance smelling like NH_3 but it burned
hence not NH_3 .



Smelling pts are different.
Substances dissolve in H_2O
Sours are of same character.
Strongly basic. $\text{R} = \text{C}_n\text{H}_{2n+1}$

Hoffmann started with $\text{NH}_3 + \text{RI}$
alc. Sealed tube
ST 100°
1852.

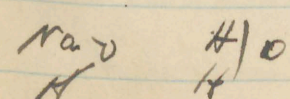
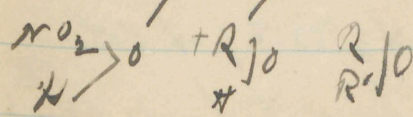


also Pol sets free base.

$\text{H} \text{ N} \text{ X}$ Chemistry of NH_3 salts.

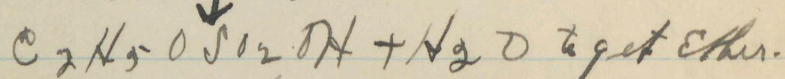
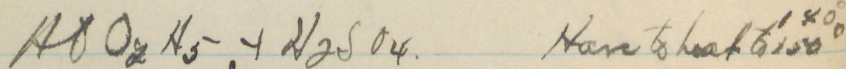
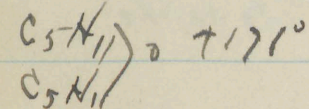
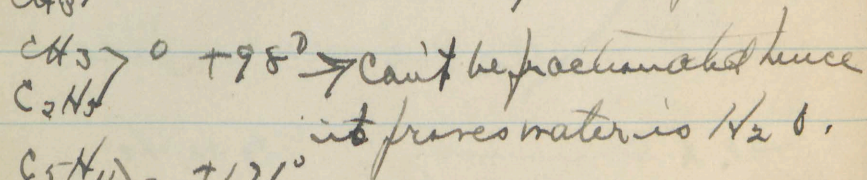
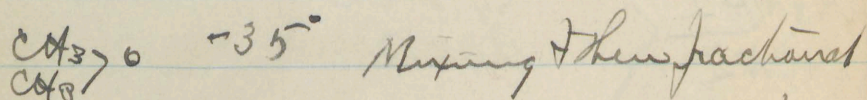
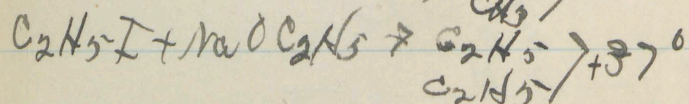
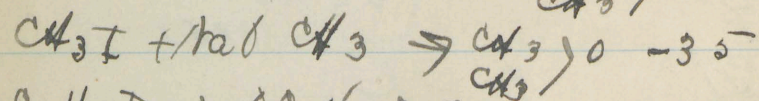
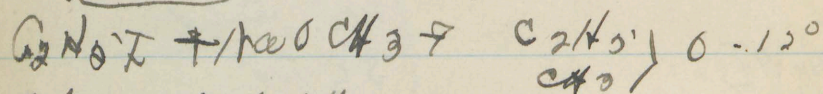
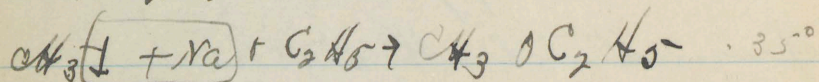
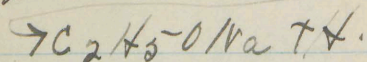
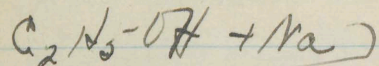
Basics of type theory.

Water Hydrogen or ammonia derivatives



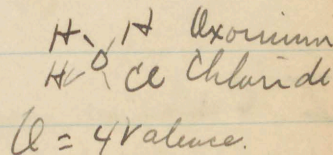
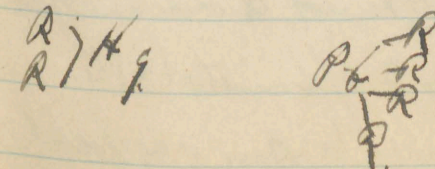
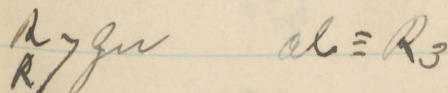
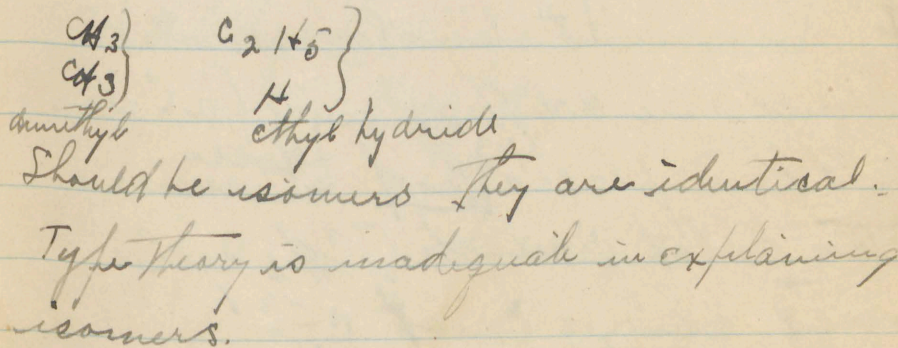
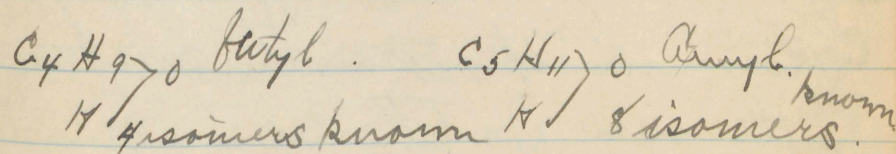
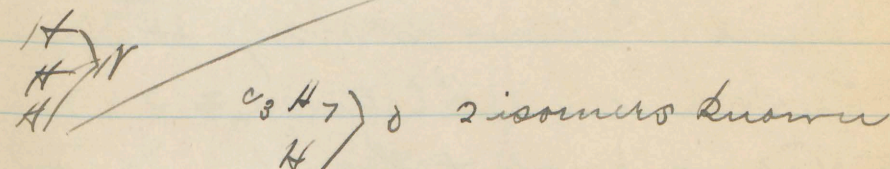
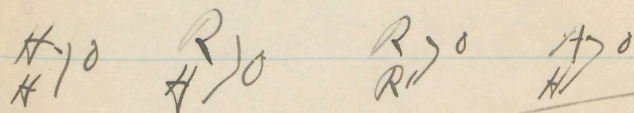
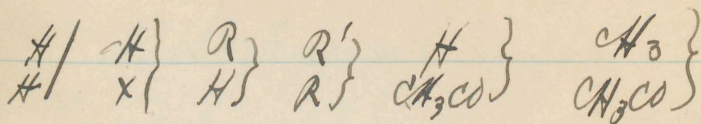
Villmanson's work on Ether. 1852

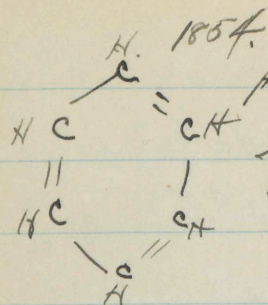
Presented in this theory



Water is refrigerated at 10° & hence acid in small quantity only is needed.

Tues. Oct 12. c.p.





Kekulé was the dominant spirit of organic chem

We assume.

I Valence of C atom is always IV

II The 4 valences of the C atom are =

III To be equivalent the 4 aff. units of the C atom must act in the direction of the axes of a tetrahedron.

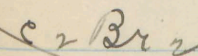
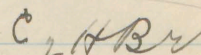
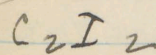
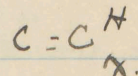
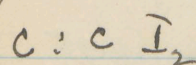
IV The univalent atoms (or radicals) bound to the 4 diff. aff. units of a C atom hold their places. ^{space} Proof: no isomeric tetra subst. products of CH_4 eg C a-b-c-d always exist $\text{C}=\text{C}$
 $\text{H}_2\text{C}=\text{CH}_2$

V C atoms may be bound to one another
 (1) by one (2) by 2 (3) by 3 aff. units (4) to form chains which may be (a) open or (b) closed.

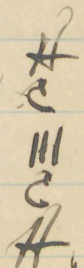
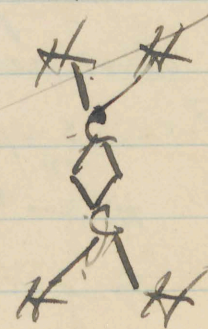
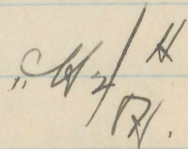
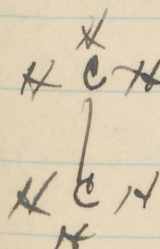
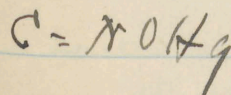
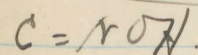
$\left(\begin{smallmatrix} \text{C} \\ \parallel \\ \text{C} \end{smallmatrix}\right)^{\text{X}}$ very explosive never isolated
 Goes to graphite etc.

C_2 is present in electric arc at 3000°
 Berthelot, etc. obs. this.

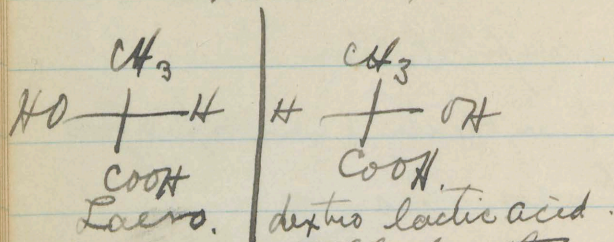
Exceptions $\text{C}=\text{O}$ $\text{C}\equiv\text{N}$ $\text{C}\equiv\text{N}$ $\text{C}=\text{N}$



acetylene
 Compd



Sed. Oct 13, '09.



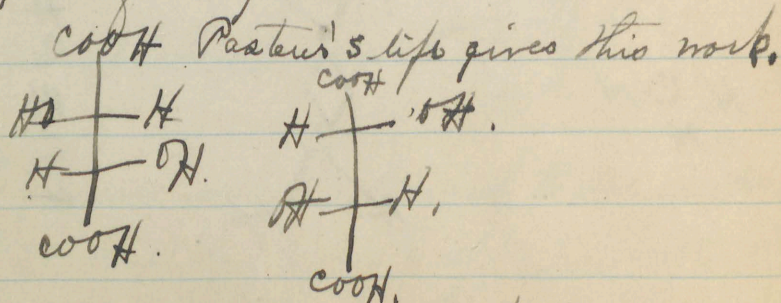
Pasteur established this.

All methods of resolving tartaric acid into laevo + dextro acid. by this way.

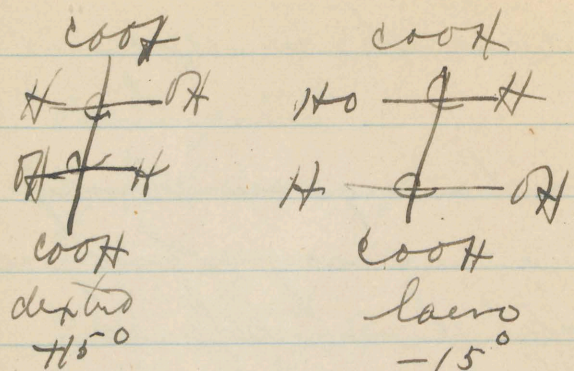
Treat $\pm$ lactic acid with gummi we get the d + l acid. This is due to asymmetric Catons.

By heat 130° equal mixture we can get the $\pm$ back again. Ayrw. time will do the same thing.

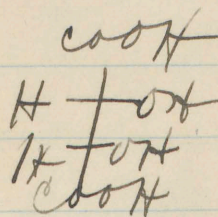
Mixture of two gives racemic acid.



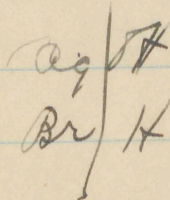
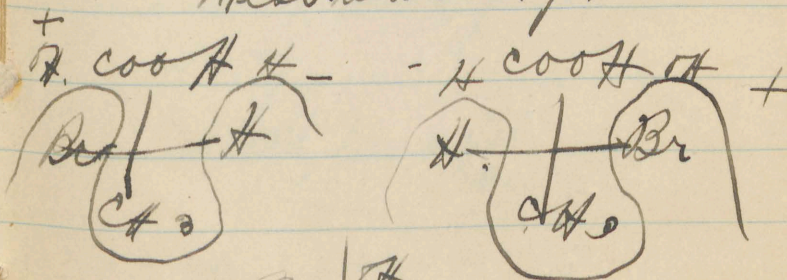
Tartaric acid in beet + grape juices



Racemic



Meso-tartaric, opt. inactive



Valences are diff in character otherwise

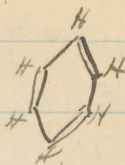
The OH + H would go to both places
OH to + in both cases H to - in both cases

The above demonstrates no require
of atoms.

Organic reactions go on slowly
being diff from inorg which goes
very rapidly. Hence life is
possible.

Monday Oct. 18, 1909.

5th Assumption.



Ring + chain compounds.

5 + 6 atom rings are most stable.

$C_n H_{2n+2}$ Saturated. Paraffines are
main essential of Am. petroleum.

$(C_6 H_5)_3 \equiv C$ Dissociates + we can
 $(C_6 H_5)_3 \equiv C$ get it at very high temps.

$\begin{matrix} C & H_2 & \rightarrow & X \\ || & & & \\ C & H_2 & \rightarrow & H \end{matrix}$ Absorb reagents very readily.
Alkenes. $C_n H_{2n}$. Double bond
Carbon is the weak point instead of
being strong.

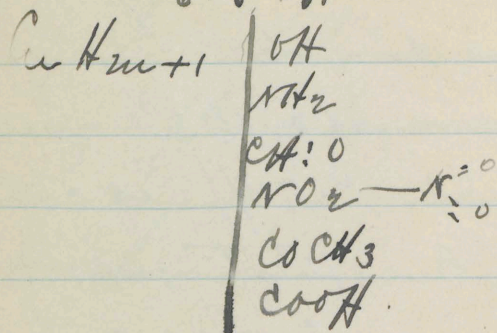
Inert ethylenes. $\begin{matrix} C & H_2 \\ | & \\ C & H_2 \end{matrix}$

$\begin{matrix} X & \rightarrow & + & \leftarrow & C & H_2 \\ H & \rightarrow & - & \leftarrow & C & H_2 \end{matrix}$ Active mols.

$\begin{matrix} C & H \\ || \\ C & H \end{matrix}$ Acetylene + homologues.

$\begin{matrix} C & H \\ || \\ C & H \end{matrix}$ $C_n H_{2n-2}$. Triple bond
has loosening effect on H atoms. They dissociate.

The unsaturated Carbons associate
into $C_6H_8 + H_2$



Greater diss. of acetic acid in alcohols
is due to unsat. Carbons.

$C_n H_{2n+2}$

Paraffins

Marsh gas hydrocarbons

Alkanes C_4H_{10} - 143° B.P.

Methane C_1H_4 - 96

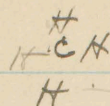
Ethane C_2H_6 - 45

Propane C_3H_8 - 120 + 120 - 17°

Butane C_4H_{10}

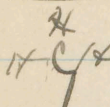
Pentane C_5H_{12}

Hexanes C_6H_{14}



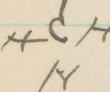
$H-CH_3$ Methyl hydride

Methane - Marsh gas.

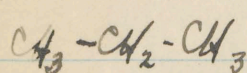


Ethyl hydride = dimethyl

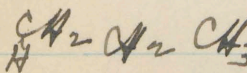
Ethane



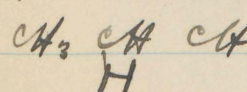
Methyl methane



Propane = Methyl ethyl



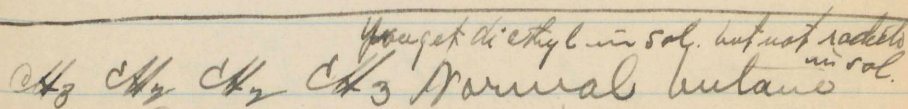
Propyl hydride



Isopropyl "

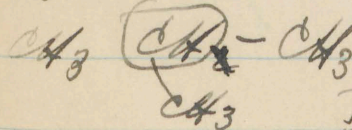
Methyl ethane

Ethyl methane



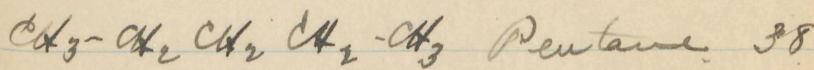
you get diethyl in sol. but not radicals in sol.

Normal butane

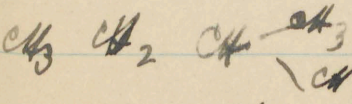


Iso butane

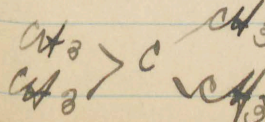
Trimethyl methane



Pentane 38

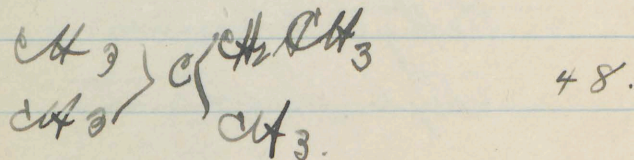
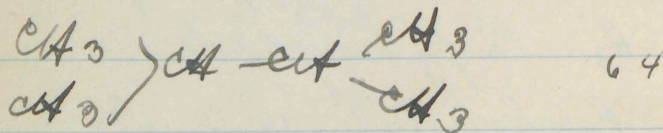
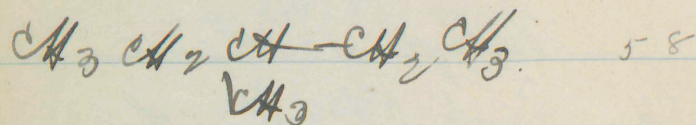
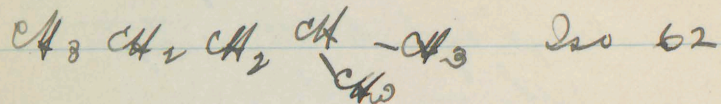
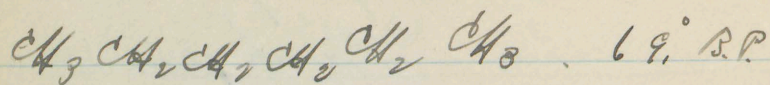


isopentane 30



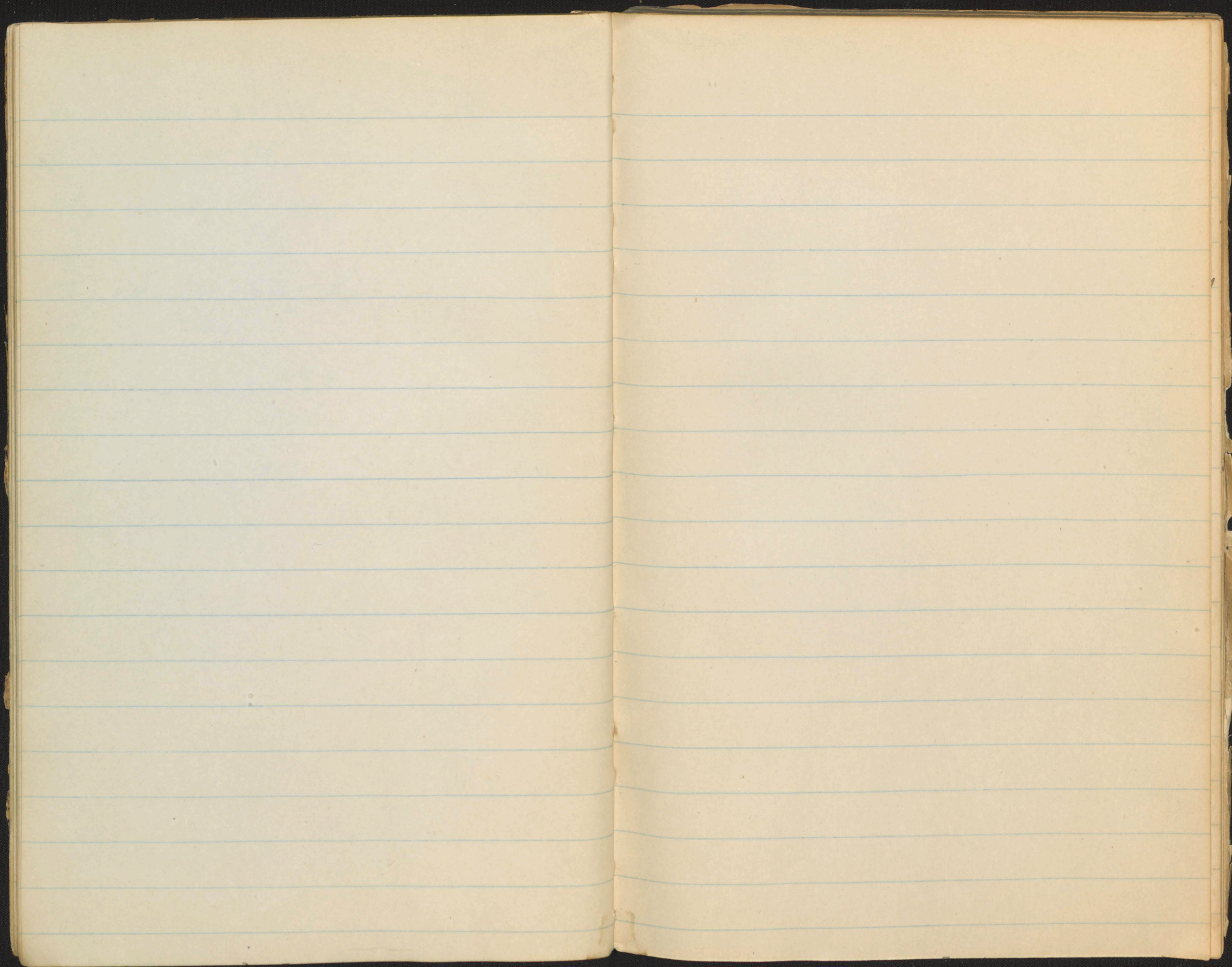
Tetra methyl methane + 9.

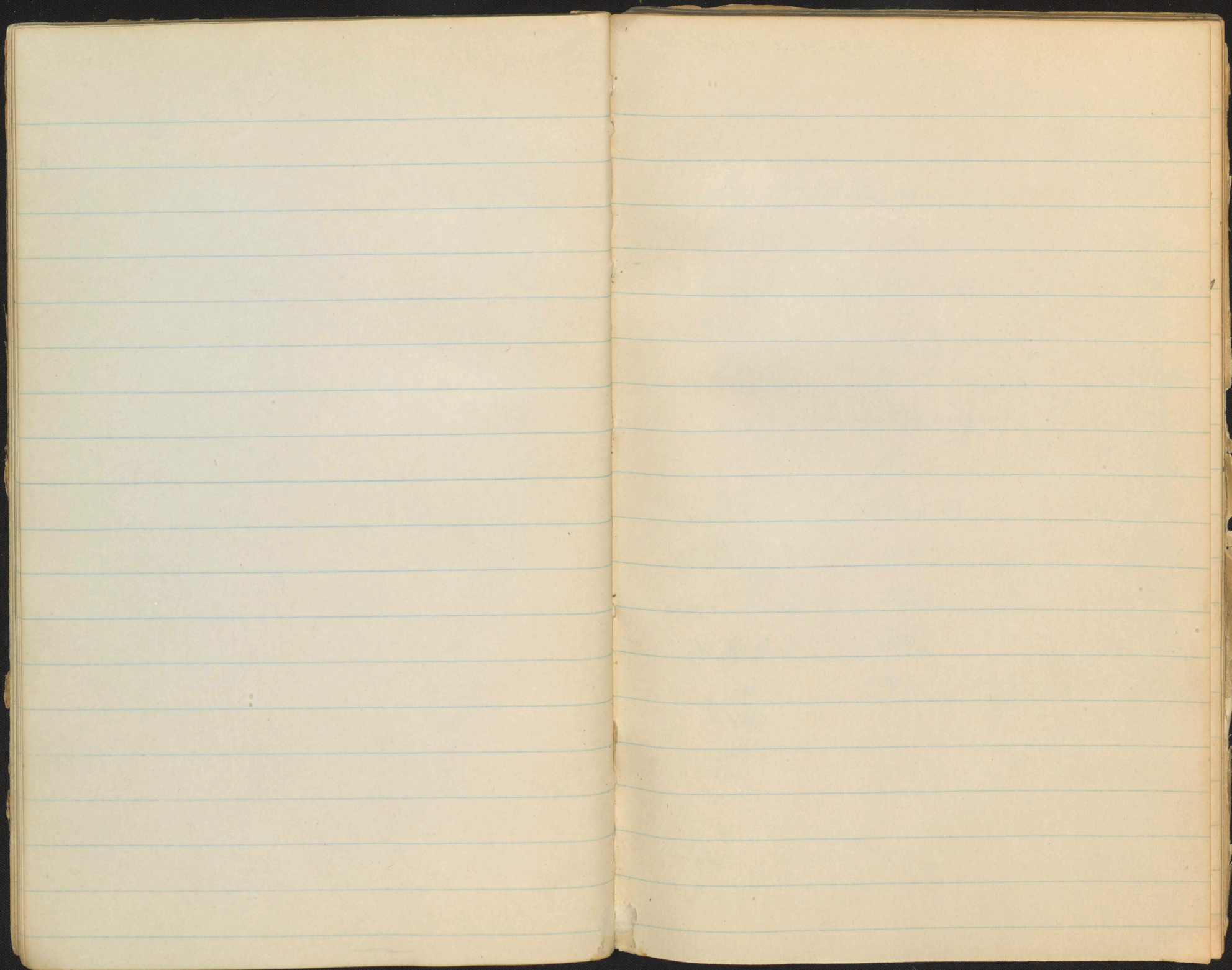
Hexanes.



Slightly soluble in H_2O . Lighter than H_2O .

Tuesday Oct. 19, '09.





Ded Oct 20, '09.

Chrich

Cayley, ^{1st} calc. isomers with See Richter
Vol 8, 105-6

- (1) $C_n H_{2n+1} X + 2H \rightarrow C_n H_{2n+1} H + HX$ alkyl hydrides
(2) $C_n H_{2n+1} X + Zn \text{ or } Na_2 \rightarrow C_n H_{2n+1} H + HX$ dialkyls.
 ~~$C_n H_{2n+1} X + Zn \text{ or } Na_2 \rightarrow C_n H_{2n+1} H + HX$~~
Fairly Franklin
100°

$C_n H_{2n+1}$

CH_3

$C_2 H_5$

$n CH_2 CH_2 \rightarrow$

$CH_2 \rightarrow CH \rightarrow$
 CH_3

$CH_3 \rightarrow C \rightarrow$
 CH_2
 CH_3

$CH_3 \rightarrow C$
 CH_3
 $C_2 H_5$

I

$(C_n H_{2n+1})_2$

20%

50%

30%

15%

0.0%

0.0%

II

$C_n H_{2n+1} H$

60%

25%

30%

42.5%

50%

50%

III

$C_n H_{2n}$

20%

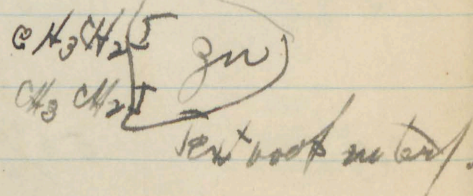
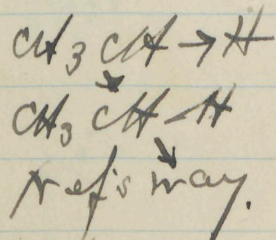
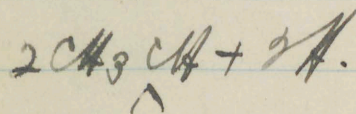
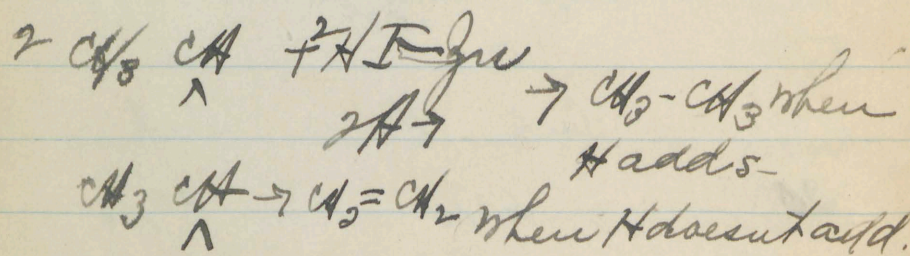
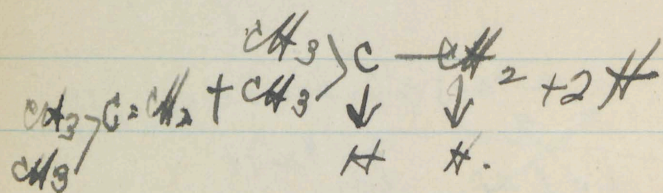
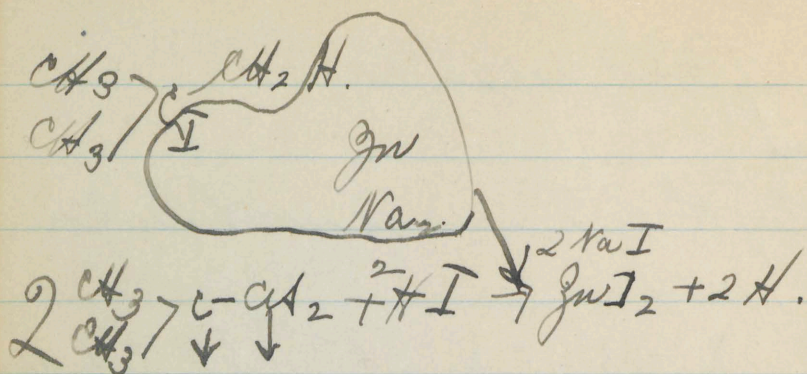
25%

30%

42.5%

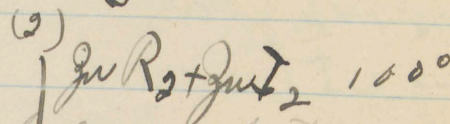
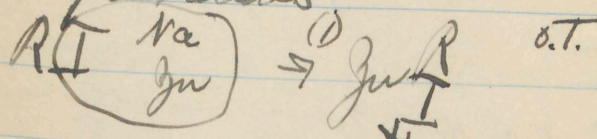
50%

50%

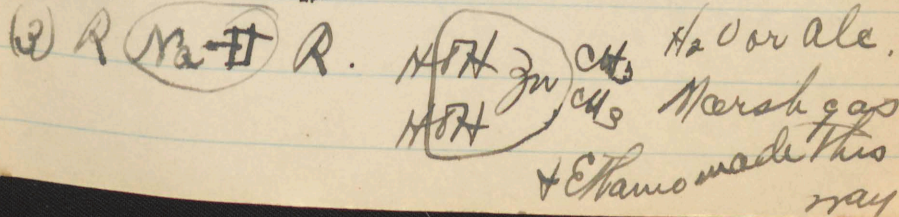
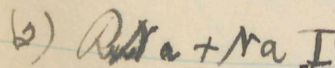
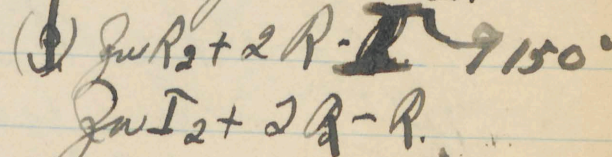


A.B. text comp is evidence against
text book method.

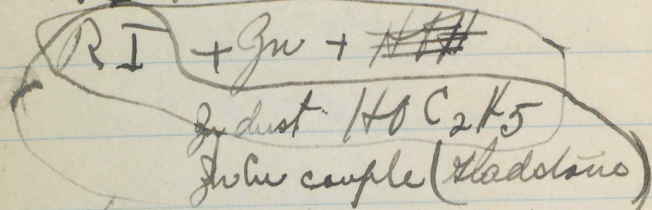
$\text{C}_2\text{H}_5\text{I}$ This proves by getting
a mixed radical that H & H has
2H and is not HO. Hence alcohols
are mono subs. prod. Ethers disub.
Mellmann's work shows yield of
mixed alkyl to be small.
Org. books should begin with alcohols &
alkyl halides.



Franklin's work.
Qualities are spontaneously comb.
Must be in nitrogen atmosphere CO_2 .



Alkyl hydrides goes much smoother



~~Ch. 300.00~~
~~to~~
~~Textbook.~~

1. 2nd Int R Don Hydrolysis
I 24h



Ch Gu Ch
Ch Gu Ch

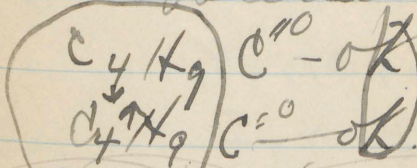
4/9/24

Let salt formation
then are hydrolyzed.

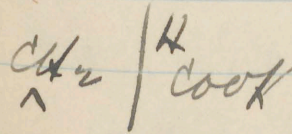
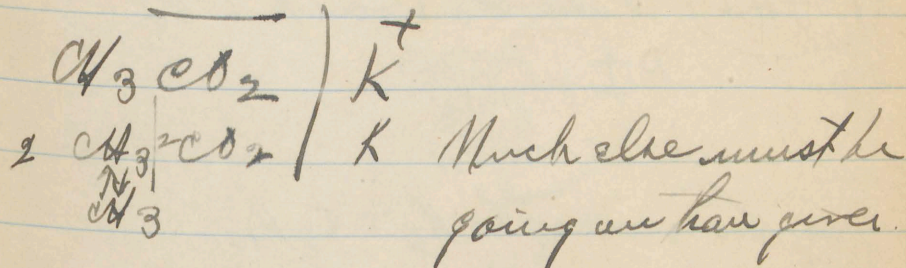
Isobutyrene has not been tried.

CH₃ cook.
CH₃ cook.

Valerianic acid K salt



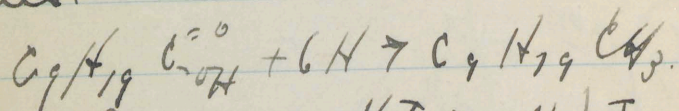
Di iso octano. Di iso butyl



Can get mixed
by electrolysis.

Nov Dec. 26. 1909.

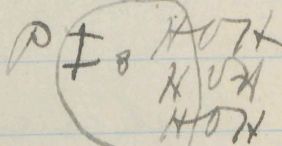
R-C₂⁰_{OH}. Synthesis where n is 10-20.
Even no of C atoms are accessible to us.



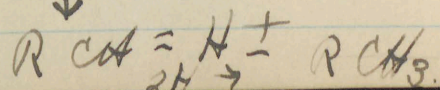
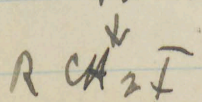
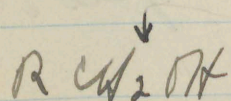
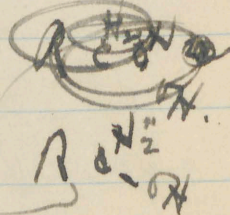
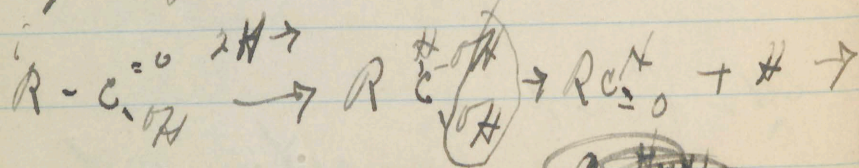
Reduced by HI $\rightleftharpoons$ $\begin{array}{c} H \\ \downarrow \\ H \end{array} \begin{array}{c} I \\ \downarrow \\ I \end{array}$

Have to use S.T. at 200 to 300°

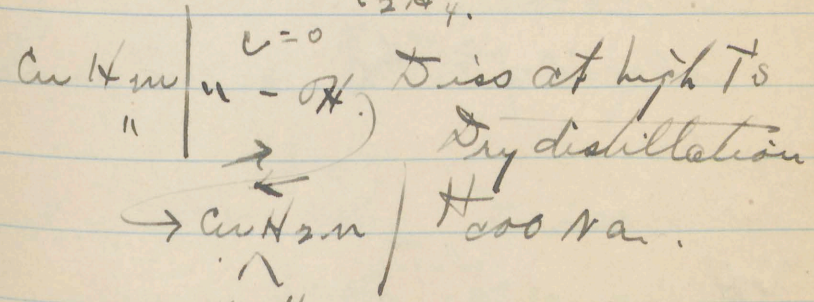
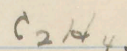
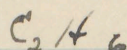
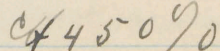
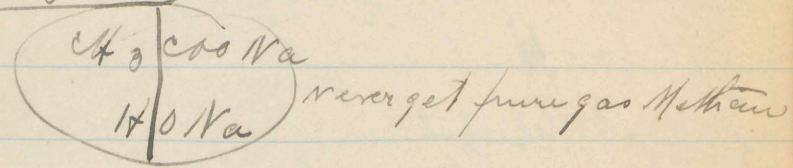
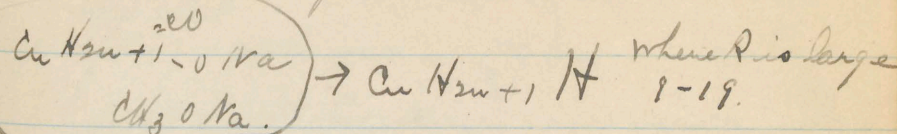
$P + HI$ P sends I back to H.



By this process $C_6H_6 \rightarrow C_6H_{12}$.



9, 13, 15, 17, 19. Crafts method.



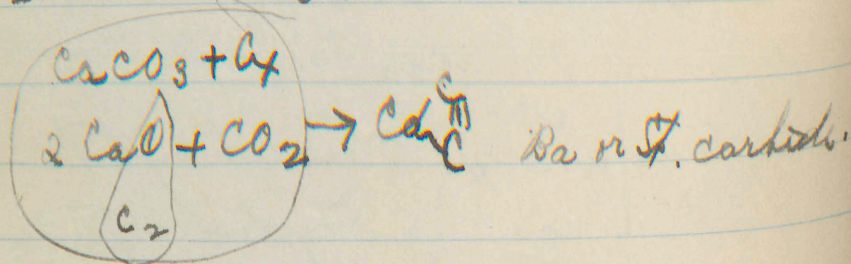
Get lots of atomic H from NaOCH₃.
 $CH_4 \rightarrow \begin{array}{c} CH_3 \\ | \\ H \end{array} \begin{array}{c} H \\ \diagup \\ O \\ \diagdown \\ H \end{array}$ Burns violently at 180° + explodes.

C from Bertholot. charcoal + S.
 $C S_2 + 2 H_2 S \xrightarrow{800^\circ} C H_4 + C H_2 S$

CCl_4 $\xrightarrow{H_2S}$
 Run vapors over copper.
 $C Cl_4 + 4 H \rightarrow$

In dust + alcohol.

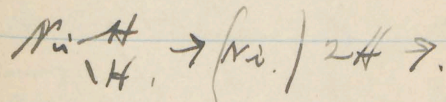
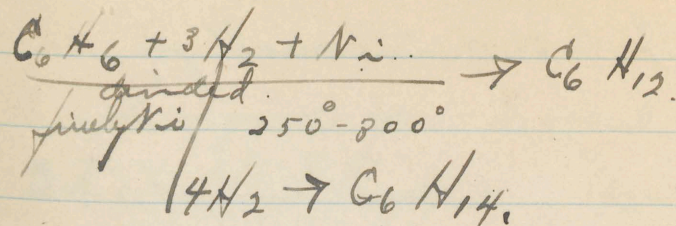
$C \vee$ Electures are 3000° Carbon vapor.
 $\sqrt{7}$
 $\frac{1}{2} C_2 + 2 H \rightarrow \begin{matrix} C-H \\ | \\ C-H \end{matrix}$

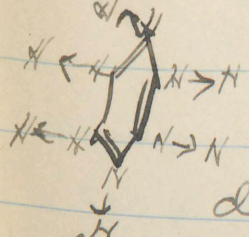


Moissan

$\begin{matrix} C-H \\ | \\ C-H \end{matrix} \rightleftharpoons \begin{matrix} \text{Ord. T.} \\ C \equiv C^+ + 2 H \end{matrix}$
 Energy of sub is so great as to blow up a building.

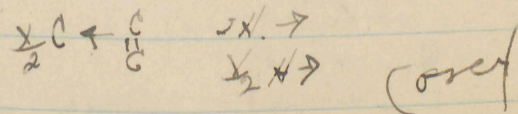
Fe Ni Co Run acetylene over these metals & these are raised to red heat.
 Sabatier + Senderens.



Ni increases amount H. very much.

 Made very cheaply
 Almost all benzene derivatives may be changed in this way.

$C_2 H_2 + 2 H \rightarrow C_2 H_4$ Depends on pressure & Temp conditions.

Russian oil contains cycloparaffine. $C_2 H_2 + X H_2 \xrightarrow{250^\circ}$



Can get $\begin{array}{c} \text{H} \\ | \\ \text{H}-\text{C}-\text{H} \\ | \\ \text{H} \end{array}$ in small qts.

$\begin{array}{c} \text{H} \\ | \\ \text{H}-\text{C}-\text{H} \\ | \\ \text{H} \end{array}$
 $\begin{array}{c} \text{H} \\ | \\ \text{H}-\text{C}-\text{H} \\ | \\ \text{H} \end{array}$
 $\begin{array}{c} \text{H} \\ | \\ \text{H}-\text{C}-\text{H} \\ | \\ \text{H} \end{array}$

You can get C to
condense & go to
C, C₂ C₃ C₄ C₅
C₈ C₁₀ C₁₂ Etc.

C₆H₁₄ & C₁₀H₂₂.

You can thus get all compounds
Quack oil with Charcoal & at 300°

Al₄C₃ Al₂O₃ Oxidized
3 CH₄ + AlCl₃ H.

Fe + H

You get all kinds of salts.

Get salts of hydrocarbons

" " " " methane Al₄C₃ Then

hydrolyze with water.

CH₄ + 2 → C₂H₆ + 2

CH₄ + 2
CH₄ + 2
CH₄ + 4
CH₄ + 6 Benz of coal tar series

Tues. Oct. 26, 1909.

Sulphur gives odor to Rock oil.

SR₂ H SR Minute quantities only.
Rat H & Can H₂SO₄ takes out these
traces.

Petroleum Ether Ligroin B.P. 30°-55°

50°-80°

80°-110°

Gasoline

Kerosene 150°-200°

Vaseline

Paraffine

Benzone
Heptanes
Octanes
Hence are distilled
under reduced pressure
15 mm.

CH₂ addition increases B.P. 20°-30°

in a series of homologues.

From decane an H₂ is nearly
0.77. Insol in H₂O fairly sol in
Ether.

15 Aug 1859 Titusville Petroleum found

Russian jet hasnt much 20-80 frac.
Sp. Gr is higher by 0.3. Contains
cyclo paraffines.

H_2 Cl_2 act on paraffins

$$\text{Cu}^{+2} + \text{Cl}_2 \rightarrow \text{Cu}^{+2} \text{Cl} + \text{HCl etc.} \text{ Supp. Prod.}$$

Br₂ similar less energetic

Conc. H_2SO_4 & HNO_3 act slowly on lumps

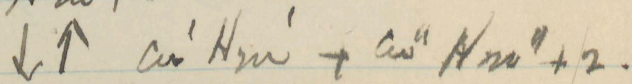
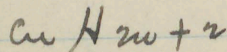
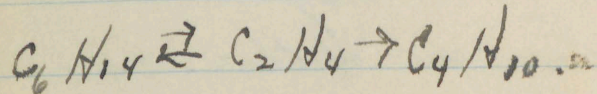
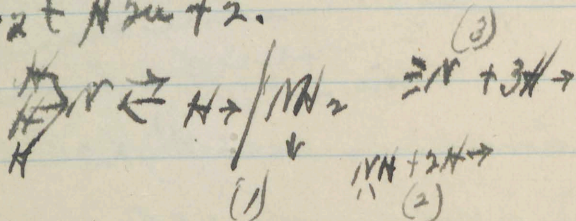
Flame burning of C_{10} on

$$\text{Cu}(\text{H}_2\text{O})_{n+2}^+ \rightleftharpoons \text{Cu} \frac{1}{2} \text{H}_{2n+2}$$

(1) $\text{CuH}_{m+2} \rightarrow \text{CuH}_{m+1} + \text{H}$.

$$(2) \text{ Cu H}_{2n} + 2 \rightarrow \text{Cu H}_{2n-2} + 2\text{H}.$$

(iv) $C_2 + H_2 \rightarrow 2$.



Cracking of Petroleum.

Ship

$C_{20}H_{42}$ goes to about 50% CH_4 .

Marsh gas & Ethane secured for
lighting purposes.

Phosphorescence in dark due to slow burning

43 $\frac{\cos \theta}{N}$ Very little dissociated

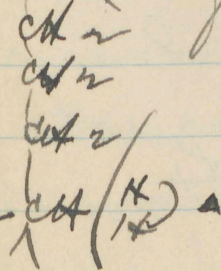
$\frac{1}{2}$ to ethylidene + $\frac{1}{2}$ O. Air

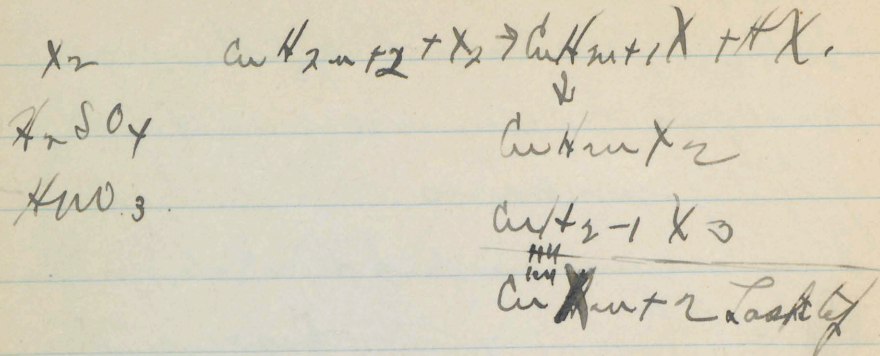
want do it. Put in the

place of H
 $\frac{c}{H} \rightarrow \frac{c}{H}$ or $\frac{c}{H}$
 va increases fold.
 dissociation

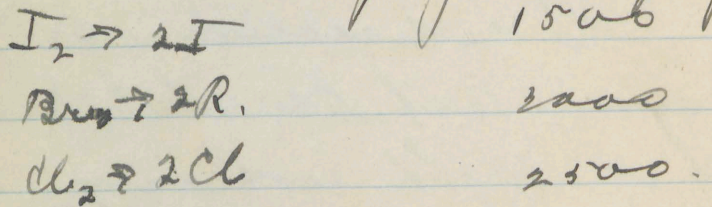
HO Enzyme. Act like metallic hydride

H. Ch. 2. right having
~~Ch. 2~~ H. formation two ways.
 Ch. 2





can't be realized
 $C_2 Cl_4$ There is large
 $C Cl_4$ the products simply
 $C_2 Cl_3$ diff. apart & separate
 1500

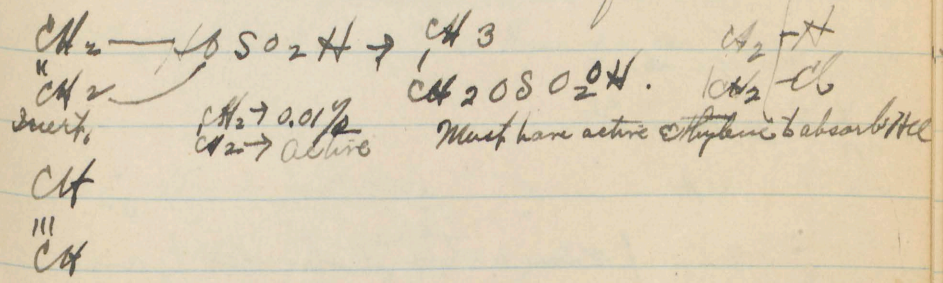


$Fl_2 \rightarrow 2Fl$
 Inert.
 F_2 Active mol. fluorine
 Cl_2 $Fl \rightarrow$ is greater than
 Br_2 $Fl \rightarrow$ active molecular
 I_2 $Cl \rightarrow$ chlorine.
 $Cl \rightarrow$

Dec. Oct. 27, 1909.

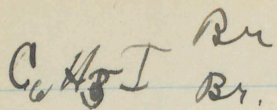
X	$X_2 \rightleftharpoons 2X \rightarrow$	
I	I_2	1500°
Br	Br_2	2500°
Cl	Cl_2	3500°
Fl	Fl_2	4510°

Activity is just opposite. They must
 be active in molecular form.



$2NH_3$ Unsaturated $\rightarrow$ Inert.
 Dissociated ammonia. Addition of HCl
 depends on amount of diss. in HCl % of
 active NH_3 .

This ether active. Inert.
 $Br_2 SR_2$ SR_2 $Br_2 SR_2$
 Br_2 Br is dissociated into two apart

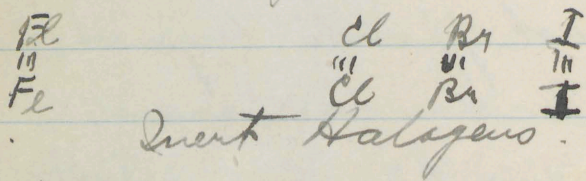


$H-F = F-H$ Dibasic acid.

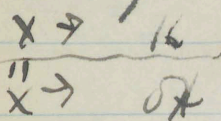
$H-Cl = Cl-H$.

$CH_3Cl = Cl-CH_3$ Inert.

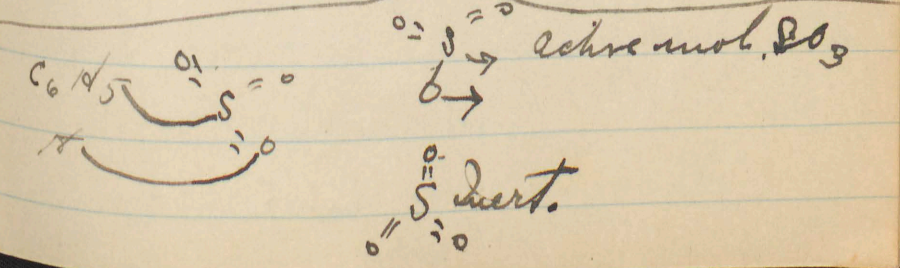
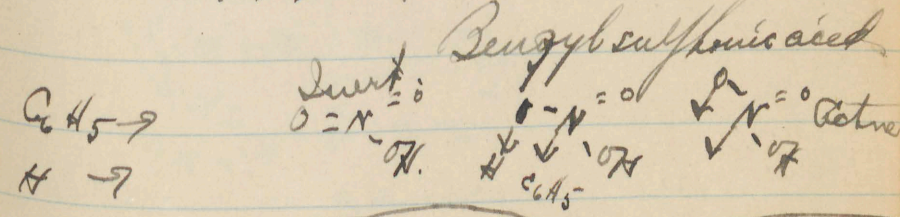
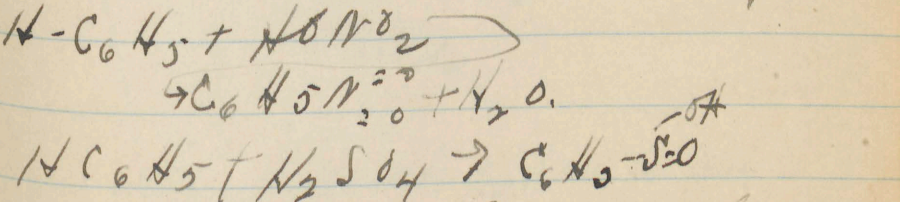
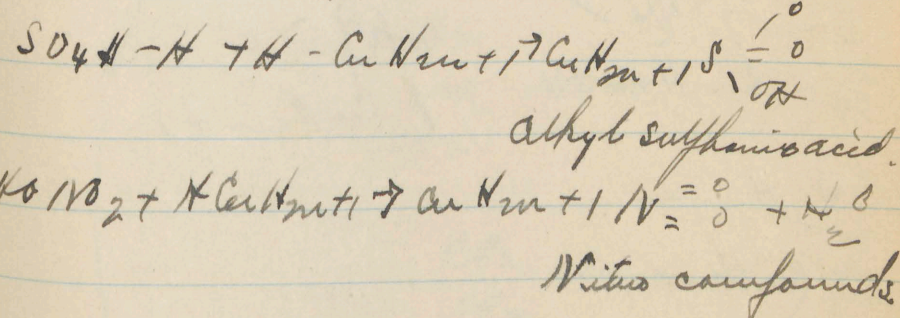
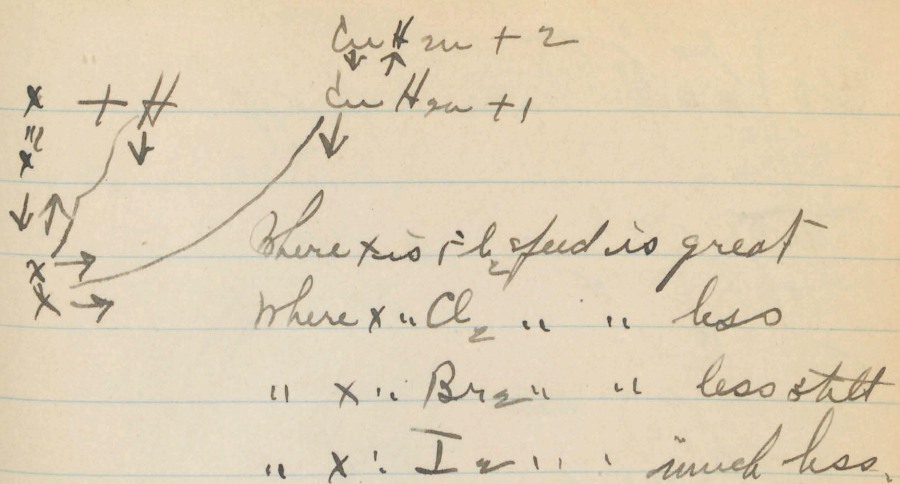
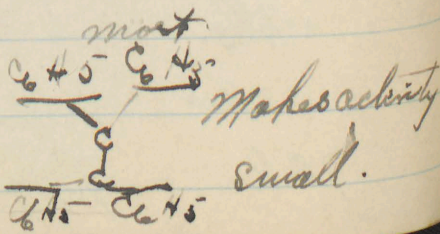
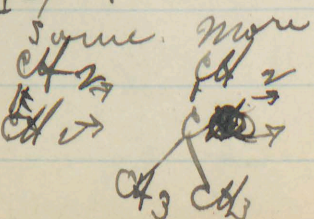
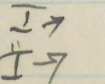
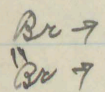
$CH_3Cl = Cl-CH_3$ Inert.

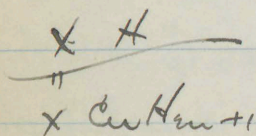
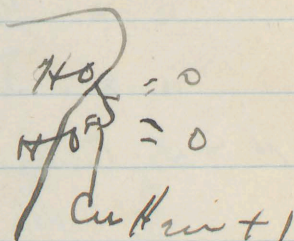
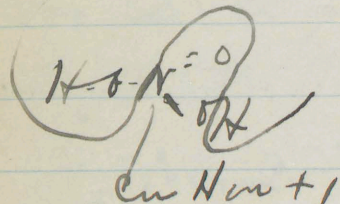
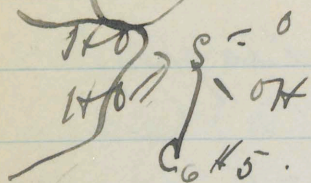
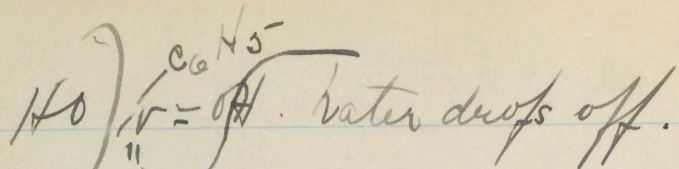


Active Halogens.



More active molecules by an increasing % of about 20%.





Monday Nov 1st 1909.

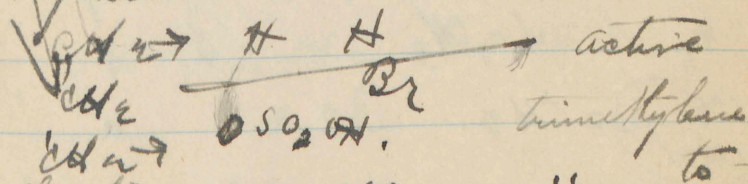
C_nH_{2n} . (a) Cycloparaffines or Polymethylenes
 $\text{CH}_2 \text{ CH}_2 \text{ CH}_2$ Trimethylene

$\text{CH}_2 \text{ CH}_2 \text{ CH}_2 \text{ CH}_2$ Tetra. methylenes
 $\text{CH}_2 \text{ CH}_2$

$\text{CH}_2 \text{ CH}_2 \text{ CH}_2 \text{ CH}_2 \text{ CH}_2$ Penta. methylenes
 $\text{CH}_2 \text{ CH}_2$

$\text{CH}_2 \text{ CH}_2 \text{ CH}_2 \text{ CH}_2 \text{ CH}_2 \text{ CH}_2$ Hexa methylenes.
 $\text{CH}_2 \text{ CH}_2$

Trimethylene absorbs H_2SO_4 & HBr .



Hot Palladium causes
 absorb 2H + give normal propylene.

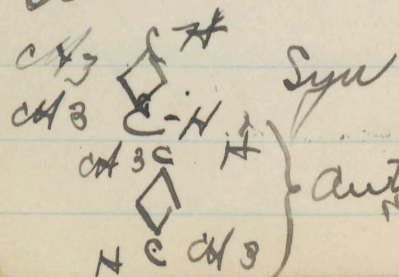
(b) alkylenes.
 (c) olefines.

(B) Alkylenes. $RCH + R_2 = C$.

Mono & disub. prods of CH_2 . Just as dis.
 $7 CH_2$ methylene. } prods of primary
 $CH_2 = CH_2$ Ethylene. } secondary
 $CH_2 = C_2H_2$ Propylene. } alcohols & primary
 CH_3 } $C =$ B propylene. } secondary alkyl
 CH_3 } } halides.
 all above are spontaneously They rearrange
 to give olefines.

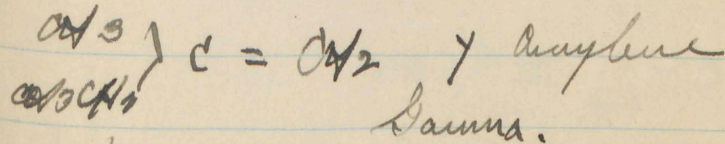
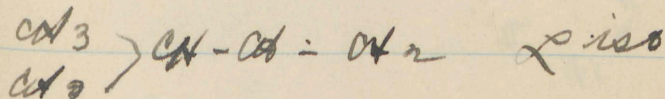
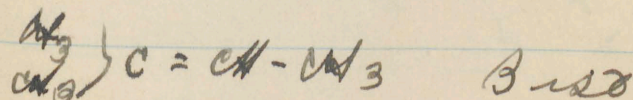
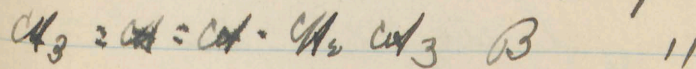
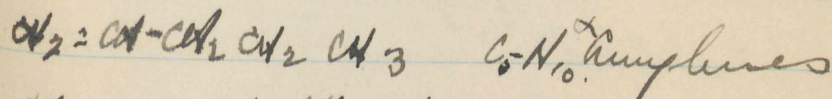
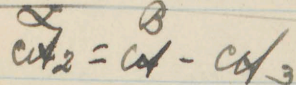
(C) Olefines. Alkyne

$CH_2 = CH_2$ Olef forming gas.
 $H_2 + 1/4$ Alcohol. $\rightarrow$ Ethylene
 $CH_2 = CH - CH_3$ - C_3H_6 Propylene.
 $CH_2 = CH - CH_2 - CH_3$ C_4H_8 Butylene
 CH_3 } $CH = CH - CH_3$ B " "
 CH_3 } $C = CH_2$ Iso " "



We want to prove that alkylenes
 rearrange to give olefines " "
 are diso products of paraffines also.

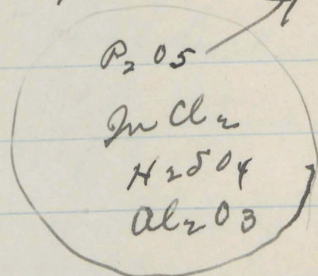
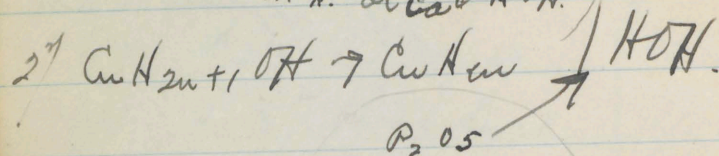
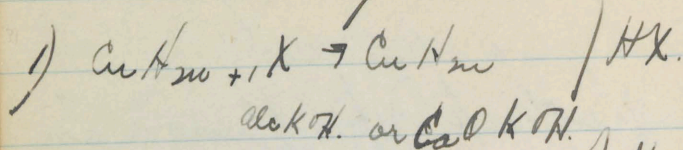
Position.



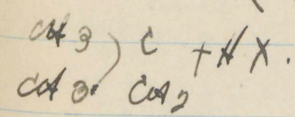
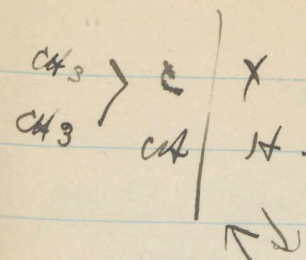
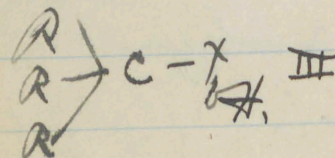
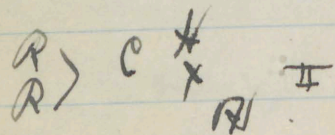
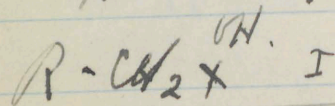
5 Structural Isomers

6 Space " "

Tuesday Nov. 2. 1909.

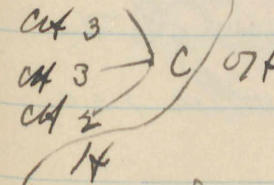


These dehydrating agents do more than
 take off water they interact.
 alkylidene diss.

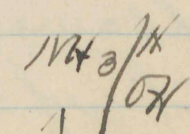


C_4H_9Br Liquid boils 80°
 vapor density.

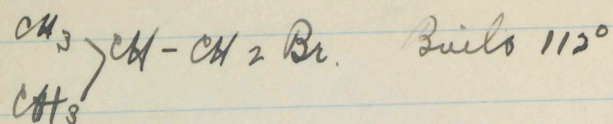
115°	% diss.
115°	4.2%
130°	10.0%
150°	26.0%
183°	42.0%
204°	60%
250°	76%
300°	85.2%



Boils 180°



250° belongs exists

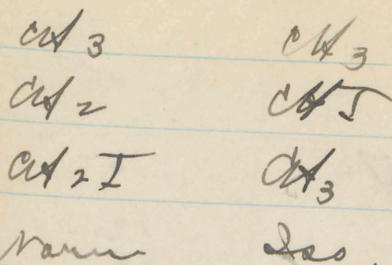


at 260° we 28.5% HBr & C₂H₄.

			diss
CH_2	CH_3	113°	5.4%
CH_2	CHBr	138	7.8%
CH_2Br	CH_3	180	15%
none	iso	210	31%
	Diss	262	56%

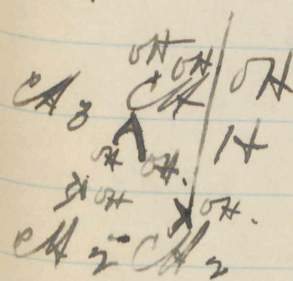
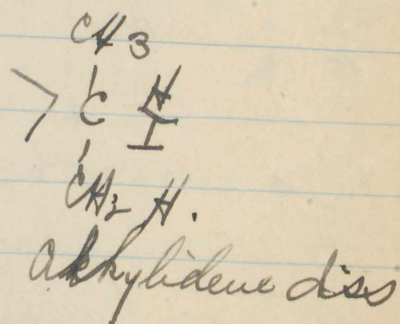
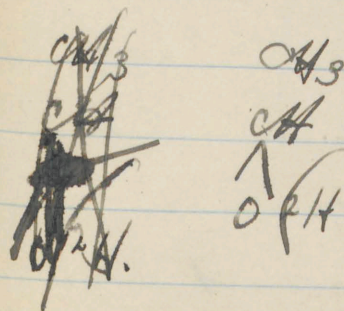
180	2.9%
210	10.4%
262	31.0%

CH_3 To get same amt
 CH_2 CHCl of diss you have
 CH_2Cl CH_3 to go up 100° to
 none iso get same amt diss.
 Fibrous it up another 100°



That I breaks
 up. and is there
 in % at rest.
 huge with 99
 we get 1 ft.

If H comes from my bearing
 Carbon atom then we have definite
 diss.



Treat alkyl halides with alc K HI II

Cu Hm + 1 X	Cu Hm	Cu Hm + 100%
$\text{CH}_3\text{CH}_2\text{-Cl}$	50%	95%
$\text{CH}_3\text{CH}_2\text{-Br}$	10%	90%
$\text{CH}_3\text{CH}_2\text{-I}$	15%	85%
$\text{CH}_3\text{CH}_2\text{CH}_2\text{-Cl}$	10%	90%
$\text{CH}_3\text{CH}_2\text{CH}_2\text{-Br}$	20%	80%
$\text{CH}_3\text{CH}_2\text{CH}_2\text{-I}$	40%	60%
$\text{CH}_3\text{CH}_2\text{CH}_2\text{-Cl}$	50%	50%
$\text{CH}_3\text{CH}_2\text{CH}_2\text{-Br}$	75%	25%
$\text{CH}_3\text{CH}_2\text{CH}_2\text{-I}$	95%	5%

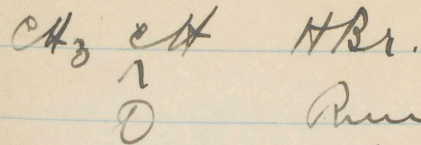
X is correct dis.

Rearrangement must take place in alkyl halides.

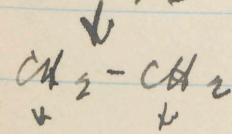
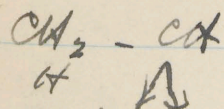
$\text{CH}_3\text{CH}_2\text{CH}_2\text{-Cl}$	60%	40%
$\text{CH}_3\text{CH}_2\text{CH}_2\text{-Br}$	75%	25%
$\text{CH}_3\text{CH}_2\text{CH}_2\text{-I}$	95%	5%

$\text{CH}_3\text{CH}_2\text{CH}_2\text{-Cl}$	100%	0%
$\text{CH}_3\text{CH}_2\text{CH}_2\text{-Br}$		
$\text{CH}_3\text{CH}_2\text{CH}_2\text{-I}$		

definite dis is here exact.



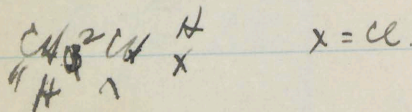
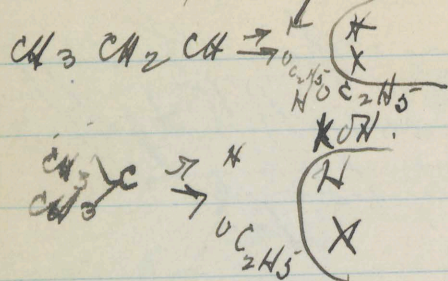
Run vapor through hot tube with Al + get acetylsolvent.



$\text{CH}_2\text{-CH}_2$ from reversible process.

Viol Questions

Wednesday Nov. 3, 1909.



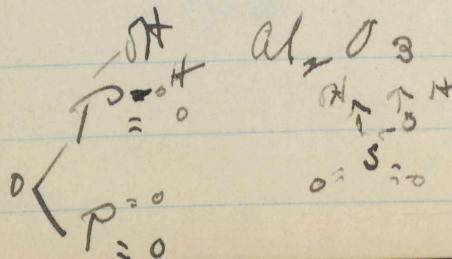
$\text{CH}_2 = \text{CH}_2$ 600°
 $\downarrow \quad \downarrow$
 $\text{CH}_2 = \text{CH}_2 + \text{HCl}$. By passing the chloride through hot tube & absorbing HCl in H_2O .
 Pass over at 200-400 & we get with KOH the alcohol.

Aldehydes by dehydration of Alcohols.
 $\text{C}_n\text{H}_{2n+1}\text{OH} \rightarrow \text{C}_n\text{H}_{2n} = \text{O}$

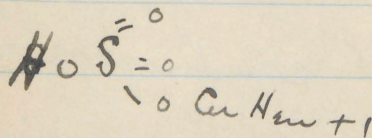
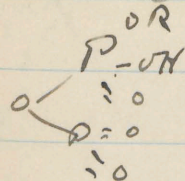
P_2O_5 Most powerful dehydrating agent.

H_2SO_4

Al_2O_3



Alcohols are diss in same manner as H_2O .



$\text{O}_2\text{P} - \text{O} - \text{C}_n\text{H}_{2n+1}$ Can be isolated
 Primary alcoh. sulfates

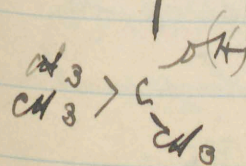
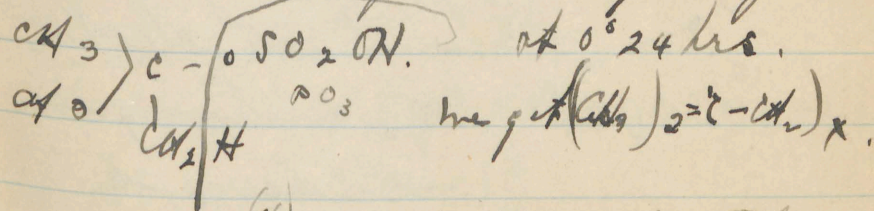
$\text{R} - \text{OSO}_2\text{OH}$

Benzyl alcohol.

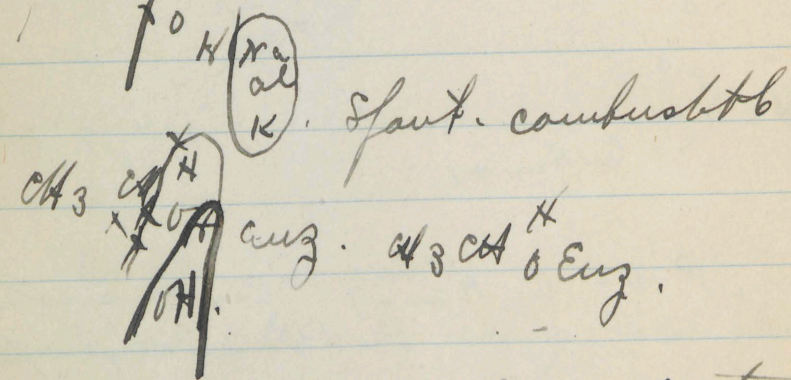
$\text{C}_6\text{H}_5\text{CH}_2\text{OSO}_2\text{OH}$ H_2SO_4 drops off at 0°

$(\text{C}_6\text{H}_5\text{CH}_2)_x$ Polymerize.

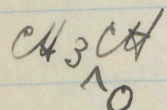
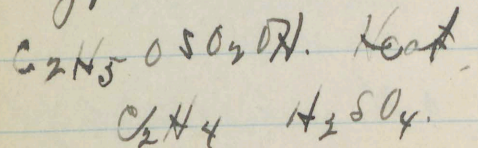
Tert. alc. don't form alkyl sulfates



Phosphates & sulfates of these alcohols cannot be isolated.



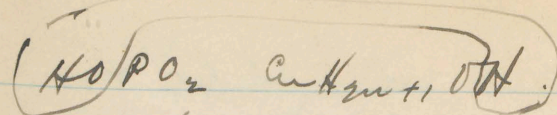
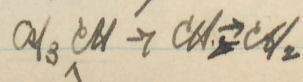
Enzyme increases dissociation



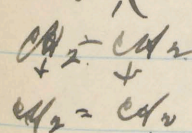
$\text{C}_4\text{H}_3\text{COH}$
 $\downarrow$
 $\text{SO}_3 \rightarrow \text{SO}_2 + \text{O}$

Ethylene has tendency
 to unite with alcohol
 80% reaction gives
 ethylene oxide.

209, Ethylene much less

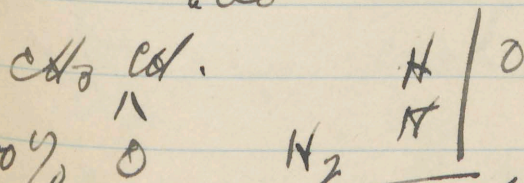


$C_{10}H_{16}OPO_2$ warm 100 to 150 me
 $\wedge$ # get olefins quant.
 all 2nd 3rd PO



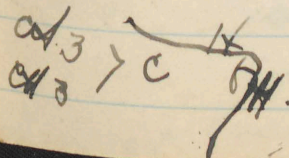
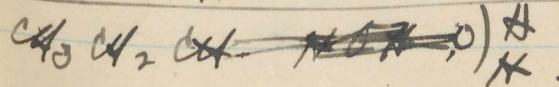
Ideal method for making
alcohols. (Polymerizing)
→ not high catomers but by
using fume stone in
combustion tube. you
can get all alcohols to go
over.

Case

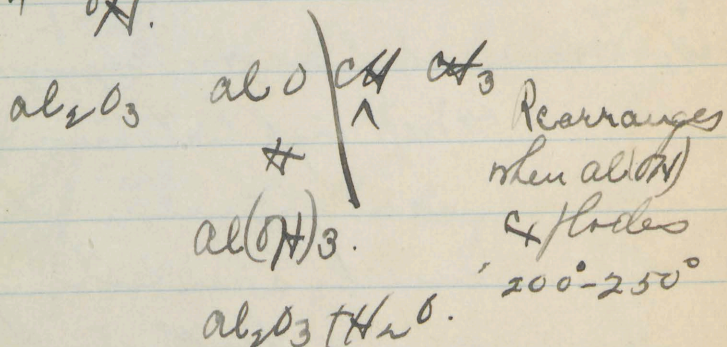
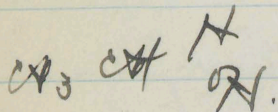


$\frac{80\% \text{ O} \quad \text{H}_2}{20\% \text{ is ethylene + water}}$

$\text{CH}_3\text{CHO} + \text{H}_2 \rightarrow \text{CH}_3\text{CH}_2\text{OH}$



H₂O on H₂CO₃ catalytic action

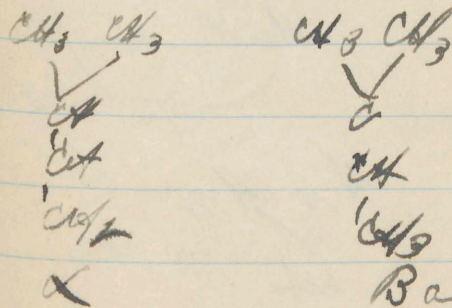
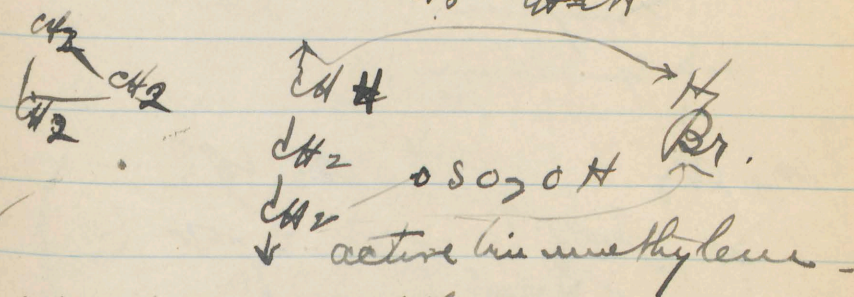
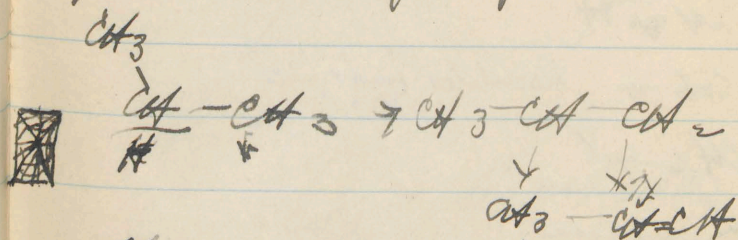


Monday June.

H_2O , Benzol, + dil. Alc. & nerys. *Quindragobenzol*

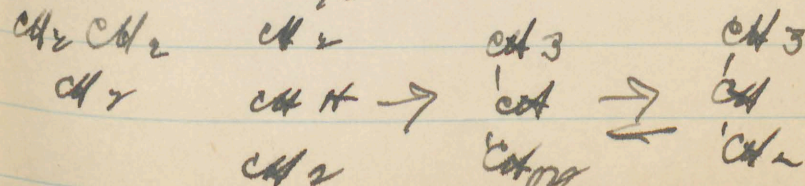
Tuesday Nov. 9, 1909

Annalen 19^{und} 318. alkyl halides
& formation of olefines



Respects very respectfully.

that increases % act. mols.



of tube 300° non-reversible

Cu H₂ X₂

X's on neighbouring chains
Judustale. (1,2)

CH₃

CH₃ Br + Zn
CH₃ Br

Halogen is pulled off
quantitatively.

CH₃

CH₃ Br

CH₃ Br

Then this is displaced & absorbed

CH₃ Br

CH₃ Br

CH₃ Br

H

Cu H₂ X₂ / COO⁻ K⁺
COO⁻ K⁺ (12) Electrolysis of K salt
Yields acid

Cu H₂ m + 2

Cu H₂ m + 2

Cu H₂ m

X

Methylene cross

Cu H₂ m + Cu H₂ m + 2 then add

Cracking of petroleum.

Wednesday, Nov. 10, 1909.

Ethylene

B.pt. S.G.

Propylene

Boiling pt goes

& Butylene

up as another

B

methyl is introduced.

150

"

&

Can be separated by

100

"

B.

different reagents.

Double bond increases boiling point in and
place of decim.

Unsat chain depresses boiling pt.

Unsaturated compounds. Olefines

CH₂ - H

Addition prod.

CH₂ & non electrolyte ethyl chloride

H - NH₃ electrolyte.

CH₂ - CH₂ → CH₂ → Cl

CH₂ → H.

CH₂ - OH.

Things that can be taken up by
unsaturated compounds.

Chlorine abstract.

1. $X \rightarrow Cl_2 Br_2 I_2$

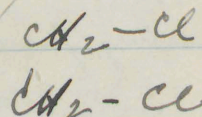
2. H_2SO_4

3. HX , $Cl_2 Br_2 I_2$ end of absorption.

4. $H \rightarrow$

5. O or $(HOCl)$

6. $H \rightarrow$



Ethylene chloride.

Bromide

Iodide

Greatest

Heat evolution in absorption.

% active mol.

% diss in subs taken up.

Determine speed of reaction.

Active mol CH_2 is taken up and then the molecules fall apart afterwards.

With Haloid acids the order is diff.

$H \rightarrow H$

$Cl \rightarrow Cl$ 25-30°

$H \rightarrow H$

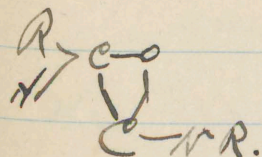
$Br \rightarrow Br$ 15-20°

$H \rightarrow H$

$I \rightarrow I$ 6-10°

Diss is complete at temperatures given.

Chlorine does not tear HX apart. The HX must be diss to be absorbed.



$CH_2 \rightarrow H$

$CH_2 \rightarrow OSO_2 OH$

Fuming H_2SO_4 clearly. Raise surface exposure by fuming or heads turning as clearly.

Asymmetric addition.

CH_3

$CH_3 + HX \rightarrow$

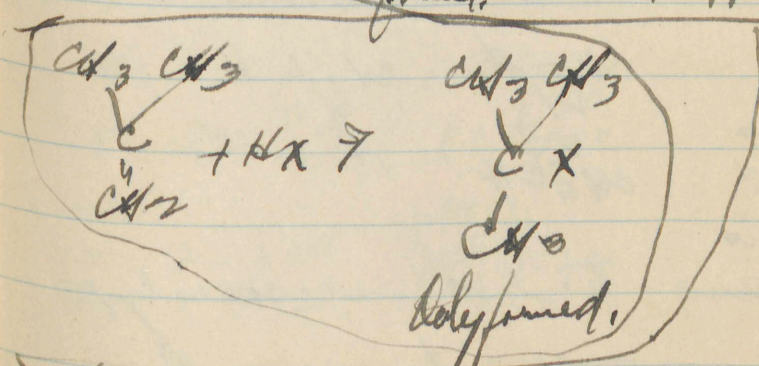
CH_3

CH_3

CH_3

only no formed.

Isopropyl halide or Sulfate formation, active propylene.



$CH_3 \rightarrow + X^-$
 $CH_2 \rightarrow - H^+$

Larger ratio.

CH_3

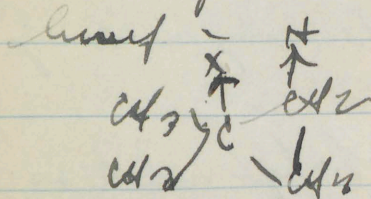
$CH_3 \rightarrow -$

$CH_2 \rightarrow +$

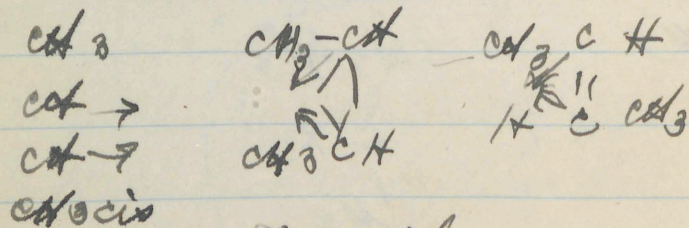
Smaller ratio present.

CH_3CH_3
 $\swarrow$
 CH
 $\swarrow$
 CH_2
 CH_2
 Dist. absort.
 inc. active

2. Factorial must be above a certain.



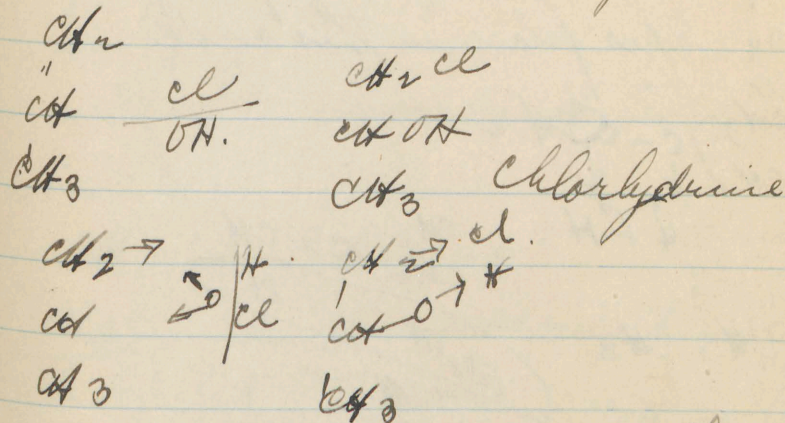
Chloroform through ^{can} H_2SO_4
" is absorbed.



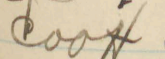
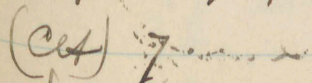
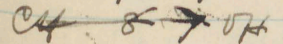
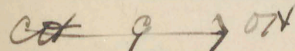
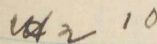
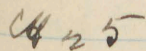
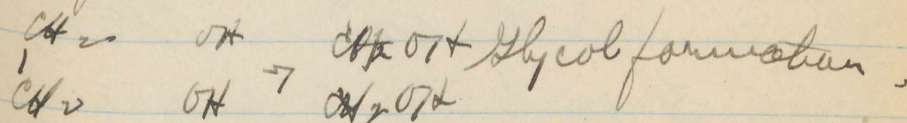
trans. to not necessarily go
over into one another

$$\text{CuH}_{2n} + \text{H}_2 \rightarrow \text{CuH}_{2n+2}$$

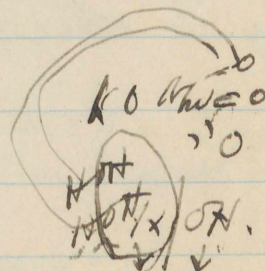
Use Pd or Ni. Low temperatures.



Alphus Toward K M 04 a Kaitu.

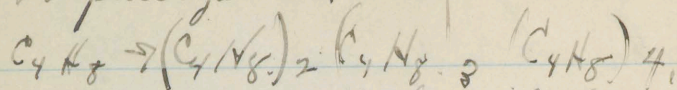


Ohio Bird



Add. prod's with (5) oxygen

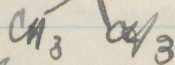
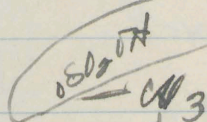
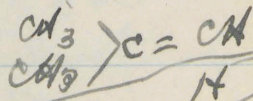
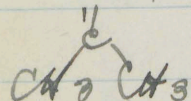
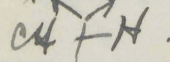
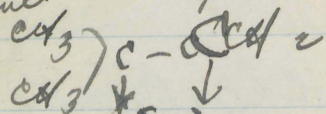
Polymerization.



H_2SO_4 Not understood how the polymerization

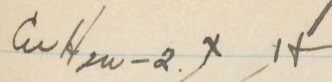
H_3PO_4 takes place in this case.

Enzyme

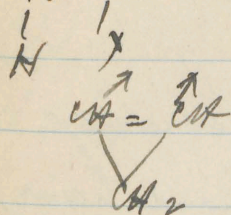
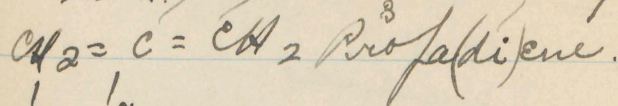


Sulfuric acid adds on and then
drops off again, and the pieces are
absorbed by the other molecule.

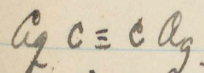
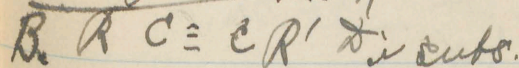
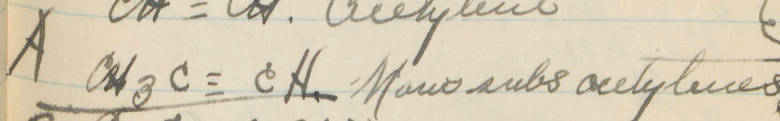
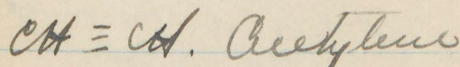
Tuesday Nov 16, 1909.



Doubly bonded 2 links
in chain

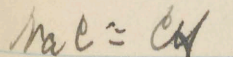
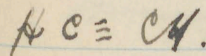


absorb and then open.

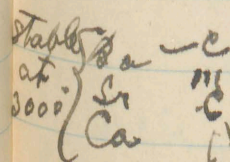
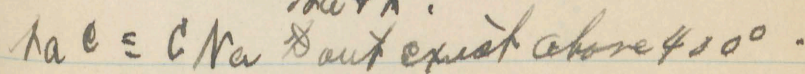


KNO_3 aqueous gives back the gas.

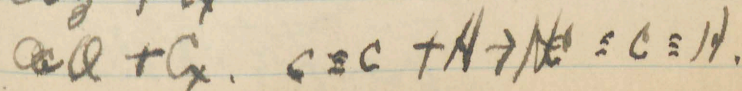
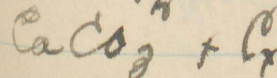
Acetylenes are slightly ionizable.



Na + K.

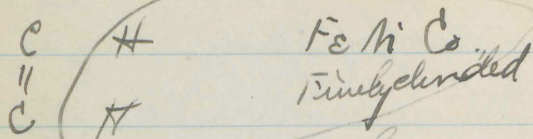


at 3000° these salts form.



weak acids
Formosalts
K, Ag, Cu
insol in
 H_2O .
Na, Ba
St. Ca
explode
with H_2O

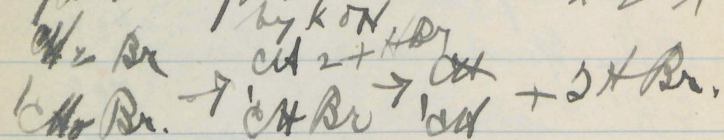
Acetylene has been liquefied but is now forbidden.



This explodes when H is taken away.

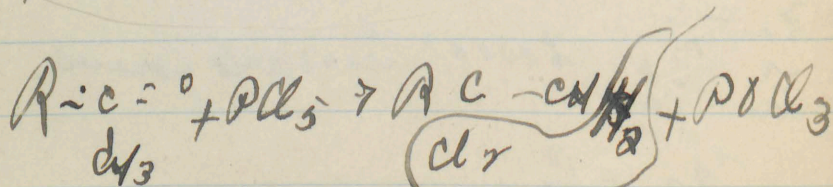
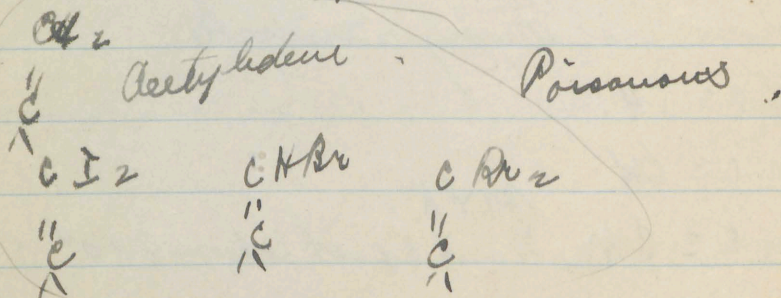
This explodes downward. Shock to air.

$\text{Ag}_2\text{C}_2 + \text{Hg}_2\text{C}_2$ are white Cu_2C_2 brownish.

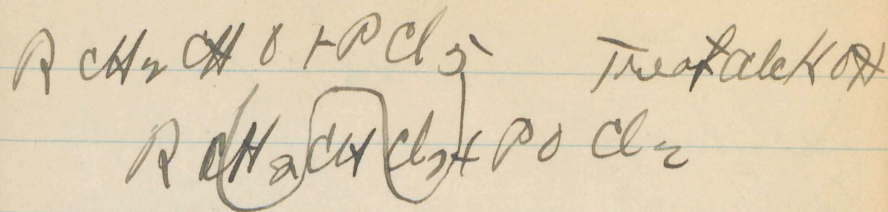


Brown ring.

Prepared in stages.

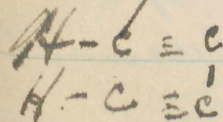


Treat with Ale.

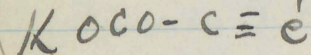
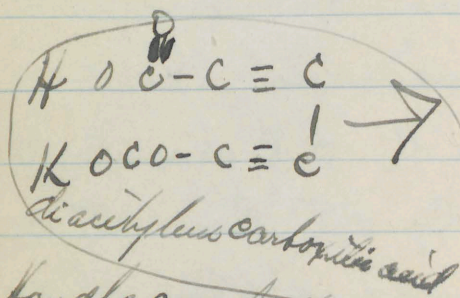
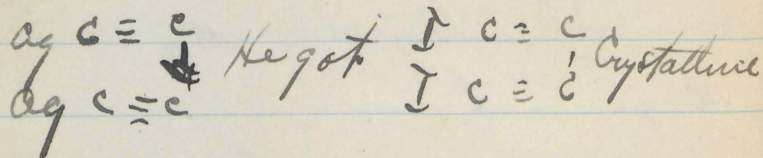
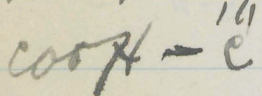
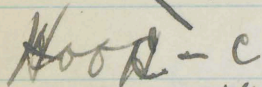
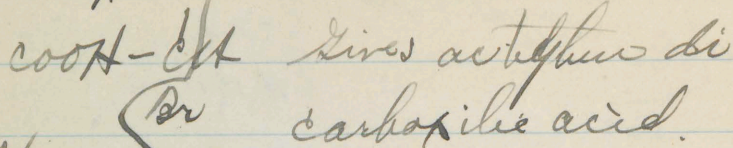
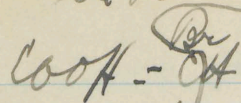


Aldehyde is replaced by Cl_2 & then 2HX splits off.

Quadrats I_2 + not 2 I_2 but with C_2 & C_3
arr. get. di & let's x_2

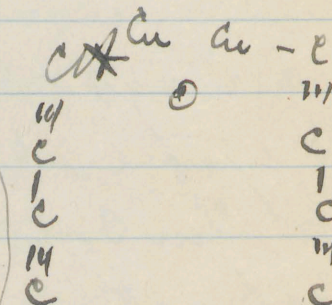


Di brom succinic Acid



Diacyclops carbonatus Baird

Handle carefully in
sol to get off CO_2



Pertylene ^{Tetra} carboxylic
acid ^{Barbitic}

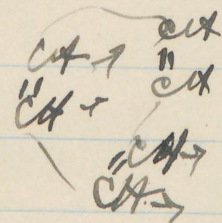
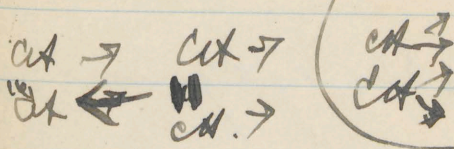
H₂ C₈. Explosive

Carlton in demand
must therefore be
bound in some more
stable way than 3 bonds

1828 Fathy in all gas.

Passapar hat tulo = benzol.

Est. Electric discharge = "



Polymerization: benzol.

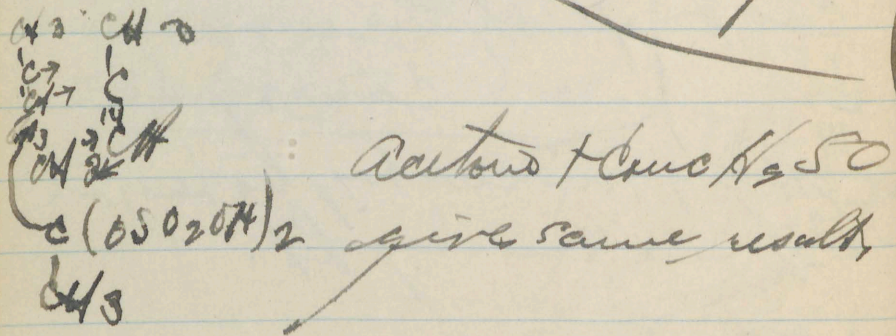
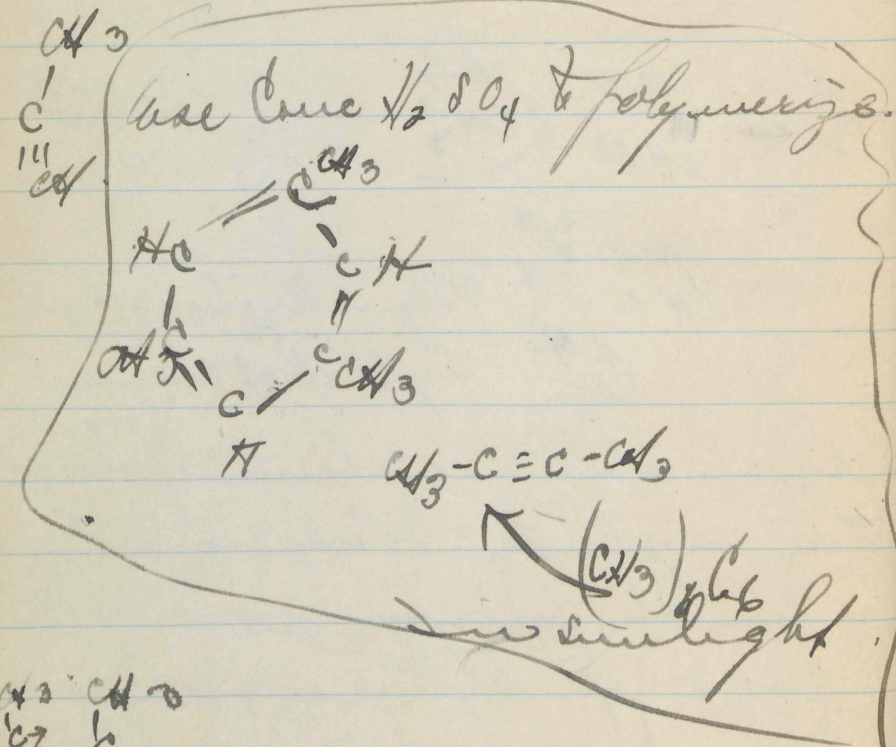
Light Heat Electrical

absorb itself in absence of any
other reagent. Above is an
excellent process.

COOK } Acetylenous
d } carb. y hē
14 }
CH } Tri carb. hē kenzol
Kenzol } in sunlight.
Baker }
Peterson }

KCO_3
 H_2O no pulled off. Too active & get no polymer
 H_2O no pulled off. Too active & get no polymer

Too active to get ill. Polymerizes.



Two. Nov. 1901 24.

