

Module 16

Basic Concepts of Sensation and Perception

Before You Read

Module Summary

Module 16 lays out the difference between sensation and perception and introduces the concepts of top-down and bottom-up processing. Multiple phenomena that influence our ability to attend to stimuli are discussed and studies of multi-tasking and distracted driving are used to drive home the point that human attention is a little-understood and complex process. The principles of thresholds and signal detection, as well as the development of Weber's Law and sensory adaptation are reviewed.

Before beginning the module, take a moment to read each of the following terms and names you will encounter. You may wish to make vocabulary cards for each.

Key Terms

sensation	psychophysics
sensory receptors	absolute threshold
perception	signal detection theory
bottom-up processing	subliminal
top-down processing	difference threshold
selective attention	priming
inattentional blindness	Weber's law
change blindness	sensory adaptation
transduction	

Key Names

Gustav Fechner
Ernst Weber

While You Read

Answer the following questions/prompts.

16-1

1. How does the module opening story of Heather Sellers explain why we study sensation and perception in psychology

3. What do each of the following phenomena tell us about how humans attend to experiences around them?
 - a. inattentional blindness
 - b. change blindness:
 - c. choice blindness:

4. Many people today claim to be “multitaskers,” capable of processing multiple tasks at one time. Use your knowledge from this section to respond to that claim

16-3

1. What are the three steps basic to all our sensory systems?

2. Define transduction.

3. What does the field of psychophysics research?

16-4

1. What percentage of time must we be able to detect a stimulus, for it to be our absolute threshold for that stimulus?
2. Other than stimulus strength, what additional factor determines whether we will detect a sound, sight, taste, touch or smell stimulus? What is meant by that? Give an example.
3. What do signal detection theorists try to understand about human sensation? Be sure to elaborate your answer.
4. The textbook uses an example of detecting a text message to describe signal theory. Give an example from your own life of a stimulus or signal you are more likely to detect (hear, see, smell, and so on) than a friend or parent might be and why you would be more likely to detect it.
5. What is a difference threshold and why is it important to humans?
6. What does Weber's law tell us about human perception?

7. If Jenny were lifting twenty pounds and added two pounds to her load, she would notice that it was heavier. According to Weber's law, how much weight would Jenny have to add to forty pounds of weight to notice the same difference?

16-5

1. What determines if a signal is subliminal?
2. How does priming work? Give an example from your own life, of a time you have primed someone else or have been primed yourself to perceive stimuli in your environment.

16-6

1. Define and give an example from the text of sensory adaptation. Give an example from your own life of sensory adaptation.
2. Why can't a classmate who wears a lot of cologne notice that they are doing so?
3. How does sensory adaptation explain why television programming has the power to grab our attention?

After You Read

Module 16 Review

Answer the following questions to see if you have mastered the basics.

Identify whether each of the situations below represents the use of top-down (T) or bottom-up (B) processing:

- _____ 1. A preschool child gives her father a picture she drew that day and he tries to decide what she has drawn by examining the lines of the picture.
- _____ 2. A literature teacher instructs her students to locate the examples of sexism in the poem she assigns for homework.
- _____ 3. On a long-distance road trip with his family, Joachim occupies himself by reading the license plates from passing cars. When he sees the plate "3DUC8R," Joachim quickly shouts out "EDUCATOR"!
- _____ 4. A classmate shows you a hidden image 3D visual puzzle and tells you to find the fish.
5. Bottom-up processing is essentially the same as _____ while top-down processing is essentially the same as _____.

Multiple Choice

Circle the correct answer.

1. If you can just notice the difference in brightness between two flashlights when one is using a 10-watt bulb and the other a 15-watt bulb, which of the following bulb wattages could you discriminate from a 100-watt bulb?
 - a. 90-watt
 - b. 120-watt
 - c. 75-watt
 - d. 60-watt
 - e. 150-watt
2. When you enter your friend's home you are bothered by the very strong garlic smell from the kitchen. After a period of time in the house, you realize you are no longer aware of the once-powerful smell. This occurrence is best explained by
 - a. Weber's law.
 - b. the signal detection theory.
 - c. sensory adaptation.
 - d. the difference threshold.
 - e. the absolute threshold.
3. Ming-li's parents have to go out of town and are leaving her alone in the house for the first time. Being quite nervous, Ming-li is not at all pleased with staying alone. She hears every faint creak, whispered moan, soft whine, and shudder the house makes and is convinced each is an intruder. Her response to these noises is best explained by
 - a. the signal detection theory.
 - b. priming.
 - c. absolute threshold.
 - d. transduction.
 - e. sensory adaptation.

4. While attending a magic show at your school's pep assembly, you are amazed at the skill and expertise of the tricks. Whether she makes the school mascot disappear, identifies your secret card from the deck, or arranges for your watch to come off your wrist, you are amazed and in awe of her talent. Your friend, an AP® Psychology student, recognizes that the magician has just made use of
- pop-outs.
 - choice blindness.
 - change blindness.
 - inattentional blindness.
 - transduction.
5. You are sitting in a crowded cafeteria when someone at the next table says your name, which you immediately hear, even though you had not been paying attention to that conversation at all. This is an example of
- sensory adaptation.
 - the cocktail party effect.
 - priming.
 - the difference threshold.
 - transduction.

Module 17

Influences on Perception

Before You Read

Module Summary

Module 17 explains how our expectations, contexts, emotions and motivation influence our perception. The module also contains a lengthy discussion of extrasensory perception and the conclusions of researchers who have put ESP to the test.

Before beginning the module, take a moment to read each of the following terms you will encounter. You may wish to make vocabulary cards for each.

Key Terms

perceptual set

extrasensory perception

parapsychology

While You Read

Answer the following questions/prompts.

17-1

1. How does perceptual set relate to top-down processing (from Module 16)?

2. How does the cartoon of the motorcycle officer on page 170 explain perceptual set?

3. Give an example from the text and one from your own life of perceptual set.
4. How do context effects relate to top-down processing (from Module 16)?
5. How does the “Big and Little” picture (Figure 17.4) demonstrate context effects?
6. How do our expectations, emotions, and motivations influence our perceptions?

17-2

1. Describe the relationship between sensation and perception that underlies a belief in ESP.
2. Cite research from the text that explains the scientific opinion regarding the existence of ESP.
3. Fill in each blank with the type of ESP described
 - a. Carly claims that she can predict winning lottery numbers:
 - b. Jose claims to be able to move furniture with his mind:
 - c. Mandy claims to be able to read people’s minds and know what number they are thinking of:

After You Read

Module 17 Review

Answer the following questions to see if you have mastered the basics.

Discuss how perceptual set might impact how you perceive each of the following.

1. Moviegoers burst into laughter when a black-leather-clad, large man on a Harley Davidson motorcycle shows up on the screen and begins to sing excerpts from the musical *The Sound of Music*.
2. Your friend tells you that he learned all about backward masking of subliminal messages in rock songs and plays a few selections for you. He says you can clearly hear the word "Satan" and "devil" in the music.
3. You have heard advertising touting the nutritional benefits of a name-brand dog food and have purchased it for your puppy. After a few months of having your dog eat it, you tell your friends how healthy and full-of-life your dog seems.
4. You have asked your father repeatedly over the last few months if you can use the car to go meet friends. Despite being denied over and over, you approach him again and ask for the car. Expecting him to say *no* again, you actually hear him say *no* and walk off upset. Your father, puzzled, asks why you are upset that he finally said, "Yes, you can use the car."
5. A bank robber, using only his thumb and forefinger in his pocket as a weapon, is able to successfully rob multiple banks before he is caught.

Module 18

Vision: Sensory and Perceptual Processing

Before You Read

Module Summary

Module 18 provides very thorough coverage of the theories, physiology, and physics of vision. Physical properties of light waves and detailed drawings of the anatomy of the eye and visual processing systems of the brain explain the mechanisms by which we see color, recognize faces, and process visual information. Like with the sections on the brain and neuron, you should be able to interpret diagrams of the visual system for the AP[®] Exam.

Before beginning the module, take a moment to read each of the following terms and names you will encounter. You may wish to make vocabulary cards for each.

Key Terms

wavelength
hue
intensity
cornea
pupil
iris
lens
retina
accommodation

rods
cones
optic nerve
blind spot
fovea
Young-Helmholtz trichromatic
(three-color) theory
opponent-process theory

Key Names

David Hubel
Torsten Wiesel

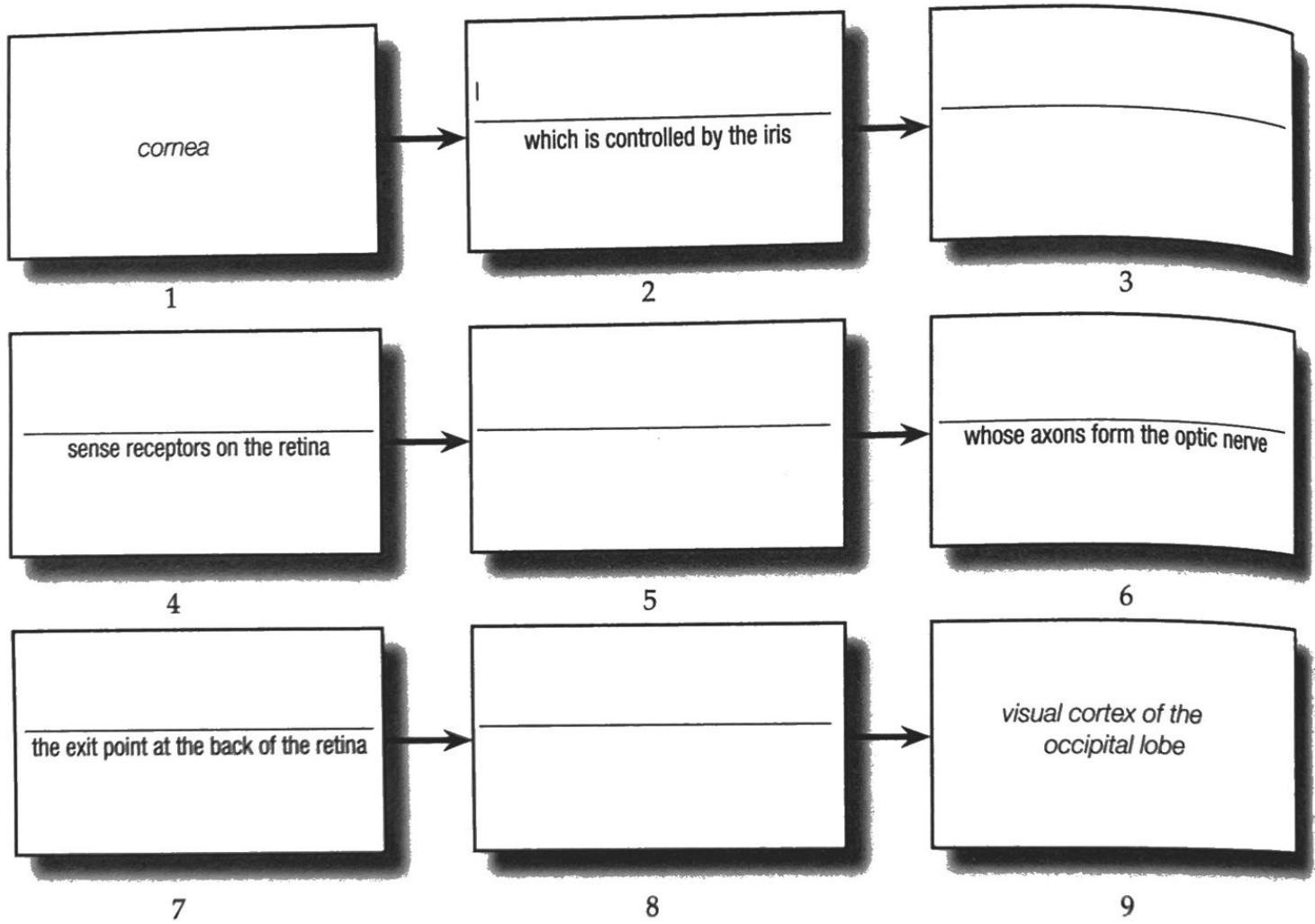
While You Read

Answer the following questions, and complete the charts and diagrams below.

18-1

1. How large is the portion of light visible to humans related to the spectrum of electromagnetic energy?
2. The frequency or wavelength of a light wave determines _____.
The amplitude or wave height of a light wave determines _____.

3. Trace the path of light through the eye as it enters the cornea, is transduced into neural energy, and ends in the visual cortex of the occipital lobe. Use Figures 18.3 and 18.4 as well as the information you learned in Module 12-1 to help with your diagram. Additionally, you may find you need some information from the beginning of Module 18.



4. Complete the chart below, using your own words to describe the function of each.

Structure	Function
cornea	
pupil	
iris	
lens	

Structure	Function
retina	
rods	
cones	
bipolar cells	
ganglion cells	
optic nerve	
blind spot	
fovea	

18-2

1. Identify three ways in which rods and cones differ.
2. Why does our vision have a blind spot?
3. How do you explain the fact that we do not have 'blind spots' in our everyday vision?

18-3

1. Discuss how the Young-Helmholtz trichromatic theory explains how we see and perceive color. Then discuss how it explains color blindness.

2. Explain how Hering's opponent-process theory adds to the explanation of how we see and perceive color.

3. Concerning the phenomenon of color blindness,
 - a. what is the most common deficiency? _____
 - b. what subgroup of humans is most impacted? _____
 - c. what percentage of people are impacted? _____

4. Why do we see an afterimage when we look away at a white piece of paper after staring at a yellow and green flag, as in Figure 18.9?

18-4

1. Where are feature detectors located, and what is their function? How do feature detectors work together to portray a "whole" image?

2. Using fMRI scans, how are we able to tell if a person is looking at a shoe, chair or face?

18-5

1. How does parallel processing help us analyze a visual scene? How would the four subdimensions mentioned in the text allow you to see and perceive a person walking down the hallway towards you?

2. How might parallel processing be related to blindsight (described in Module 13)?

After You Read

Module 18 Review

Complete the questions below to see if you have mastered the basics.

Terms

- _____ 1. pupil
- _____ 2. lens
- _____ 3. cones
- _____ 4. fovea
- _____ 5. blind spot
- _____ 6. iris
- _____ 7. cornea
- _____ 8. optic nerve
- _____ 9. retina
- _____ 10. rods

Definitions

- A. adjustable opening in the center of the eye through which light enters
- B. receptor cells that are concentrated near the center of the retina and detect fine detail and color
- C. protects the eye and bends light to provide focus
- D. the central point in the retina, around which the eye's cones cluster
- E. the light-sensitive inner surface of the eye containing the receptor cells
- F. begins the process of neural transmission from the eye to the brain
- G. transparent structure behind the pupil that changes shape to help focus images on the retina
- H. the point at which the optic nerve leaves the eye, no receptor cells are located there
- I. receptor cells that detect black, white and grey and are necessary for peripheral and night vision
- J. ring of muscle tissue that forms the colored portion of the eye and controls the size of the pupil opening

Multiple-Choice and Short Answer Questions

1. Light waves with longer wavelengths/low frequencies will produce which colors?

2. Light waves with short wavelengths/high frequencies will produce which colors?

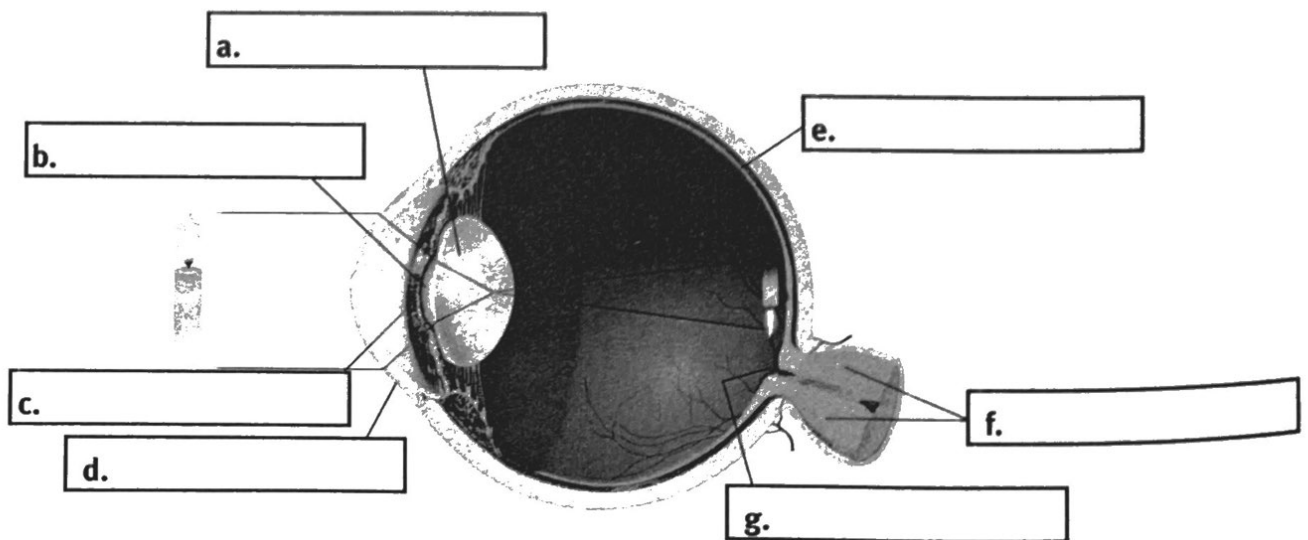
3. Frequency is to amplitude as _____ is to _____.

4. Why are cones, rather than rods, better able to detect fine detail?
 - a. Cones are significantly more numerous than rods.
 - b. Cones function better than rods in dim light.
 - c. Cones have a direct connection to bipolar cells, whereas rods share bipolar cells with other rods.
 - d. Cones are placed throughout the retina whereas rods are primarily concentrated along the fovea.
 - e. Cones are placed around the blind spot whereas rods are concentrated within the blind spot.

5. In order to focus near and far objects on the retina, the lens changes its shape through a process called
 - a. parallel processing.
 - b. feature detecting.
 - c. transduction.
 - d. accommodation.
 - e. after-imaging.

6. The Young-Helmholtz theory suggests that humans perceive color through
 - a. cones on the retina that contain three different color receptors
 - b. color receptors that are inhibited or stimulated by pairs of colors
 - c. the focusing of the light wave along the section of the retina containing the most rods
 - d. the pulses of electromagnetic energy that produce gamma rays
 - e. the transduction of infrared waves in the visual cortex

Label the structures of the eye in the diagram below.



Module 19

Visual Organization and Interpretation

Before You Read

Module Summary

Module 19 reviews Gestalt principles of perceptual organization and discusses how depth cues, both monocular and binocular, are used to perceive the world in three dimensions. The module also introduces the way in which perceptual constancies aid in organization of visual information and the research on restored and restricted vision as it relates to the impact of experience on perception.

Before beginning the module, take a moment to read each of the following terms you will encounter. You may wish to make vocabulary cards for each.

Key Terms

gestalt	retinal disparity
figure-ground	monocular cue
grouping	phi phenomenon
depth perception	perceptual constancy
visual cliff	color constancy
binocular cue	perceptual adaptation

While You Read

Answer the following questions, and complete the charts and diagrams below.

19-1

1. How does the German word *gestalt* help explain how humans organize their perceptions?
2. How does the illustration of the Necker Cube in Figure 19.1 illustrate the difference between sensation and perception?

3. What is meant by the fundamental truth: *Our brain does more than register information about the world?* (p. 187)

4. How does the "faces/vases" in Figure 19.2 demonstrate figure-ground?.

5. What are three examples of the principles we use to group stimuli? Explain and provide a real-life, nongeometric example of each.

a.

b.

c.

19-2

1. Why is depth perception a necessary component of organizing sensory input?

2. Referring to the work of Gibson and Walk or Campos et al., discuss our general understanding about the age and onset of depth perception in the human species. How does it differ in various animal species?

3. How does retinal disparity occur and how does it help us perceive the depth of objects in our environment?

4. Explain how monocular cues differ from binocular cues. When might we use monocular cues rather than binocular cues?

5. How does the phi phenomenon create the perception of motion? Give an example of this phenomenon.

6. Using Figure 19.6, complete the chart below with the mechanism by which each monocular cue operates and a hand-drawn example of the illusion it creates. Your ability to draw is not essential—even a basic stick figure drawing can convey that you understand the cues.

Monocular Depth Cue	How It Helps Us Perceive Depth	Illustration
relative height		
relative motion		
relative size		
linear perspective		
interposition		
light and shadow		

19-3

1. How does perceptual constancy demonstrate a top-down process?

2. Complete the chart below. One has been filled in for you as an example.

Perceptual Constancy	How It Aids Our Perception of the Sensory Information From Our World
color	
brightness	
shape	<i>We perceive the form of familiar objects as constant even while our retinas receive changing images of them. The neurons in the visual cortex learn to associate different views of an object. A door opening seems to be changing shape, but we still perceive it as rectangular.</i>
size	

3. How do perceptual constancies help us organize our sensations into meaningful perceptions?

4. Can you think of an example, other than the example of Figure 19.8, of how color depends on context?

5. How does the Ames Room pictured in Figure 19.11 demonstrate the context effect (from Module 17)?

19-4

1. Explain how research on restored vision and sensory restriction helps us understand the importance of experience on perception.
2. What is meant by a “critical period,” and how does the research on sensory restriction stress its importance?
3. How does the concept of perceptual adaptation inform our understanding of how humans perceive the sensations in our environment?
4. What evidence does the text provide to suggest that we can adapt to new ways of interacting with the world?

After You Read

Module 19 Review

Answer the questions below to see if you have mastered the basics.

Use this story to answer questions 1–3. Maria is enrolled in a research project to determine how humans perceive depth. She is shown a set of 3 images and is asked to describe locations of people and objects in the images. Maria will be using a variety of monocular cues to detect depth in the images and respond to the researcher. Using the list of monocular cues below, discuss which are providing Maria with the information she needs to detect depth in each of the images and how it is functioning. You will not use each cue to answer. Be sure to also discuss the “how” of your answer.

relative height
interposition

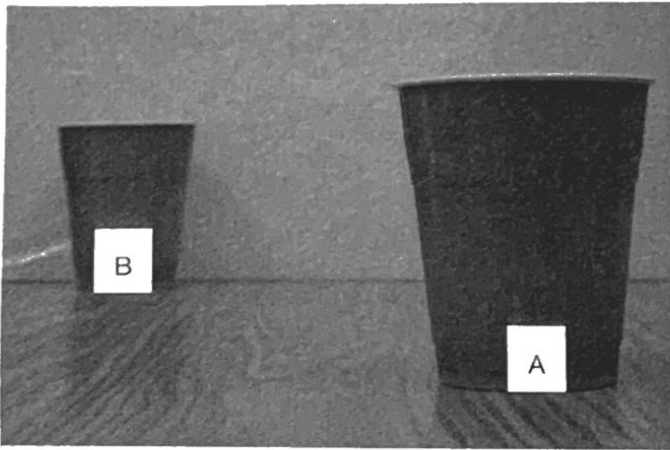
relative size
linear perspective

relative motion
light and shadow

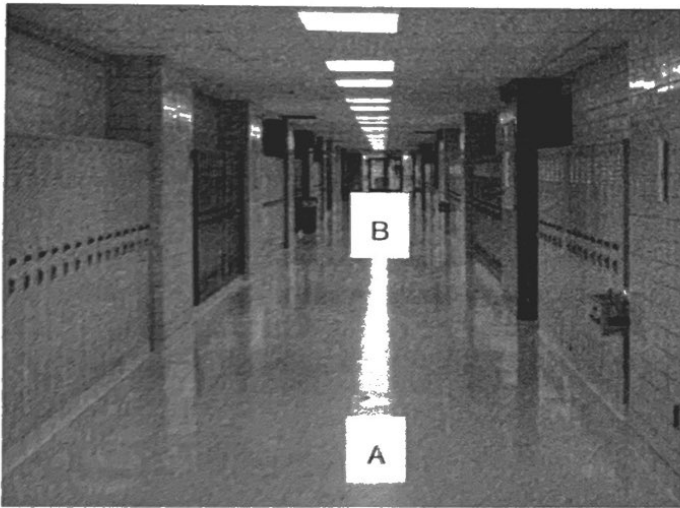
1. Maria is shown the circle and square below. How does she know that the square is farther away than the circle?



2. Maria is shown the two 3 ½ inch cups on a table below. How would she use two cues to describe the relationship of cup A to cup B?



3. Maria is shown a long hallway of student lockers and is asked to imagine she was standing at Point A and then again at Point B while her friend remained at Point A. How would she describe her position in the hallway in relation to her friend in both instances?



4. How would you discriminate figure from ground in the following instances?
- You are looking for a classmate in the cafeteria at lunch and remember she was wearing a red sweatshirt.
 - You are listening intently for sounds that your newborn baby brother is upset.
 - You are trying to identify the musical instruments used in a piece of music.
 - You are trying to identify leaf types for your botany class.
 - You are looking for your friend in the large crowd at the Homecoming game.

Module 20

Hearing

Before You Read

Module Summary

Module 20 is a thorough discussion of the theories and physics of audition. The physical characteristics of sound waves and the mechanisms by which the structures of the ear process sound are explained in great detail. A distinction between types of hearing loss and an explanation of how we locate directionality of sound conclude the module.

Before beginning the module, take a moment to read each of the following terms you will encounter. You may wish to make vocabulary cards for each.

Key Terms

audition	sensorineural hearing loss
frequency	conduction hearing loss
pitch	cochlear implant
middle ear	place theory
cochlea	frequency theory
inner ear	

While You Read

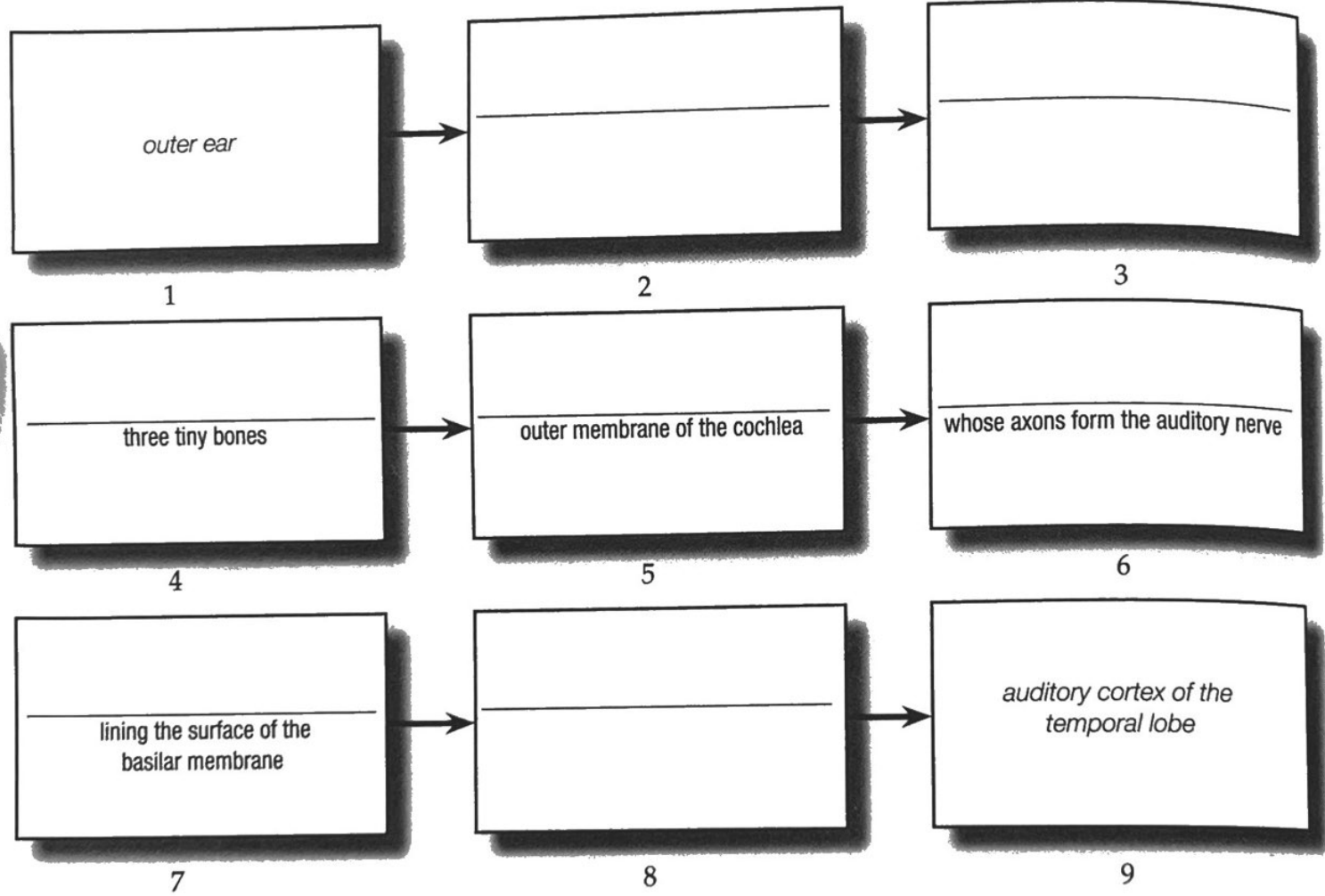
Answer the following questions, and complete the chart below.

20-1

1. The _____ of a sound wave determines the pitch—high notes or low notes; the _____ of a sound wave determines how loud a sound is. (Figure 20.1 shows this for sound waves; you learned these for light waves in Figure 18.2)

20-2

1. Using Figure 20.2, trace the path of sound waves through the ear beginning with the outer ear and ending with the auditory cortex of the temporal lobe.



2. Complete the chart below, using your own words to describe the function of each

Structure	Function
ear drum	
middle ear	

Structure	Function
cochlea	
basilar membrane	
auditory nerve	
semicircular canals	

3. Distinguish between sensorineural hearing loss and conductive hearing loss.

4. Which type of hearing loss is restored by a cochlea implant? How does the device work?

5. Consider Figure 20.3 and a typical day in your life. Estimate the highest decibel and source of sound you are exposed to on a daily basis.

6. In what way do the limitations of cochlear implants add to the explanation of the critical period theory discussed in Module 19?

20-3

1. How does the place theory explain how we discriminate pitch?
2. How does the frequency theory suggest an alternative to the explanation of how we discriminate pitch?
3. Describe how the volley principle addresses the limitations of neural firing when explaining how we hear pitch.
4. How might the placement of our ears alongside our head make it difficult to hear sounds coming from certain locations? Explain.
5. Discuss how the physical characteristics of sound, along with our own body's anatomy, works to help us determine directionality of sound.

After You Read

Module 20 Review

Complete the questions below to see if you have mastered the basics.

- Pitch is to frequency as _____ is to _____ .
 - loudness; amplitude
 - wavelength; amplitude
 - loudness; wavelength
 - sound; light
 - height; length
- A teen diagnosed with sensorineural hearing loss most likely
 - has spent too much time listening to loud music.
 - has a fracture in the bones of the middle ear.
 - has a perforation on the eardrum.
 - has wax buildup in the auditory canal.
 - has an ear infection.
- What is the correct path of sound through the ear to the brain?
 - stirrup, cochlea, basilar membrane, auditory nerve, auditory canal, eardrum
 - auditory canal, eardrum, the bones of the middle ear, cochlea, basilar membrane
 - eardrum, cochlea, auditory nerve, anvil, auditory canal
 - auditory canal, basilar membrane, cochlea, oval window, hammer
 - eardrum, auditory nerve, basilar membrane, oval window, the bones of the middle ear
- The best explanation for how we understand and process the high pitch of a violin, with a frequency of more than 100 waves per second, comes from
 - the place theory.
 - the frequency theory.
 - the volley principle.
 - the transduction model.
 - Brown's stereophonic theory.
- Lashawna is exposed to a short wavelength with a tall/great amplitude. It is likely that she is perceiving
 - a bright fuchsia color.
 - a loud bass guitar.
 - a dusky green color.
 - a soft cello.
 - a very loud piccolo.

Module 21

The Other Senses

Before You Read

Module Summary

Module 21 concludes Unit IV with a review of the remaining senses of touch, pain, taste, smell, and body positioning. Mechanisms by which each receives and conveys information to our brain about stimuli in our environment as well as the manner in which they interact makes up the majority of the module.

Before beginning the module, take a moment to read each of the following terms you will encounter. You may wish to make vocabulary cards for each.

Key Terms

gate-control theory

olfaction

kinesthesia

vestibular sense

sensory interaction

embodied cognition

While You Read

Answer the following questions, and complete the charts and diagrams below.

21-1

1. What has research shown about the essential nature of touch?

2. What are the four basic sensations skin can detect?

21-2

1. Based on the information in the text about Ashlyn Blocker, how is “pain a gift?”
2. How does the gate-control theory serve as a model for how we feel and block pain signals?
3. Describe the effect of endorphins on pain. Would this make endorphins agonists or antagonists for the messages of pain (Module 9)?
4. How might the experience of pain be involved with the phantom limb syndrome?
5. What are the biopsychosocial influences on pain?
6. What have placebo studies revealed about the psychological aspects of pain?
7. What roles does virtual reality seem to play in pain relief?

21-3

1. Why do evolutionary psychologists see taste as adaptive?
2. What life experiences and choices impact the receptivity of taste buds?
3. Discuss the psychological influences on taste. How can our taste buds occasionally be fooled?
4. What is an evolutionary explanation for olfactory signals not processing first through the thalamus, as with other senses?
5. In what way are smells connected with memories and emotions?
6. The text mentions that humans detect about 1 trillion odors and that we have a strong tie between smell and memory. Provide an example of a personal memory that is tied to a smell.

21-4

1. Distinguish kinesthesia from your vestibular sense.
2. For which tasks might the kinesthetic system be most useful? When might the vestibular sense be most useful?

21-5

1. In what ways can the sense of smell change the perception of taste? Describe two additional examples of sensory interaction that you have experienced.
2. How does the McGurk effect illustrate how senses interact?
3. Give an example of how our bodily sensations and states can influence our cognitive perceptions and judgments.

After You Read

Module 21 Review

Circle the correct answers below to see if you have mastered the basics.

1. Which of the following senses receives information from the environment and does not pass signals through the thalamus to process?
 - a. taste
 - b. vision
 - c. hearing
 - d. smell
 - e. body positioning
2. A combination of warm and cold produces which of the following sensations?
 - a. pressure
 - b. tickle
 - c. cold
 - d. pain
 - e. hot
3. Your toddler refuses to eat the spinach and brussels sprouts that the rest of the family eats for dinner. The theory that over many generations, your toddler inherited the aversion to these bitter tastes would most likely be suggested by
 - a. a cognitivist.
 - b. an evolutionary psychologist.
 - c. a behaviorist.
 - d. a humanist.
 - e. a psychoanalyst.

4. Katie received a 10 on balance beam during her gymnastics routine. She may have a highly functioning
- kinesthetic nervous system.
 - sense of smell.
 - transduction.
 - vestibular sense.
 - ganglion cell.
5. Which of the following is true about pain?
- No single stimulus produces pain.
 - Pain diminishes when neurotransmitters such as endorphins are released.
 - The brain can create pain.
 - We edit our memories of pain.
 - All of the above are true.

✓ Check Yourself

Now that you have mastered the basics, work through the problems below to see if you can *synthesize*, *evaluate*, and *analyze* what you have learned.

Two psychologists are discussing the processes and theories of sensation. One psychologist is adamant that the trichromatic theory of vision, the place theory of audition, and the kinesthetic system are the most useful in explaining human behavior. His companion believes strongly that the opponent-process theory of vision, the frequency theory of audition, and the vestibular system are the most useful in explaining human behavior.

Using your knowledge of Unit IV and specific terminology, make the case for each psychologist's argument, explaining the theories and their application to human behavior.

✓ Check Yourself

Now that you have mastered the basics, work through the problems below to see if you can *synthesize*, *evaluate*, and *analyze* what you have learned.

Rodrigo is asleep in his home when a potential intruder begins to break into Rodrigo's home. Discuss the potential role of each of the following in Rodrigo's discovery of the potential intruder:

- signal detection theory:

- visual receptors:

- auditory receptors:

- interposition:

- perceptual set:

- olfaction: