

Today you will:

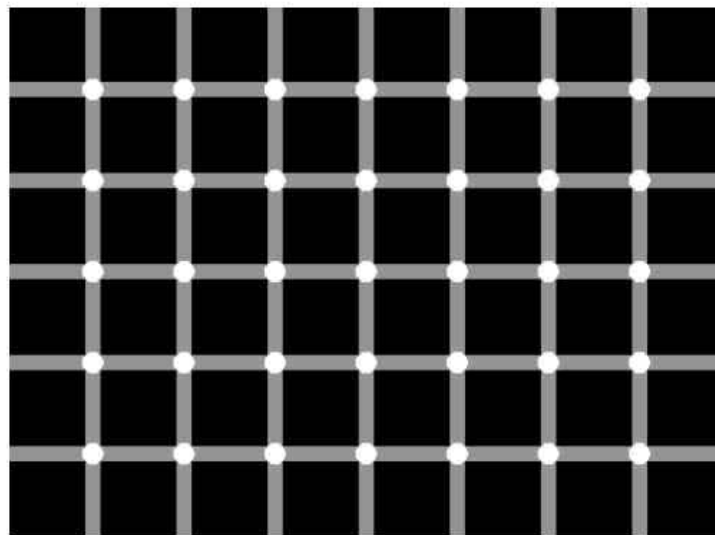
- write your quiz on the brain (label + state functions)
- look at the different types of senses of the body
- state the structure and function of the eye

Sensory Receptors and Sensation

- different forms of energy stimulate the **sensory receptors** - the nerve endings and cells that detect sensory information
- the sensory receptors then initiate neural impulses
- **sensation** occurs when the neural impulses arrive at the cerebral cortex
- each person's unique **perception** results from how the cerebral cortex interprets the meaning of the sensory information
- massive amount of sensory information, coming from many neural pathways, bombards the brain every second
- the brain can filter out redundant, insignificant information (**sensory adaptation**)



The brain parallels or splits up information input to various areas of the brain. Sometimes the sensory information does not get reintegrated precisely , and what we sense is not necessarily what we preceive.



Count the black dots! :o)

Sensory Receptors

Highly modified dendrites of a sensory neuron

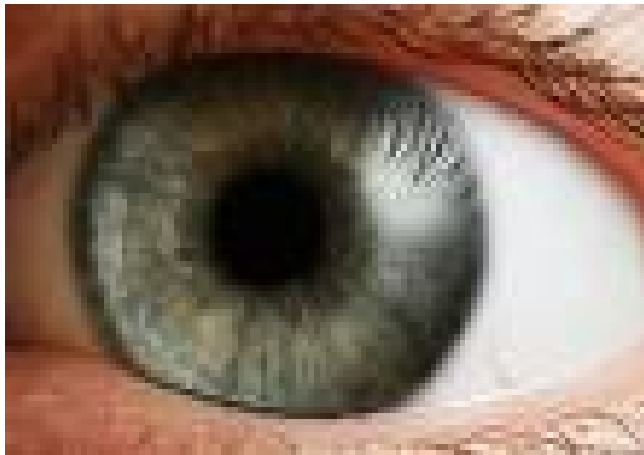
- specialized cells or neuron endings that detect specific stimuli
- are able to convert one form of energy from a specific stimulus into electrochemical energy, which can be processed by the nervous system
- human sensory receptors can be classified into four main types

Major Sensory Receptors in the Human Body

Category and type of receptor	Examples of receptor	Stimulus
Photoreceptors Vision	rods and cones in the eye	visible light
Chemoreceptors Taste	taste buds on the tongue	food particles in saliva
Smell	olfactory receptors in the nose	odour molecules
Internal senses	osmoreceptors in the hypothalamus receptors in the carotid artery and aorta	low blood volume blood pH
Mechanoreceptors Touch/ pressure/ pain	receptors in the skin	mechanical pressure
Hearing	hair cells in the inner ear	sound waves
Balance	hair cells in the inner ear	fluid movement
Body position	proprioceptors in the muscles and tendons, and at the joints	muscle contraction, stretching, and movement
Thermoreceptors Temperature	heat and cold receptors in the skin	change in radiant energy

The Eye

- The most important sense organ.
- Responds to light energy
- Impulses must reach the brain in order to see



FACTOIDS OF THE HUMAN EYE

- length of eyeball = 24.5 mm
- average time between blinks = 2.8 seconds
- average duration of a single blink = 0.3 seconds
- thickness of cornea = 0.54 mm in center; 0.65 in periphery
- diameter of cornea = 11.5 mm
- thickness of lens = 4 mm
- diameter of lens = 9 mm
- composition of lens = 65% water; 35 % protein
- number of retinal receptor cells = 5-6 million cones; 120 million rods
- number of retinal ganglion cells = 800 thousand to 1 million
- density of cones in fovea = 200, 00 per square mm

Structures of the Eye

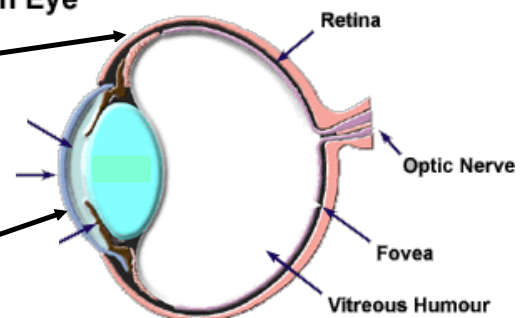
The Human Eye

a) Sclera

- Tough, white outer layer
- Covers blood vessels
- resists punctures

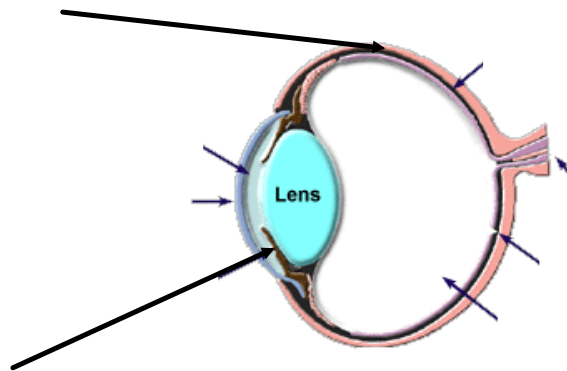
b) Cornea

- transparent portion of the sclera
- bulges forward
- lacks blood vessels
- completely clear
- cells obtain nutrients from the interstitial fluid
- contains sensitive touch receptors
- admits light into eye interior



c) Choroid layer

- middle layer
- contains many blood vessels and pigmented granules
- prevents light from straying (like black paint inside a camera)

**d) Iris**

- pigmented portion of the choroids coat (blue, brown, green)
- 'pupil' opening in the iris
- controls amount of light entering the eye
- contains two sets of smooth muscles

Pupil

- allows light to enter

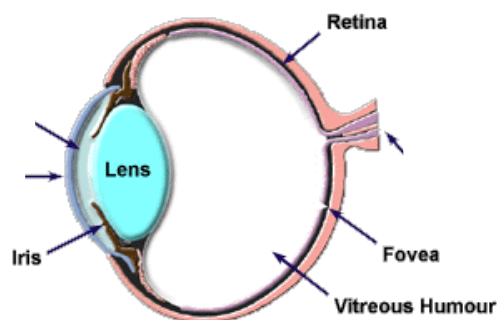
e) Retina*

- inner layer of the eye

- i) pigmented cells - lie next to choroids layer
- ii) nerve cells - several layers, primary function is image formation

Layer of Nerve Cells - convert light energy to nerve impulses (to brain)

- i) **photoreceptor neurons - Rods and Cones**
- ii) **Bipolar neuron** and
- iii) **Ganglion neuron** - both are primarily connector neurons which accept nerve impulses and carry them to the brain



aa) Rods

- specialized for vision in dim light
- useful for night vision
- useful for shape and movement
- contains **rhodopsin** (a pigment that absorbs light) which requires vitamin A for its production
- 125 000 000 rods in a retina
- if there's a lack for vitamin A (therefore, lack of rhodopsin) a person adjusts to darkness slowly (night blindness)

Excitation of Rods

- must generate action potentials
- rods contain rhodopsin; --> contains the proteins scotopsin and retinene
- break down of rhodopsin into components through light stimulation generates an action potential

bb) Cones

- responsible for **sharp vision**
- responsible for colour detection
- three kinds of cones - each responds to different wavelengths of light (red, blue, green)
- less numerous than rods
- 7 - 10 million cones in a retinal
- less sensitive than rods, but operate well under bright light (we cannot see colour by moonlight)
- red-green colour-blindness is caused by defective cones

Excitation of Cones

- contain photopsin and retinene
- these proteins break down and reform quickly in bright light

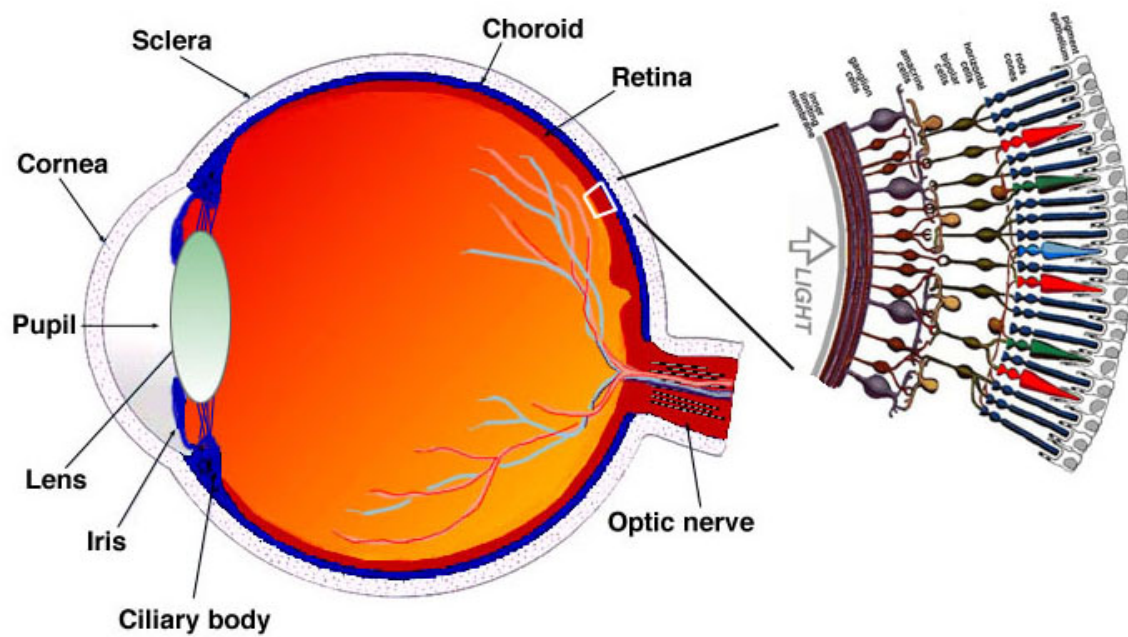
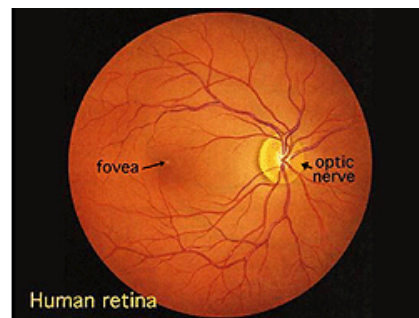


Fig. 1.1. A drawing of a section through the human eye with a schematic enlargement of the retina.

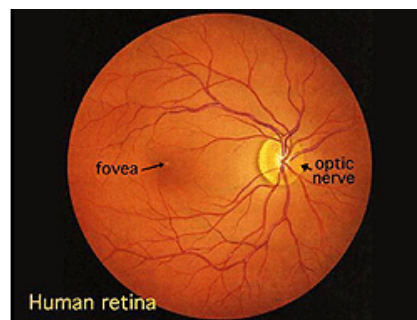
Fovea Centralis

- back and center of retina
- small yellowish spot
- has cones, but no rods
- dense area of cones in the fovea (90%)
- special area for examination of detail
- area of sharpest vision (reading, threading needle)

Blind Spot

- area where the **optic nerve** meets the retina
- no rods or cones present

contains 1 million axons to occipital lobe



f) Lens

- located immediately behind opening of pupil
- transparent disk-shaped structure
- elastic and can change shape
- interior of lens is a jelly-like substance
- held in place by ligaments connecting to muscles

Ciliary muscles

- control the shape of lens for focussing

g) Fluids

- Aqueous humor - between the iris and cornea
- Vitreous humor - middle of eye; maintains shape of eyeball

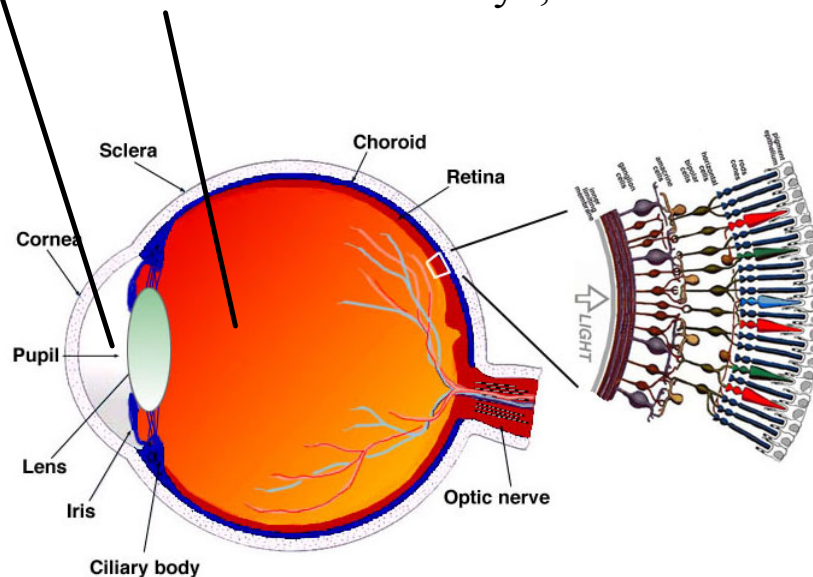
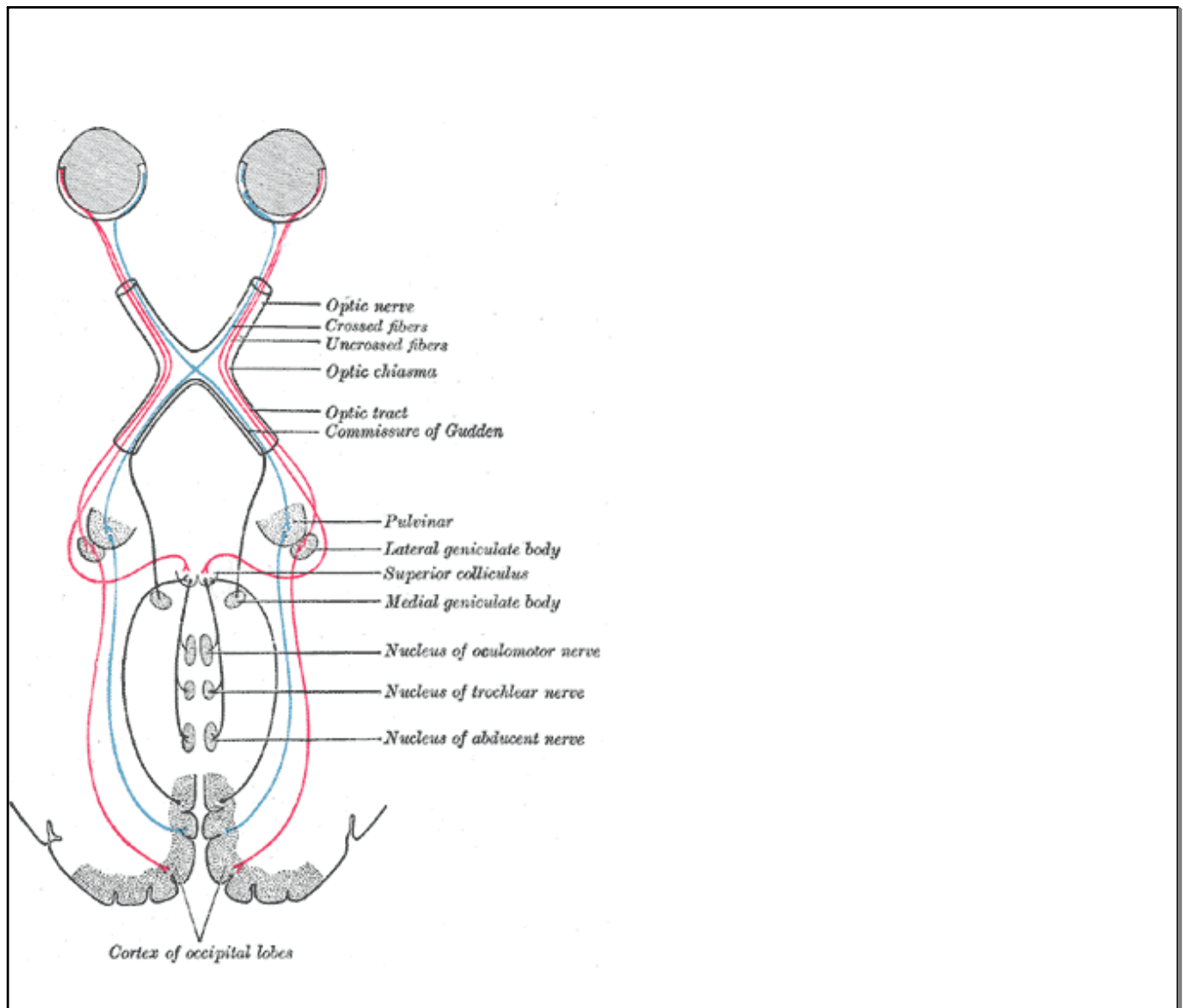


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Evaluation:

