



DEPTH OF BIOLOGY



STUDY MATERIAL



YT-DEPTH OF BIOLOGY

INSTA- DEPTH OF BIOLOGY

TELE- DEPTH OF BIOLOGY



Pharmacology of Drug Acting on C.N.S.

①

Unit - 4

[DEPTH OF BIOLOGY]

① Neurohumoral transmission in the C.N.S. special emphasis on Importance of various Neurotransmitter like with.

⇒ GABA ⇒ Glutamate ⇒ Glycine ⇒ Serotonin ⇒ Dopamine

I. GABA → Gamma-Amino Butyric Acid.

→ Inhibitory Neurotransmitter found in C.N.S.

→ GABA is also found in periphery Region. (Little amount)

Synthesis of GABA ⇒ [DEPTH OF BIOLOGY]

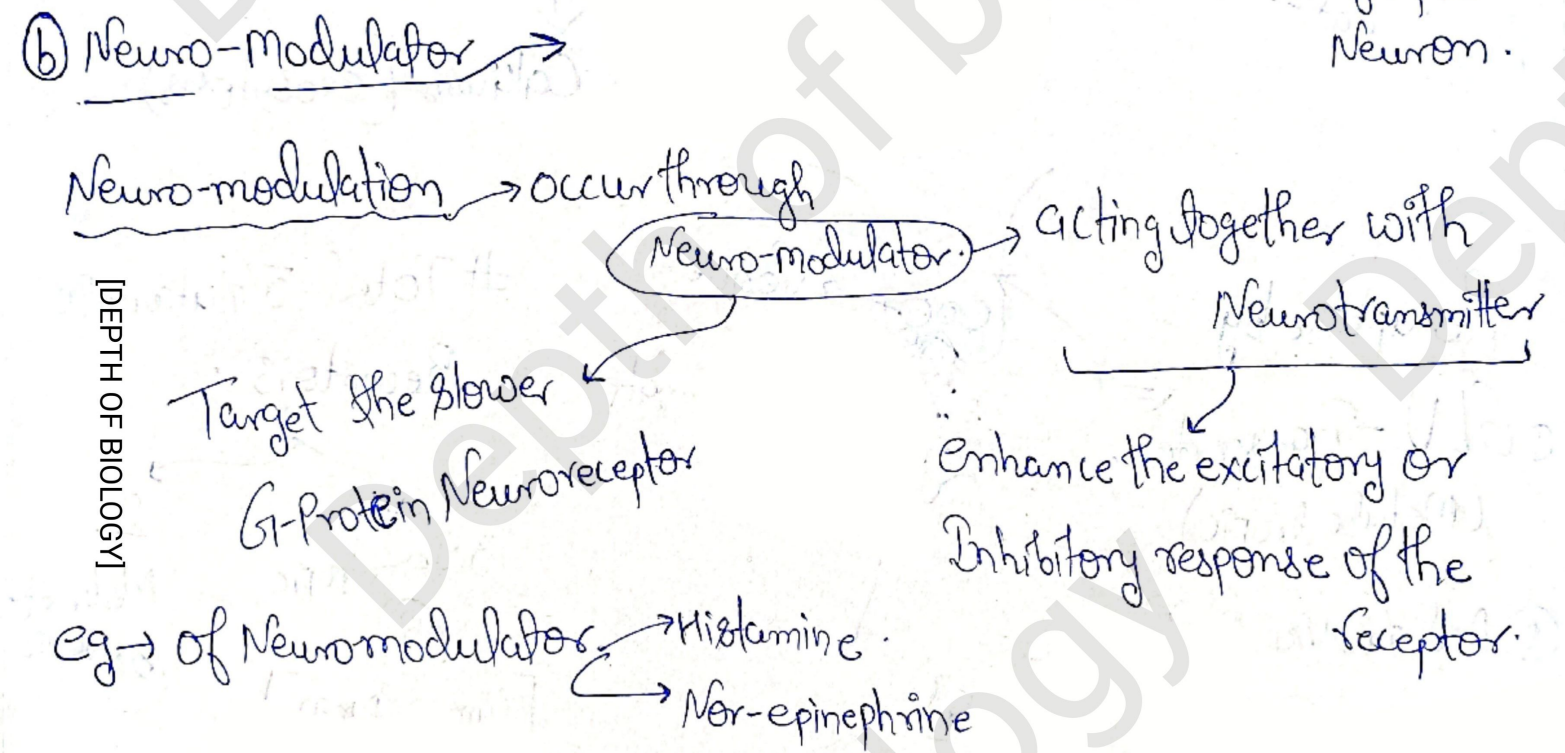
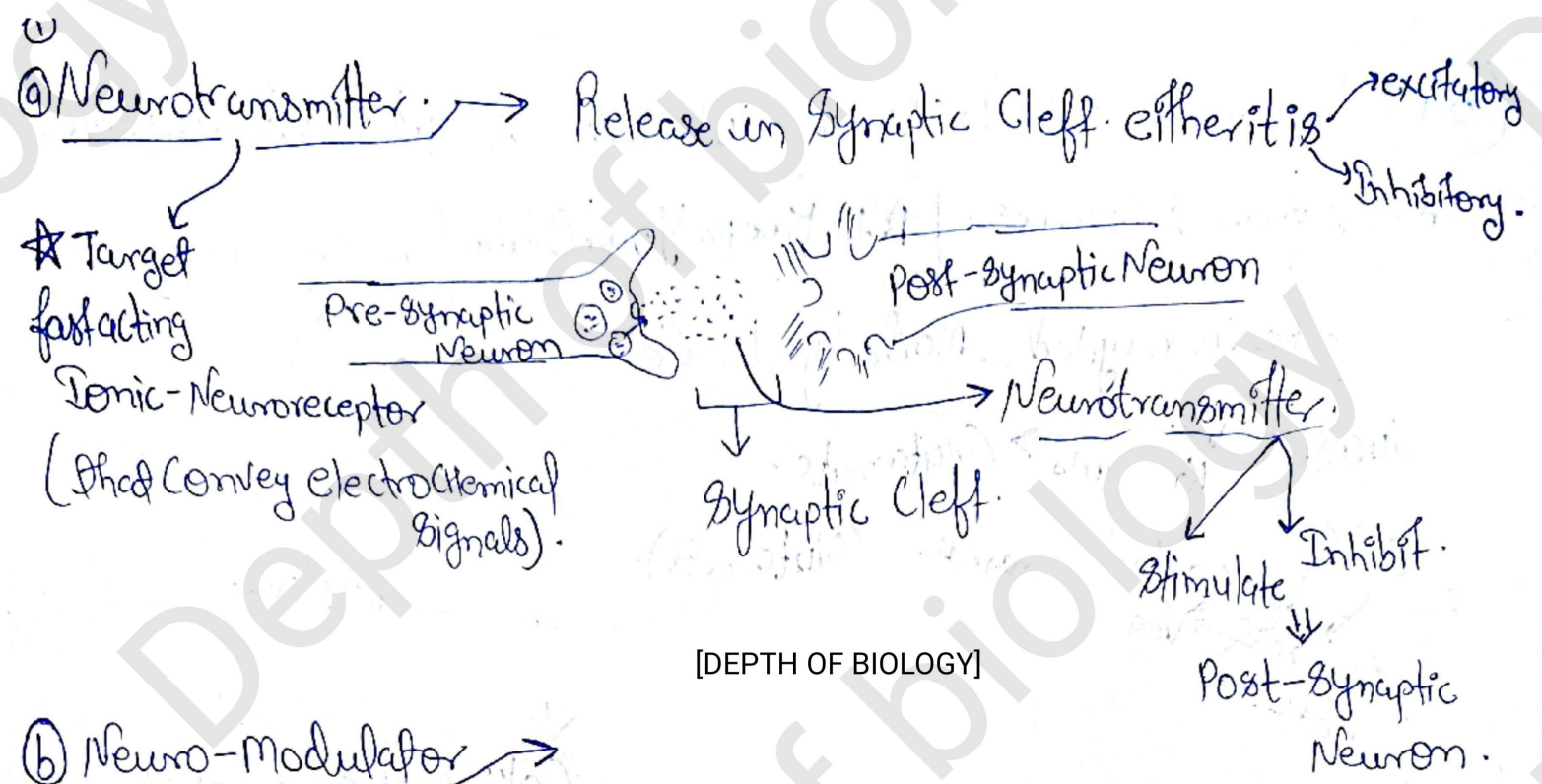
Glutamine $\xrightarrow{\text{Glutaminase}}$ Glutamate $\xrightarrow[\text{Decarboxylase}]{\text{Glutamate}}$ GABA.

Metabolism of GABA ⇒

[DEPTH OF BIOLOGY]

GABA $\xrightarrow{\text{GABA-T}}$ Succinic Semi Aldehyde $\xrightarrow[\text{Aldehyde dehydrogenase}]{\text{succinic semi}}$ Succinate.

⇒ There are 2 types of GABA-R $\begin{cases} \rightarrow \text{GABA}_A \\ \rightarrow \text{GABA}_B \end{cases}$



③ Neurotrophic factor ⇒ Act by binding to the specific Cell Surface Receptor that signal the Neuron to survive.

[DEPTH OF BIOLOGY]

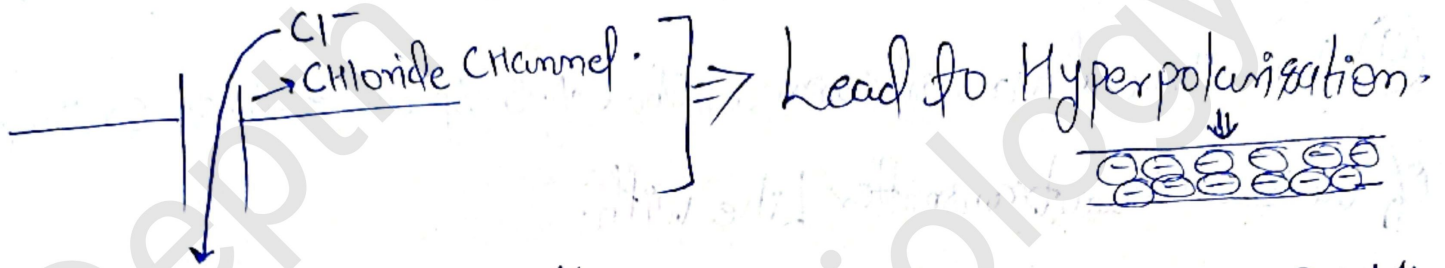
★ Stem Cell & Immune Cell are Cellular Source of Neurotrophic factor.

[DEPTH OF BIOLOGY]

②
⑨ $GABA_A (R) \Rightarrow$ Ionotropic Receptor:

→ Located on Post-synaptic (R)
→ Linked with Chloride Channel:

[DEPTH OF BIOLOGY]



↓
& Lead to Reduction of Membrane Excitability or Neurone excitability. } by Inhibiting Nerve Transmission

$GABA_A (R) \Rightarrow$ Consists of 5 subunits

- $2\alpha_1$
- $2\alpha_2$
- $1\gamma_2$

[DEPTH OF BIOLOGY]

★ As we know $GABA$ (Inhibitory Neurotransmitter).

↓
It decreasing Brain Activity (slow down CNS function).

⑥ $GABA_B (R) \Rightarrow$ G-PCR. [DEPTH OF BIOLOGY]

→ Its activation Use the formation of cAMP (Pathway).

This (R) Cause Pre & Post-synaptic Inhibition by Inhibiting Calcium Channel Opening.

Saclofen [Antagonist] → $GABA_B$ Receptor.

& (Rising K^+ Conductance)

↓
Main determinant of R.M.P.

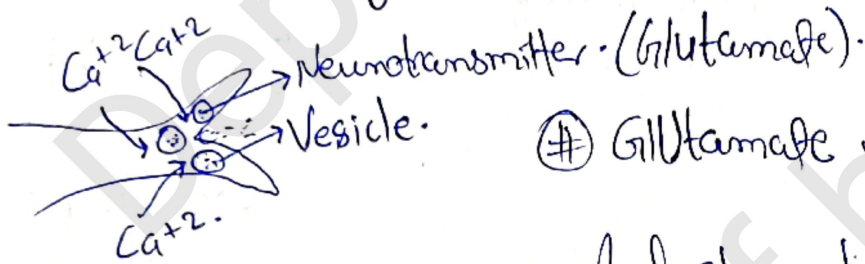
★ $GABA_B \Rightarrow Cl^-$ Opening $\Rightarrow$ Hyperpolarisation.

Same M.O.A as $GABA_A (R)$. [DEPTH OF BIOLOGY]

⑤ Glutamate. $\Rightarrow$ In Brain Glutamate. is Synthesized. in Nerve Terminal from 2 sources. [It Keeps Your Brain function properly].

(i) Glutamate is recycled & Made by Glial Cells.

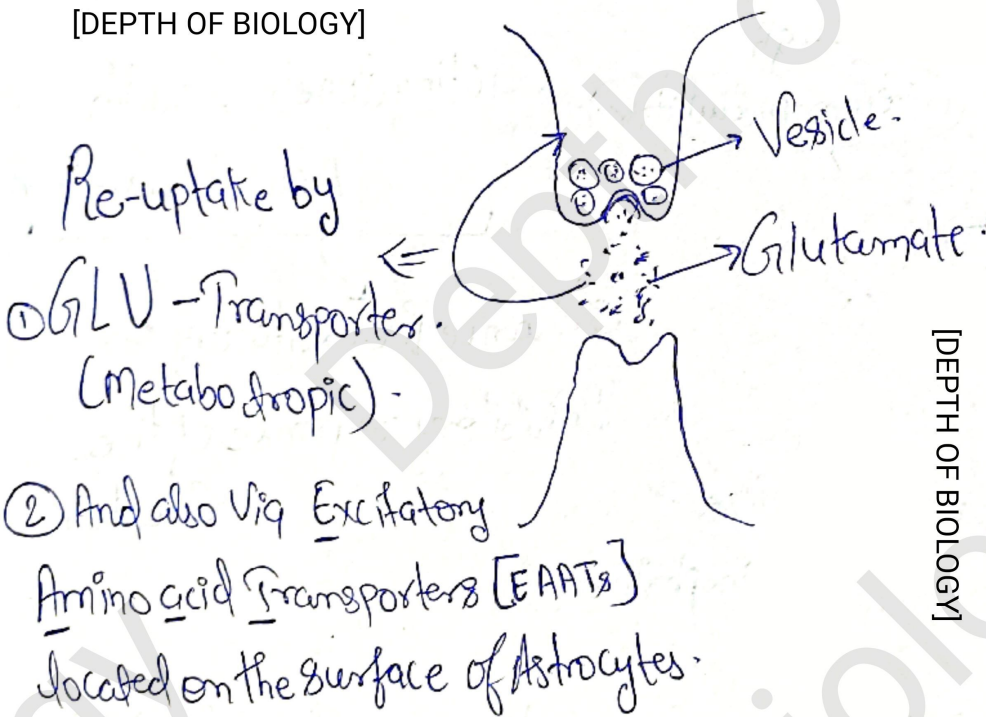
(ii) Glucose $\xrightarrow[\text{Kreb Cycle}]{\text{Via}}$ Glutamate.



⑥ Glutamate is stored in Vesicle. $\downarrow$

And release by Calcium (exocytosis).

[DEPTH OF BIOLOGY]



Total 5 Glutamate Receptors.

3 Ionotropic

(R)

[NMDA, AMPA & Kainate]

2

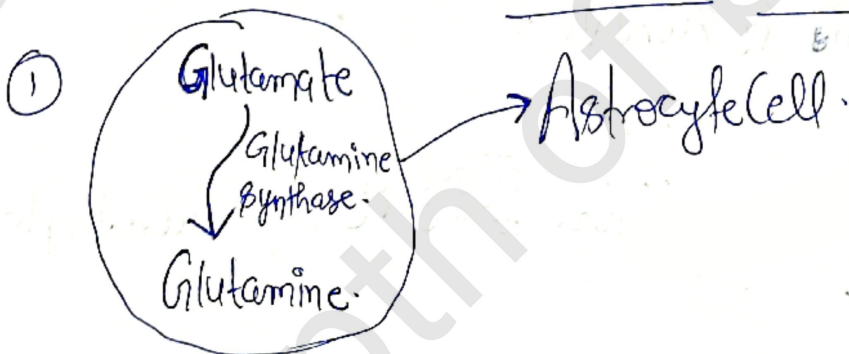
Metabotropic

(R)

[DEPTH OF BIOLOGY]

Glutamate Metabolism

② Metabolized in TCA Cycle.

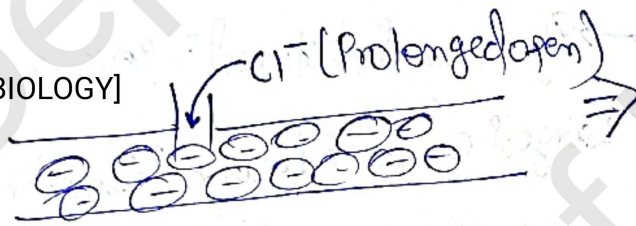


[DEPTH OF BIOLOGY]

© Glycine → Inhibitory Neurotransmitter
 → Enriched in Medulla, spinal cord, Retina.

It is structurally & functionally similar to GABA receptor
 ↓↓

Linked with Chloride Ion channel.

[DEPTH OF BIOLOGY]  ⇒ Lead to Hyperpolarisation.

↓
 Lead to Reduction of Membrane/Neuron Excitability [Calming effect].
 ↓↓

By Inhibiting Nerve Transmission.

Synthesis OF GLYCINE ⇒

Glucose

↓
 3 Phosphoglycerate [3PGA].

↓
 3 Phospho-Hydroxy pyruvate

↓
 Phosphoserine → Serine + Tetrahydrofolate.

Glycine ← [DEPTH OF BIOLOGY]

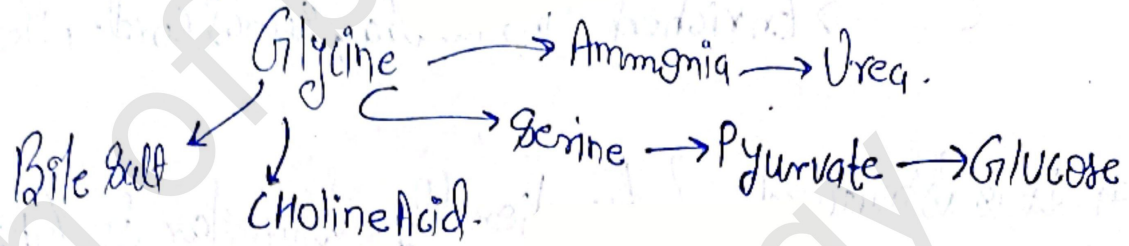
Glycine Function
 (A) Antioxidant (B) Anti-Inflamm.
 (C) Treat Schizophrenia, Brainstroke.

[DEPTH OF BIOLOGY]

#Glycine Metabolism.

[DEPTH OF BIOLOGY]

5



d) Serotonin [5-Hydroxytryptamine] ⇒

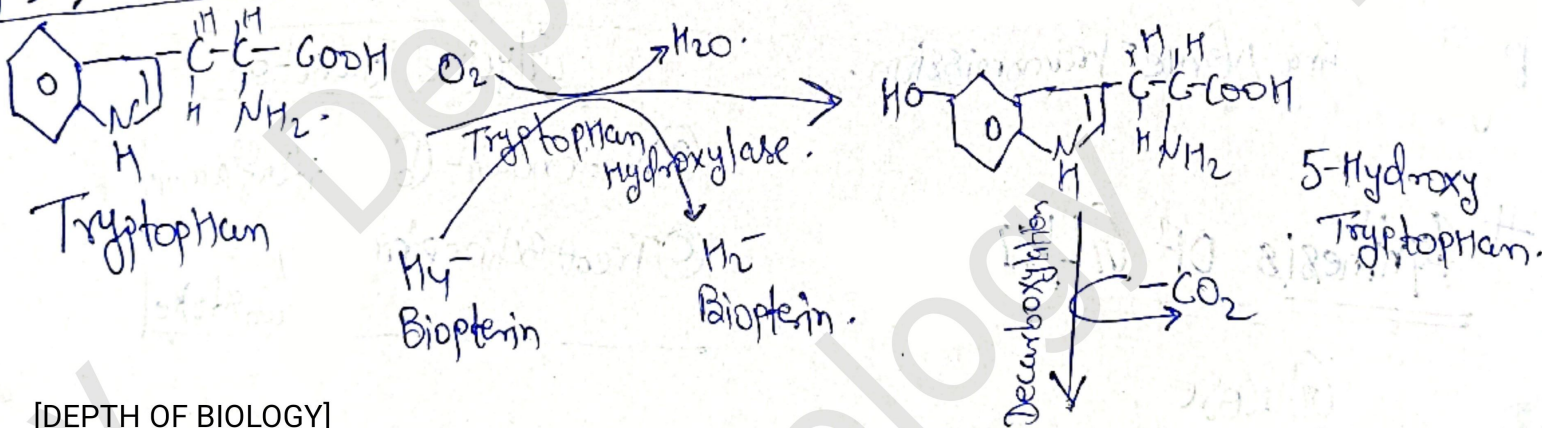
- Neurotransmitter in C.N.S. ⇒ Synthesized & stored in several sites of body.
- It is a vasoconstrictor. ⇒ Largest amount found in Intestinal Mucosa.

★ It is synthesized from Essential Amino acid (Tryptophan).

★ Its deficiency cause Depression.

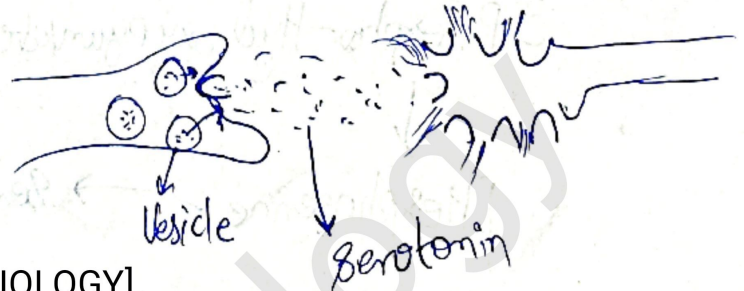
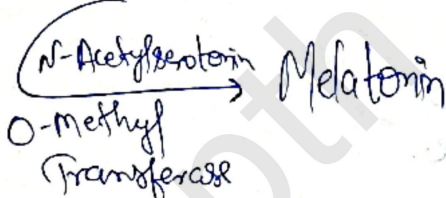
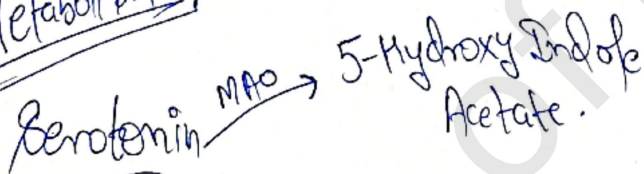
[DEPTH OF BIOLOGY]

SYNTHESIS ⇒



[DEPTH OF BIOLOGY]

Metabolism



[DEPTH OF BIOLOGY]

② Dopamine $\Rightarrow$ Neurotransmitter as well as Hormone.

$\rightarrow$ It plays roles in Many Important body function. $\rightarrow$ Euphoria.

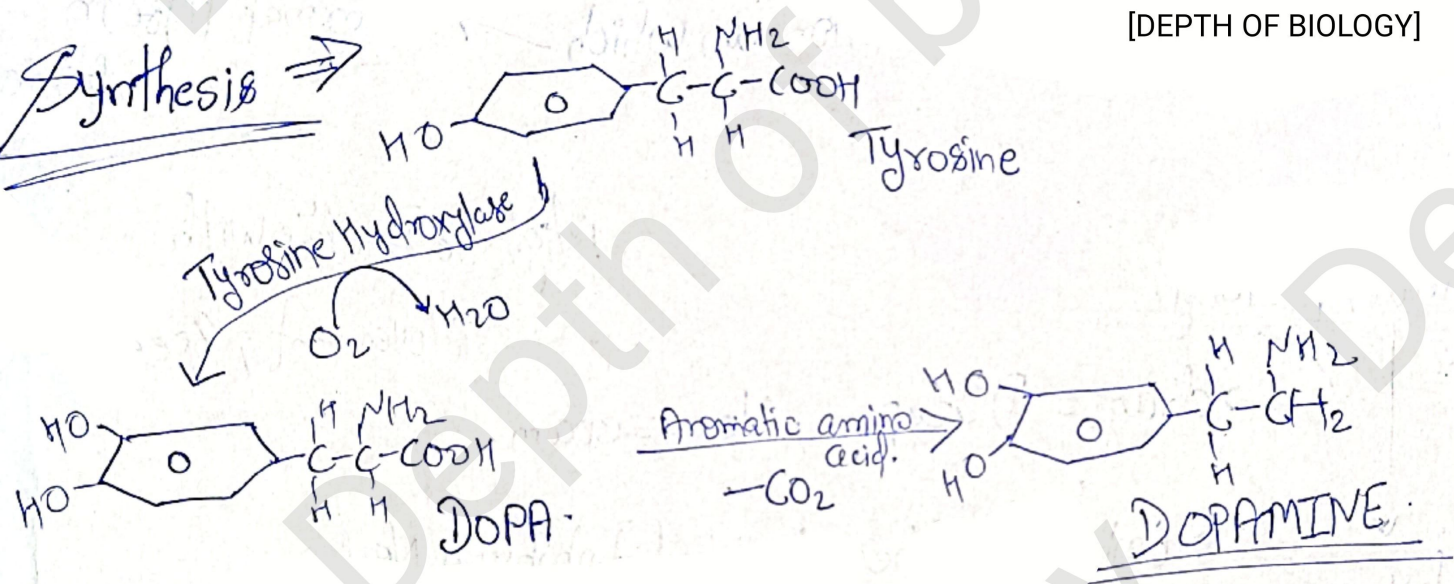
[DEPTH OF BIOLOGY]



* High & Low levels of dopamine are associated with several Mental Health & Neurological disease.

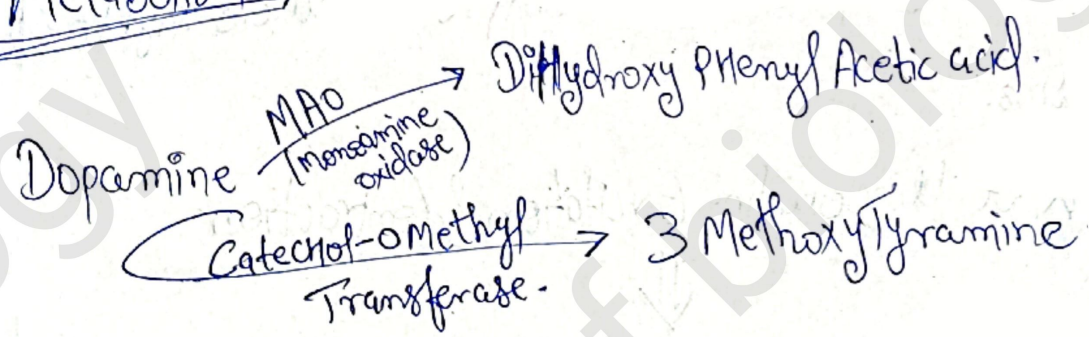
Synthesis $\Rightarrow$

[DEPTH OF BIOLOGY]



Metabolism $\rightarrow$

[DEPTH OF BIOLOGY]



$\Rightarrow$ Dopamine (R) $\rightarrow$ D₁, D₂, D₃, D₄, D₅. [DEPTH OF BIOLOGY]

D₁ & D₅ $\rightarrow$ belong in same group.

D₂, D₃, D₄ $\rightarrow$ belong in same group.

Sedative & Hypnotic → [Medi Chem]. [Unit-4]

→ Check Lecture in Playlist → Med: + Cology
Chem.

Centrally Acting Muscle Relaxant ⇒

→ Those drugs which Reduces Skeletal Muscle tone by a selective action in the Cerebrospinal axis.

[DEPTH OF BIOLOGY]

→ This drug not altering in consciousness.

SPASTICITY ⇒ Condition in which → Abnormal ↑ in Muscle tone

Might be Interfere with
Movement, Speech.

Anti-spasticity.

→ drugs = Diazepam, Clonazepam.

Act by → Enhancing the activity of Inhibitory Neuron.

→ Act on muscle Cell & Spinal Cord to Improve muscle tightness & Relieves spasms.

★ It Uncoupling Excitation & Contraction



By Inhibiting Calcium Release at the
Sarcoplasmic Reticulum.

[DEPTH OF BIOLOGY]

[DEPTH OF BIOLOGY]

① Mephenesin Group → It involve drugs → Methocarbamol, Metaxalone.

↓
It is a Synthetic Cresol Glyceryl ether
Which produce Transient Muscle Relaxation.

[DEPTH OF BIOLOGY]

⇒ This drug are spinal Neuron blocking Agent. at the level of Brain Stem.

⇒ Treat Muscle Spasm.

(ii) Benzodiazepine Group ⇒ [DEPTH OF BIOLOGY]

• Diazepam & Clonazepam Have Antispasticity Action.

↓

Work on postsynaptically on GABA_A Receptor

↓

Hyperpolarisation $\xrightarrow{\text{Cl}^-}$ ⇒ CNS depress.

[DEPTH OF BIOLOGY]

★ This also Induce Sedation → Because of Sedation
↓
Reduction of Spasticity at Night.

(iii) GABA derivative ⇒ [DEPTH OF BIOLOGY]

Baclofen → GABA Mimetic drug.

act as agonist for GABA_B Receptor → GPCR → Hyperpolarise by ↑ K⁺ Conductance & ↓ Ca²⁺ ion Conductance.

It relieve Pain & spasticity & treat pain in spasticity condition.

Anti-Convulsant

Convulsant / Epilepsy $\Rightarrow$ Check Lecture from Playlist
(or Youtube eye button).

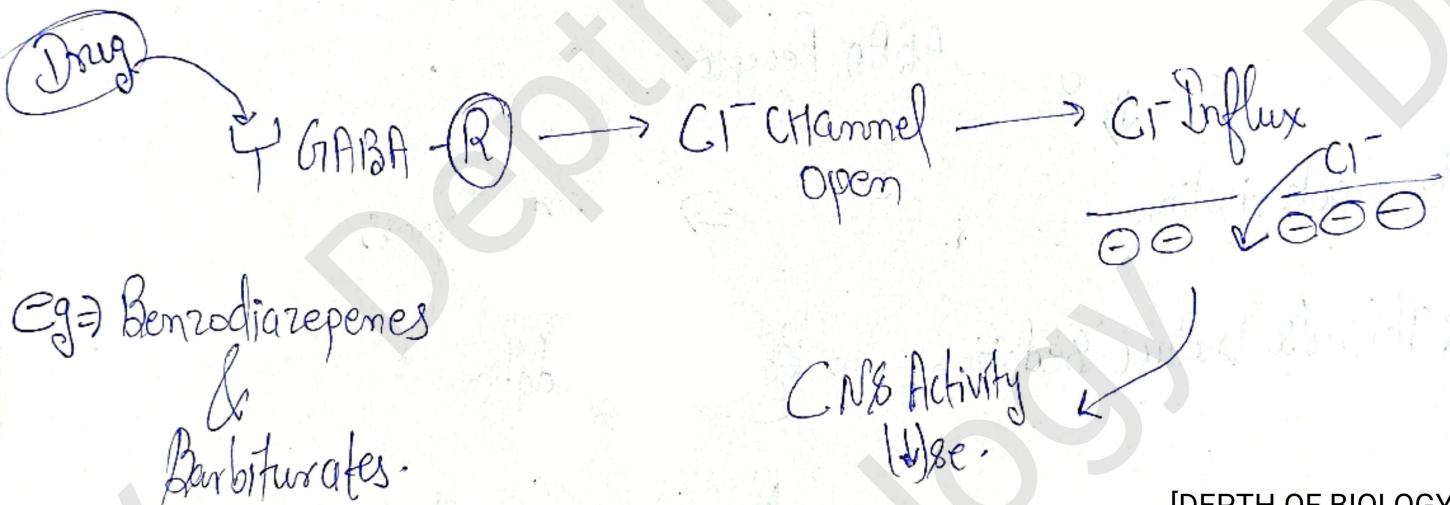
[DEPTH OF BIOLOGY]

[DEPTH OF BIOLOGY]

Mechanism of Anti-Convulsant $\rightarrow$

Anti-Convulsant Used to treat Seizure & epilepsy.

Two types of Attack $\rightarrow$ Major Attack $\Rightarrow$ Phenytoin, Carbamazepine
 $\rightarrow$ Minor Attack $\Rightarrow$ Valproic acid, Clonazepam



[DEPTH OF BIOLOGY]

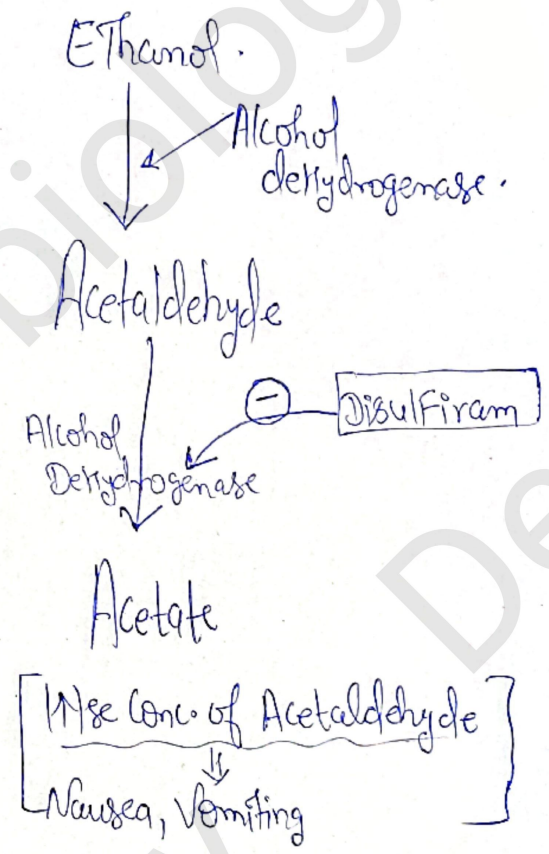
$\Rightarrow$ Epilepsy $\Rightarrow$ Neuronal firing $\rightarrow$ To Inhibit / Overcome this we give
Drugs which is GABA-Agonist. It binds with GABA Receptor it
leads to Activation of Receptor & release more GABA for Calming
effect / to depress CNS / to treat seizure / to treat epilepsy

Alcohol & Disulfiram → Medication to treat Chronic Alcoholism (10)

→ Alcohol is Neuronal depressant.
 → Alcohol raise pain Threshold.
 but it is not a dependable Analgesic.
 → Act on Brain (Anticonvulsant Action)

[DEPTH OF BIOLOGY]

Mechanism of Action.



[DEPTH OF BIOLOGY]

⇒ Chronic Alcohol Abuse
 ↓
 Damage brain Neuron.
 Also cause Shrinkage of Brain.

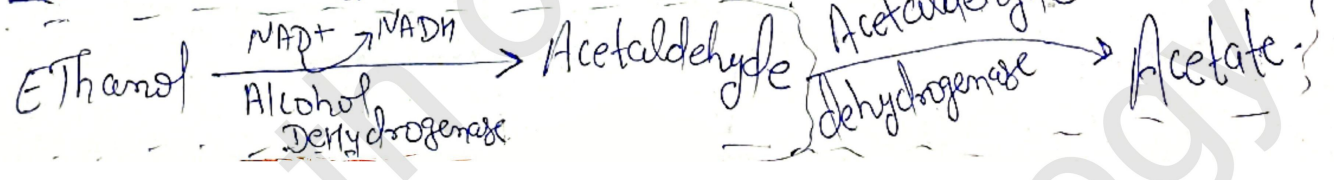
⇒ Alcohol enhance GABA Release at GABA site in the Brain.
 # It also Inhibit NMDA & Kainate type of Excitatory Amino acid receptor.

Action of 5HT & 5-HT₃ Inhibitory Autoreceptor is ↑ sed. [DEPTH OF BIOLOGY]

It also activates specific type of K⁺ Channel in certain Brain areas.

Metabolism of Alcohol.

⇒ ↑ Cytosol



As you see Disulfiram Inhibit Alcohol Dehydrogenase It may lead to ↑ in Acetaldehyde. Cause Nausea, Vomiting.

→ Mitochondria