UNIT 4: SENSATION AND PERCEPTION

BASIC PRINCIPLES OF SENSATION AND PERCEPTION

OBJECTIVE 1: Contrast sensation and perception, and explain the difference between bottom-up and top-down processing.
1. The perceptual disorder in which a person has lost the ability to recognize familiar faces is __PROSOPAGNOSIA__.
2. The process by which we detect physical energy from the environment and encode it as neural signals is __Sensation___. The process by which sensations are organized and interpreted is __Perception__.
3. Sensory analysis, which starts at entry level and works up, is called __BOTTOM__ - __UP__ __PROCESSING__. Perceptual analysis, which works from our experience and expectations is called __TOP__ - __DOWN__ __PROCESSING__.

OBJECTIVE 2: Discuss how our perceptions are directed and limited by selective attention, noting how we may or may not be affected by unattended stimuli.
4. When we focus our conscious awareness on a particular stimulus, we are using __SELECTIVE__ __ATTENTION__.
5. Your ability to attend to only one voice among many is called the __COCKTAIL__ __PARTY__ __EFFECT__. Failing to see a visible object when our attention is directed elsewhere is called __INATTENTIONAL__ __BLINDNESS__.
6. When researchers distracted participants with a counting task, the participants displayed __INATTENTIONAL__ __BLINDNESS__ and failed to notice a gorilla-suited assistant who passed through. Two specific forms of this phenomenon are __CHANGE__ __BLINDNESS__ and __CHOICE__ __BLINDNESS___. Another result of distraction involves not noticing that different people are speaking, called __CHANGE__ __DEAFNESS__.
7. Some stimuli are so powerful they demand our attention, causing us to experience __POP__ - __OUT__.

OBJECTIVE 3: Distinguish between absolute and difference thresholds, and discuss whether we can sense and be affected by subliminal or unchanging stimuli.
8. The study of relationships between the physical characteristics of stimuli and our psychological experience of them is __Psychophysics__.
9. The __Absolute__ __Threshold__ refers to the minimum stimulation necessary for a stimulus to be detected __50__ percent of the time.
10. According to __Signal__ __Detection__ theory, a person's experience, expectations, motivation, and alertness all influence the detection of a stimulus.
11. Some entrepreneurs claim that exposure to "below threshold," or __Subliminal__, stimuli can be persuasive, but their claims are probably unwarranted.
12. Some weak stimuli may trigger in our sensory receptors a response that is processed by the brain, even though the response doesn't cross the threshold into __Conscious__ awareness.
13. Under certain conditions, an invisible image or word can __Prime__ into a person's response to a later question. This illustrates that much of our information processing occurs __Automatically__.
14. The minimum difference required to distinguish two stimuli 50 percent of the time is called the __Difference__ __Threshold__. Another term for this value is the __Just___ __Noticeable__ __Difference__ (JND).
15. The principle that the difference threshold is not a constant amount, but a constant proportion, is known as __Weber's__ __Law___. The proportion depends on the __Stimulus__.
16. After constant exposure to an unchanging stimulus, the receptor cells of our senses begin to fire less vigorously; this phenomenon is called __Sensory__ __Adaptation__.

VISION

OBJECTIVE 4: Describe the characteristics of visible light, and explain the process by which the eye converts light energy into neural messages.
1. Stimulus energy is __Transduced__ (transformed) into __Neural___ messages by our eyes.
2. The visible spectrum of light is a small portion of the larger spectrum of __Electromagnetic__ energy.
3. The distance from one light wave peak to the next is called __Wavelength___. This value determines the wave's color, or __Hue__.
4. The amount of energy in light waves, or __Intensity__, is determined by a wave's __Amplitude__, or height, influences the __Brightness__ of a light.
5. Light enters the eye through the __Cornea__, then passes through a small opening called the __Pupil___; the size of this opening is controlled by the colored __Iris__.
6. By changing its curvature, the __Lens__ can focus the image of an object onto the __Retina__, the light-sensitive inner surface of the eye.
7. The process by which the lens changes shape to focus images is called __Accommodation__.
8. The retina's receptor cells are the __Rods__ and __Cones__.
9. The neural signals produced in the rods and cones activate the neighboring ___BIPOLAR____ cells, which then activate a network of ___GANGLION____ cells. The axons of ganglion cells converge to form the ___OPTIC____ ___NERVE____, which carries the visual information to the ___BRAIN____.

10. Where this nerve leaves the eye, there are no receptors; thus, the area is called the ___BLIND____ ___SPOT____.

11. Most cones are clustered around the retina’s point of central focus, called the ___FOVEA_____, whereas the rods are concentrated in more ___PERIPHERAL____ regions of the retina. Many cones have their own ___BIPOLAR____ cells to communicate with the visual cortex.

12. It is the ___CONES____ (rods/cones) of the eye that permit the perception of color, whereas ___RODS____ (rods/cones) enable black-and-white vision.

13. Unlike cones, in dim light rods are ___SENSITIVE____ (sensitive/insensitive). Adapting to a darkened room will take the retina approximately ___20____ minutes.

OBJECTIVE 5: Discuss the different levels of processing that occur as information travels from the retina to the brain's cortex.

14. Visual information percolates through progressively more ___ABSTRACT____ levels. In the brain, it is routed by the ___THALAMUS____ to the cortex. Hubel and Wiesel discovered that certain neurons in the occipital lobe's ___VISUAL____ ___CORTEX____ respond only to specific features of what is viewed. They call these neurons ___FEATURE____ ___DETECTORS____.

15. Feature detectors pass their information to higher-level cells in the brain, which respond to specific visual scenes. Research has shown that in monkey brains such cells specialize in responding to a specific ___GAZE____, ___HEAD____ ___ANGLE____, ___POSTURE____, or ___BODY____ ___MOVEMENT____. In many cortical areas, teams of cells (___SUPERCELL____ ___CLUSTERS____) respond to complex patterns.

OBJECTIVE 6: Define parallel processing, and discuss its role in visual information processing.

16. The brain achieves its remarkable speed in visual perception by processing several subdivisions of a stimulus (simultaneously/sequentially). This procedure, called ___DECODE____, may explain why people who have suffered a stroke may lose just one aspect of vision.

17. Other brain-damaged people may demonstrate ___BLINDSIGHT____ by responding to a stimulus that is not consciously perceived.

OBJECTIVE 7: Explain how the Young-Helmholtz and opponent-process theories help us understand color vision.

18. An object appears to be red in color because it ___REFLECTS (REJECTS)____ the long wavelengths of red and because our mental ___CONSTRUCTION____ of the color.

19. One out of every 50 people is color deficient; this is usually a male because the defect is genetically ___SEX____-___LINKED__.

20. According to the ___YOUNG____, ___HELMHOLTZ____, ___TRICROMATIC____ theory, the eyes have three types of color receptors: one reacts most strongly to ___RED____, one to ___GREEN____, and one to ___BLUE____.

21. After staring at a green square for a while, you will see the color red, its ___OPPONENT____ color, as an ___AFTERIMAGE____.

22. Hering’s theory of color vision is called the ___OPPONENT____-___PROCESS____ theory. According to this theory, after visual information leaves the receptors it is analyzed in terms of pairs of opposing colors: ___RED____ versus ___GREEN____, ___YELLOW____ versus ___BLUE____, and ___BLACK____ versus ___WHITE____.

Summarize the two stages of color processing.

IN THE FIRST STAGE OF COLOR PROCESSING, THE RETINA’S RED, GREEN AND BLUE CONES RESPOND IN VARYING DEGREES TO DIFFERENT COLOR STIMULI, AS SUGGESTED BY THE THREE-COLOR THEORY. THE RESULTING SIGNALS ARE THEN PROCESSED IN THE THALAMUS BY RED-GREEN, BLUE-YELLOW, AND BLACK-WHITE OPPONENT-PROCESS CELLS, WHICH ARE TURNED “ON” BY ONE WAVELENGTH AND TURNED “OFF” BY ITS OPPONENT.

HEARING

OBJECTIVE 8: Describe the auditory process, including the stimulus input and the structure and function of the ear.

1. The stimulus for hearing, or ___AUDITION____ is sound waves, created by the compression and expansion of ___AIR____ ___MOLECULES____.

2. The amplitude of a sound wave determines the sound’s ___LOUDNESS____.

3. The frequency of a sound wave determines the ___PITCH____ we perceive.

4. Sound energy is measured in units called ___DECIBELS____. The absolute threshold for hearing is arbitrarily defined as ___ZERO____ such units.

5. The ear is divided into three main parts: the ___OUTER____ ear, the ___MIDDLE____ ear and the ___INNER____ ear.
6. The outer ear channels sound waves toward the **EARDRUM**, a tight membrane that then vibrates.

7. The middle ear transmits the vibrations through a piston made of three small bones: the **HAMMER**, **ANVIL**, and **STIRRUP**.

8. In the inner ear, a coiled, bony, fluid-filled tube called the **COCHLEA** contains the receptor cells for hearing. The incoming vibrations cause the **OVAL WINDOW** to vibrate the fluid that fills the tube, which causes ripples in the **BASILAR MEMBRANE**, bending the **HAIR CELLS** line that line its surface. This movement triggers impulses in the adjacent nerve fibers that converge to form the auditory nerve, which carries the neural messages (via the **THALAMUS**) to the **TEMPORAL** lobe's auditory cortex.

9. The brain interprets loudness from the **NUMBER** of hair cells a sound activates.

**OBJECTIVE 9:** Contrast place and frequency theories, and explain how they help us to understand pitch perception.

10. One theory of pitch perception proposes that different pitches activate different places on the cochlea's basilar membrane; this is the **PLACE** theory. This theory has difficulty accounting for how we hear **LOW**-pitched sounds, which do not have such localized effects.

11. A second theory proposes that the frequency of neural impulses, sent to the brain at the same frequency as sound waves, allows the perception of different pitches. This is the **FREQUENCY** theory. This theory fails to account for the perception of **HIGH**-pitched sounds because individual neurons cannot fire faster than **1,000** times per second.

12. For the higher pitches, cells my alternate their firing to match the sound's frequency, according to the **VOLLEY** principle.

**OBJECTIVE 10:** Describe how we pinpoint sounds, and contrast the two types of hearing loss.

13. We locate a sound by sensing differences in the **SPEED (TIMING)** and **INTENSITY** with which it reaches our ears.

14. A sound that comes from directly ahead will be **HARDER** (easier/harder) to locate than a sound that comes from off to one side.

15. Problems in the mechanical conduction of sound waves through the outer or middle ear may cause **CONDUCTION** **HEARING LOSS**.

16. Damage to the cochlea's hair cell receptors or their associated auditory nerves can cause **SENSIONEURAL** hearing loss. It may be caused by disease, but more often it results from the biological changes linked with **AGING** and prolonged exposure to ear-splitting noise or music.

**OBJECTIVE 11:** Describe how cochlear implants function, and explain why Deaf culture advocates object to these devices.

17. An electronic device that restores hearing among nerve-deafened people is a **COCHLEAR IMPLANT**.

18. Advocates of **DEAF CULTURE** object to the use of these implants on **CHILDREN** before they have learned to **SPEAK**. The basis for their argument is that deafness is not a **DISABILITY**.

19. Sign language **IS** (is/is not) a complete language, **WITH** (with/without) its own grammar, syntax, and semantics. People who lose one channel of sensation (such as hearing) **SEEM TO** (seem do not seem) to compensate with a slight enhancement in their other sensory abilities.

20. (Close-Up) Deaf children raised in a household where sign language is used express higher **SELF-ESTEEM** and feel more **ACCEPTED**.

**OTHER SENSES**

**OBJECTIVE 12:** Describe the sense of touch, and distinguish between kinesthesia and the vestibular sense.

1. The sense of touch is a mixture of at least four senses: **PRESSURE**, **WARMTH**, **COLD**, and **PAIN**. Other skin sensations, such as tickle, itch, hot, and wetness are **VARIATIONS** of the basic ones.

2. The **TOP** - **DOWN** influence on touch is illustrated by the fact that a self-produced tickle produces less activation in the **SOMATOSENSORY CORTEX** than someone else's tickle. This influence is also seen in the **RUBBER - HAND** illusion.

3. The system for sensing the position and movement of body parts is called **KINESIS**. The receptors for this sense are located in the **TENDONS**, **JOINTS**, **BONES**, and **EARS**, as well as in your skin.

4. The sense that monitors the position and movement of the head (and thus the body) is the **VESTIBULAR SENSE**. The receptors for this sense are located in the **SEMIRCULAR CANALS** and **VESTIBULAR SACs** of the inner ear.

**OBJECTIVE 13:** State the purpose of pain, and describe the biopsychosocial approach to pain.

5. People born without the ability to feel pain may be unaware of experiencing severe **INJURY**. More numerous are those who live with **CHRONIC** pain in the form of persistent headaches and backaches, for example.
6. Pain is a property of our ___PHYSIOLOGY____ as well as our ___EXPERIENCES____ and ___ATTENTION____, and our surrounding ___CULTURE____.

7. The pain system ___IS NOT_____ (is/is not) triggered by one specific type of physical energy. The body has specialized ___NOCEPTORS____ that detect hurtful stimuli.

8. Melzack and Wall have proposed a theory of pain called the ___GATE_____ - ___CONTROL____ theory, which proposes that there is a neurological ___GATE____ in the ___SPINAL____ ___CORD_____ that blocks pain signals or lets them through. It may be opened by activation of ___SMALL_____ (small/large) nerve fibers and closed by the activation of ___LARGE_____ (small/large) fibers or by information from the ___BRAIN____.

9. Pain-producing brain activity may be triggered with our without ___SENSORY_____ ___INPUT_____.

10. A sensation of pain in an amputated leg is referred to as ___PHANTOM_______ ___LIMB_____. Another example is ___TINNITUS_____, experienced by people who have a ringing-in-the-ears sensation.

List some pain control techniques used in health care situations.

PAIN CONTROL TECHNIQUES INCLUDE DRUGS, SURGERY, ACUPUNCTURE, THOUGHT DISTRACTION, EXERCISE, HYPNOSIS, RELAXATION TRAINING, ELECTRICAL STIMULATION, AND MASSAGE. SIMILARLY, FOR BURN VICTIMS, DISTRACTION DURING PAINFUL WOULD CARE CAN BE CREATED BY IMMERSION IN A COMPUTER-GENERATED 3-D WORLD.

OBJECTIVE 14: Describe the senses of taste and smell, and comment on the nature of sensory interaction.

11. The basic taste sensations are ___SWEET____, ___SOUR____, ___SALTY____, ___BITTER____, and a meaty taste called ___UMAMI_____.

12. Taste, which is a ___CHEMICAL____ sense, is enabled by the 200 or more ___TASTE____ ___BUDS_____ on the top and sides of the tongue. Each contains a ___PORE_____ that catches food chemicals.

13. Taste receptors reproduce themselves every ___WEEK OR TWO____. As we age, the number of taste buds ___DECREASES____ (increases/decreases/remains unchanged) and our taste sensitivity ___DECREASES____ (increases/decreases/remains unchanged). Taste is also affected by ___SMOKING____ and by ___ALCOHOL____ use.

14. When the sense of smell is blocked, as when we have a cold, foods do not taste the same; this illustrates the principle of ___SENSORY_____ ___INTERACTION____. The ___McGURK_______ effect occurs when we ___SEE______ a speaker saying one syllable while ___HEARING____ another.

15. In a few rare individuals, the senses become joined in a phenomenon called ___SYNAESTHESIA____.

16. Like taste, smell, or ___OLFACTION____, is a ___CHEMICAL____ sense. There ___IS NOT_____ (is/is not) a distinct receptor for each detectable odor.

17. Odors are able to evoke memories and feelings because there is a direct link between the brain area that gets information from the nose and the ancient ___LIMBIC____ centers associated with memory and emotion.

PERCEPTUAL ORGANIZATION

OBJECTIVE 15: Describe Gestalt psychology’s contribution to our understanding of perception, and Identify principles of perceptual grouping in form perception.

1. According to the ___GESTALT____ school of psychology, we tend to organize a cluster of sensations into a ___WHOLE____, or form.

2. When we view a scene, we see the central object, or ___FIGURE____, as distinct from surrounding stimuli, or the ___GROUND_____.

3. Proximity, similarity, closure, continuity, and connectedness are examples of Gestalt rules of ___GROUPING_____.

4. The principle that we organize stimuli into smooth, continuous patterns is called ___CONTINUITY____. The principle that we fill in gaps to create a complete, whole object is ___CLOSURE____. The grouping of items that are close to each other is the principle of ___PROXIMITY____; the grouping of items that look alike is the principle of ___SIMILARITY____. The tendency to perceive uniform or attached items as a single unit is the principle of ___CONNECTEDNESS_____.

OBJECTIVE 16: Explain the binocular and monocular cues we use to perceive depth.

5. The ability to see objects in three dimensions despite their two-dimensional representations on our retinas is called ___DEPTH____ ___PERCEPTION_____. It enables us to estimate ___DISTANCE_____.

6. Gibson and Walk developed the ___VISUAL____ ___CLIFF____ to test depth perception in infants. They found that each species, by the time it is ___MOBILE____, has the perceptual abilities it needs.

Summarize the results of Gibson and Walk’s studies of depth perception.

RESEARCH ON THE VISUAL CLIFF SUGGESTS THAT IN MANY SPECIES THE ABILITY TO PERCEIVE DEPTH IS PRESENT AT, OR VERY SHORTLY AFTER, BIRTH.
For questions 7–15, identify the depth perception cue that is defined.
7. Any cue that requires both eyes: ___MONOCULAR____.
8. The greater the difference between the images received by the two eyes, the nearer the object: ___RELATIVE___ ___DISPARITY____. 3-D movies simulate this cue by photographing each scene with two cameras.
9. Any cue that requires either eye alone: __RETIINAL__. 
10. If two objects are presumed to be the same size, the one that casts a smaller retinal image is perceived as farther away: __RELATIVE___ ___SIZE____.
11. An object partially covered by another is seen as farther away: ___INTERPOSITION____.
12. Objects lower in the visual field are seen as nearer: ___RELATIVE___ ___HEIGHT____.
13. As we move, objects at different distances appear to move at different rates: ___RELATIVE___ ___MOTION____.
14. Parallel lines appear to converge in the distance: ___LINEAR_____ ___PERSPECTIVE____.
15. The dimmer of two objects seems farther away: ___LIGHT_____ ___AND_____ ___SHADOW___.

OBJECTIVE 17: State the basic assumption we make in our perceptions of motion, and explain how these perceptions can be deceiving.
16. Our brain normally computes motion based partially on the assumption that shrinking objects are ___RETIINAL__ (approaching/retreating) and enlarging objects are _APPROACHING_ (approaching/retreating). Sometimes we are fooled because larger objects seem to move ___MORE SLOWLY__ (faster/more slowly) than smaller objects.
17. The brain interprets a rapid series of slightly varying images as ___MOVEMENT____. This phenomenon is called ___STROBOSCOPIC____ ___MOVEMENT____.
18. The illusion of movement that results when two adjacent stationary spots of light blink on and off in quick succession is called the ___PHI____ ___PHENOMENON____.

OBJECTIVE 18: Explain how perceptual constancies help us to organize our sensations into meaningful patterns.
19. Our tendency to see objects as unchanging while the stimuli from them change in size, shape, and lightness is called ___PERCEPTUAL___ ___CONSTANCY____.
20. Due to shape and size constancy, familiar objects ___DO NOT___ (do/do not) appear to change shape or size despite changes in our ___RETIINAL__ images of them.
21. Several illusions, including the ___MOON____ and ___PONZO____ illusions, are explained by the interplay between perceived ___SIZE____ and perceived ___DISTANCE____. When distance cues are removed, these illusions are ___DIMINISHED____ (diminished/strengthened).
22. The brain computes an object’s brightness ___RELATIVE TO____ (relative to/independent of) surrounding objects.
23. The amount of light an object reflects relative to its surroundings is called ___RELATIVE___ ___LUMINANCE____.
24. The experience of color depends on the surrounding ___CONTEXT____ in which an object is seen. In an unvarying context, a familiar object is seen. In an unvarying context, a familiar object will be perceived as having consistent color, even as the light changes. This phenomenon is called ___COLOR___ ___CONSTANCY____.
25. We see color as a result of our brains’ computations of light ___REFLECTED___ by any object relative to its ___SURROUNDING___ __OBJECTS__.

OBJECTIVE 19: Describe the contributions of restored vision, sensory deprivation, and perceptual adaptation research to our understanding of the nature-nurture interplay in our perceptions.
1. The idea that knowledge comes from inborn ways of organizing sensory experiences was proposed by the philosopher ___IMMANUEL KANT____.
2. On the other side were philosophers who maintained that we learn to perceive the world by experiencing it. One philosopher of this school was ___JOHN LOCKE___.
3. Studies of cases in which vision has been restored to a person who was blind from birth show that, upon seeing tactively familiar objects for the first time, the person ___CANNOT____ (can/cannot) recognize them.
4. Studies of sensory restriction demonstrate that visual experiences during ___INFANCY____ are crucial for perceptual development. Such experiences suggest that there is a ___CRITICAL___ ___PERIOD___ for normal sensory and perceptual development.
5. Humans given glasses that shift or invert the visual field ___WILL___ (will/will not) adapt to the distorted perception. This is called ___PERCEPTUAL___ ___ADAPTATION____.
6. Animals such as chicks ___DO NOT ADAPT___ (adapt/do not adapt) to distorting lenses.

OBJECTIVE 20: Define perceptual set, and explain why the same stimulus can evoke different perceptions in different contexts.
7. A mental predisposition that influences perception is called a ___PERCEPTUAL___ ___SET____.
8. How a stimulus is perceived depends on the concepts, or ___SCHEMAS____, we form and the ___CONTEXT___ in which the stimulus is experienced.
9. The context of a stimulus creates a ___TOP-DOWN___ (top-down/bottom-up) expectation that influences our
perception as we match our **BOTTOM-UP** (top-down/bottom-up) signal against it.

10. Our perception is also influenced by **STEREOTYPES** about gender and the **EMOTIONAL** context of our experiences.

11. To best understand perception, we need multiple levels of analysis because perception is a **BIOPSYCHOSOCIAL** phenomenon.

**IS THERE EXTRASENSORY PERCEPTION?**

**OBJECTIVE 21:** Identify the three most testable forms of ESP, and explain why most research psychologists remain skeptical of ESP claims.

1. Perception outside the range of normal sensation is called **EXTRASENSORY PERCEPTION**.

2. Psychologists who study ESP are called **PARAPSYCHOLOGISTS**.

3. The form of ESP in which people claim to be capable of reading others’ minds is called **TELEPATHY**. A person who “senses” that a friend is in danger might claim to have the ESP ability of **CLAIRVOYANCE**. An ability to “see” into the future is called **PRECOGNITION**. A person who claims to be able to levitate and move objects is claiming the power of **PSYCHOKINESIS**.

4. Analyses of psychic visions and premonitions reveal **CHANCE-LEVEL** (high/chance-level) accuracy. Nevertheless, some people continue to believe in their accuracy because vague predictions often are later **INTERPRETED (RETROFITTED)** to match events that have already occurred. In addition, people are more likely to recall or **RECONSTRUCT** dreams that seem to have come true.

5. Critics point out that a major difficulty for parapsychology is that ESP phenomena are not consistently **REPRODUCIBLE**.

6. Researchers who tried to reduce external distractions between a “sender” and a “receiver” in an ESP experiment reported performance levels that **BEAT** (beat/did not beat) chance levels. Follow-up studies **FAILED TO REPLICATE THE RESULTS** (failed to replicate the results/found equally high levels of performance).