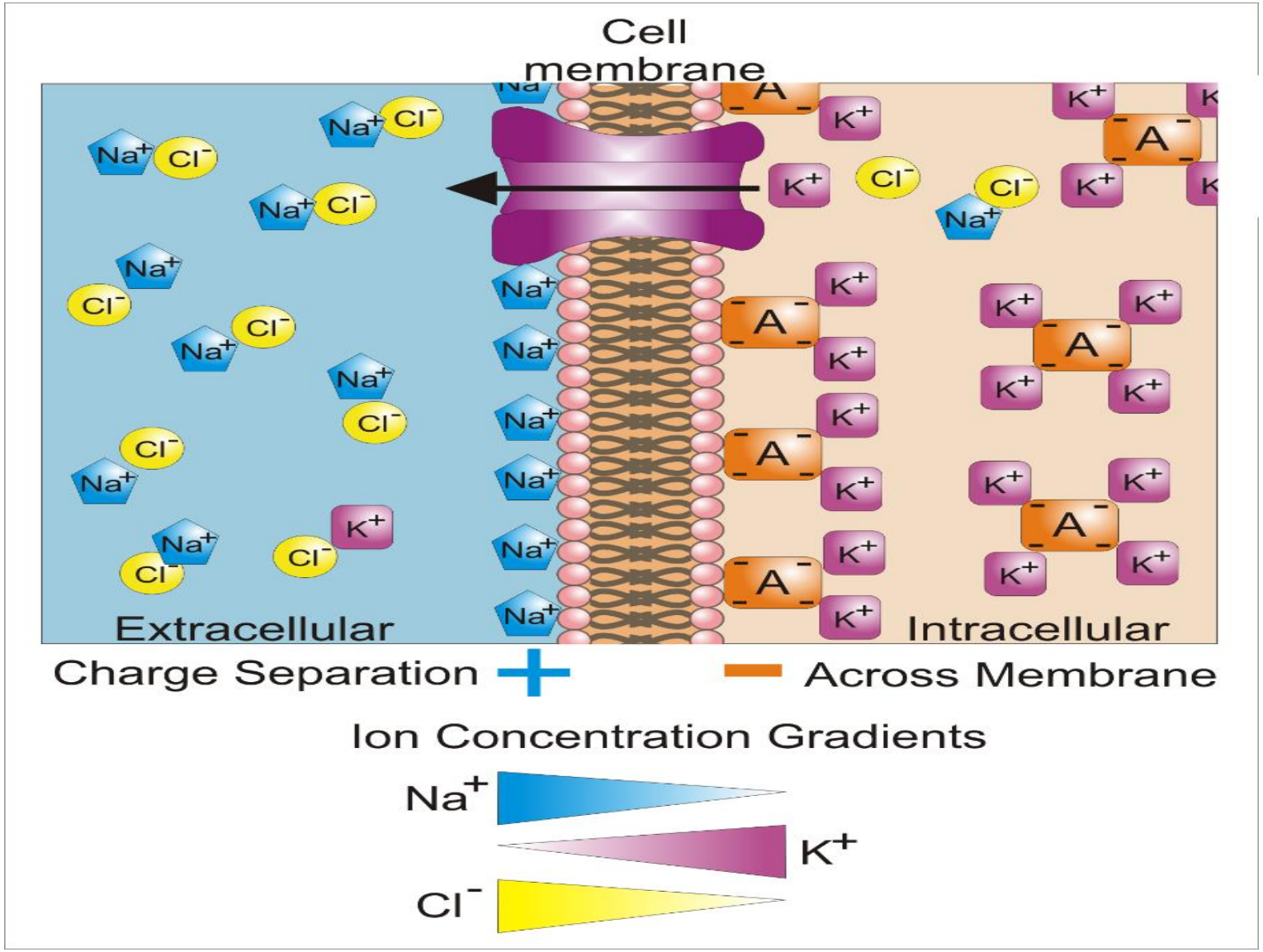
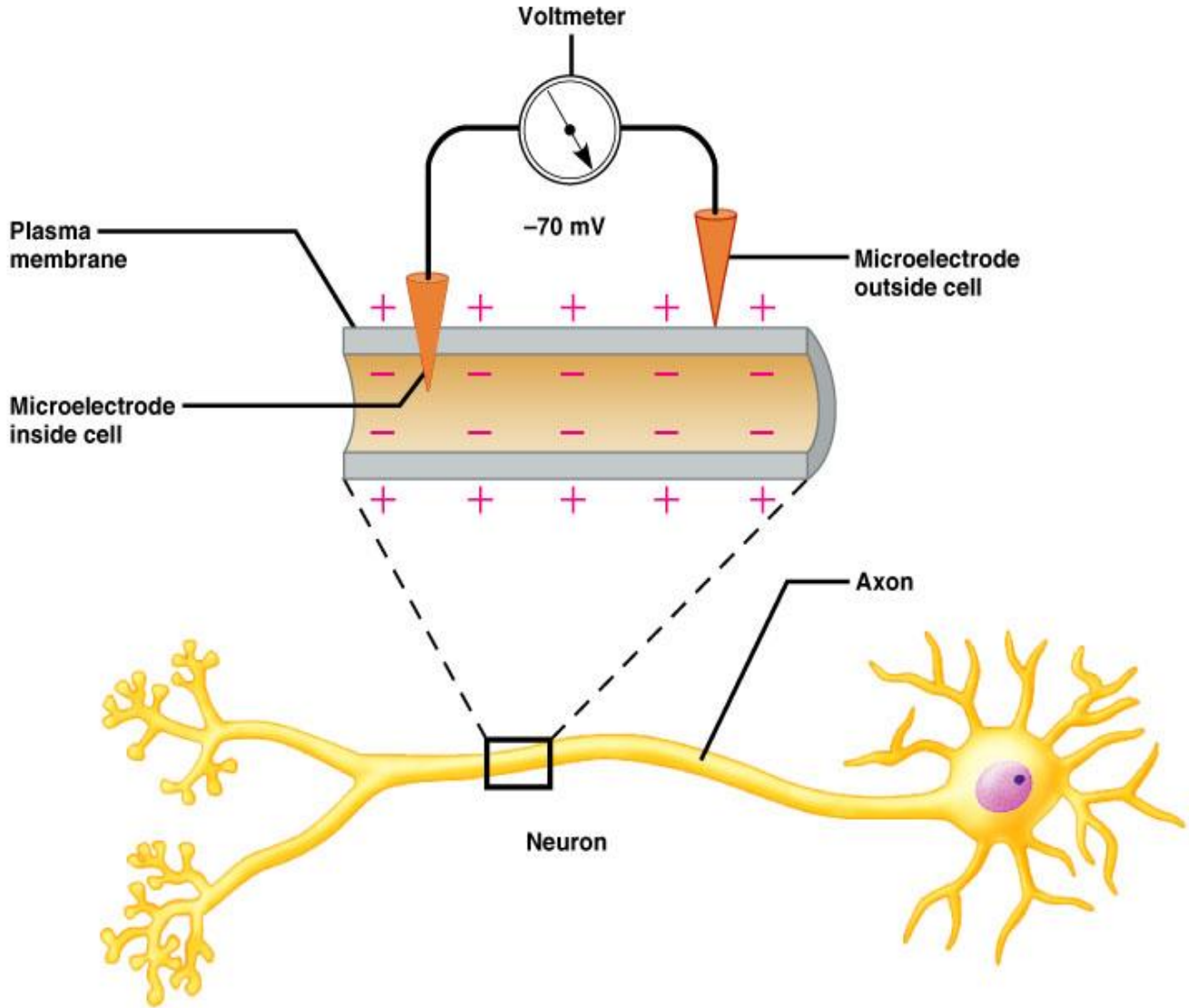
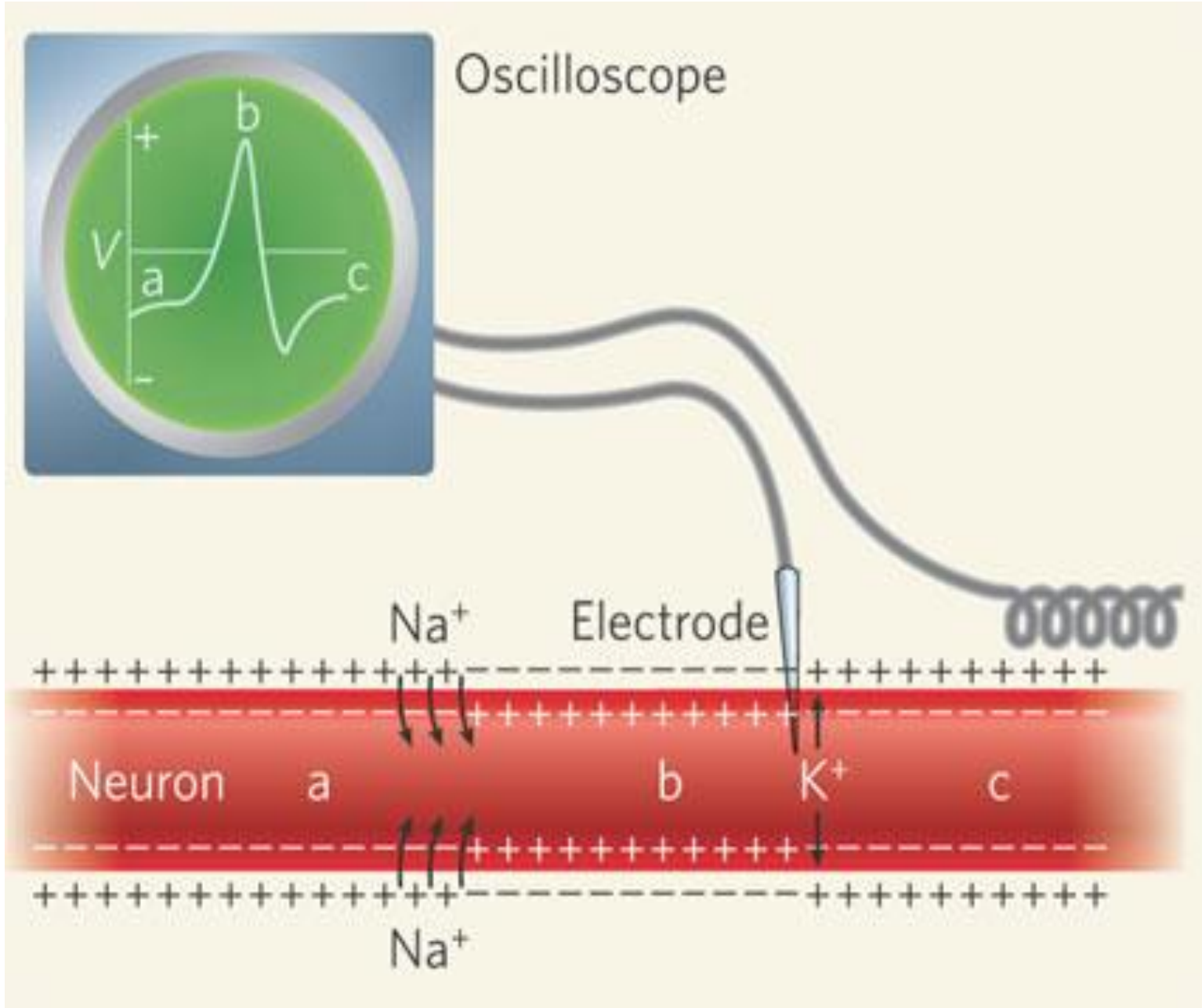
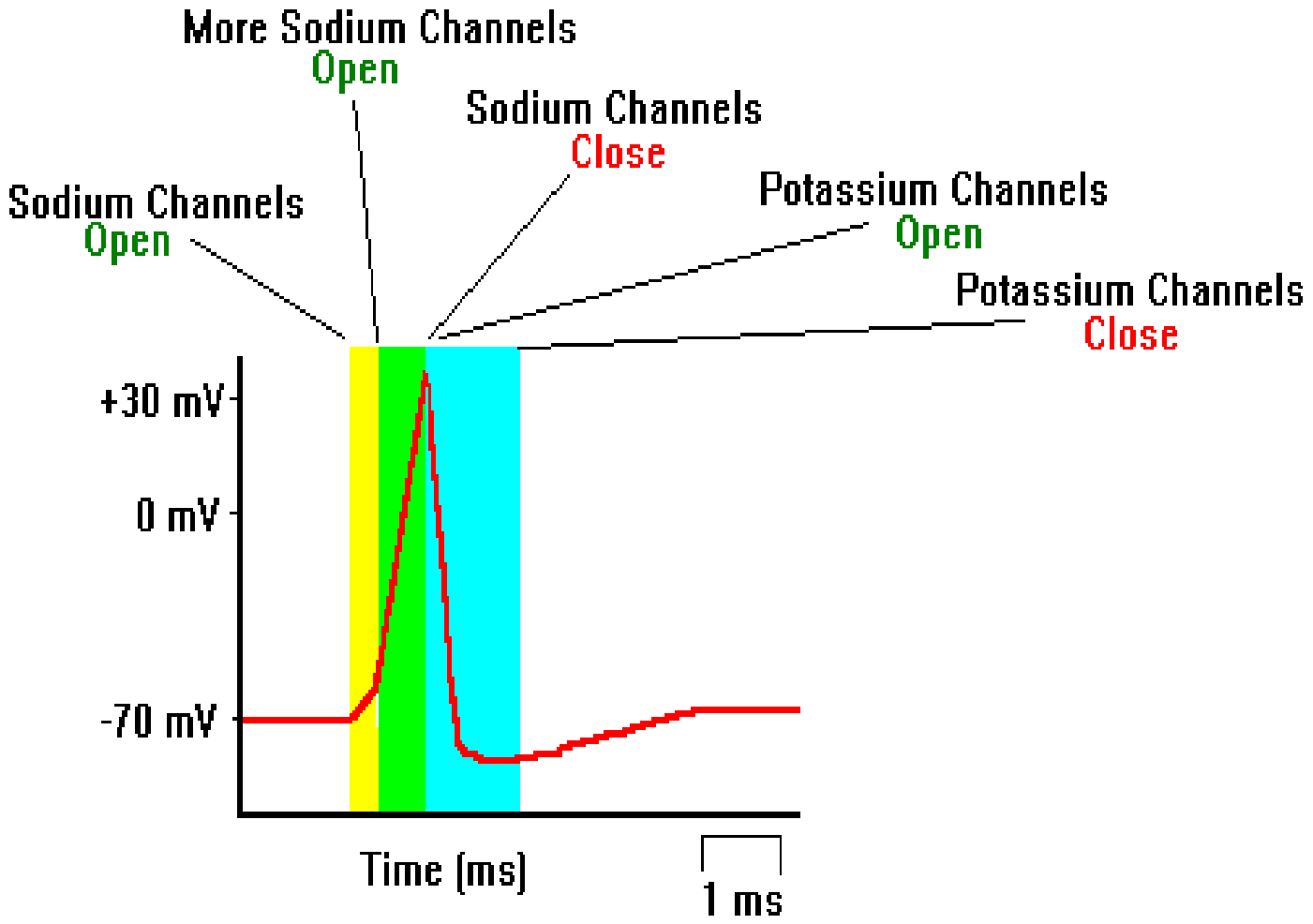
مبانی علوم اعصاب، جلسه هشتم

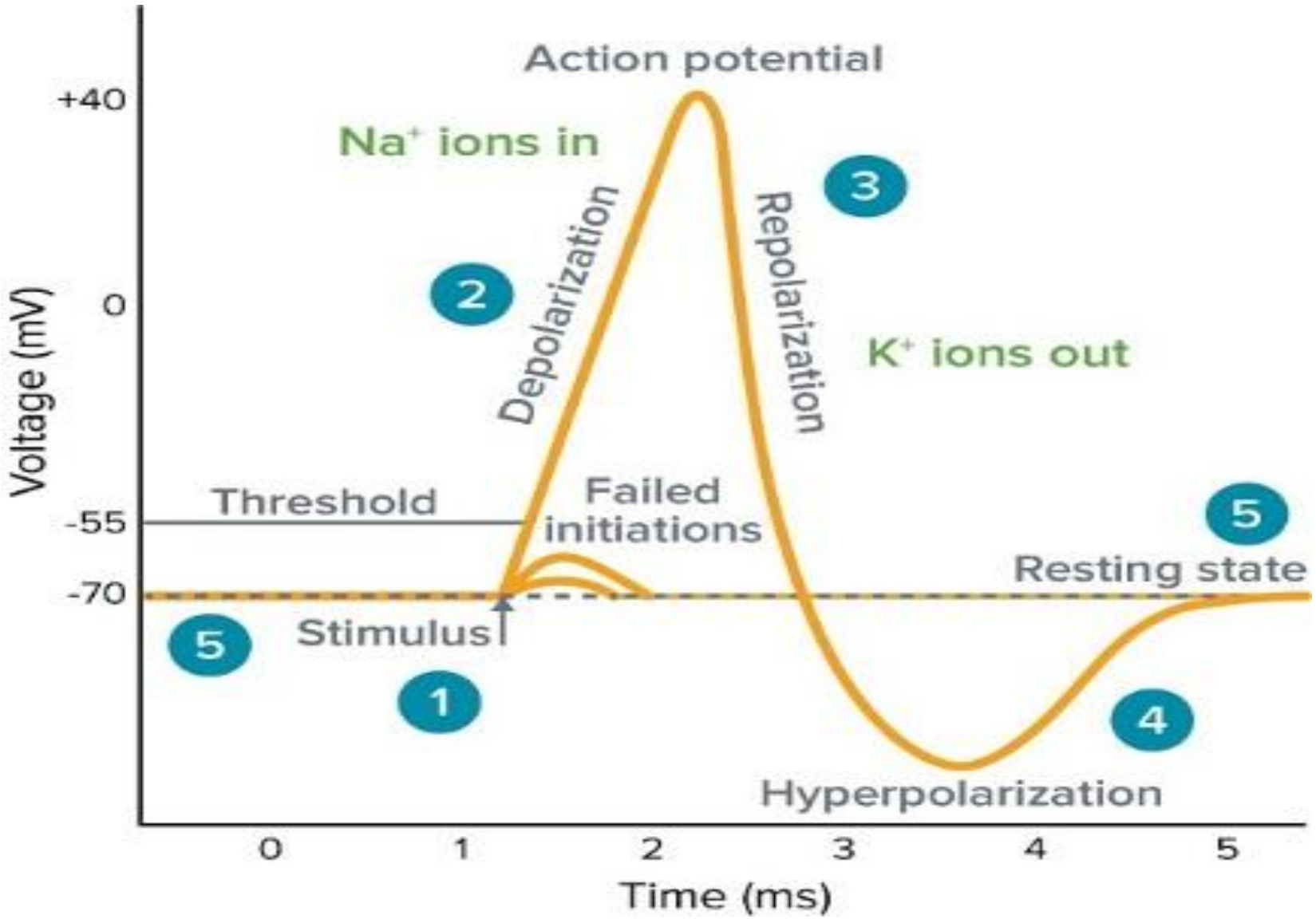
پتانسیل های الکتریکی استراحت وعمل


Cell membrane
Extracellular
Intracellular
Charge Separation
Across Membrane
Ion Concentration Gradients
Na+
K+
Cl−




Oscilloscope
+
b
V
a
c
–
Na+
Electrode
Neuron
a
b
K+
c
Na+


More Sodium Channels
Open
Sodium Channels
Close
Sodium Channels
Open
Potassium Channels
Open
Potassium Channels
Close
+30 mV
0 mV
-70 mV
Time (ms)
1 ms


Action potential
+40
Na⁺ ions in
Depolarization
Repolarization
3
2
0
K⁺ ions out
Voltage (mV)
Threshold
Failed initiations
5
-55
Resting state
-70
5
Stimulus
1
4
Hyperpolarization
0
1
2
3
4
5
Time (ms)

مبانی علوم اعصاب، جلسه نهم

گیرنده های حسی

مقایسه مسیرهای عصبی حسی

Definition of Sensory Receptors:

- Receptors are specialized cells / nerve endings which respond to stimuli.
- These generate impulses which inform CNS about changes in internal & external environment.
- Receptors are transducers, which convert various forms of energy into action potential or electrical energy.

Types of Sensory Receptors

- Based on energy transduced, sensory receptors fall into five categories:
  - Mechanoreceptors
  - Chemoreceptors
  - Electromagnetic receptors
  - Thermoreceptors
  - Pain receptors

مبانی علوم اعصاب، جلسه دهم

حس های پیکری و ویژه(قسمت اول)

Categories

- Somatic Senses
  - Touch
  - Pressure
  - Temperature
  - Pain
- Special Senses
  - Smell
  - Taste
  - Hearing
  - Equilibrium
  - vision

Somatic senses

fine touch, deep touch, pressure, temp, pain, joint and muscle position, muscle stretch

Visceral senses

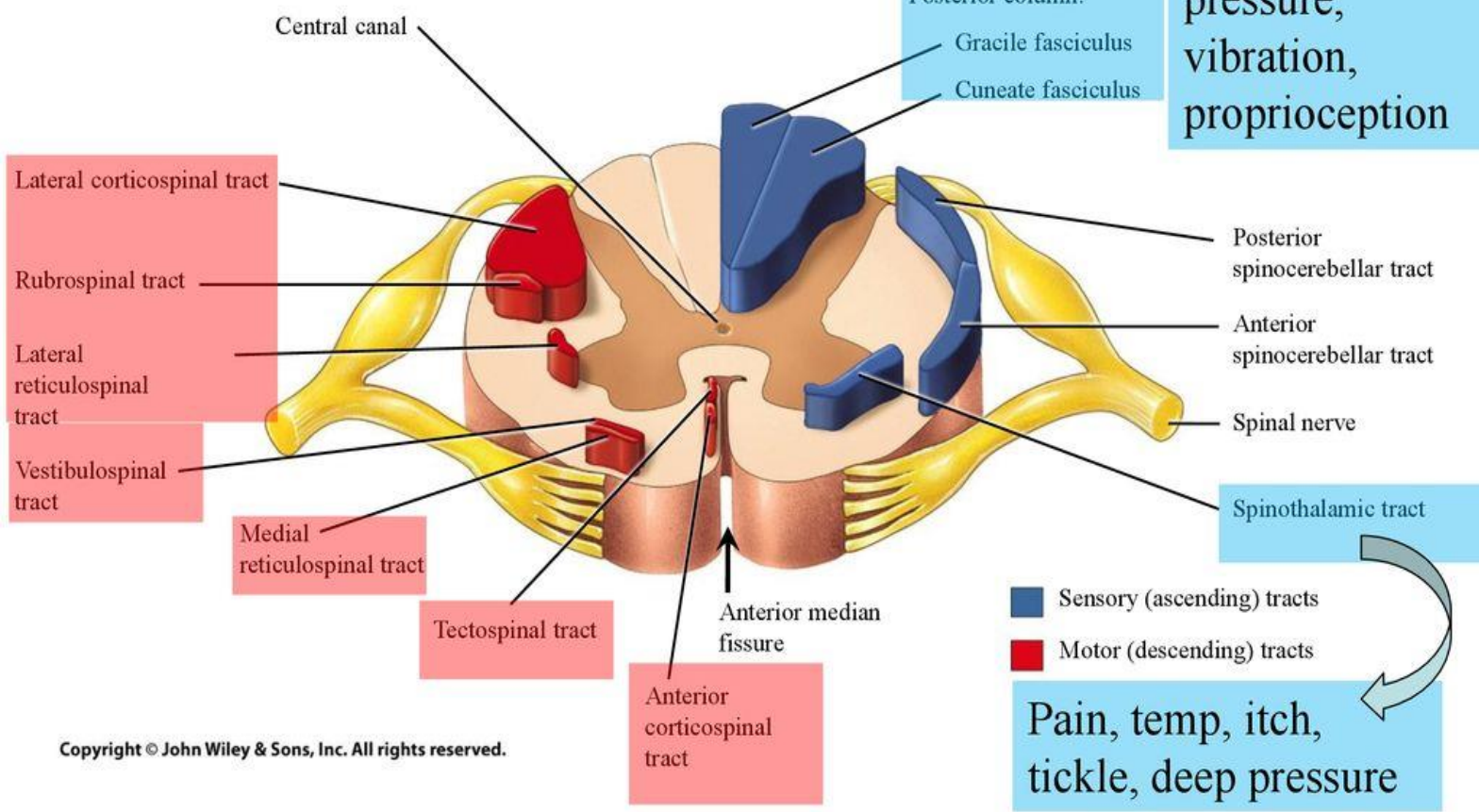
pH, O_2, CO_2, OsM, glucose, blood pressure, lung inflation, stomach stretch

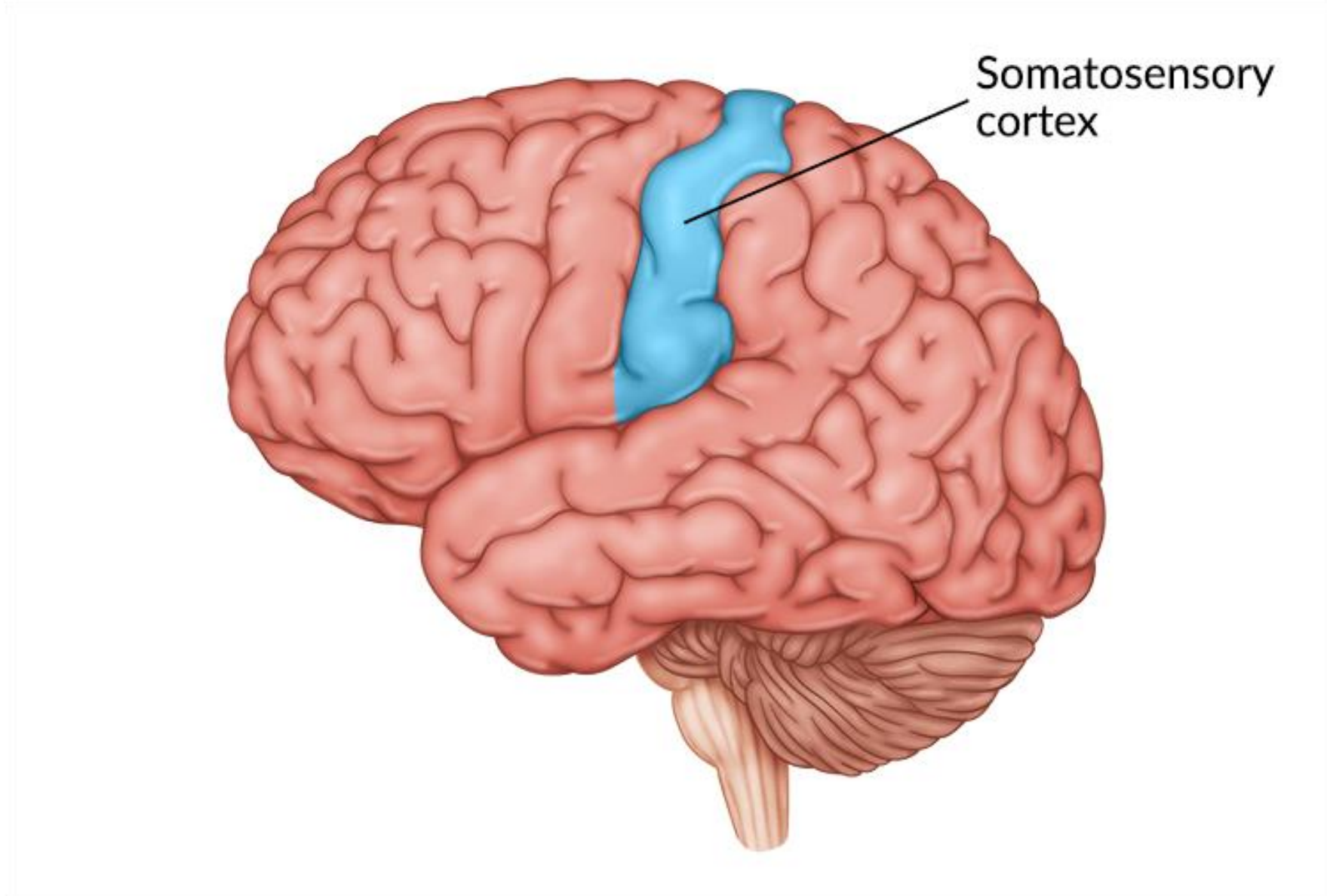
Special senses

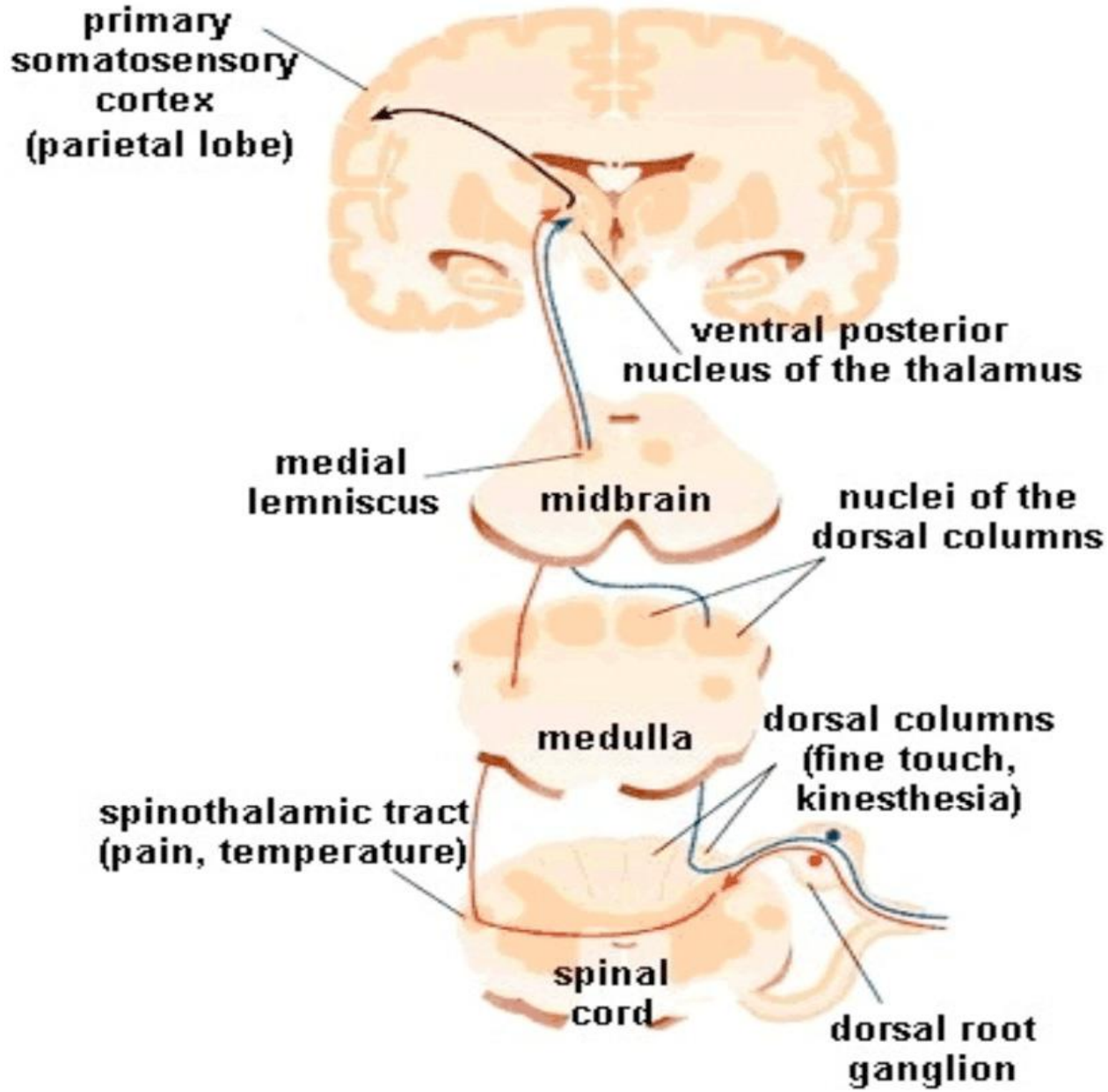
olfaction, gustation, hearing, equilibrium, vision

Major Sensory and Motor Tracts

Direct and Indirect Motor Pathways




Somatosensory
cortex


primary somatosensory cortex (parietal lobe)
ventral posterior nucleus of the thalamus
medial lemniscus
midbrain
nuclei of the dorsal columns
medulla
dorsal columns (fine touch, kinesthesia)
spinothalamic tract (pain, temperature)
spinal cord
dorsal root ganglion

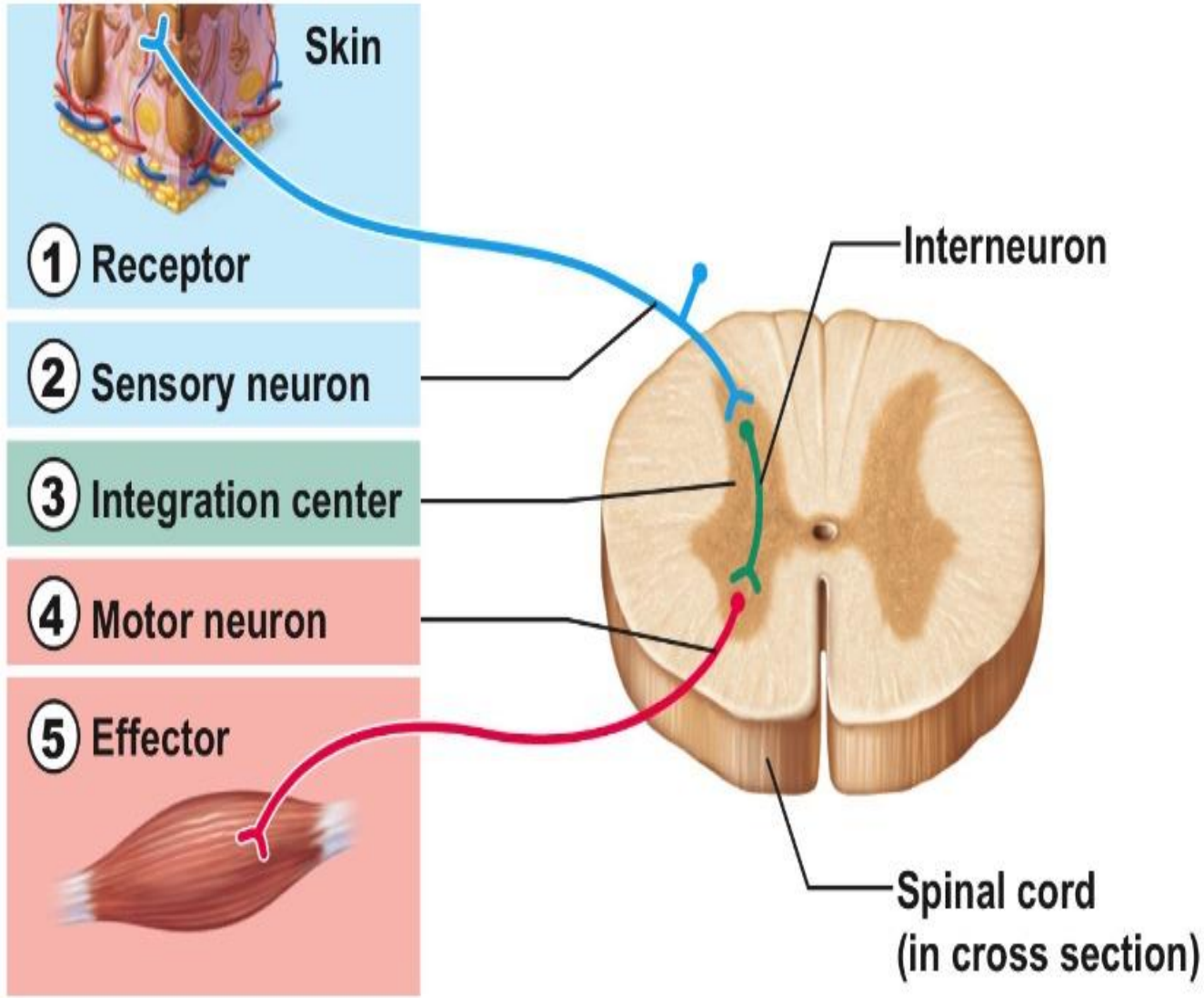
مبانی علوم اعصاب، جلسه یازدهم

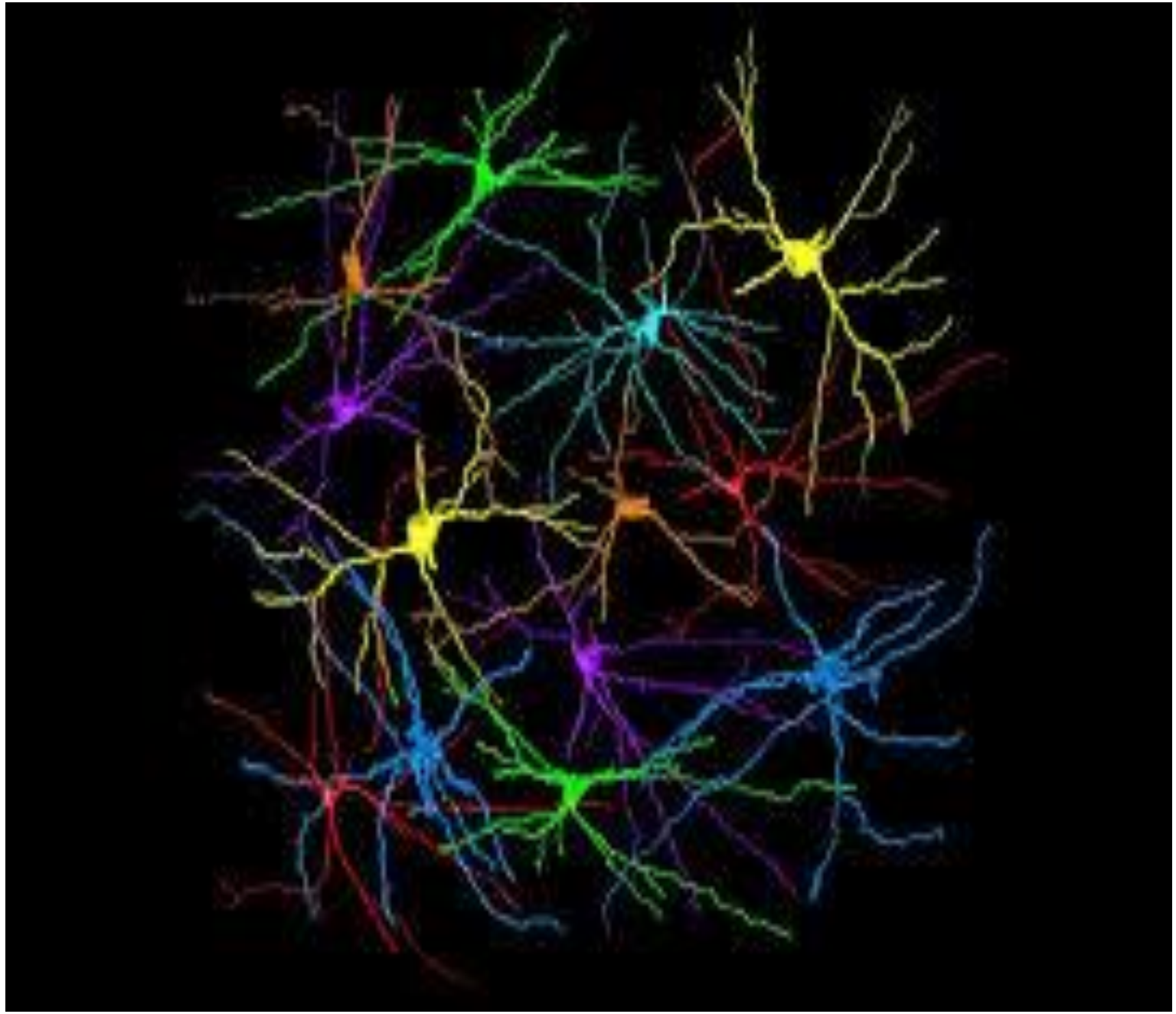
حس های پیکری و ویژه(قسمت دوم)

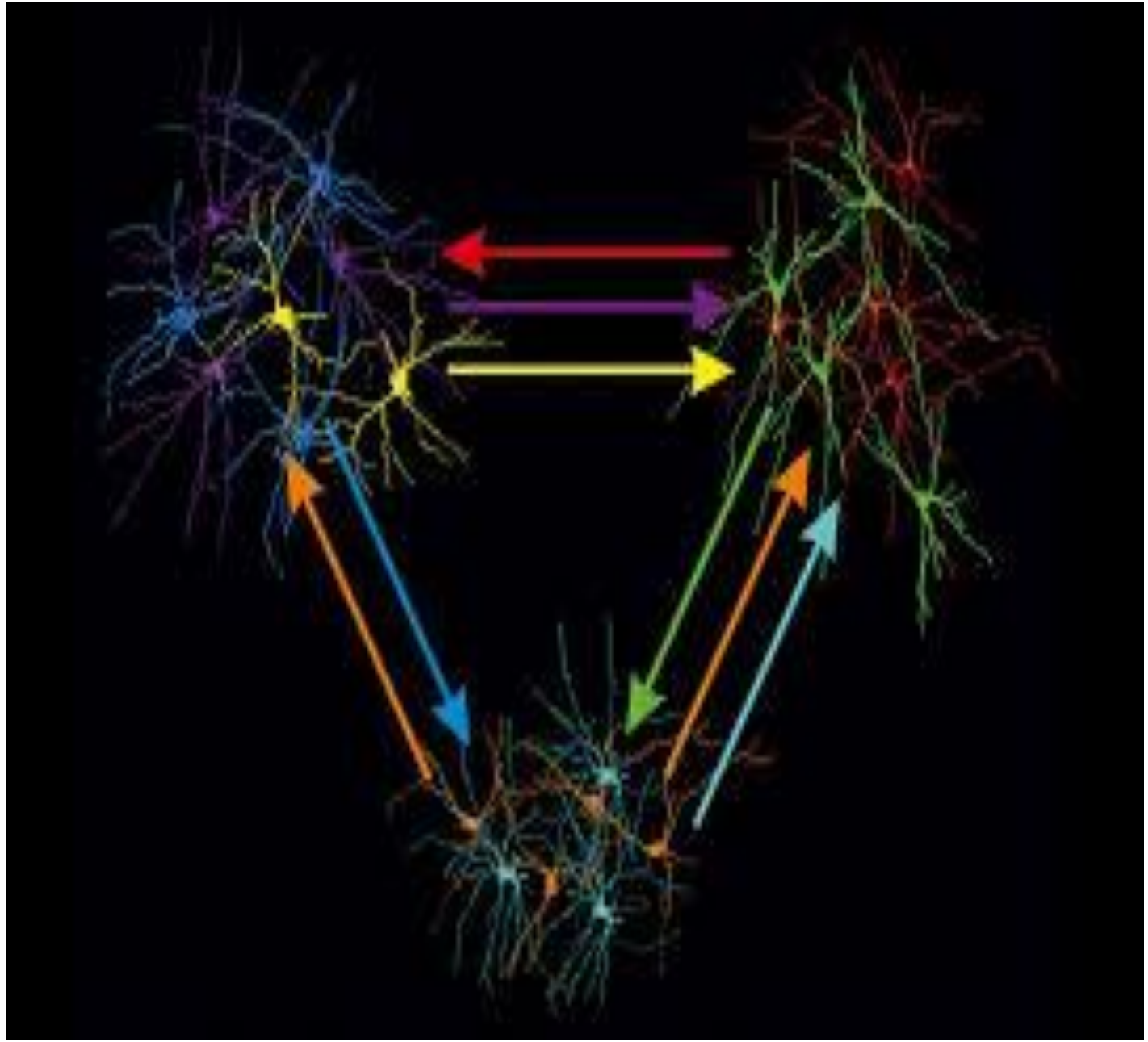
مبانی علوم اعصاب، جلسه دوازدهم

بازتاب های عصبی

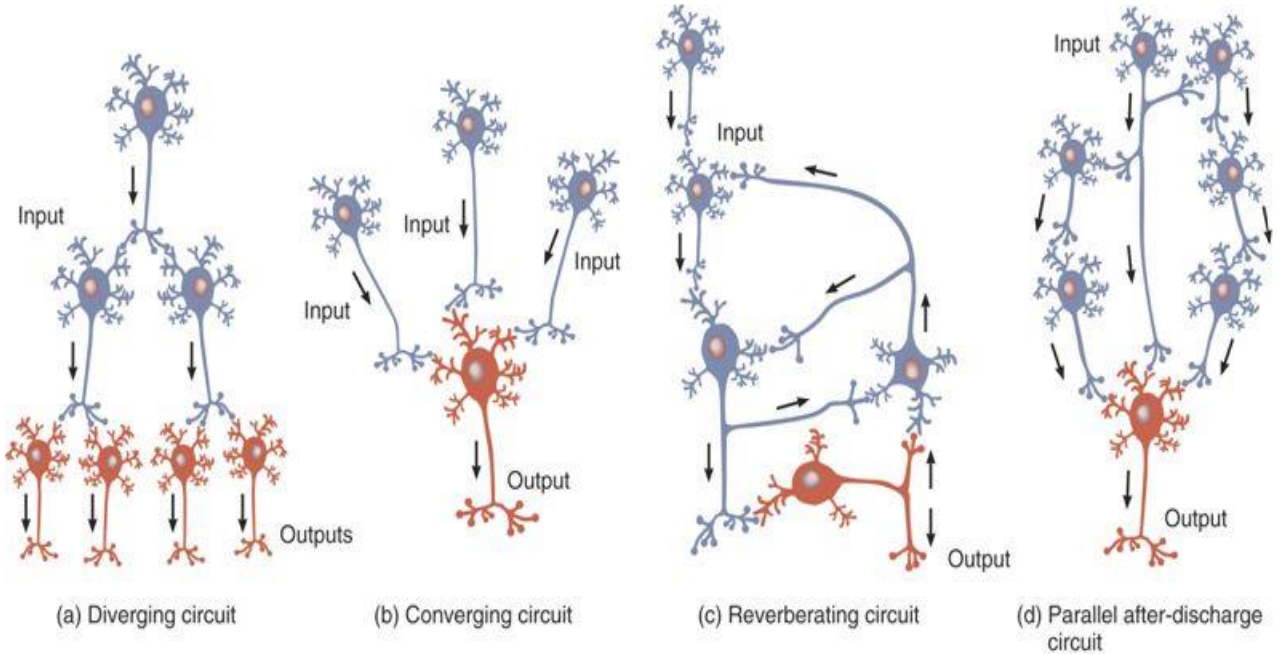
مدارهای نورونی


Skin
1 Receptor
2 Sensory neuron
3 Integration center
4 Motor neuron
5 Effector
Interneuron
Spinal cord
(in cross section)





Neuronal Circuits



(a) Diverging circuit (b) Converging circuit (c) Reverberating circuit (d) Parallel after-discharge circuit

- Diverging -- single cell stimulates many others
- Converging -- one cell stimulated by many others
- Reverberating -- impulses from later cells repeatedly stimulate early cells in the circuit (short-term memory)
- Parallel-after-discharge -- single cell stimulates a group of cells that all stimulate a common postsynaptic cell (math problems)

مبانی علوم اعصاب، جلسه سیزدهم

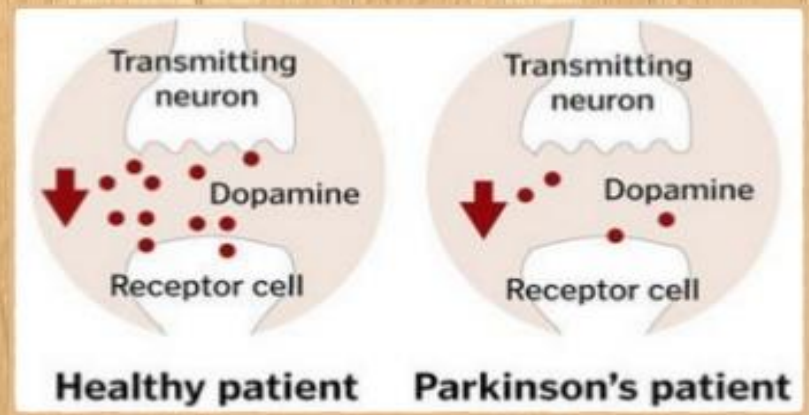
ناقلین عصبی

Neurotransmitter	Behavioral effect
Dopamine	Pleasure, appetite suppression
Norepinephrine	Arousal, appetite suppression
Acetylcholine	Arousal, cognitive enhancement
Glutamate	Learning, memory enhancement
Serotonin	Mood modulation, appetite suppression
Beta-endorphin	Reduction of anxiety and tension
Gamma-amino-butyric acid (GABA)	Reduction of anxiety and tension

Neurotransmitters

An excess or lack of neurotransmitters can impact our behavior.

For example, Parkinson's Disease causes the brain cells that produce **dopamine** to die. The lack of dopamine in the body leads to shaking, irregular movements, and loss of motion control. Lack of dopamine also depresses your mood, which affects your personality and habits.



مبانی علوم اعصاب، جلسه چهاردهم

Neuroplasticity


Neuroplasticity

neu·ro·plas·tic·i·ty

/ˌn(y)o͝orōˌplaˈstisədē/

noun

1. The brain's ability to reorganize itself by forming new neural connections throughout life… in response to new situations or to changes in [the] environment.

- Medicine.net

World Science Festival

Neuroplasticity occurs in the brain under two primary conditions:

1. During normal brain development when the immature brain first begins to process sensory information through adulthood (developmental plasticity and plasticity of learning and memory).

2. As an adaptive mechanism to compensate for lost function and to maximize remaining functions in damaged brain.

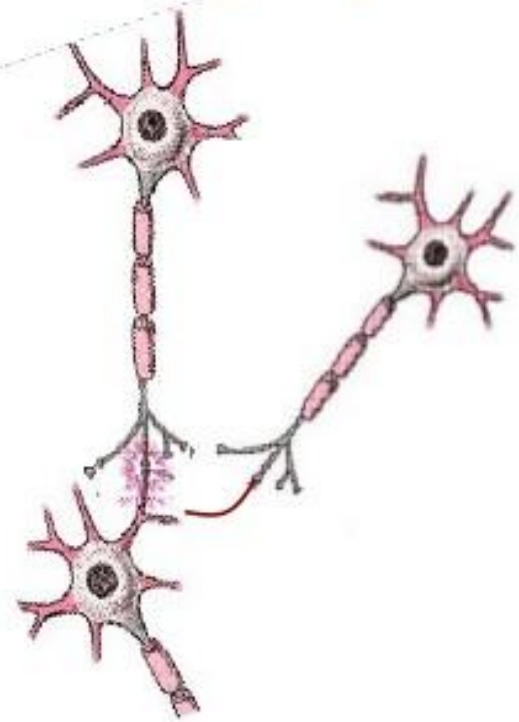
2 Types of Plasticity

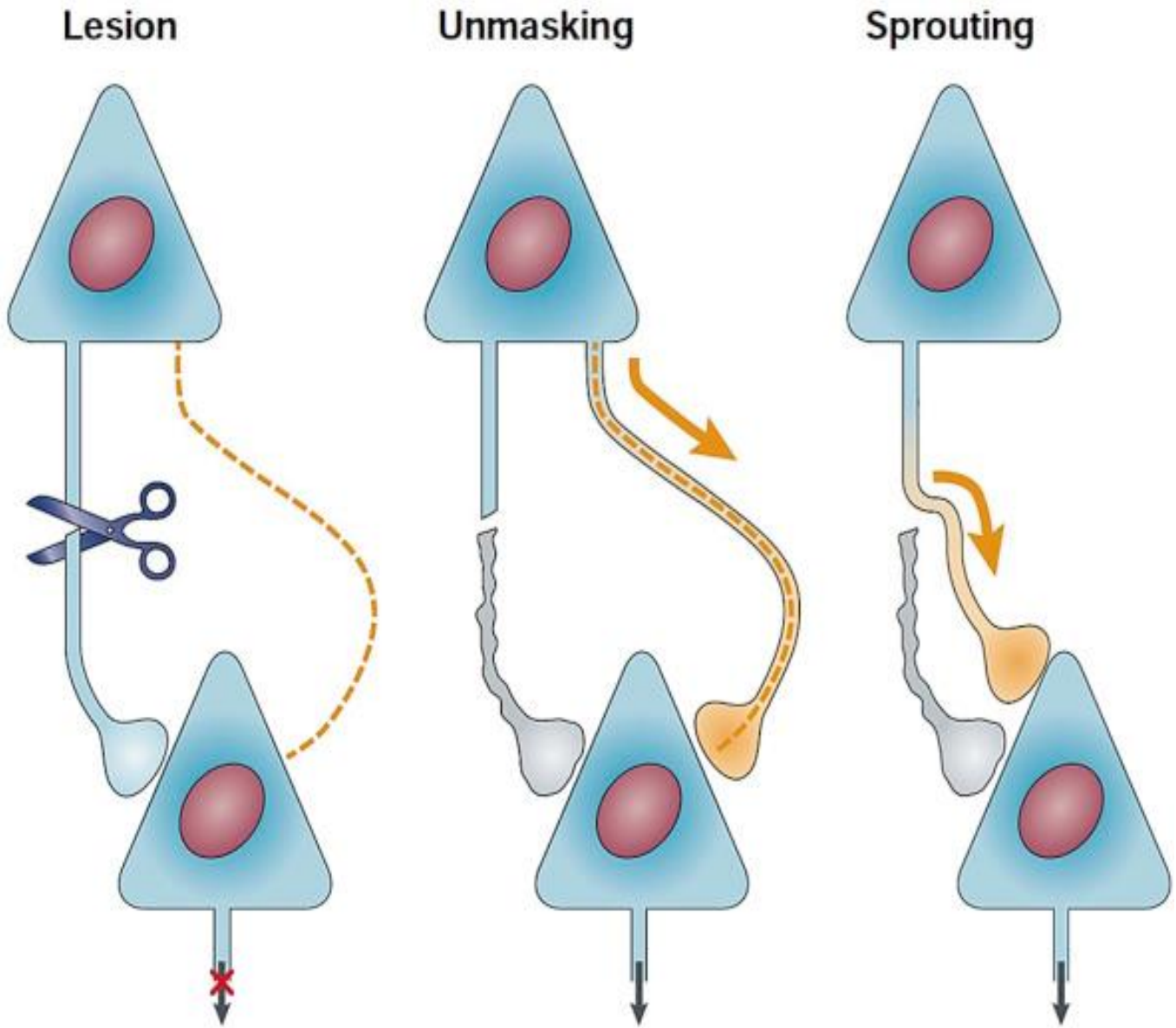
1. Structural Plasticity – Actual changing of the neuron or actually growing new neurons.
   - Neurogenesis only occurs in the hippocampus
2. Functional Plasticity – When an area of the brain takes up a new function to replace a damaged area of the brain.

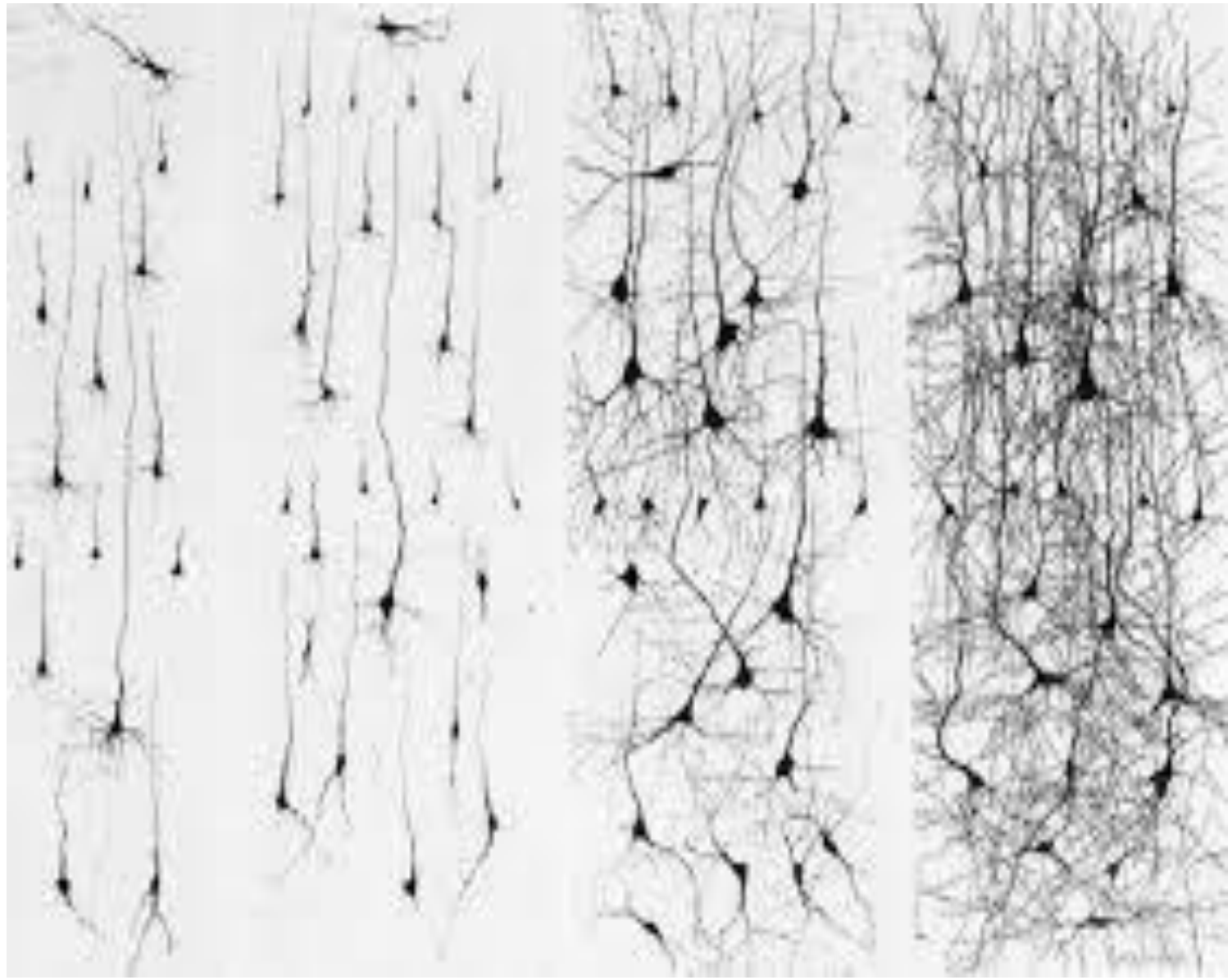
Mechanism of Neuroplasticity in CNS after an injury

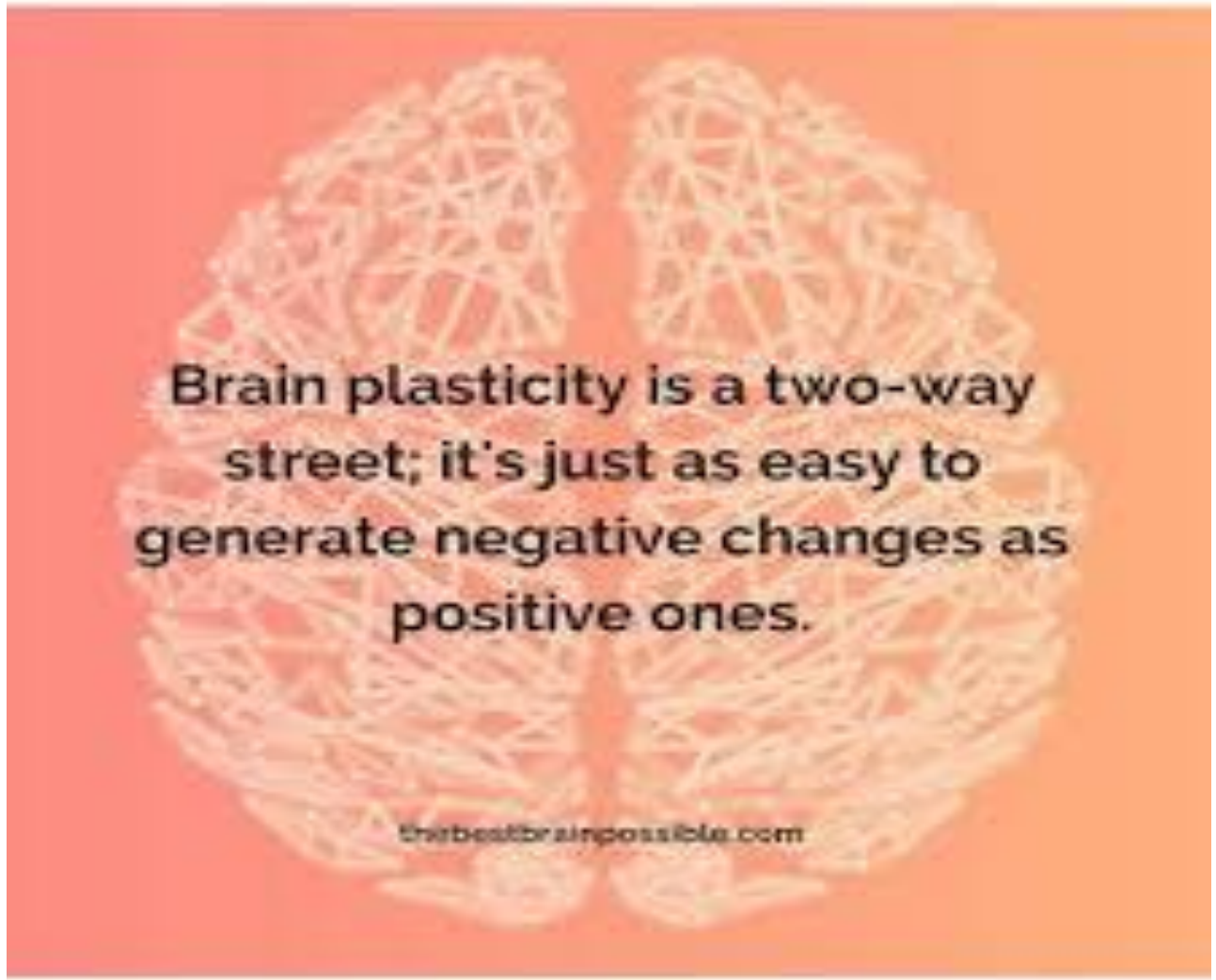
- Acute reorganization
  - Unmasking of previously present lat synapses.
- Chronic reorganization
  - Changes in synaptic efficacy.
  - Growth of new synapses by axonal sprouting.

These plasticity changes in CNS can occur at multiple levels like cerebral cortex, brain stem and spinal cord.




Lesion
Unmasking
Sprouting




Brain plasticity is a two-way street; it's just as easy to generate negative changes as positive ones.
thebestbrainpossible.com