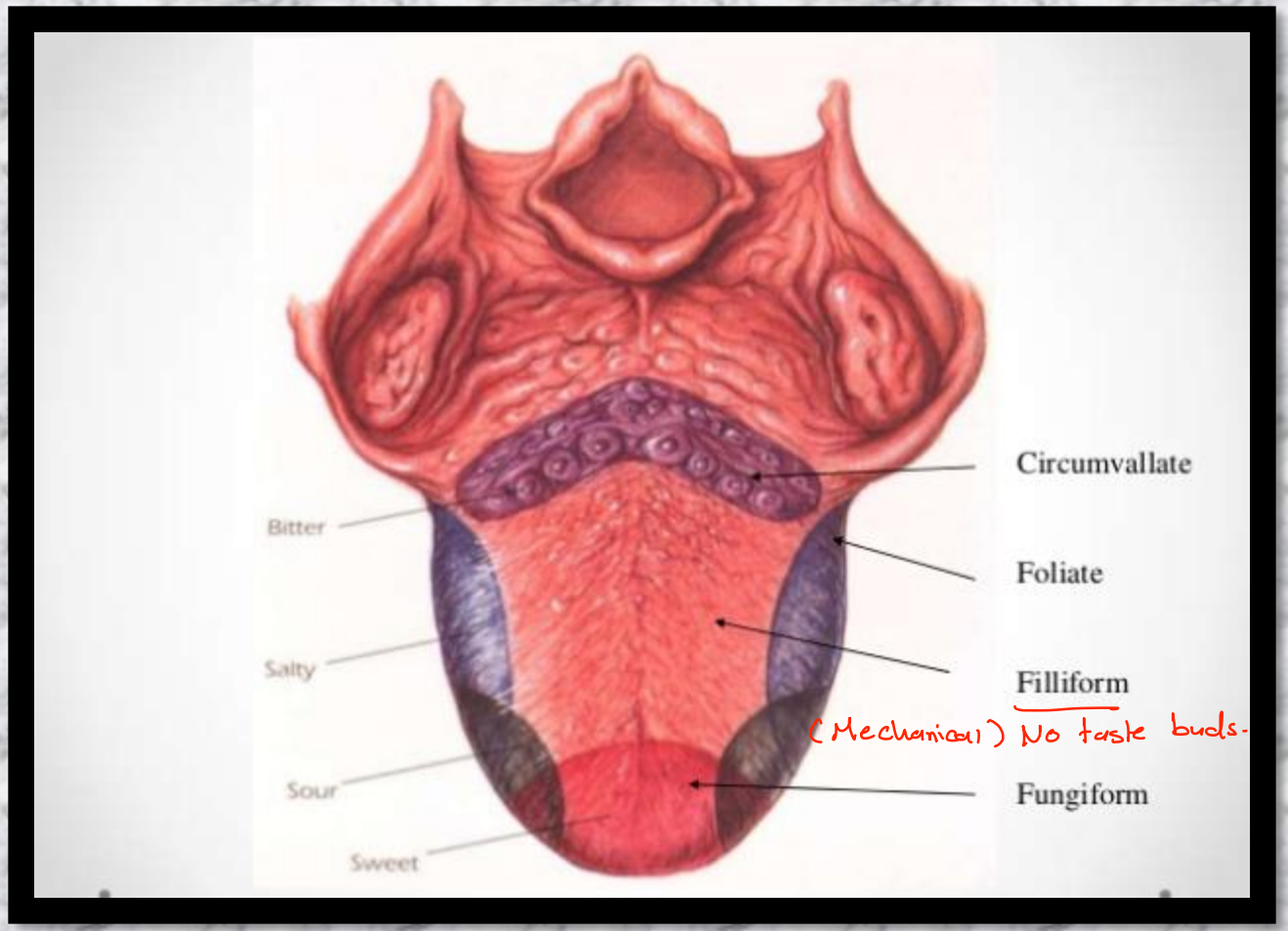
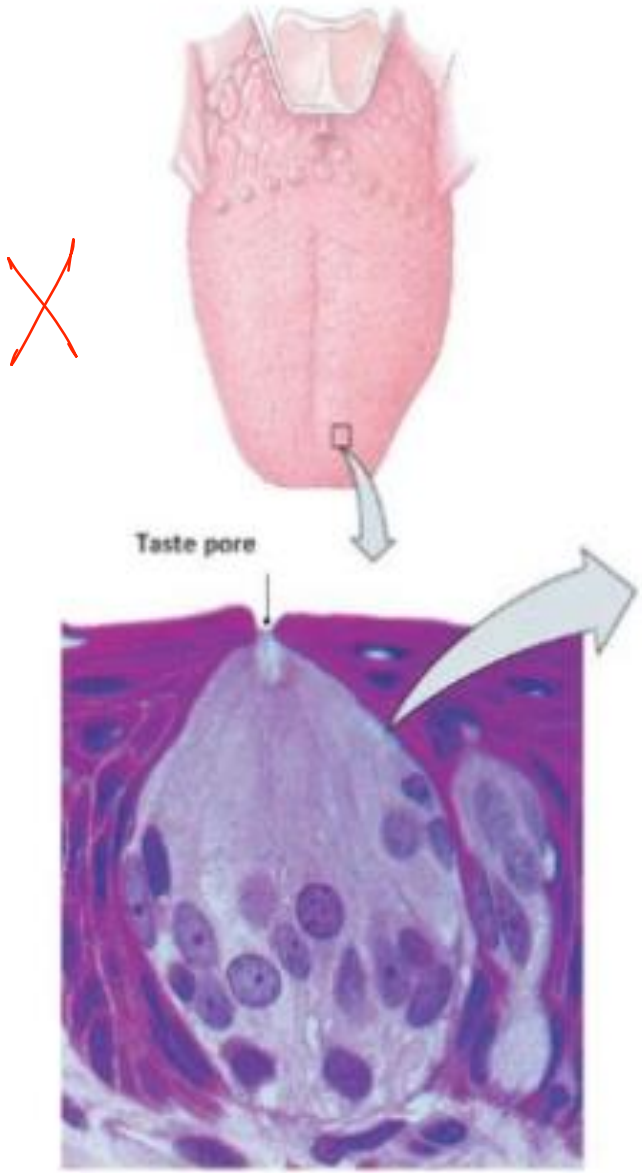
Neurophysiology of smell and taste (gustation)

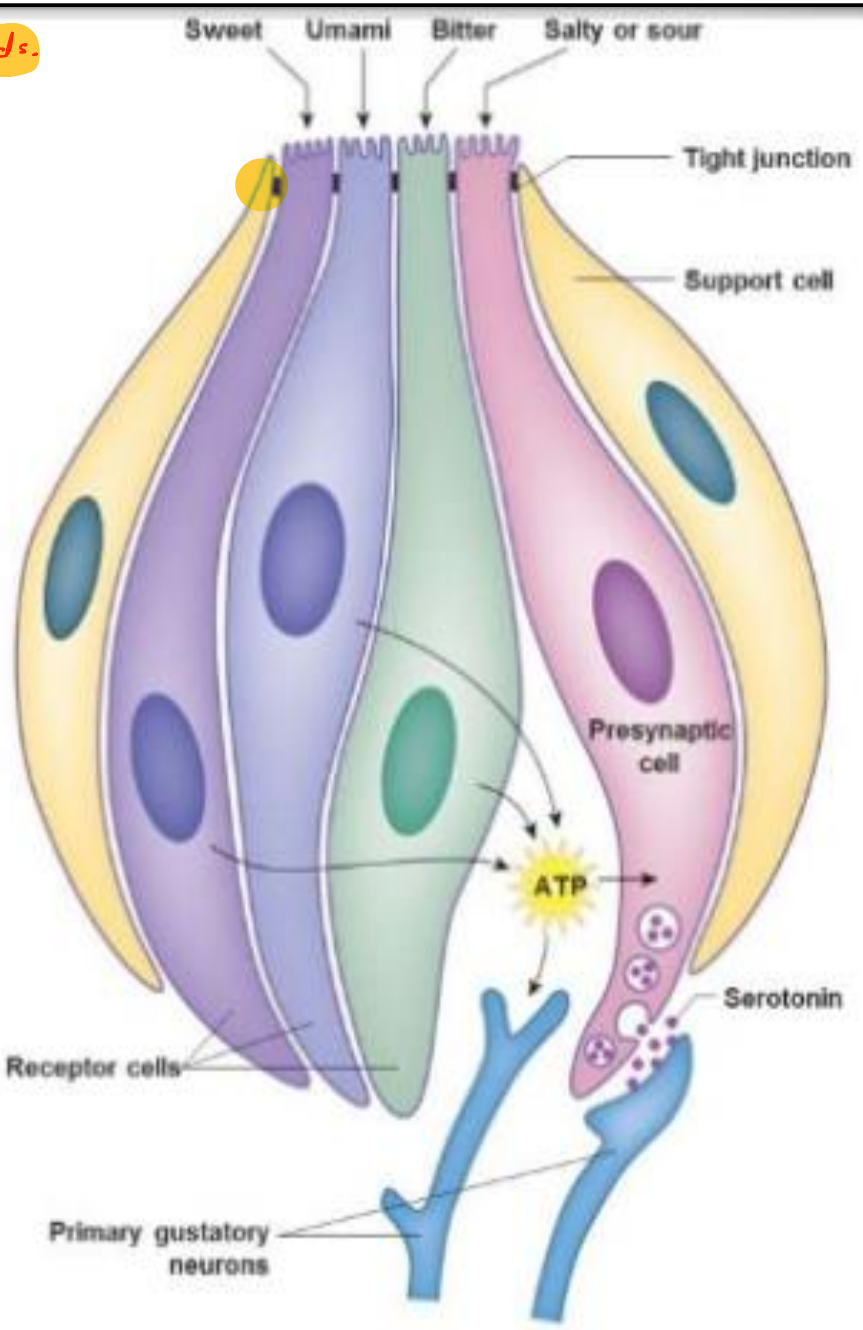
Dr. Arwa Rawashdeh

Physiology of taste



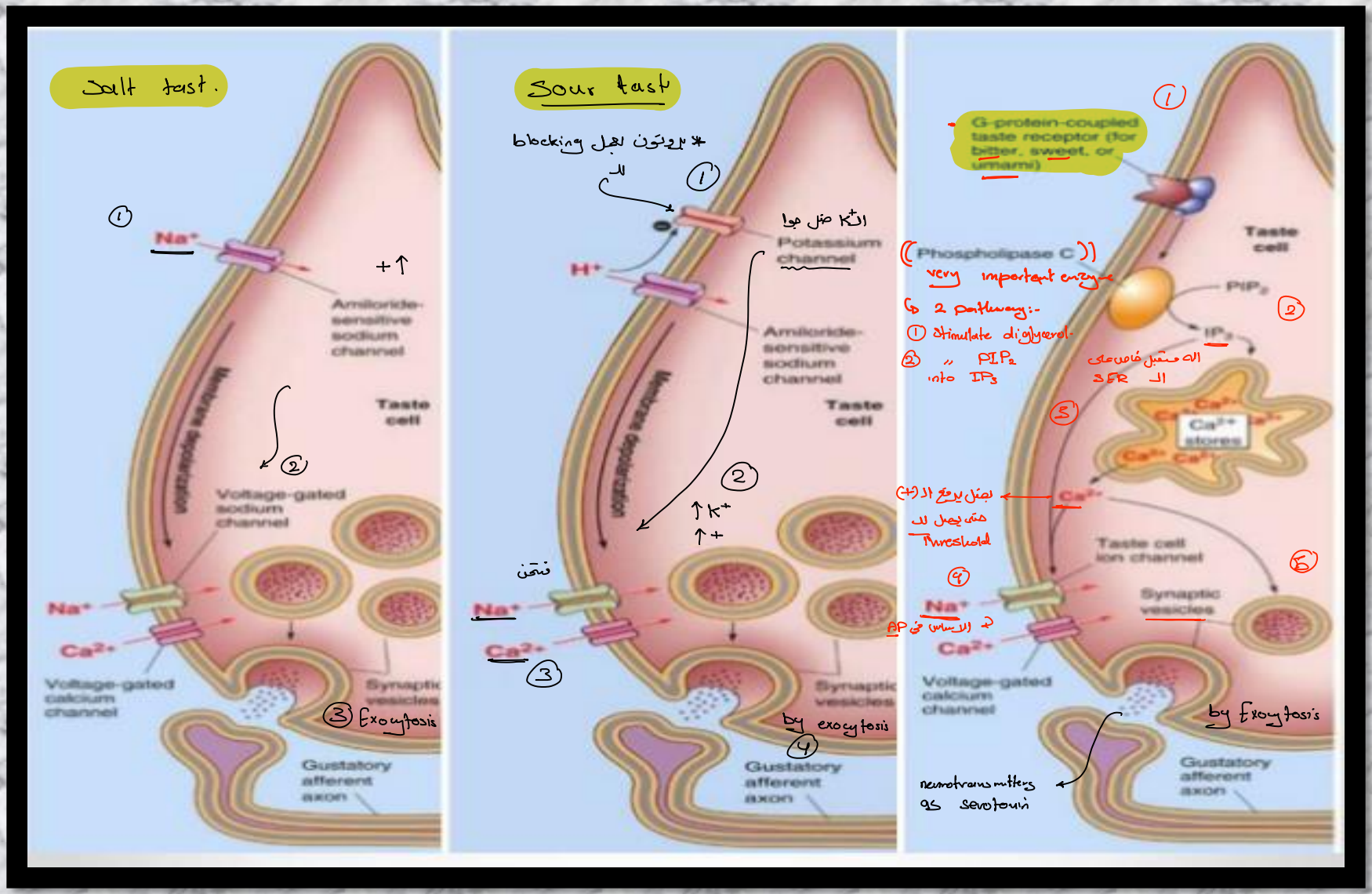
* Chemical stimulation in taste buds.



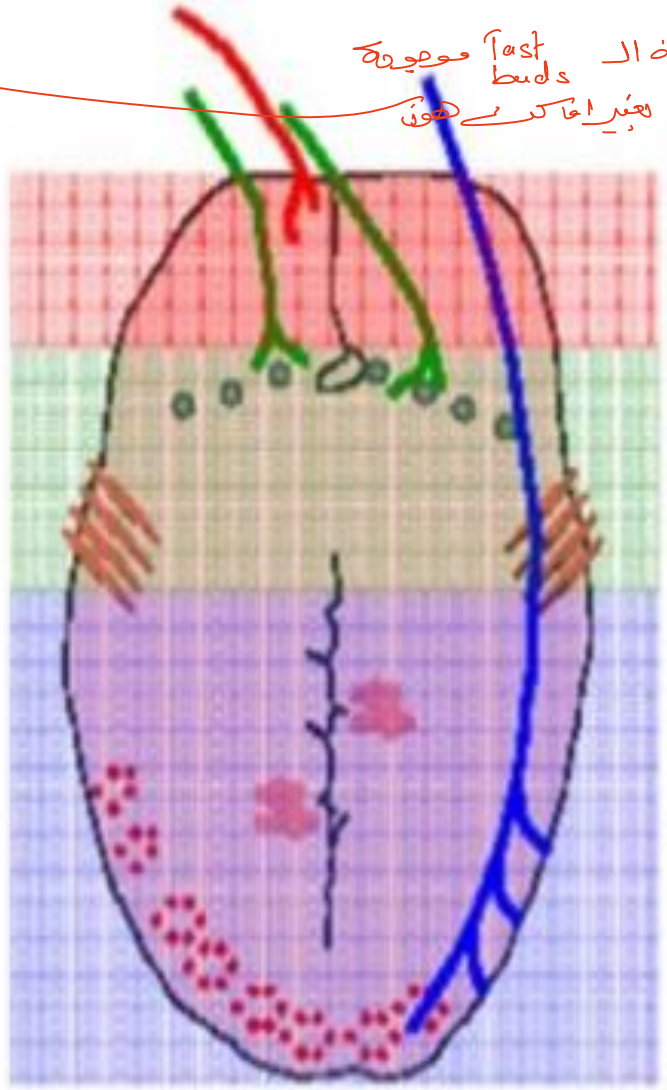


Mechanism of stimulation

* Each kind of taste has " " ".



Gustatory Nerves



Pharynx, Epiglottis, Esophagus

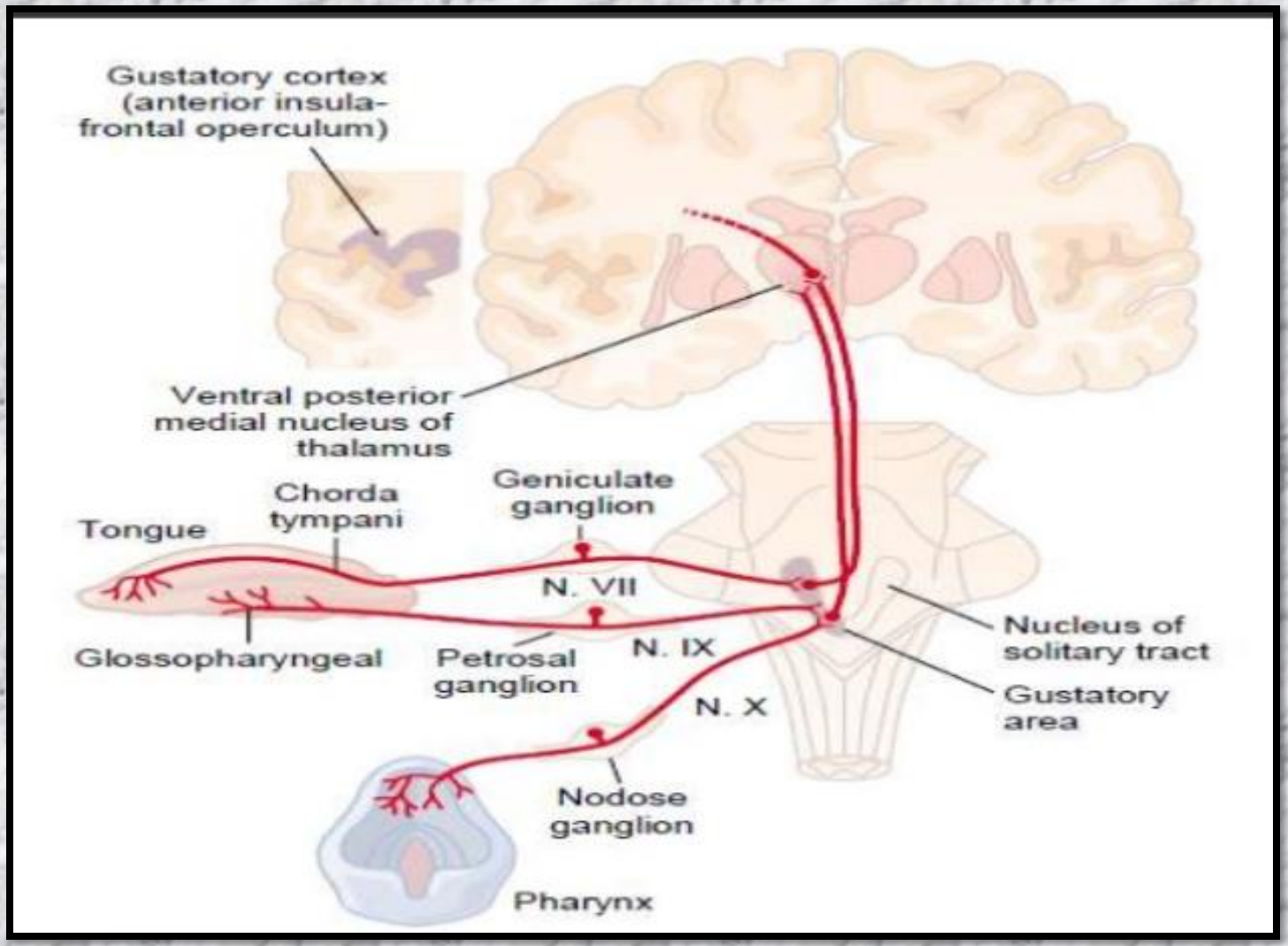
1/3 of anterior tongue innervated by glossopharyngeal nerve

2/3 of anterior tongue innervated by tympanic nerve

Vagus Nerve (X)

Glossophryngeal Nerve (IX)

Facial Nerve (VII)


Gustatory cortex
(anterior insula-
frontal operculum)
Ventral posterior
medial nucleus of
thalamus
Geniculate
ganglion
Chorda
tympani
Tongue
N. VII
Nucleus of
solitary tract
Glossopharyngeal
Petrosal
ganglion
N. IX
Gustatory
area
N. X
Nodose
ganglion
Pharynx

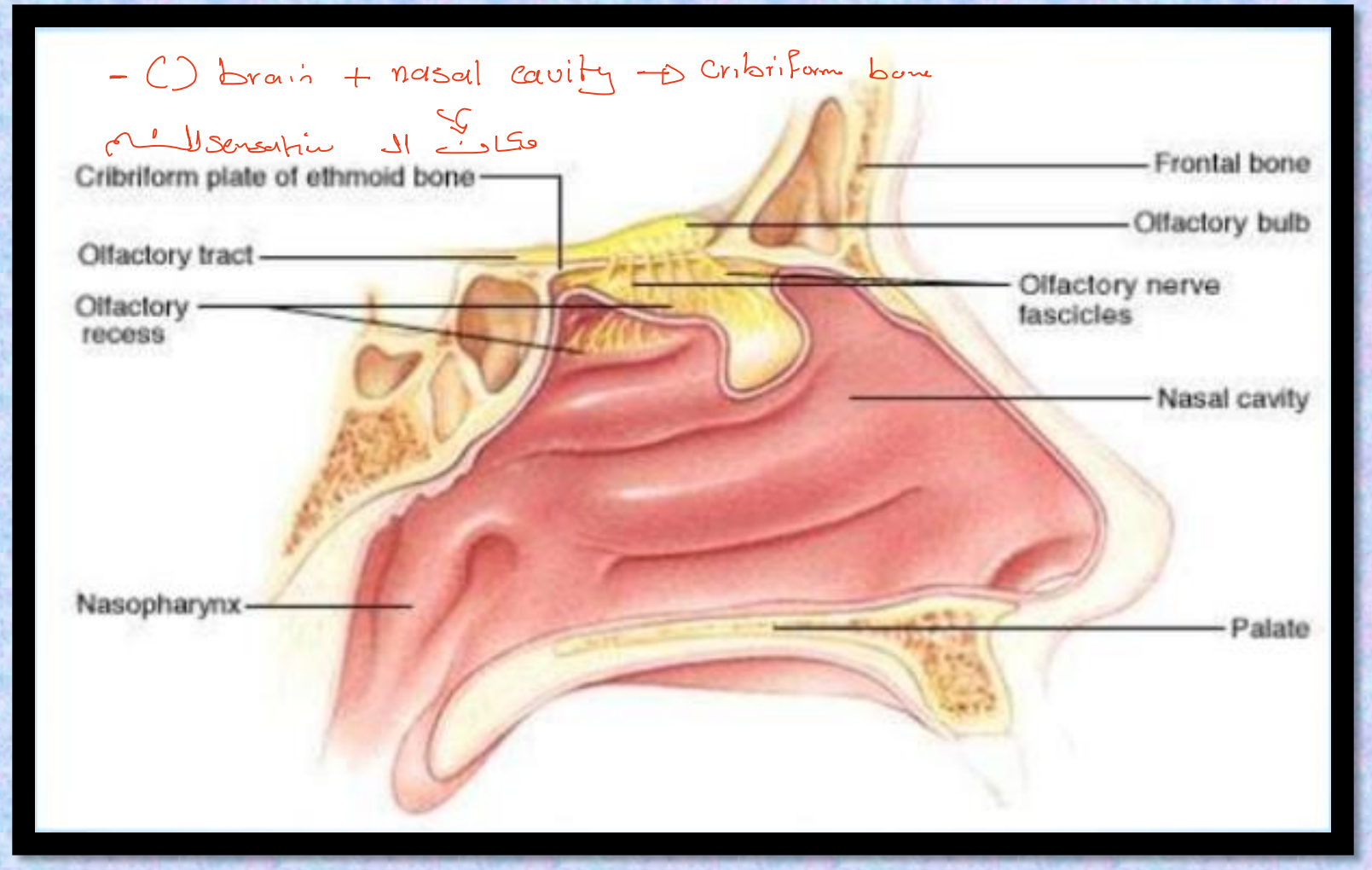
- Geniculate ganglion

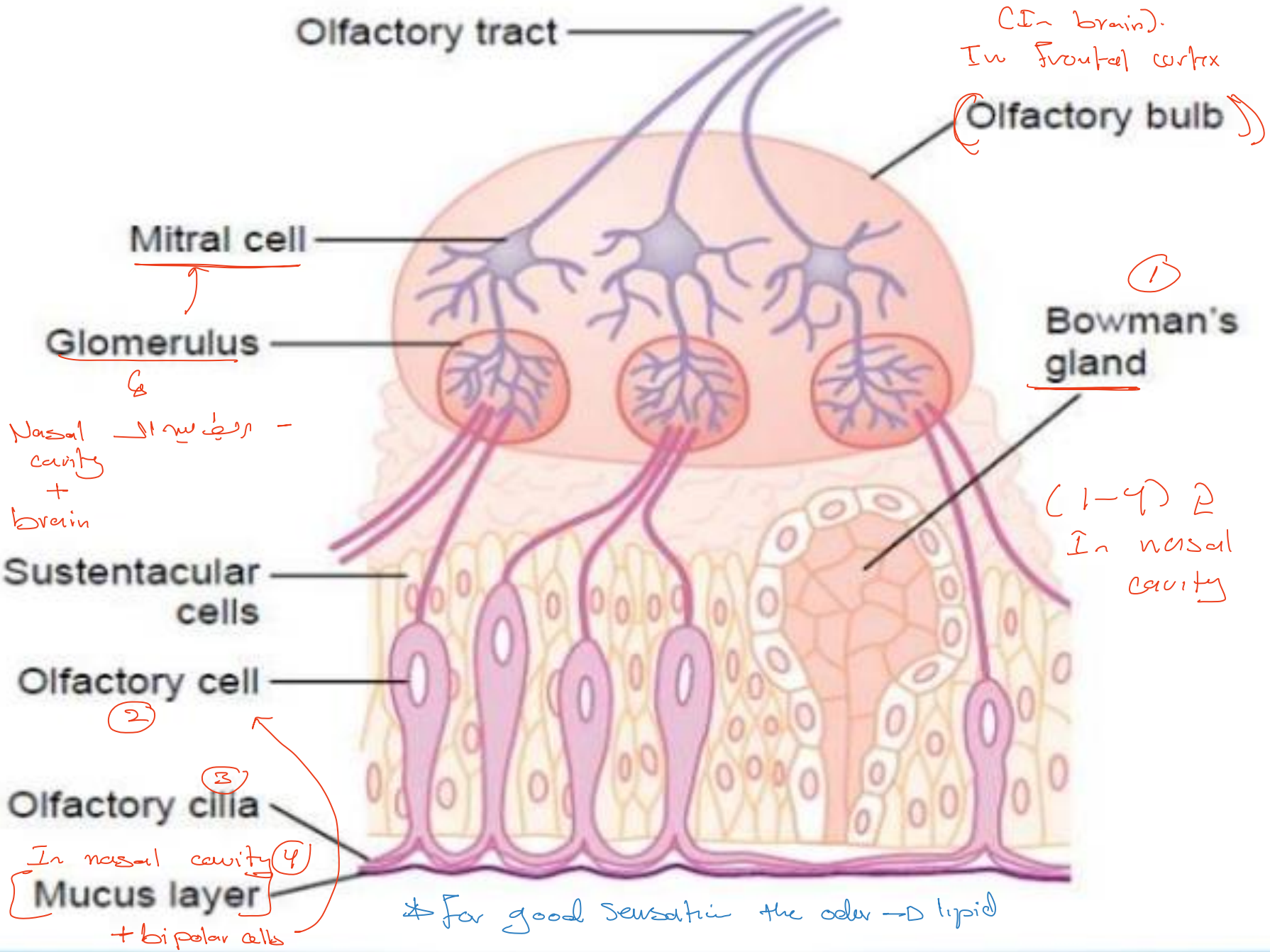
→ damage of Facial nerve → So loss of sensation is

Herpes zoster, also known as shingles, is caused by ant-2?3 the reactivation of the varicella-zoster virus (VZV), the same virus that causes varicella (chickenpox)

- Bell's palsy is an unexplained episode of facial muscle weakness or paralysis. This condition results from damage to the facial nerve (the 7th cranial nerve)

Physiology of olfaction





(In brain).
In frontal cortex

Nasal cavity + brain

(1-4) In nasal cavity

+ bipolar cells

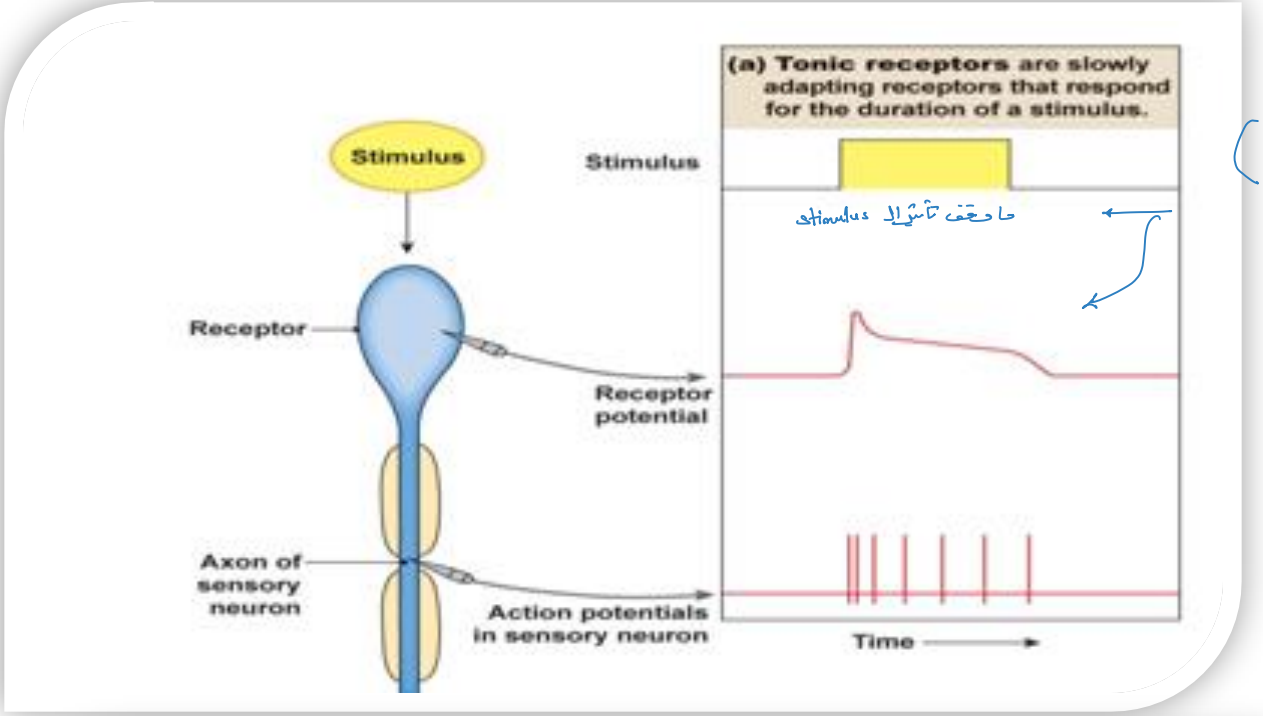
* For good sensation the odor → lipid

- A cilia of specific cilia express a specific protein receptors which can respond to different odorants

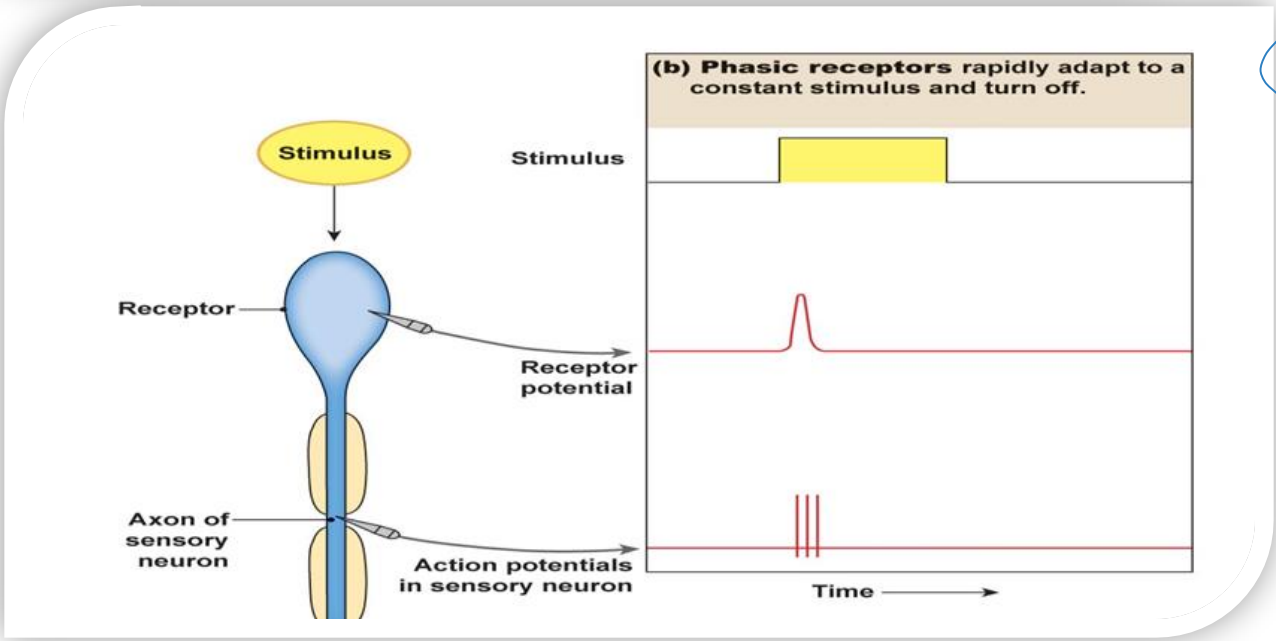
- One odor can bind to many different types of olfactory receptors protein

- G olfactory protein bind to GDP . But gets rid of GDP and binds with ATP and become very active

- Bind with AC that makes ATP converts into c AMP and bind to sodium channels and flow in sodium and calcium (adaptation response) and leaving chloride (component of mucus layer)



(Tonic adaptation) is Mechanoreceptors



(phasic adaptation)

Receptors adaptation

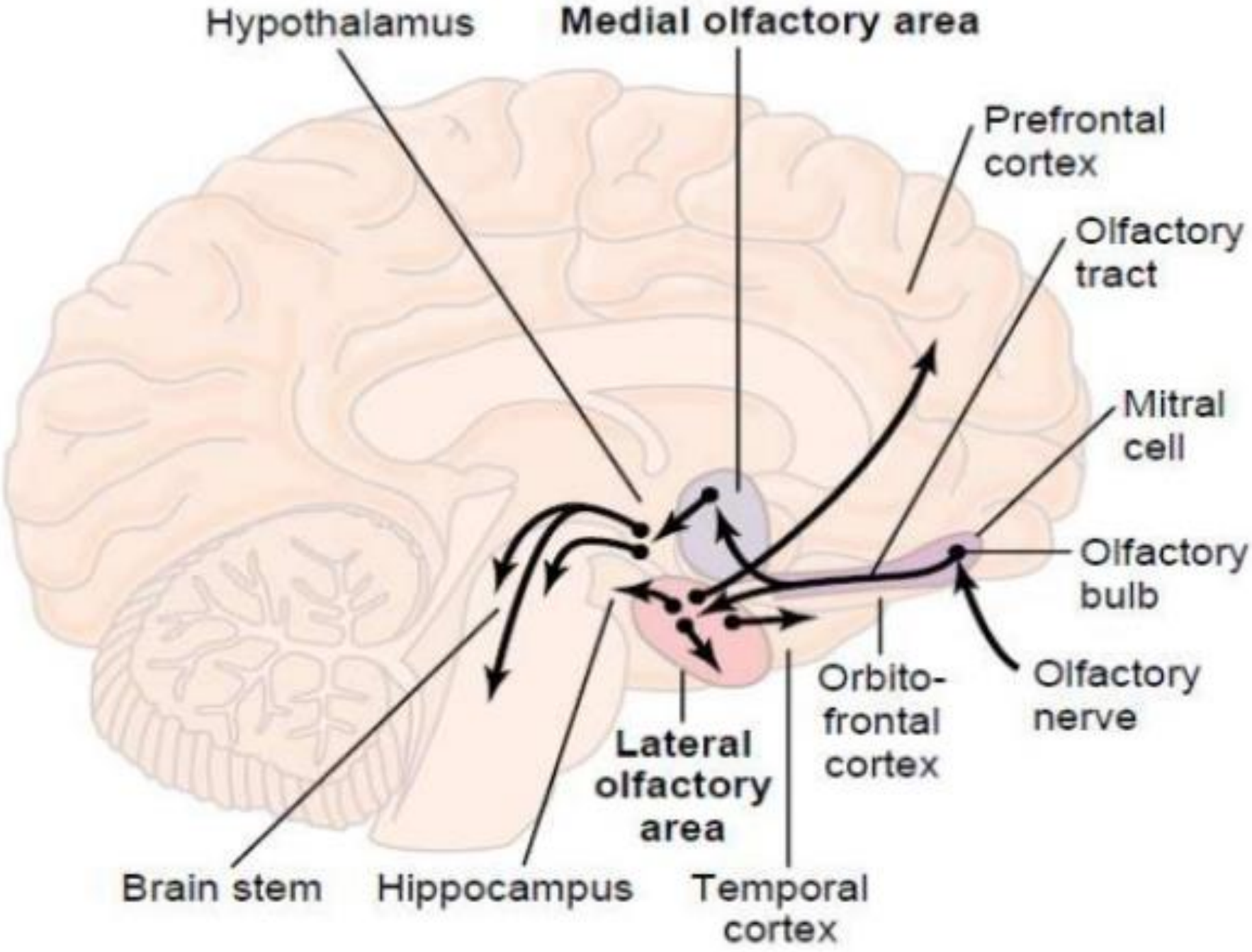
- The duration of a stimulus is coded by duration of action potentials.
- A longer stimulus generates longer series of APs.
- If a stimulus persists, some receptors adapt or stop responding
- There are 2 classes of receptors according to how they adapt:
  - Tonic receptors – slowly adapting – they fire rapidly when first activated, then they slow and maintain firing as long as the stimulus is present (Mechanoreceptors)
  - Phasic receptors – rapidly adapting receptors – rapidly firing when first activated but stop firing if the strength of stimulus remains constant

    انه البداية اعطاك تنبيه انه في واحدة معينة ثم خلص التنبيه

    - This type of reaction allows the body to ignore information that was evaluated and found not to be a threat to homeostasis (smell)

وظيفة

Granule cells connected glomerular with mitral and when they get excited, they releasing GABA inhibitory neurotransmitter .Granule cells neurons are interneurons that are thought to be involved with fine-tuning the processing of olfactory information by doing things like helping to sharpen the contrast between different odorants.


Hypothalamus
Medial olfactory area
Prefrontal cortex
Olfactory tract
Mitral cell
Olfactory bulb
Olfactory nerve
Orbito-frontal cortex
Lateral olfactory area
Brain stem
Hippocampus
Temporal cortex

olfactory bulb → lat. area, Media area

Lateral olfactory area gives branches to :

Into lat. region in brain

1. Deep part in the temporal lobe ; the incus and supply the piriform cortex

& Inside temporal bone

2. Limbic system

- نفس الـ Test لذلك الشم والتذوق
- Emotions متعلقات بالذاكرة والـ

Entorhinal cortex (EC) , Hippocampus (memories)

Amygdale (emotion)

Taste is 80% ⇒ Smelling

مرتبطات ببعض

Medial olfactory area gives branches to :

Subcallosal gyrus

Orbital frontal cortex

Some small fibers can cross over

Other fibers are ipsilateral

So smell can be bilateral

يعني لو سكرت منفذ معا الاخر

بضل اشم معا الثاني

All the olfactory nerves and taste nerves are intermingled

Taste is 80% smell

Anosmia (loss sensation of smelling)

Nasal infection

Paranasal sinus infection (كل رائحة بدها تدخل تذوب في الـ mucous layer لانها ادات)

Olfactory groove meningiomas

↳ prevent signal transduction

Trauma rhinorrhea

sign of neurodegenerative disease

AD , PD

damage of ciribriform plate

لذلك ال CSF بصير يطلع من الانف

- **Only volatile substances** that can be sniffed into the nostrils can be smelled

- Substance must be at least **slightly water soluble** so that it can pass through the mucus to reach the olfactory cilia.

- substance to be at least **slightly lipid soluble**, presumably because lipid constituents of the **cilium** itself are a weak barrier to non-lipid-soluble odorants.

تنسيش * [الـ Bio] X

ركز ← سلايد 17 , Shingles , Nerves

سلايد 11 , 12 (مهم)

سلايد 15 , 16 , 17