

Physiology Exam 6 Study Guide

Visual System

-Info = energy waves

-All about what receptors we have → which waves we register

-We pick up only a specific range of waves (only certain energy levels)

-Ex: birds can see UV rays that we can't

-Type = photoreceptors

-Components of the eye

-Cornea and lens: focus image

-Glasses = lens doesn't match up to the shape of the eye

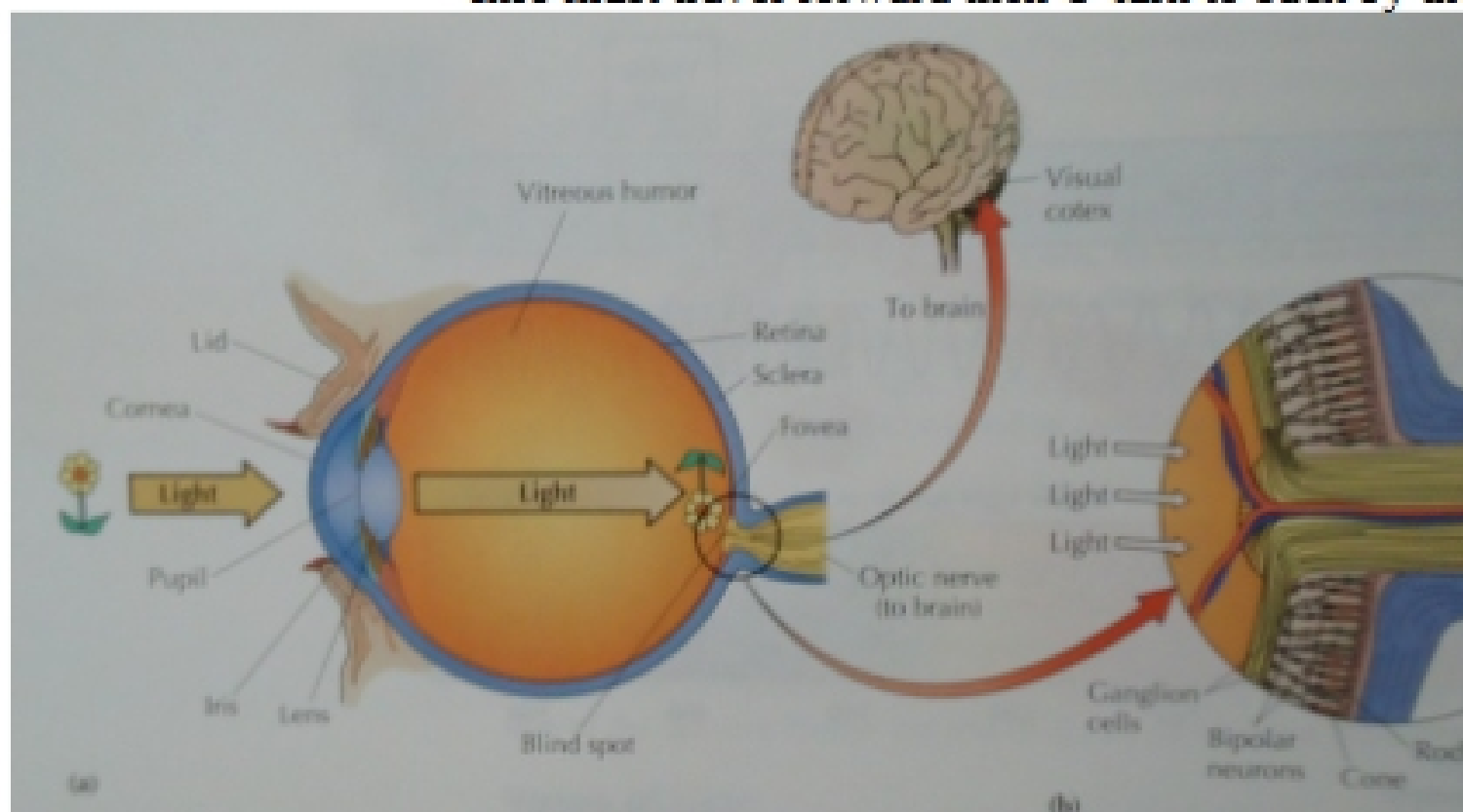
- problem is the position of the retina relative to where the cornea and lens create the focused image

-Retina: registers information and transforms into signal

-Receptors located at the back → light must be intense enough to get through all other cells (like afferent neurons)

-Not very properly design → reason we are daytime mammals

-Info must travel forward then U-turn to back by the brain



* Light enters the eye → pass through/around small blood vessels/capillaries, ganglion neuronal cell bodies, and bipolar neurons on its way to back of the eye → absorbed by pigments/picked up by cones and rods in the retina → information carried back towards light by the bipolar cells → condensed in the ganglion cells → Info carried by the ganglion cell's axons to the blind spot → turns again (now the U is complete) → back into the head

-Ex: octopus has receptors in the front (good nighttime vision)

-Afferent neurons in the front

-Ex: Glow in pet's eyes - allows them to visual success in low light (nighttime)

-have an extra coating at the back of their eyes that reflects photons that have gone past the receptors back towards them
-the light you are seeing actually made it past their receptors twice without actually hitting them

*Where afferents exit = NO receptors (no detection) → blind spot

- Have 1 blind spot in each side → brain doesn't see hole but makes up image based on surroundings
- Encoding (based on receptors in retina):
 - Rods: bigger → activated more in dim light
 - Cone: smaller → only activated in bright light (colors)
- *As light gets dimmer, rods activated more and cones are lost → less color (gray wash)
 - Color Vision based on 3 cone pigments (RGB – red/green/blue)
 - Pigments respond differentially → range of colors via algorithm translating the amount of response coming from each cone
 - Ex: yellow color = no blue activated, little green activated, lot of red activated
 - Signals (inputs) sent to visual cortex of brain → translate into color
 - Colorblind = “lacking” pigments → -Receptors (cones) are present but not responding as in one w/ normal vision
 - For every possible input combination, algorithm has a color associated with it and assigns it = wrong translation in colorblind people
 - There is a problem with the receptors which causes translation problems in the brain
 - Red/green is most common in white males (10-20%)
- *Problem for everyone → traffic accidents
 - Solution: reflector added around whole perimeter of traffic light
 - Border to match up light to its position

Chemosensory System

- Info = dissolved chemicals
- Type = chemoreceptors
- Components:
 - External: Taste and smell used to do so
 - Internal: Tracks changes in pH, [Oxygen], [CO₂] etc. in body
 - *Must constantly be monitoring levels
- Taste: In mouth/throat area
 - Aftertaste is different – activating receptors in throat (not mouth)
 - Lots of surface area (bumpy) → more receptors
 - Categories:
 - Salt: Sodium binding to sodium channels (vital for APs)
 - Want more salt if low levels in body
 - Many animals lick roads for salt (used to be limited)
 - Sour: H⁺ blocks potassium channels → potassium accumulates in receptor cell (can't diffuse down gradient out of cell) → depolarization
 - Necessary to maintain acidity in the body
 - Sweet: sugars bind → used for energy
 - Bitter: various substances bind (high levels can be toxic)
 - Avoid – want to eat less of it
 - Umami: Glutamate (agonist MSG) binds → savory/flavorful taste
 - Eat more if present (ex: MSG vs. non MSG brownies)
 - *Glutamate key for cell metabolism
- *Likely adding a 6th receptor category soon (fat)
- Olfaction: In nasal passages (dissolved chemicals)
 - Receptors = differing types and quantities among people

- Same general categories, but don't all take in the same chemicals
- Last only about 2 months, then change over (affect inputs)
 - Ex: farmers don't register poop info, but register trash in NYC
 - Ex: You won't smell bad roommate after 2 months
 - Ex: People bathe in cologne (they can't smell it as well)
- Perception: How we interpret signals → putting all together in cerebrum
- *Signals often combine
 - Ex: Taste is not just in the mouth → don't taste as well when nose stuffed up or ears are plugged (think chips are stale if don't hear the crunch)
 - Ex: autism = auditory/visual not occurring at the same pace (don't process together)
 - Like when lips and voices on screen are different
- *We are better at detection than consciously aware
 - Guys know when a girl is ovulating?
 - *You alter your choices/behavior based on certain chemicals in the air even though if asked to say if there was a reason for your choice, you would not believe that you had even registered the chemical difference let alone based your decision on it.

Types of Muscle

1. Skeletal: striated
 - Attaches to bone via tendons
 - Supports and moves skeleton (via contractions)
 - Voluntary control
2. Cardiac: striated
 - Heart muscle
 - Autonomic/involuntary control
3. Smooth: GI tract
 - Sheets surrounding organs
 - Contraction alters flow (ex: of air in lungs, or blood circulating)

Anatomy of Skeletal Muscle

- Muscle (skeletal implied for now) → is an organ
- Myofibers** – called fibers because of appearance of cells (many are long)
 - Muscle cells = fibers
 - Multi-nucleated (another reason muscle cells are referred to as fibers): multiple cells that have been fused together to create 1 long myofiber
 - Movement would otherwise rip individual cells apart

Myofibrils – bundles of protein (myofilaments) within a myofiber

Myofilaments – within myofibrils → 2 different kinds:

- **Basic structure – protein interactions affect how muscles work
 - Thick = **myosin** → bunch of myosin put together = myosin myofilament
 - Thin = **actin** → bunch of actin put together = actin myofilament

Sarcoplasmic Reticulum (SR) – surrounding myofibrils

- Without the SR, bundles would not exist → would lose myofibrils
- Holds Ca^{2+} → necessary for exocytosis of NTs
 - Basic intracellular fluid in muscle is low (holds Calcium like a bank)

Transverse Tubules (TT) – plasma membrane extensions that go down into cell (like funnel)

- Interstitial fluid channels → allows IF to gain access to inside parts of myofiber
 - Critical to function of muscle fibers → increases their surface access