

SI A&P - Full Discipline Demo - Biodigital

Senses - BioDigital

Final Report - Answer Guide

Institution	Science Interactive University
Session	SI A&P - Full Discipline Demo - Biodigital
Course	SI A&P - Full Discipline Demo - Biodigital
Instructor	Sales SI Demo

Test Your Knowledge

Match each term with the best description.

⌘ Cone	Clear, gelatinous matrix that maintains the shape of the eye	1
⌘ Pupil	Layer in the posterior area of the eye that contains photoreceptors	2
⌘ Retina	Opening in the middle of the iris through which light enters the eye	3
⌘ Sclera	Photoreceptor responsible for color vision	4
⌘ Vitreous humor	White, outer layer of the eye	5

Correct answers:

1 Vitreous humor 2 Retina 3 Pupil 4 Cone 5 Sclera

Categorize each statement as true or false.

⚡ Sensorineural hearing loss occurs when nerve impulses diminish due to damage to hair cell receptors.	
⚡ The malleus, incus, and stapes are the bones of the inner ear.	
⚡ Olfactory chemoreceptors are able to detect more subtle differences in chemical substances than are detected by taste buds.	
⚡ A single taste bud includes only one chemoreceptor along with supporting and regenerative cells.	
True	False
1	2

Correct answers:

1

Sensorineural hearing loss occurs when nerve impulses diminish due to damage to hair cell receptors.

Olfactory chemoreceptors are able to detect more subtle differences in chemical substances than are detected by taste buds.

2

The malleus, incus, and stapes are the bones of the inner ear.

A single taste bud includes only one chemoreceptor along with supporting and regenerative cells.

Exploration

The ____ is the layer of the eye containing the blood vessels and connective tissues.

- ☐ cornea
- ☐ sclera
- ☐ fovea centralis
- ☒ choroid

✓

The pupillary light reflex constricts the pupil in response to light.

- ☒ True
- ☐ False

✓

The ____ is the fluid filled spiral cavity where sound is converted to nerve impulses.

- ☒ cochlea
- ☐ stapes
- ☐ auricle
- ☐ malleus

✓

Smell is integrated with taste in the ____ cortex of the brain.

- ☐ gustatory
- ☐ olfactory
- ☒ orbitofrontal
- ☐ auditory

✓

Exercise 1

What is the hole in the center of the iris? What is its function?

The adjustable circular opening in the front of the iris is the pupil. It contracts or expands to regulate the amount of light that enters the eye.

What is the function of the lens?

The lens, by changing shape, functions to change the focal distance of the eye so that it can focus on objects at various distances, thus allowing a sharp real image of the object of interest to be formed on the retina.

What part of the eye controls the shape of the lens?

The ciliary muscles.

Photo 1: Eye External Anatomy
(SAMPLE ANSWER BELOW)

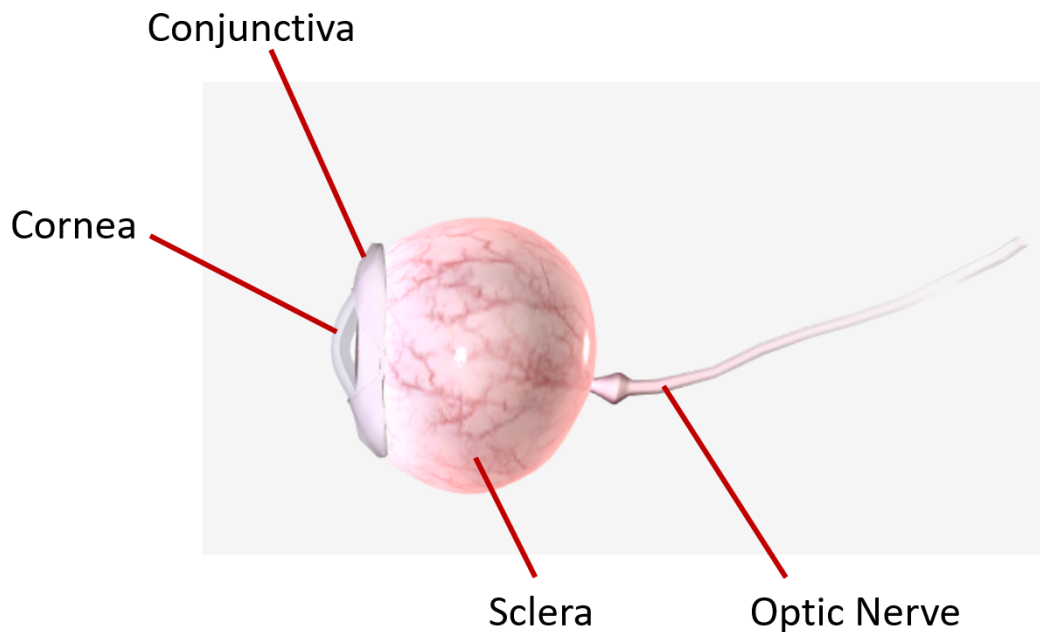


Photo 2: Iris and Pupil
(SAMPLE ANSWER BELOW)

Pupil

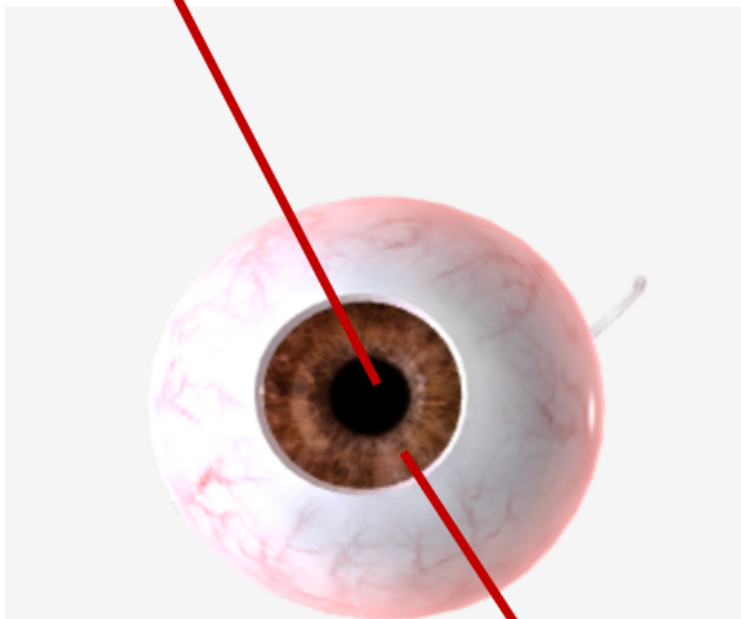




Photo 3: Lens, Ciliary Muscle, and Choroid
(SAMPLE ANSWER BELOW)

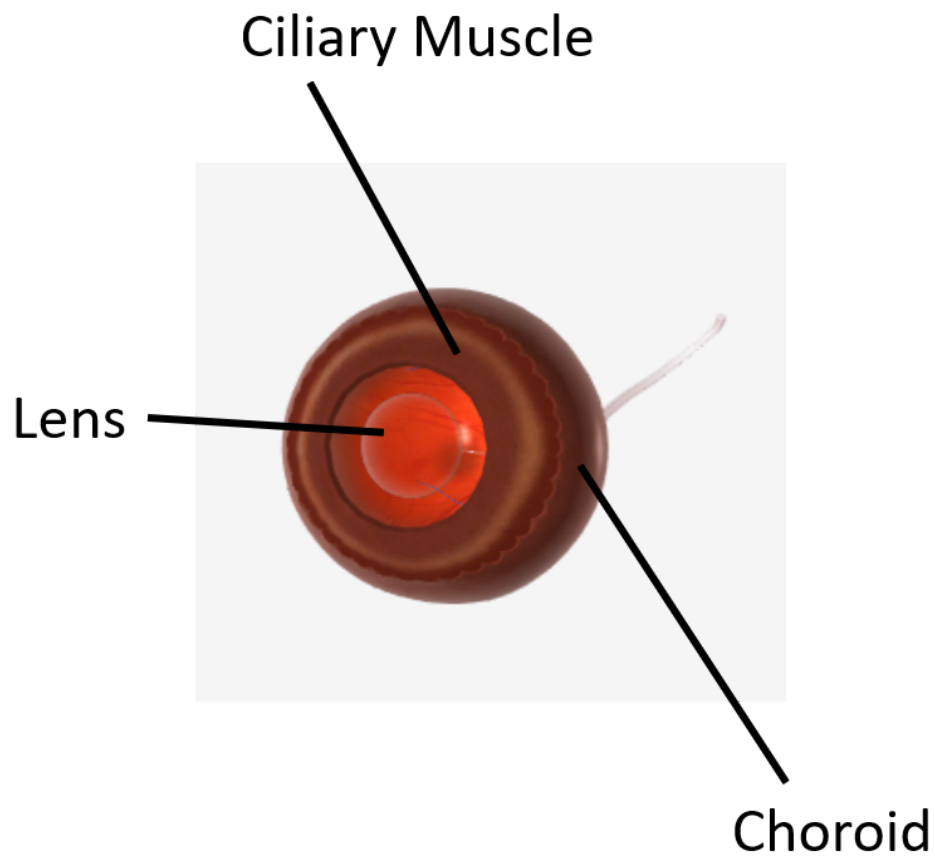


Photo 4: Vitreous Body and Retina
(SAMPLE ANSWER BELOW)

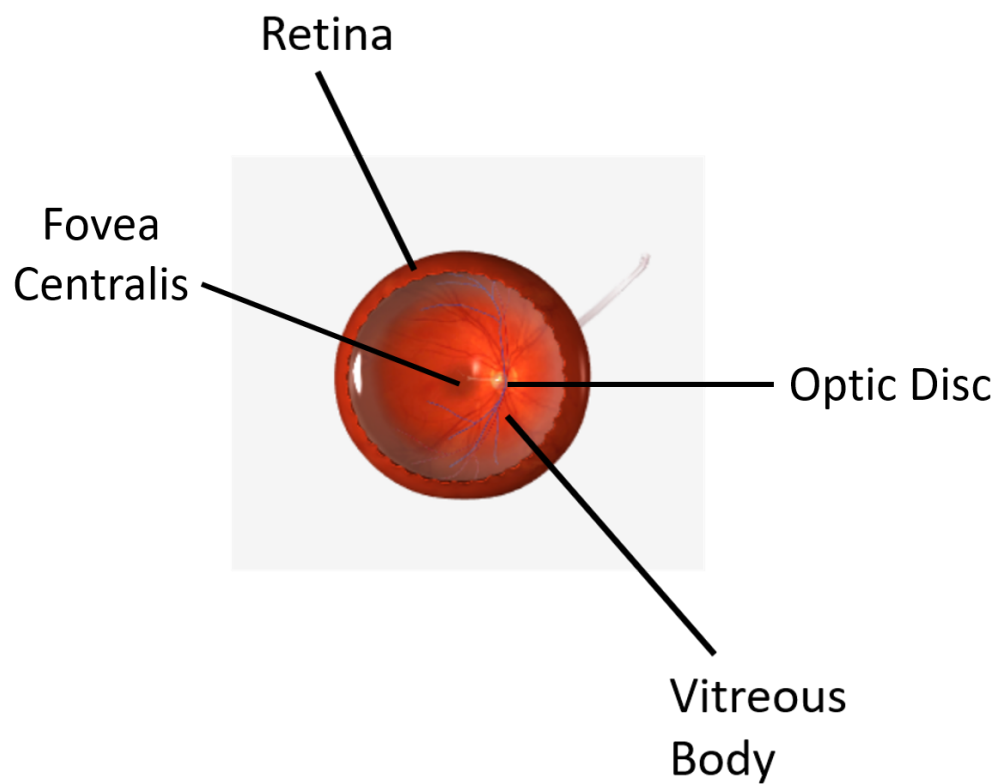
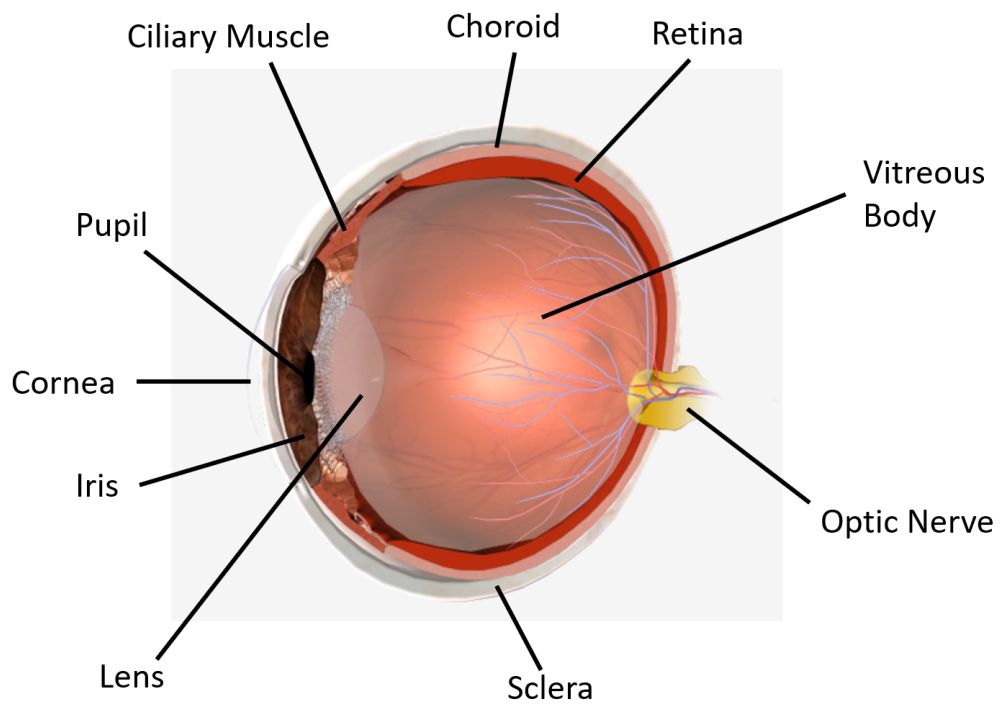


Photo 5: Eye Sagittal Cross Section
(SAMPLE ANSWER BELOW)



Exercise 2

How did the distance from where the circle disappeared to where it reappeared in Part 2 of this exercise differ between each eye and what does this indicate? Reference Data Table 1 results in your explanation.

The distances for the blind spot to appear and disappear only differed slightly between both eyes as recorded in Data Table 1. The optic nerve is in approximately the same location for each eye and is approximately the same dimensions for each eye.

What is an afterimage and why does it occur? Reference your results in Panels 3 and 4 in your explanation.

An afterimage is a false image that is the opposite color of the original, real image that was viewed. If a cone is exposed to the same wavelength for too long, it will become overstimulated, tire, and cease responding for a period of time. During that time, the retina will not be able to perceive color in the area that the image overstimulated resulting in the afterimage. The results recorded in Panels 3-4 indicate the overstimulation of cones by prolonged exposure to the yellow and blue triangles respectively.

Panel 1: Pupillary Response in the Right Eye
(SAMPLE ANSWER BELOW)

The pupil will constrict when exposed to a bright light.

Panel 2: Pupillary Response in the Left Eye
(SAMPLE ANSWER BELOW)

The left pupil should constrict when a bright light is shown into the right eye.

Data Table 1: Measurements for Blind Spots
(SAMPLE ANSWER BELOW)

	Distance from Eye - Far (cm)	Distance from Eye - Near (cm)
Right Eye	32.5	22
Left Eye	33	23.5

Panel 3: Yellow Triangle
(SAMPLE ANSWER BELOW)

Students should see a blue afterimage.

Panel 4: Blue Triangle
(SAMPLE ANSWER BELOW)

Students should see a yellow after image.

Exercise 3

What does it mean if you can hear the tuning fork more clearly in one ear or another during the Weber test?

During the Weber test, most of the sound is traveling to the cochlea without going through the ear canal. Therefore, because both ears should experience the same intensity of sound, one ear may have damage to the cochlea if the intensity of the sound is not the same in both ears. For example, if the sound is heard louder in the right ear than in the left ear, then there is possible damage to the cochlea in the left ear. If the sound lateralizes to one ear, it may be an indication of conductive loss in that ear.

How is the mechanism of hearing different if the handle of the tuning fork is held on the mastoid process instead of holding the tuning fork tines near the ear canal?

When the tuning fork is held on the mastoid process, the vibrations are sent through the skull directly to the cochlea (cochlear duct). When the tuning fork tines are held near the ear canal, the vibrations in the air hit the tympanic membrane, and are transferred to the malleus, incus, and the stapes. The stapes vibrates the oval window which then sends the vibrations through the vestibular duct to a specific area of the cochlear duct.

Panel 5: Weber Test
(SAMPLE ANSWER BELOW)

Students with normal hearing should report an equally loud tone in both ears. Students with hearing loss in one ear should report decreased tone volume in the affected ear.

Panel 6: Rinne Test
(SAMPLE ANSWER BELOW)

Students with normal hearing should report the tone occurred again when the tuning fork was placed in front of the ear canal after they could no longer hear the tone through the mastoid process. Both right and left ears should produce similar results unless the student is experiencing hearing loss in one ear.

Exercise 4

What effect did plugging your nose have on the taste of the extracts? Reference your results recorded in Data Table 2 in your explanation.

Plugging the nose reduced the sensation of taste as recorded in Data Table 2.

Which parts of the brain are communicating to merge the sensations of smell and taste into what we experience as a food's flavor?

The olfactory cortex is the part of the brain responsible for smell, and the gustatory cortex is the part of the brain responsible for taste. These signals are combined in the orbitofrontal cortex to give the combined experience of flavor.

Data Table 2: Taste and Smell Observations
(SAMPLE ANSWER BELOW)

Sample	Taste Only	Smell Only	Taste And Smell Together
Unknown Extract 1	Very muted lemon flavor	Strong lemon scent	Strong lemon Flavor
Unknown Extract 2	Very muted banana flavor	Strong banana scent	Strong banana flavor
Unknown Extract 3	Very muted vanilla flavor	Strong vanilla scent	Strong vanilla flavor
Unknown Extract 4	Very muted peppermint flavor	Strong peppermint scent	Strong peppermint flavor

Competency Review

The anterior chamber of the human eye contains ____.

- ☒ aqueous humor
- ☐ tapetum lucidum
- ☐ fovea centralis
- ☐ vitreous humor



____ are specialized neurons that convert light energy from the environment into electrical signals.

- ☐ Hair cells
- ☐ Chemoreceptors
- ☒ Photoreceptors
- ☐ Ciliary bodies



Within the auditory canal, the ____ vibrates at frequencies unique to the wavelengths of sound waves.

- ☐ auricle
- ☐ cochlea
- ☐ temporal
- ☒ tympanic membrane

✓

Conduction hearing loss results from damage to the tympanic membrane, bones of the middle ear, or the oval window.

- ☒ True
- ☐ False

✓

Taste and smell are senses that interpret chemical stimuli.

- ☒ True
- ☐ False

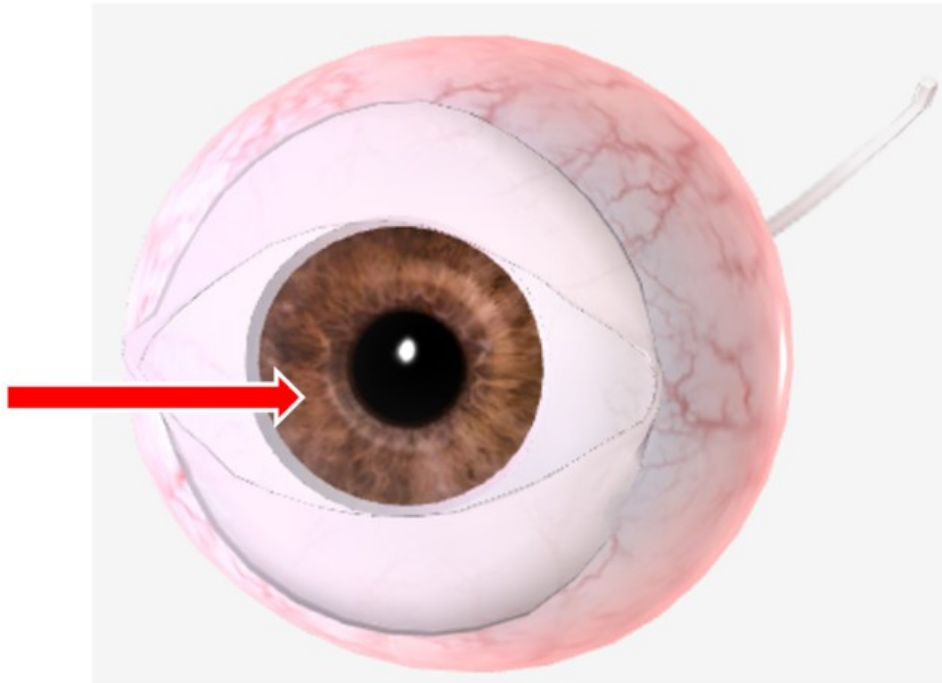
✓

Olfactory chemoreceptors are located at the superior aspect of the ____.

- ☒ nasal passage
- ☐ gustatory cortex
- ☐ retina
- ☐ cochlea

✓

The ____ is indicated by the arrow in the image of the virtual human eye below.



- ☐ optic disc
- ☒ iris ✓
- ☐ lens
- ☐ stapes

The afterimage produced after staring at a yellow triangle appears as a ____.

- ☐ blue circle
- ☐ red triangle
- ☐ yellow triangle
- ☒ blue triangle ✓

The Weber hearing test is performed by placing the handle of a vibrating tuning fork against the scalp.

- ☒ True ✓
- ☐ False

The identity of an unknown flavor is most easily determined by taste alone.

☐ True

☒ False



Extension Questions

Anosmia is a condition where a person loses their sense of smell. Apply our knowledge to predict the effects of anosmia on other senses. (SAMPLE ANSWER BELOW)

A person suffering from anosmia should also experience a reduced sense of taste due to the strong connection between smell and taste.