

① stimulation of neuron = small depolarization (DP)
 - 70mV to -60mV
 LG neurotransmitter

② opening of voltage-gated = bigger DP
 Na⁺ channels - 60mV to -50mV
 * threshold

③ Action Potential (A) opening of more VG Na⁺ channels = large DP
 - 50mV to +30mV

③ opening of VG K⁺ channels = large RP (repolarization)
 +30mV to -50mV

③ hyperpolarization due to REFRACORY PERIOD
 excess K⁺ out
 → 50mV to -80mV

④ Pumping of Na⁺ & K⁺ ions back to original compartments

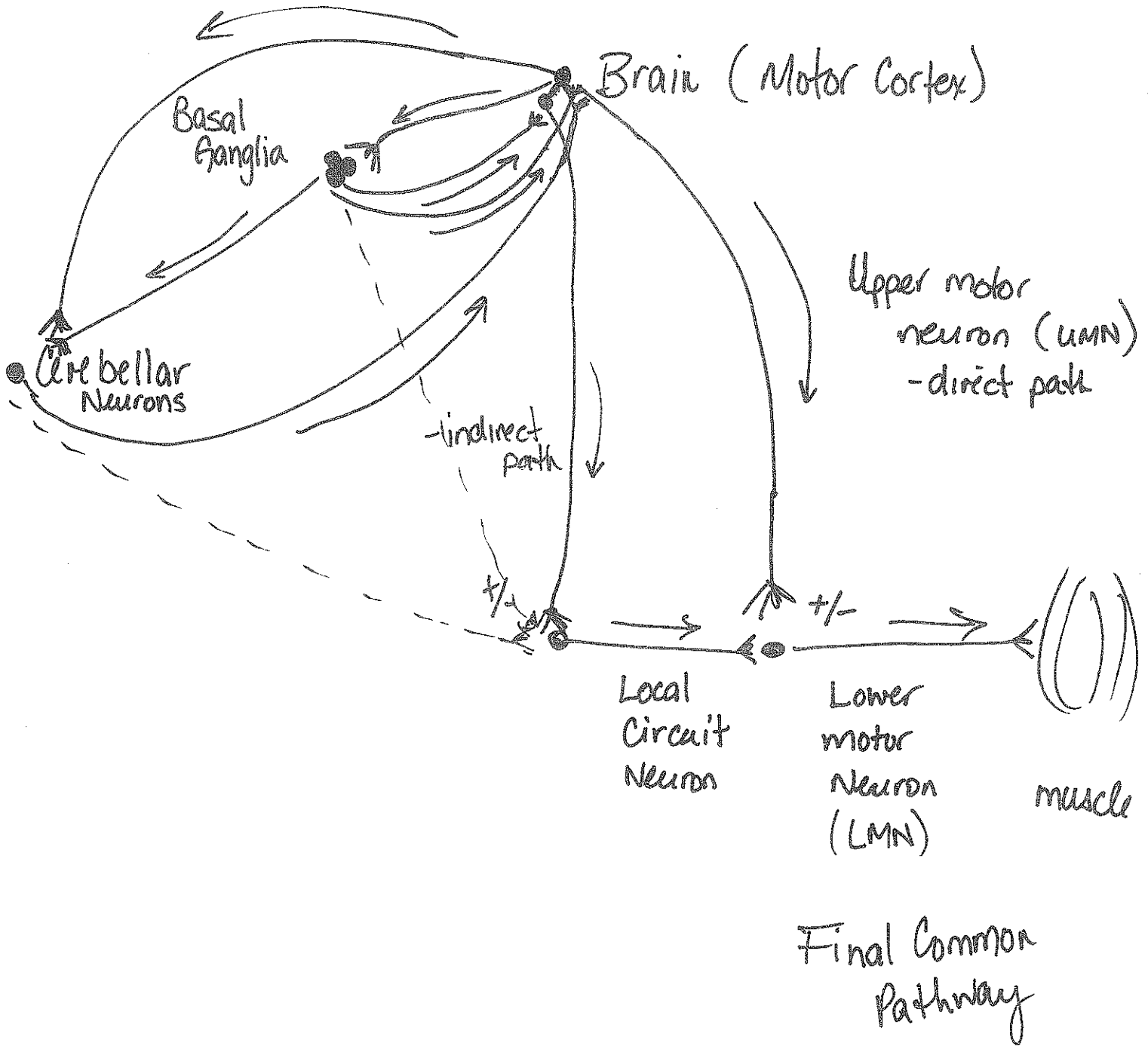
ECF

Na⁺ out

Resting Membrane Potential -70mV

K⁺ in

cytoplasm



Posterior Column

- touch, proprioception, vibration, texture, shape recognition
- receptors: skin, joints, muscles
- 1st order receptor: posterior column to medulla oblongata
- 2nd order receptor: medulla oblongata to thalamus
- 3rd order receptor: thalamus to primary somatosensory area

Spinothalamic (Anterior, Lateral)

- pain, heat, tickle, itch, pressure
 - o lateral: pain and temperature
 - o anterior: tickle, itch, pressure
- receptors: trunk, neck, limbs
- 1st order receptor: dorsal root ganglion
- 2nd order receptor: posterior gray horn to thalamus
- 3rd order receptor: thalamus to primary somatosensory area

Spinocerebellar (Anterior, Posterior)

- balance, posture, coordination
- not consciously perceived
- receptors: lower limbs
 - 1st order receptor: muscle spindles & tendon organs
 - 2nd order receptor: dorsal gray horn to thalamus
 - -3rd order receptor: thalamus to cerebellum

Somatic

- Lower motor neuron from anterior gray horn
- Target: skeletal muscle
- NT: Ach
- “one neuron, one NT, one target” system

ANS: Sympathetic

- short preG neurons – from lateral gray horn
- long postG neurons
- ganglion: sympathetic trunk & prevertebral (celiac, superior mesenteric, inferior mesenteric)
- preG: lateral gray horns of T1 – L2
- target: cardiac and smooth muscle, glands
- NT: ACh (preG) or NE (postG)

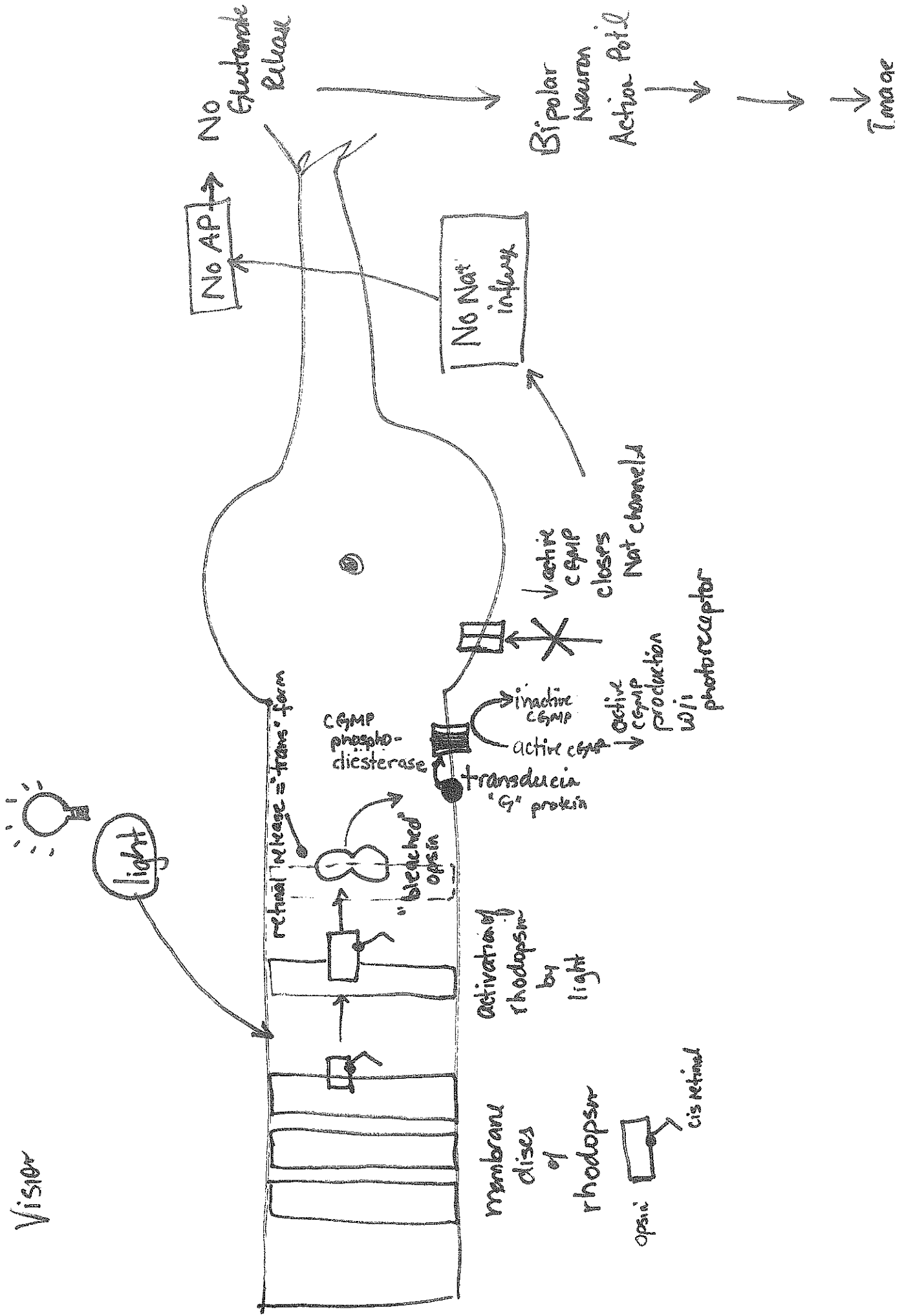
ANS: Parasympathetic

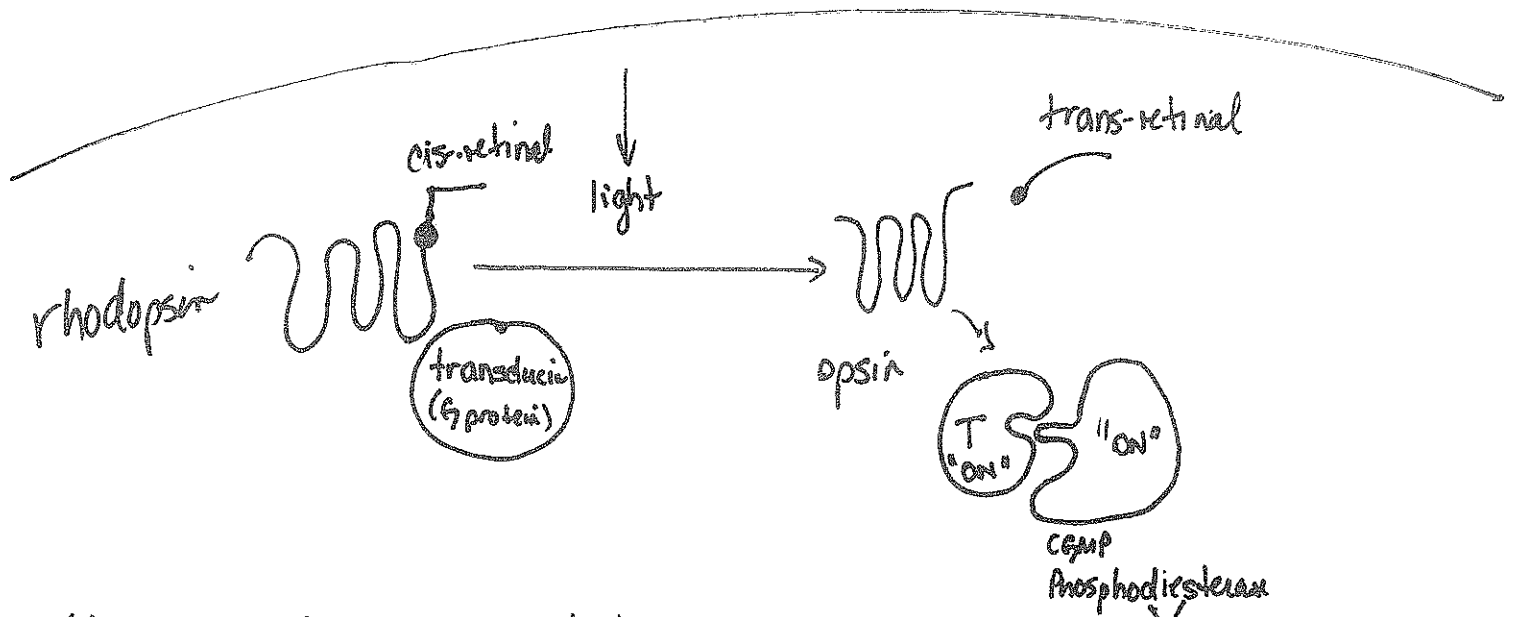
- long preG neurons: from lateral gray horn
- short postG neurons
- ganglion: terminal ganglion
- preG: III, VII, IX and X, lateral gray horns of S2 – S4
- target: cardiac and smooth muscle, glands
- NT: Ach (preG and postG)

“two neuron, 2 NT, multiple target “system

Photoreceptor

Visier





resting potential of rod in dark:

- 30mV
- caused by open channels for Na^+ , Ca^{2+} & K^+

GTP → cGMP

↓ cGMP levels
close ligand-gated Na^+
channels

↓
hyperpolarization of
photoreceptor

↓
↓ glutamate release from P.R

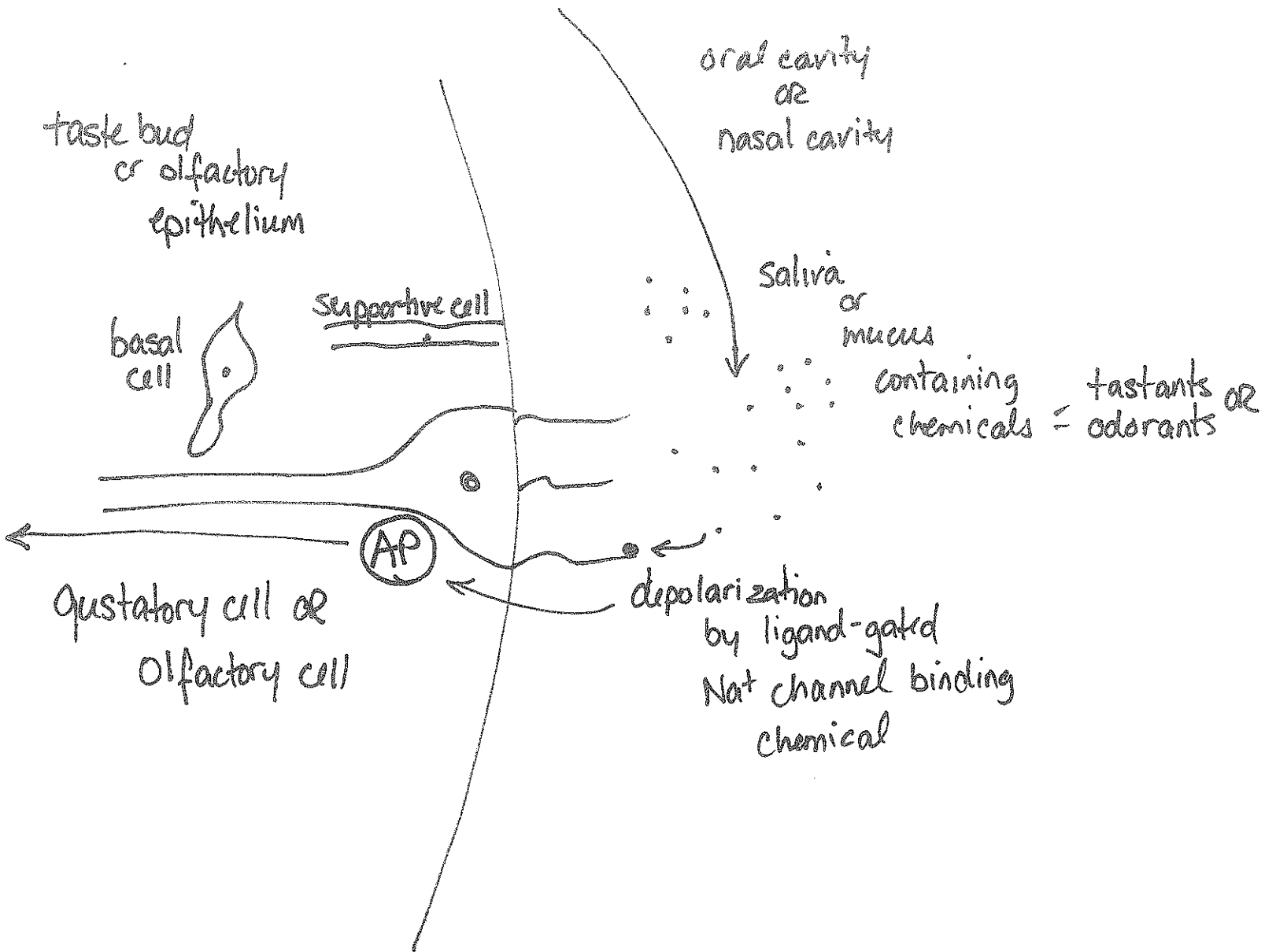
↓
AP by bipolar & ganglion
neurons

↓

Visual
Processing

← AP starts in optic nerve

Taste + Smell - the Chemical Senses



Gustatory cell - 1 cell; 1 channel; 1 tastant = Tastant specific
type per taste bud ; type per cell ; binding eg. HCl channels
 sour taste bud

Olfactory cell - 1 cell, multiple channels, multiple odorants
 in the olfactory epithelium