

Color & Sound Lab: Student Guide

AP Psychology · Unit 3, Day 5

Name: _____ Period: _____ Date: _____

Keep this guide next to the online lab at taylored.works/extras/color-and-sound-lab. At each station, do the activity first, then fill in that station's notes. Every blank is answered on the lab page.

Station 1 · The afterimage

Do the 30-second stare before you read anything else. Then record what you saw.

	Stripes	Stripes	Corner
Colors on the screen			
Colors I saw on the white screen			

Each color was replaced by its _____ color.

Which theory explains this? (You'll learn it in Station 3.) _____

Station 2 · Trichromatic theory

- Also called the _____-_____ theory.
- The retina has _____ types of _____: long (_____), medium (_____), and short (_____).
- Every color comes from the _____ of activity across the three cone types.
- There is no “yellow cone.” You see yellow when _____ and _____ cones fire together.
- Which cones are rarest? _____ (well under _____%)

Cone mixer. Record the slider settings that made each color.

Goal	Red (long)	Green (medium)	Blue (short)	The rule in your own words
Yellow				

Goal	Red (long)	Green (medium)	Blue (short)	The rule in your own words
Purple				
White				
Cyan				

Exam trap: trichromatic theory cannot explain _____.

Station 3 • Opponent-process theory

- Proposed by _____. After the cones, color signals are handled in opposing _____.
- A cell excited by one color in a pair is _____ by the other.
- Stare at one color and that side of the pair _____. Look away and the opposite side _____, so you see the _____ color as an afterimage.
- You can picture a reddish-yellow, but never a reddish-_____.

So who's right? Both, at different stages.

Stage	Where it happens	What happens	Theory
1			
2			

The three opposing pairs: _____ vs. _____ ' _____ vs. _____ ' _____ vs. _____

FRQ practice: in one sentence, explain how the two color theories fit together.

Station 4 • Color vision deficiency

- Most “color-blind” people still see color. The most common form is _____: one cone type is missing or doesn't work, usually _____ or _____.

- True color blindness, seeing only shades of _____, is called _____. It is very _____.
- Red-green deficiency is inherited on the ____ chromosome, so it is far more common in _____ (about 1 in ____ males vs. about 1 in _____ females).
- It supports _____ theory, because losing one cone type loses exactly the colors that cone helps separate.

Simulation. Turn on “Simulate red-green deficiency.”

Colors that collapsed together: _____

Colors that stayed distinct: _____

Why do blue and yellow survive? _____

Station 5 • Check: color

Answer the four questions on the lab page. My first-try score: ____ of 4

For one question you missed, or found hardest: what is the right answer, and why?

Station 6 • The ear, step by step

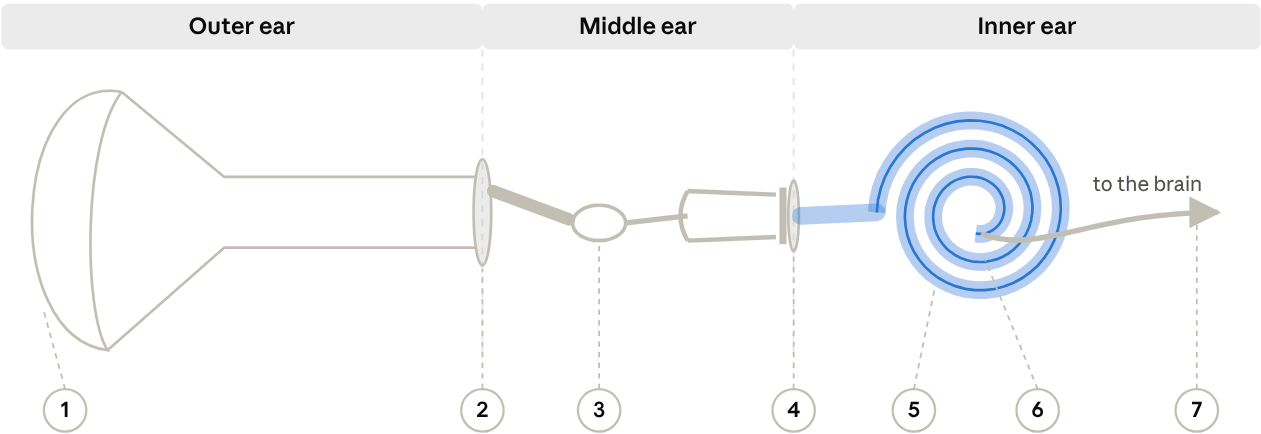
Transduction means _____. In hearing, it happens in the _____.

The pathway of sound

1. _____ ear funnels sound waves in.
2. The _____ vibrates.
3. _____ → _____ → _____: the three middle-ear bones (_____) _____ the vibration.
4. The _____ window passes the vibration into the cochlea.
5. Fluid in the _____ ripples the _____ membrane.
6. _____ cells bend and fire, in the organ of _____. This is where transduction happens.
7. Auditory nerve → _____ → auditory cortex, in the _____ lobe.

Sound passes through the outer, middle, and inner ear

Each number matches a step in the pathway above. Write the part's name beside its number.



The ear, outer to inner · 7 numbered parts

Label the diagram: next to each number, write the part from that step of the pathway.

How high can you hear? Keep the volume low.

- The human range is roughly _____ to _____ Hz.
- The highest tone I could hear: _____ Hz, on headphones / speakers (circle one).
- High pitches disappear first because the hair cells for high pitches sit near the _____ of the cochlea, where _____.
- Damaged hair cells don't grow back. That is _____ hearing loss.

Station 7 · Pitch, location, and deafness

- Loudness comes from the wave's _____ (its height).
- Pitch comes from the wave's _____ (waves per second, measured in _____).

Three theories of pitch

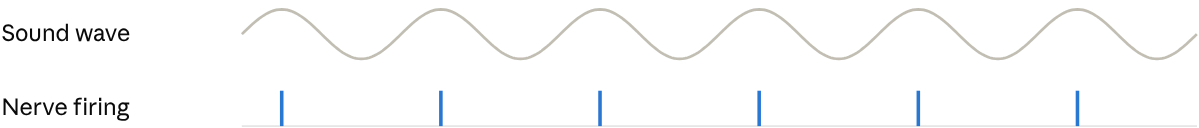
Theory	How it works	Best for (high, low, or mid-range pitch)
Place theory		
Frequency theory		
Volley theory		

Three theories explain how the ear codes pitch

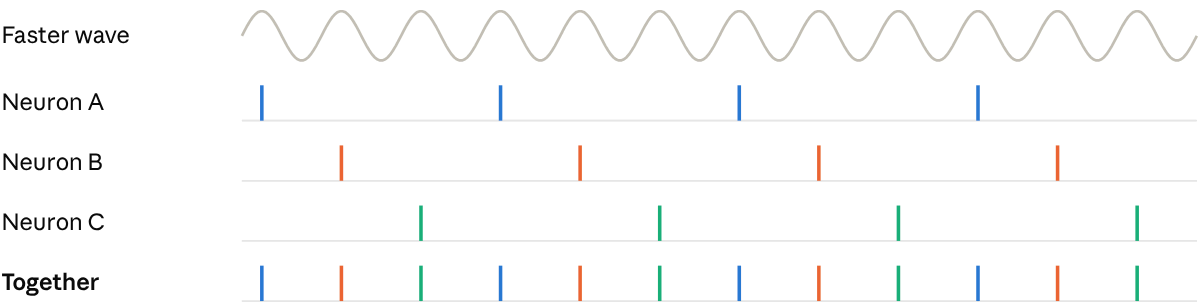
Place theory: different pitches vibrate different places on the basilar membrane



Frequency theory: the nerve fires at the same rate as the sound wave



Volley theory: neurons take turns, so together they keep up with faster waves



Place, frequency, and volley theory · a model

Use the model to fill in the table above.

Sound localization. A sound off to one side reaches the nearer ear slightly _____ and slightly _____. Sounds directly _____ or _____ are the hardest to place.

Two kinds of deafness

	Conduction deafness	Sensorineural deafness
What is damaged		
Common causes		
Permanent?		
What can help		

Exam trap: high pitch → _____ theory. Low pitch → _____ theory.

Station 8 · Check: hearing

Answer the five questions on the lab page. My first-try score: ____ of 5

Check for understanding

Answer on paper, without the lab page open.

1. Mia stares at a green square for 30 seconds, then looks at a white wall. What color does she see? Name the theory that explains it, and where in the visual system it happens.

2. Someone's red cones do not work. Why would a red and a green traffic light look alike to them, while blue and yellow still look different?

3. A tuba plays a 50 Hz note, then a flute plays a 15,000 Hz note. Which pitch theory best explains how you hear each one?

Tuba: _____ Flute: _____

4. Sam has a torn eardrum. Lena's hair cells were damaged by years of loud music. Name each one's type of deafness, and say which of them a cochlear implant is for.

Exit ticket

In three sentences or fewer: explain why you saw a red, white, and blue flag in Station 1, using **both** color theories. Then name the hearing theory that explains your top frequency in Station 6.

