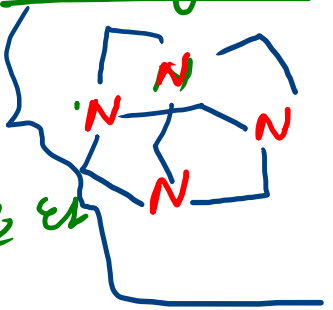
Preparation of amino acid :

HVZ :

i) $CH_3-\underset{\underset{O}{\|}}{C}-OH \xrightarrow[+Br_2]{red\ P} CH_2(Br)-\underset{\underset{O}{\|}}{C}-OH$ (α-halo acid) $\xrightarrow{NH_3}$ $CH_2(NH_2)-\underset{\underset{O}{\|}}{C}-O^-$ (glycine) + α-amino acid

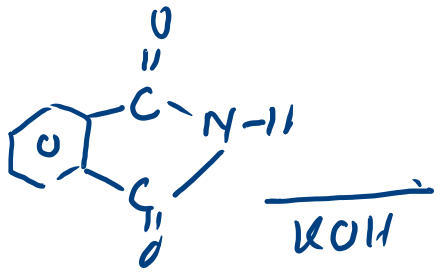
$6H_2C=O + 4NH_3 \longrightarrow (CH_2)_6N_4 + 6H_2O$ (urotropin)

(urinary track)



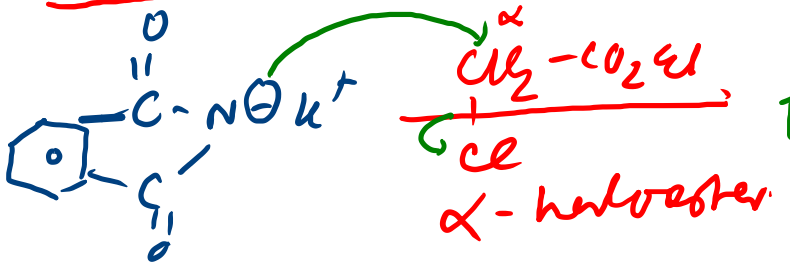
Gabriel Phthalimide Synthesis

ii)



Acid

KOH Base



α-halo ester

$\xrightarrow{H_3O^+}$

(Glycine)

Strecker Synthesis :

$CH_3-\overset{\overset{O}{\|}}{C}H + NH_3 + HCN \rightleftharpoons CH_3-CH=NH \xrightarrow{HCN} CH_3-CH(CN)-NH_2 \xrightarrow{H_3O^+} Alanine$

E

Glycine can not be prepared

Here aldehyde should be $H_2C=O$

$HO_2C-(CH_2)_n-CO_2H$ $\xrightarrow[ii)\ NH_3]{i)\ SOCl_2\ (1eq)}$

iii) $Br_2 + KOH$.

iv) red P + Br_2

v) ~~Strecker~~

Coop Synthesis

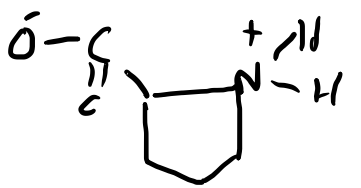
$CH_3-\underset{O}{\overset{}{C}}-\underset{O}{\overset{}{C}}-OH$

α-keto acid

Pyruvic acid

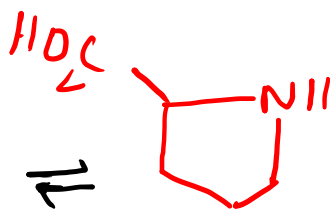
$\xrightarrow{NH_3}$ $CH_3-\underset{NH}{\overset{}{C}}-\underset{O}{\overset{}{C}}-OH$ $\xrightarrow{H_2(Ni)}$ $CH_3-\underset{NH_2}{\overset{\alpha}{CH}}-CO_2H$

$CH_3-\underset{NH_3^+}{\overset{\alpha}{CH}}-CO_2^-$ $\rightleftharpoons$ $CH_3-\underset{NH_2}{\overset{\alpha}{CH}}-CO_2H$



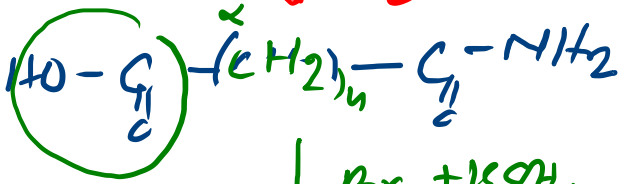
(Proline)

$\rightleftharpoons$



$HO-\underset{O}{\overset{}{C}}-(CH_2)_n-\underset{O}{\overset{}{C}}-OH$

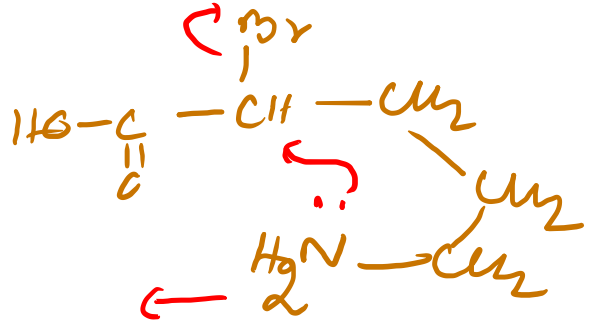
$\downarrow NH_3$



$\downarrow Br_2 + KOH$.

$HO-\underset{O}{\overset{}{C}}-\underset{NH_2}{\overset{\alpha}{CH}}-(CH_2)_n-NH_2$

$\downarrow$ red P + Br_2



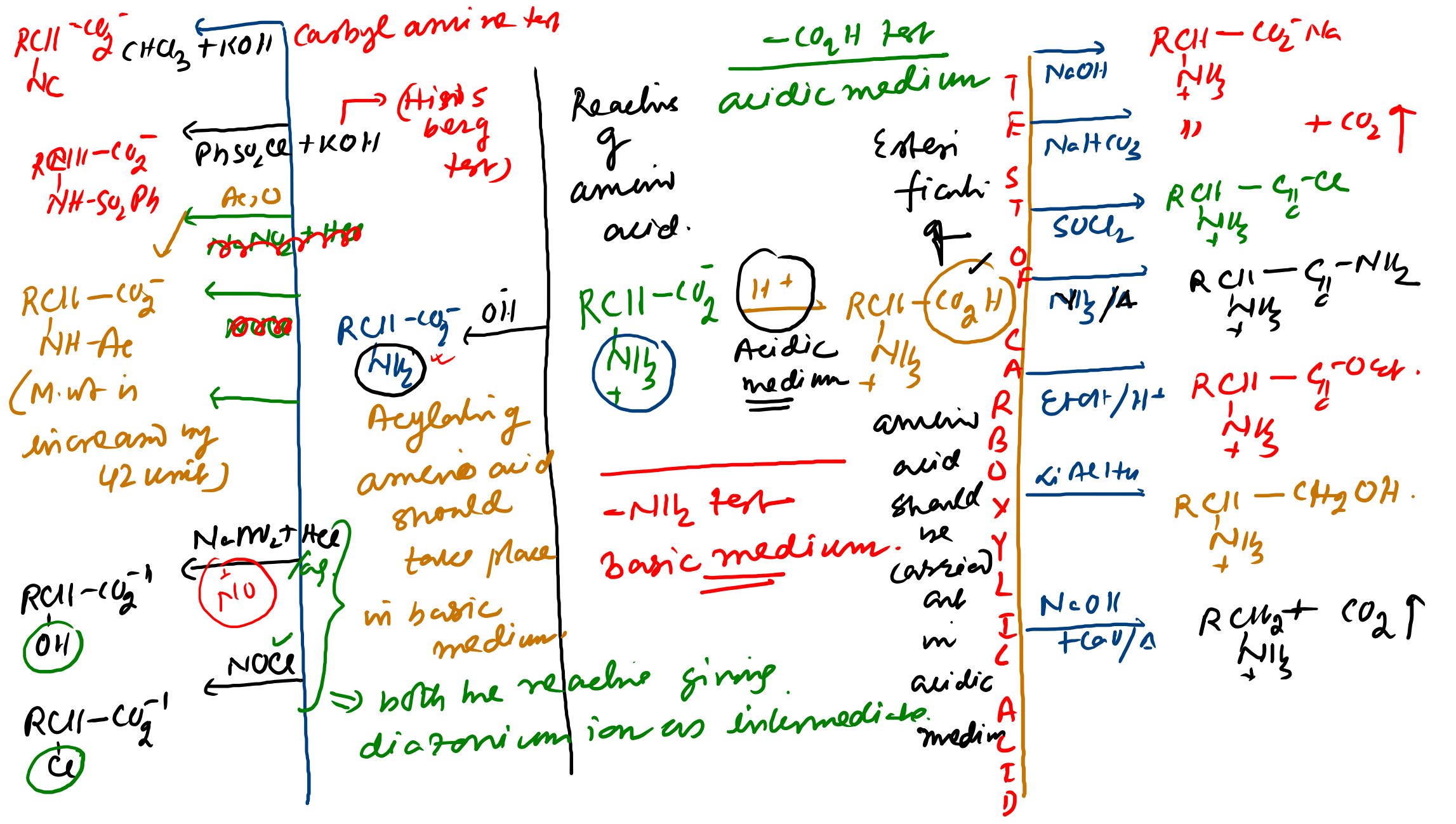
⇒ HVZ

⇒ Koop/Coop

⇒ Strecker

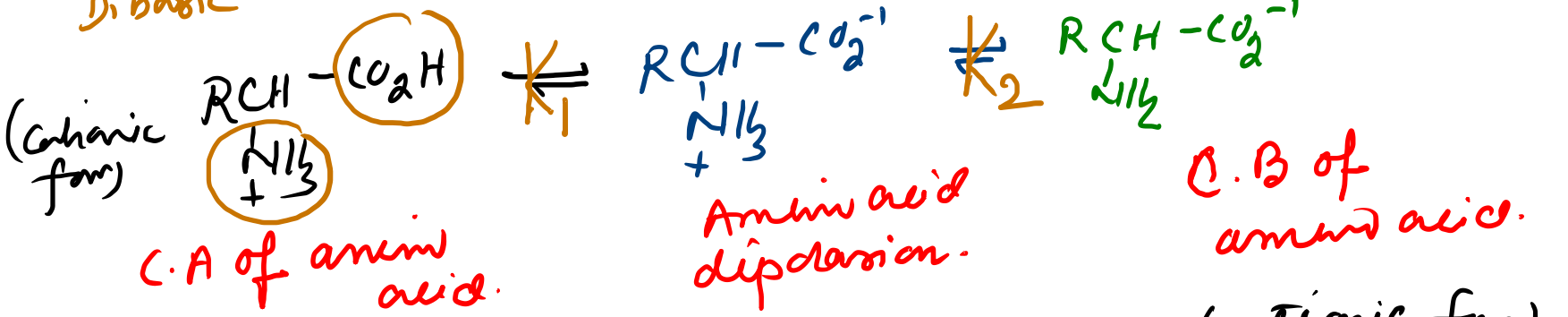
⇒ Gabriel Phthalimide Synthesis

⇒ Proline preparation


carbyl amine test
$CHCl_3 + KOH$
(Hinsberg test)
$PhSO_2Cl + KOH$
Ac_2O
Acylating amino acid should take place in basic medium
$NaNO_2 + HCl$
$NOCl$
H_2O
both the reactions giving diazonium ion as intermediate
$-CO_2H$ test
acidic medium
Reacting g amino acid.
Acidic medium
Esterification g
amino acid should be carried out in acidic medium
$-NH_2$ test
basic medium.
NaOH
$NaHCO_3$
$SOCl_2$
NH_3/Δ
$EtOH/H^+$
$LiAlH_4$
$NaOH + CaO/\Delta$
$+ CO_2 \uparrow$
(M.wt increasing by 42 units)
TEST OF CARBOXYLIC ACID

Isoelectric point

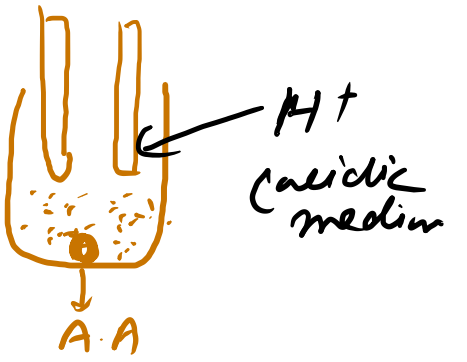
Dibasic acid



C.A of amino acid.

Amino acid dipolarion.

C.B of amino acid.

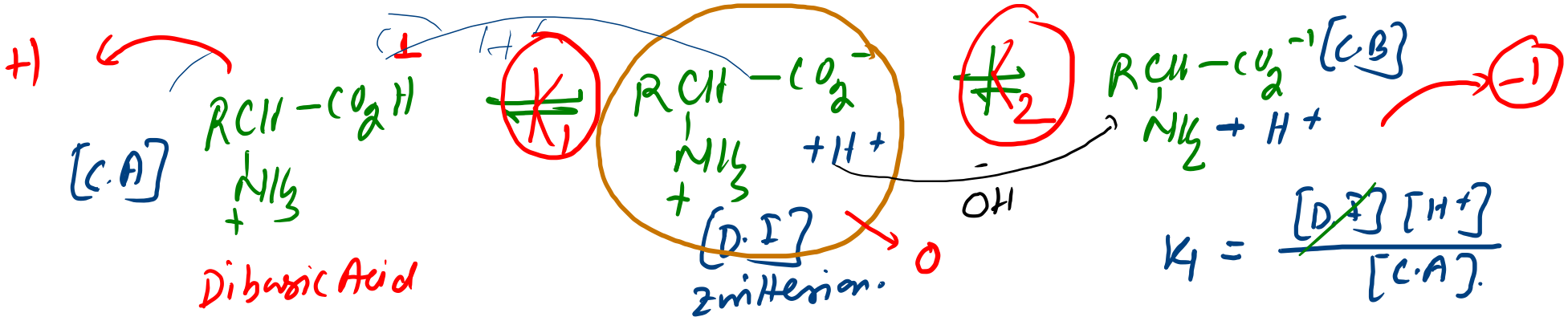


In acidic medium it exists as C.A. (cationic form)
On passing electric current, it migrates to cathode.

In basic medium it exists as C.B (anionic form)
On passing electric current, it migrate to anode.

At a particular pH, there is no net migrating amino acid.
that particular point is called "Isoelectric point"

pH at Isoelectric point



$K_1 = \dfrac{[D.I][H^+]}{[C.A]}$

$K_2 = \dfrac{[C.B][H^+]}{[D.I]}$

Isoelectric point. $[C.A] = [C.B]$.

Amino Acids Alanine $pK_1 = 2.3$.

$pK_2 = 9.7$. At

$K_1 K_2 = [H^+]^2 \dfrac{[C.B]}{[C.A]}$

$[pH]_{I.P} = \frac{1}{2}[2.3 + 9.7) = 6.$

$[H^+] = \sqrt{K_1 K_2}$

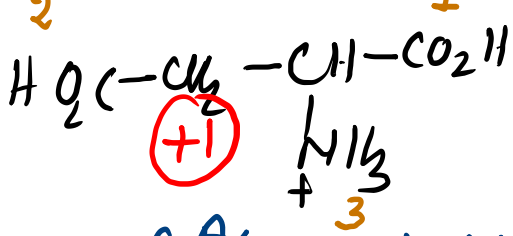
$pH = \frac{1}{2}[pK_1 + pK_2]$

$pH = 6$. neutral amino acid. no net migration.

Zwitterion conc^r is maximum.

At $pH = 2$, amino acid migrates to cathode acidic medium.

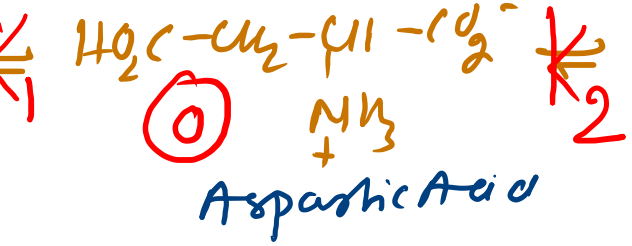
At $pH = 12$, amino acid migrates to anode.

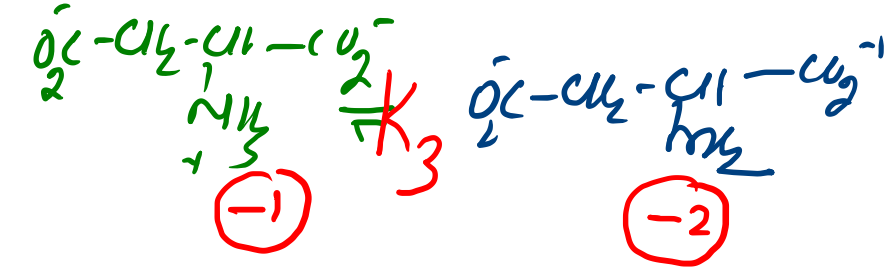


CA (Tribasic acid)

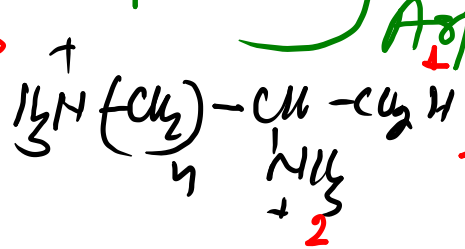
$pK_1 = 1.8$ $pK_2 = 4.2$ $pK_3 = 8.$ $pH = \frac{1}{2}[pK_1 + pK_2]$.

$pH\left[(pH)_{\text{Isoelectric point}}\right] = \frac{1}{2}[1.8 + 4.2] = \underline{3}$





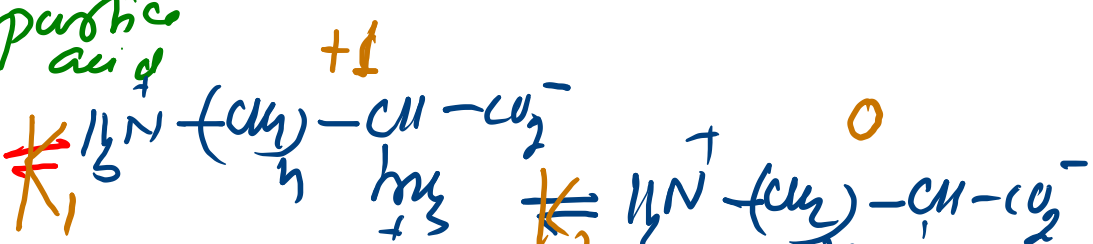
	$(pH)_{IP}$
a) N.A.A	$\approx 6.$
b) A.A.A	$\approx 3.$
c) B.A.A	$\approx 9.$



C.A of Lysine

$\left[(pH)_{IP}\right] = \frac{1}{2}(8+10)$

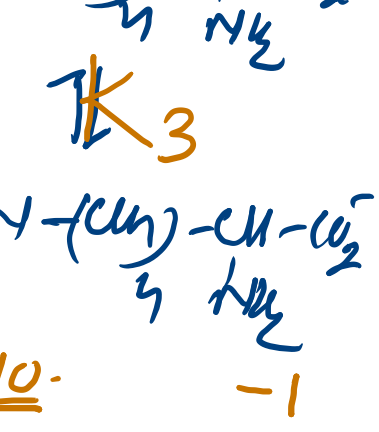
Lysine $= \underline{9.}$



$pH = \frac{1}{2}[pK_2 + pK_3]$

$pK_1 = 2.8.$

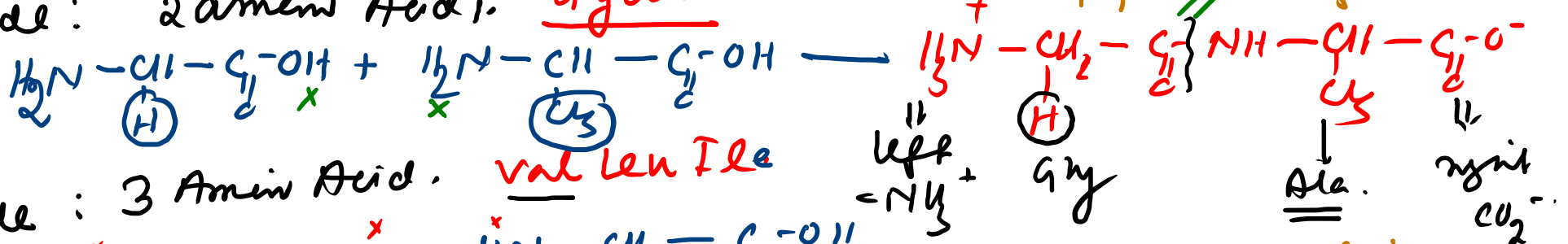
$pK_2 = 8.$ $pK_3 = \underline{10.}$



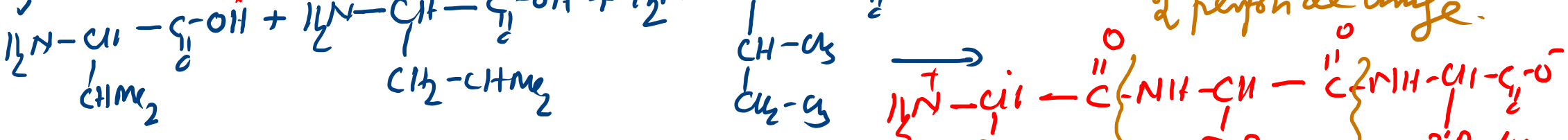
Peptide: When α-amino acid are joined together, then a polymer is formed which is called protein through peptide linkage.

Amide.

Dipeptide: 2 amino Acid. glycine.



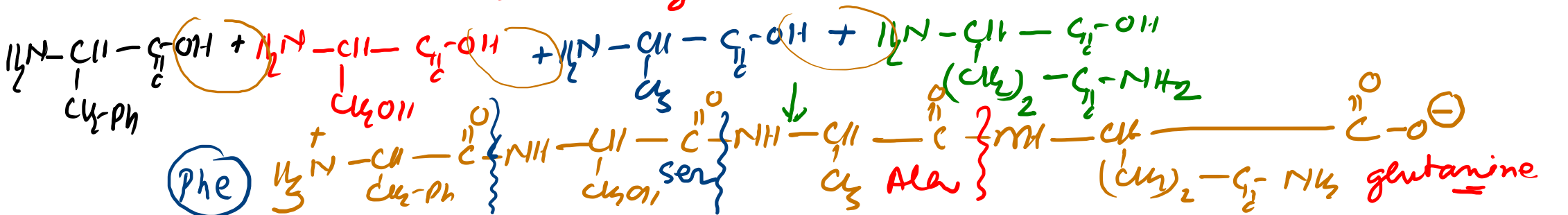
Tripeptide: 3 Amino Acid. valine Leu Ile

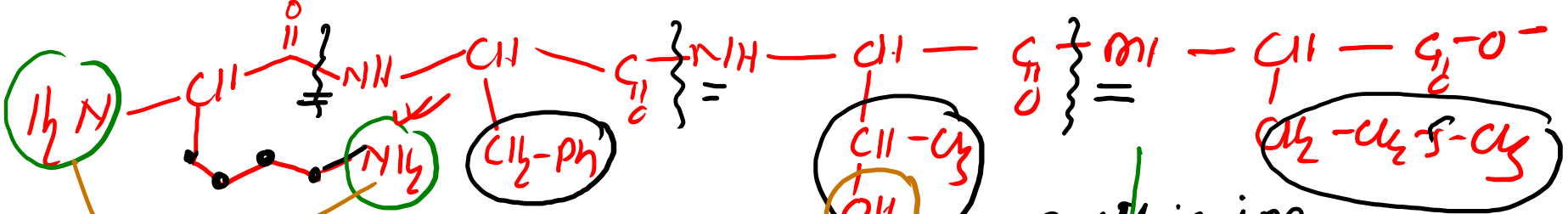


val — Leu — Ile.

Tetrapeptide: 4 amino acid.

Phe. ser. ala. gln





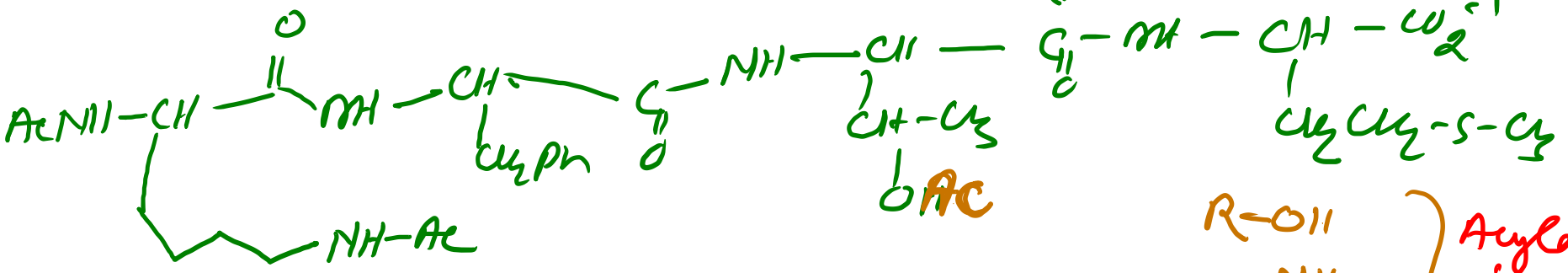
Lysine – Phenylalanine – threonine – methionine

Lys – Phe – Thr – met

Ac_2O (xs)

=) 3 peptide linkage

=) Tetrapeptide



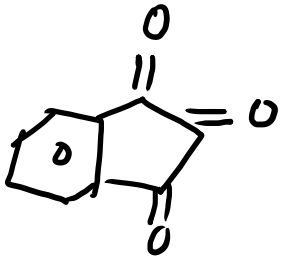
M. wt is increased by $3 \times 42 = 126$ units.

- R–OH
- $-NH_2$
- $-NHR$
- 
- 

} Acylation is possible.

α-amino Acids.

⇒ Ninhydrin test



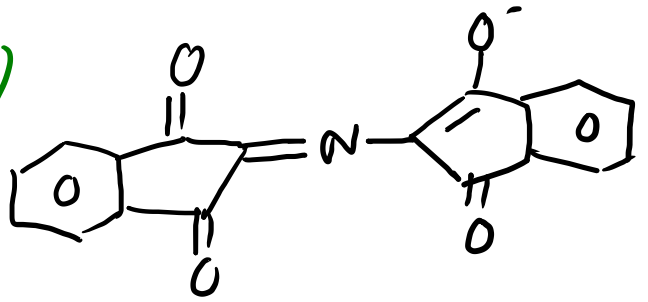
+ $RCH(NH_3^+)-CO_2^-$ ⇌ Purple / Violet Color

"Rhuman's Purple"

amide linkage

↓

(1 mole H_2O required)



$CH_2(NH_3^+)-CO_2^-$ M.Wt = 75

+ $RCH(NH_3^+)-CO_2^-$

$+ CO_2 \uparrow$.

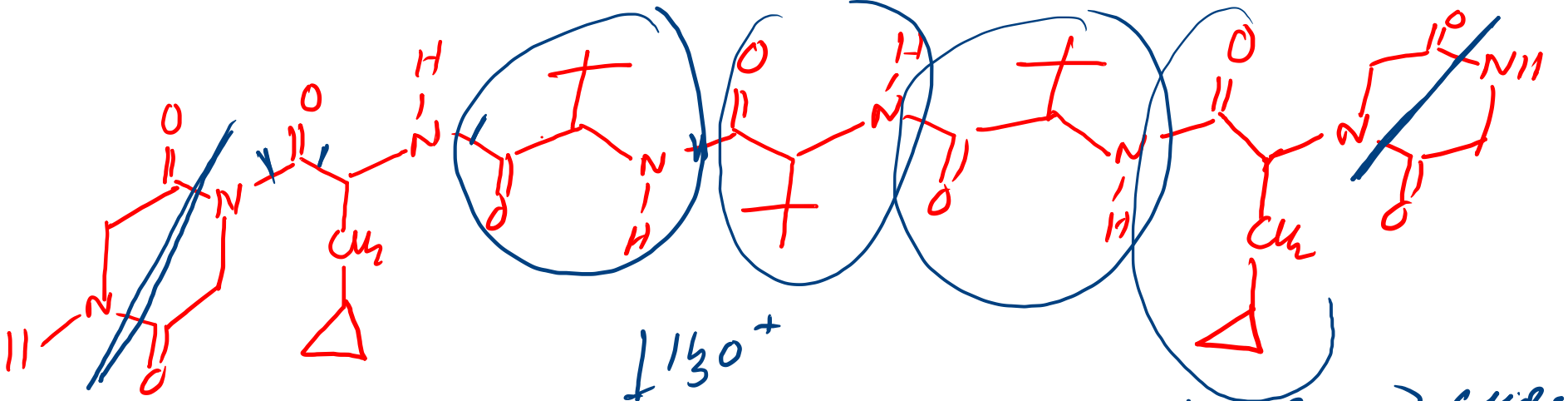
ALLEN JEE

You tube.

A decapeptide (M.Wt 796) on complete hydrolysis it gives glycine (M.Wt 75), alanine, phenyl alanine. Glycine contributes 47% total wt. of the hydrolysis pdt. Find out no. of glycine units in decapeptide

Decapeptide + 9 moles H_2O (9×18) = total wt of hydrolysed pdt) ×47

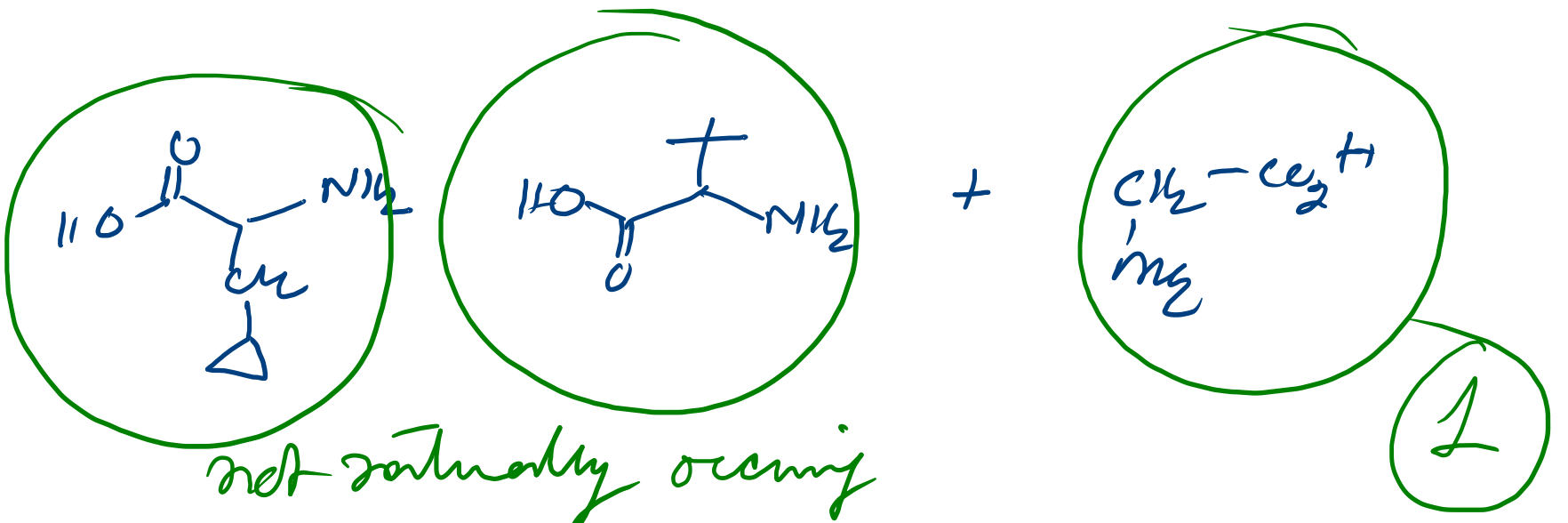
796 + 162 = 958 × 47/100 = wt of glycine. = 450/75 = No. of glycine units = 6



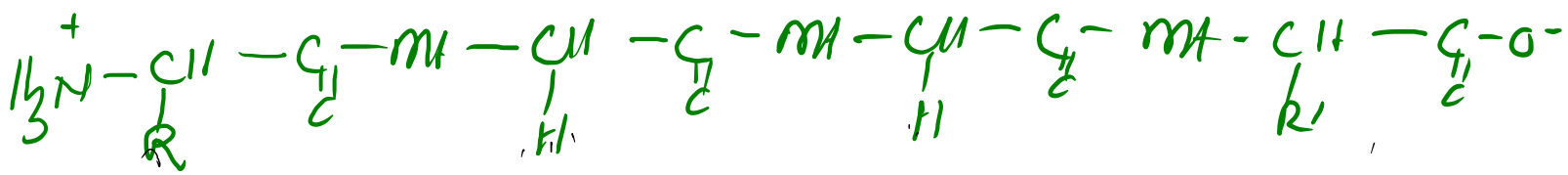
H_3O^+

Find out the no. of distinct naturally occurring amino acids

obtained



not naturally occurring amino acids.

Q. 

Peptide.

Advance (JEE)

a) R = H, R' = H — ✗✗

b) ClH_2CO_2H — $(CH_2)_2-NH_2$ — SH ✗✗

c) $(CH_2)_n-NH_2$ — $-CH_3$ ✗

d) ✗ $-CH_2-\overset{O}{\overset{\|}{C}}-NH_2$ — $-CH_3$

e) ✗ $-CH_2-OH$ — $(CH_2)_2-\overset{O}{\overset{\|}{C}}-NH_2$

f) $(CH_2)_n-NH_2$ — $(CH_2)_n-NH_2$

g) $-CH_2-OH$ — $-CH_2-CH_2-S-CH_3$

h) ✗ $-CH_3$ — $-CH_2-CO_2H$

i) ✗ $-(CH_2)_5-NH_2$ — $-CH(CH_3)_2$

$(B.A.A)_{pH} = (q.)(pH)_{I.P}$

In acidic medium only B.A.A exists as cationic form.

neutral amino acid. pH = 6

How many g peptides have cationic form at pH = 6 ??

no negative.

acidic amino acid pH = 6. anionic fm

3