1. Sensations

a. Match the structures with the statements that follow.

<table>
<thead>
<tr>
<th></th>
<th>1) Cerebral cortex</th>
<th>2) Nerve fiber</th>
<th>3) Receptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Projects sensation back to region where impulses seem to originate.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Carries impulses.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Forms sensory impulses.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Interprets impulses as sensations.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Decreases impulse formation when repeatedly stimulated.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Sensitive to a particular type of stimulus.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Exhibits adaptation.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b. Define adaptation.  **The decrease in impulse formation when a receptor is repeatedly stimulated by the same stimulus.**

2. General Senses

a. Match the responses with the statements that follow.

<table>
<thead>
<tr>
<th></th>
<th>1) Cold receptors</th>
<th>2) Free nerve endings</th>
<th>3) Heat receptors</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Pain receptors.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2, 4</td>
<td>Touch receptors.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Most sensitive to temperatures over 25°C.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Most sensitive to temperatures under 10°C.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>May be located in epidermis.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2, 5</td>
<td>Located in visceral organs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2, 4</td>
<td>Located in superficial portion of dermis.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Located in dermis and joints.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Temperature receptors closest to epidermis.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Touch receptor abundant in hairless skin.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1, 3, 4</td>
<td>Only in the skin.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b. What is referred pain?  **Projection of a pain sensation to a body part that is not involved in the source of the stimulus.**

3. Taste and Smell

Write the terms described by the statements in the spaces at the right.

1) Organs containing taste receptors.  **Taste buds**
2) Receptors located in nasal epithelium.  **Olfactory**
3) Type of taste receptors at back of tongue.  **Bitter**
4) Type of taste receptors at sides and tip of tongue.  **Salt**
5) Type of taste receptors at tip of tongue only.  **Sweet**
6) Type of taste receptors at sides of tongue only.  **Sour**
4. Ear Structure

a. Label the figure by placing the number of the structure in the space by the correct label.

11. Auditory tube  
1. Auricle  
6. Cochlea  
13. External auditory canal  
3. Incus  
2. Malleus  
8. Oval window  
4. Stapes  
10. Tympanic cavity  
9. Round window  
12. Tympanic membrane  
11. Tympanic cavity  
1. Oval window  
6. Cochlea  
13. External auditory canal  
3. Incus  
2. Malleus  
8. Oval window  
4. Stapes  
10. Tympanic cavity  
9. Round window  
12. Tympanic membrane

b. Write the terms that match the statements in the spaces at the right.

1) Part of the bony labyrinth that contains receptors for
   a) hearing;  
   b) static balance;  
   c) dynamic balance.

2) Fills membranous labyrinth.

3) Fills bony labyrinth.

4) Fills tympanic cavity.

<table>
<thead>
<tr>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cochlea</td>
</tr>
<tr>
<td>Utricle, saccule</td>
</tr>
<tr>
<td>Semicircular canals</td>
</tr>
<tr>
<td>Endolymph</td>
</tr>
<tr>
<td>Perilymph</td>
</tr>
<tr>
<td>Air</td>
</tr>
</tbody>
</table>
5. Hearing

a. Write the terms that match the statements in the spaces at the right.

1) Receptor organ for hearing. 
2) Receptor cells for hearing. 
3) Carry vibrations from eardrum to perilymph. 
4) Directs sound waves to tympanic membrane. 
5) Contains fibers of increasing length. 
6) Membrane-covered opening into scala tympani. 
7) Membrane struck by sound waves. 
8) Membrane that determines pitch of sound. 
9) Membrane contacting hairs of receptor cells. 
10) Allows air to enter tympanic cavity.

b. Write the terms that complete the sentences in the spaces at the right.

Sound waves enter the ___1___ and strike the ___2___, causing it to vibrate. This vibration is transmitted by the ___3___ to the ___4___ that fills the scala vestibuli and scala tympani. Oscillating movements of this fluid cause comparable vibrations of portions of the ___5___ membrane and the ___6___ that rests upon it. This causes the hair cells to contact the ___7___, which stimulates them to form ___8___ that are carried to the brain by the ___9___ nerve. The hearing centers in the ___10___ lobes interpret these impulses as sound sensations.

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6. Equilibrium
Write the terms that match the statements in the spaces at the right.
1) Receptor organ for static equilibrium.
   - Macula
2) Chambers containing receptors for static equilibrium.
   - Utricle, saccule
3) Force stimulating hair cells of macula.
   - Gravity
4) Receptor organ for dynamic equilibrium.
   - Crista ampullaris
5) Locations of receptor organs for dynamic equilibrium.
   - Semicircular canals
6) Fluid moving cupula when head is turned.
   - Endolymph
7) Part of brain controlling equilibrium.
   - Cerebellum

7. Accessory Structures of the Eye
Write the terms that match the statements in the spaces at the right.
1) Lines eyelids and covers anterior sclera.
   - Conjunctiva
2) Group of muscles that move the eye.
   - Extensic eye muscles
3) Secretes tears.
   - Lacrimal gland
4) Collect tears at inner corner of eye.
   - Canaliculi
5) Carries collected tears into nasal cavity.
   - Nasolacrimal duct

8. Eye Structure
   a. Write the terms that match the statements in the spaces at the right.
1) Fills anterior cavity.
   - Aqueous humor
2) Pigmented layer of the eyeball.
   - Choroid
3) Substance holding retina against choroid.
   - Vitreous humor
4) Opening in center of iris.
   - Pupil
5) Fluid mostly responsible for internal pressure in eye.
   - Aqueous humor
6) Protective outer fibrous coat of eye.
   - Sclera
b. Label the figure by placing the number of the structure in the space by the correct label.

- **7** Aqueous humor in anterior cavity
- **15** Choroid coat
- **9** Ciliary body
- **8** Conjunctiva
- **4** Cornea
- **13** Fovea centralis
- **3** Iris
- **6** Lens
- **11** Optic disk
- **12** Optic nerve
- **5** Pupil
- **14** Retina
- **10** Sclera
- **2** Suspensory ligaments
- **1** Vitreous humor in posterior cavity

9. Vision

Write the terms that match the statements in the spaces at the right.

1) Contains photoreceptors. _____________
2) Site of direct vision. _____________
3) Clear window through which light enters eye. _____________
4) Controls amount of light entering eye. _____________
5) Focuses light rays on retina. _____________
6) Layer containing blood vessels. _____________
7) Changes shape of the lens. _____________
8) Retinal area lacking photoreceptors. _____________
9) Causes greatest bending of light rays. _____________

Retina
Fovea centralis
Cornea
Iris
Cornea and lens
Choroid
Ciliary body
Optic disk
Cornea
10) Absorbs excessive light in eye.
11) Receptors for dim light vision.
12) Receptors for color vision.
13) Receptors absent in fovea.
14) Carries impulses from retina to brain.
15) Where medial nerve fibers cross over.
16) Light-sensitive pigment in rods.
17) Colors of light absorbed by three types of cones.
18) Vitamin required for rhodopsin synthesis.

10. Disorders of Hearing and Vision

Write the disorders described in the spaces at the right.

1) An infection called “pink eye.”
2) Cloudiness of the lens.
3) Acute infection of the middle ear.
4) Deafness due to exposure to loud noises.
5) Deafness correctible by hearing aids.
6) Results from unequal curvatures of lens or cornea.
7) Corrected by convex lenses.
8) Corrected by concave lenses.
9) Decreased elasticity of the lens.
10) Nausea due to repeated stimulation of equilibrium receptors.
11) Group of disorders producing nausea, dizziness, and tinnitus.
12) Cancer of immature retinal cells.
13) Caused by excessive intraocular pressure.
14) Crossed eyes.

11. Clinical Applications

a. An older patient calls the office and complains of pain at the base of the neck, left shoulder, and left arm. What is the probable cause of the pain? **Heart attack**. Why was the pain localized in these areas? **Sensory impulses from the heart use nerve serving neck, shoulder, and arm.**

What would you advise the patient to do? **Call 911 or go to the emergency room.**

b. An audiometry test verifies that a college student has a decreased sense of hearing. Discussion brings out that he has been working as an audio engineer at a local disco for three years. What relationship probably exists between his job and his hearing loss? **The loud music has probably caused partial nerve deafness.**