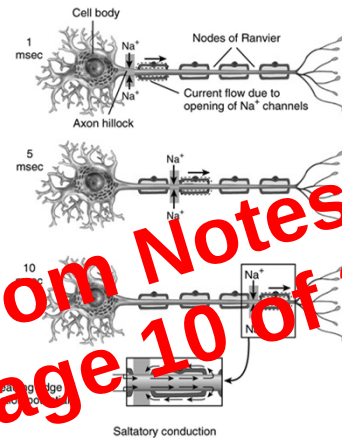


Conduction of Nerve Impulses



Synaptic Transmission

- Similar sequence of events occurs at
 - Synapse (neuron-neuron)
 - Neuromuscular junction (neuron-muscle fiber)
 - Neuroglandular junction (neuron-gland)
- Triggered by action potential (nerve impulse)
- Components of synapse:
 - Sending neuron: presynaptic neuron (releases neurotransmitter)
 - Space between neurons: synaptic cleft
 - Receiving neuron: postsynaptic neuron

Synaptic Transmission

- Action potential arrives at presynaptic neuron's end bulb
- Opens voltage gated Ca^{2+} channels $\rightarrow \text{Ca}^{2+}$ flows into presynaptic cytosol
- Increased Ca^{2+} concentration $\rightarrow$ exocytosis of synaptic vesicles
- Neurotransmitter (NT) released into cleft
- NT diffuses across cleft and binds to receptors in postsynaptic cell membrane

Synaptic Transmission

- NT serves as chemical trigger (stimulus) of ion channels
- Postsynaptic cell membrane may be depolarized or hyperpolarized
 - Depends on type of NT and type of postsynaptic cell
 - 1000+ neurons converge on synapse; the sum of all of their NTs determines effect
- If threshold reached, then postsynaptic cell action potential results

Aging

- Rapid brain growth during first few years of life
 - Due to increase in size of neurons and proliferation of neuroglia
 - Increase in development of dendritic branches and synaptic contacts
- From early adulthood through old age:
 - Decline in brain mass
 - Fewer synaptic contacts, brain function
 - Some decrease in brain function

Somatic Senses and Special Senses

Special Senses

- Smell (olfaction)
- Taste (gustation)
- Vision
- Balance
- Hearing

General Senses: Somatic and Visceral

- Somatic
 - Tactile: touch, pressure, vibration
 - Thermal (warm, cold)
 - Pain
 - Proprioception (joint, muscle position sense; movements of limbs, head)
- Visceral: internal organ conditions

Pain Sensations

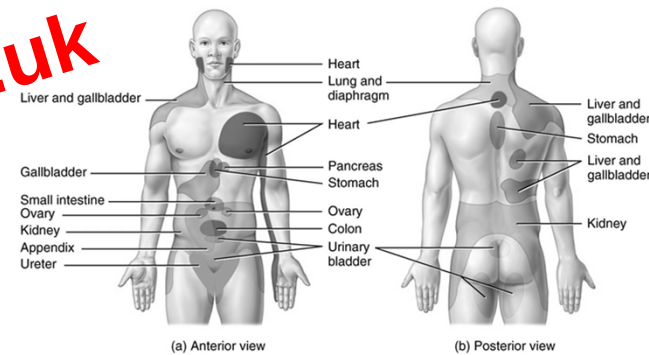
■ Nociceptors

- Free nerve endings in every tissue except brain
- Can respond to any excessive stimulus
- Minimal adaptation

■ Types of pain

- Fast pain: acute, sharp pain
 - Well localized
- Slow pain: chronic, burning, aching, throbbing
 - More diffuse and localized
- Referred pain is visceral pain displaced to surface

Distribution of Referred Pain



Proprioception (Kinesthesia)

■ Awareness of

- Body position, movements, weight of objects

■ Sites of receptors

- Muscles (muscle spindles)
- Tendons (tendon organs)
- Joint kinesthetic receptors (synovial joints)
- Inner ear (hair cells): head position

■ Tracts to

- Somatosensory area of cerebral cortex and Cerebellum

■ Slight adaptation

Functional Areas of the Cerebrum

