1. The dorsolateral fasciculus contains axons that will:
   A. cross to the opposite side of the CNS
   B. ascend to the medulla before synapsing
   C. synapse in laminae I and V
   D. enter the ventral white commissure
   E. mediate proprioceptive sensation

2. When you injure yourself, you immediately feel a sharp pain from the site of injury followed by a throbbing painful sensation. Which of the following statements about this is FALSE:
   A. the immediate pain sensation is carried by A\textsuperscript{δ} fibers
   B. the immediate pain sensation travels via the lateral spinothalamic pathway
   C. the throbbing pain sensation travels via the spinoreticulothalamic pathway
   D. the throbbing pain sensation is mediated by the ventroposterior lateral nucleus
   E. the immediate pain sensation is localized on the body by the postcentral gyrus

3. All of the following contain axons or cell bodies of second-order sensory neurons EXCEPT:
   A. medial lemniscus
   B. fasciculus cuneatus
   C. internal arcuate fibers
   D. nucleus gracilis
   E. anterior white commissure

4. At which of the following locations is the somatotopic orientation of the body in the medial lemniscus represented as upper body is dorsomedial and lower body is ventrolateral:
   A. midbrain
   B. rostral pons
   C. caudal pons
   D. rostral medulla
   E. cortex

5. A patient displays a symmetrical loss of pain and temperature on the shoulder area on both sides of the body with no loss of tactile sensation. Pain and temperature and tactile sensation are normal over the rest of the body. This condition would be due mostly likely to lesion of:
   A. anterior white commissure from C2 to C4
   B. anterior white commissure from C6 to T1
   C. anterior white commissure from T1 to T5
   D. Anterolateral system on right at C2
   E. paracentral lobule on the left
6. A patient shows a loss of tactile sensation on the right starting at the lateral aspect of the thigh and continuing over the rest of the lower right limb. There is also a loss of pain and temperature on the left from the medial aspect of the leg and below on the left. This would be caused by a lesion of the spinal cord:
   A. on the left at T12
   B. on the left at L2
   C. on the right at T12
   D. on the right at L2
   E. on the right at L4

7. Which statement is NOT true about the mesencephalic nucleus of V:
   A. it contains the cell bodies of second-order sensory neurons
   B. it is involved in the jaw-jerk reflex
   C. axons of its neurons travel in the trigeminal nerve
   D. axons of its neurons synapse in the trigeminal motor nucleus
   E. it contains pseudounipolar neurons

8. Loss of pain, temperature, and touch sensation on the right side of the face could be caused by a lesion of the:
   A. left spinal trigeminal nucleus
   B. right spinal trigeminal nucleus
   C. right chief sensory nucleus of V
   D. ventral trigeminothalamic tract on the left
   E. ventral trigeminothalamic tract on the right

9. Information about tactile sensation from the chin is carried by all of the following EXCEPT:
   A. chief sensory nucleus of V
   B. mandibular division of cranial nerve V
   C. mesencephalic nucleus
   D. ventral trigeminothalamic tract
   E. VPM

10. Cell bodies in the brainstem that send axons to spinal cord to inhibit pain transmission are located in:
    A. periaqueductal gray
    B. nucleus raphe magnus
    C. association cortex
    D. cingulate cortex
    E. all of the above

1. C
2. D
3. B
4. C
5. A
6. D
7. A
8. D
9. C
10. B
VISUAL SYSTEM

1. Which of the following statements about the eye is FALSE:
   A. aqueous humor is produced by the secretory retina
   B. relaxation of the ciliary muscle causes the lens to flatten (become less convex)
   C. convergence in the pathway increases the retina's sensitivity to light
   D. an increase in the pressure of aqueous humor causes glaucoma
   E. the optic disc contains only cones and has the highest visual acuity

2. Information from the lower nasal retina of the right eye would be found in all the following locations EXCEPT the:
   A. right optic tract
   B. right optic nerve
   C. left loop of Meyer
   D. left temporal lobe
   E. left lingual gyrus

3. On examination, you find that a patient's eyes have the position at rest shown on the right. This is most likely due to a lesion of:
   A. Right cranial nerve VI nucleus
   B. Left cranial nerve VI nucleus
   C. MLF
   D. Left cranial nerve III
   E. Right cranial nerve III

4. The accommodation reflex would be affected by damage to which of the following structures:
   A. left and right occipital cortex
   B. right cranial nerve III
   C. right Edinger Westfall nucleus
   D. A, B and C
   E. B and C

5. A patient has a large left pupil that does not respond to light shone into either eye although the right pupil does respond. This could be caused by damage to the:
   A. left optic nerve
   B. left cranial nerve III
   C. right cranial nerve III
   D. left pretectal nucleus
   E. left intermediolateral cell column

6. Which of the following statements is FALSE about the pathway that controls voluntary conjugate lateral gaze of the eyes:
   A. eye movement is triggered by activity in the frontal lobe
   B. internuclear ophthalmoplegia is caused by a lesion in this pathway
   C. stimulation of the frontal eye fields on one side causes deviation of the eyes to the opposite side
   D. a lesion of the MLF does not effect this movement
   E. the paramedian pontine reticular formation influences the nuclei of CN VI and III
7. Voluntary movement of your eyes to look from one stationary object to another in your visual field is known as:
   A. saccade
   B. smooth pursuit
   C. vergence
   D. nystagmus
   E. tracking movement

8. Smooth pursuit movements can be generated:
   A. by irrigating one ear with warm or cold water
   B. by looking from point to point in a stationary environment
   C. only in response to a moving target
   D. by rotation of the head
   E. all of the above

9. Choose the best answer concerning the retina.
   A. When light strikes a rod photoreceptor, rhodopsin binds to sodium channels in the outer segment membrane.
   B. Cone photoreceptors fire action potentials under conditions of bright light.
   C. Retinal ganglion cell axons comprise the optic nerve.
   D. The transmitter released at photoreceptor synapses is cGMP.
   E. Both A and B are true

10. Choose the best answer concerning the visual system.
    A. Visual cortex neurons predominately have center-surround receptive fields
    B. Some cells in layer 4 of striate cortex are directionally-selective.
    C. A lesion of parietal cortex will lead to selective loss of ability to recognize faces while leaving the ability to detect the motion of objects intact.
    D. Cells of one column in the striate cortex have the same orientation selectivity.
    E. Both A and B are true

11. Choose the best answer concerning the normal development of the visual system.
    A. In a fetus, about once a minute, all ganglion cells in one eye will fire simultaneously.
    B. NMDA receptors may help to stabilize appropriate connections by triggering calcium influx into cortical cell dendrites.
    C. On the day of birth, the striate cortex on the left side of the brain receives axonal projections from the lateral geniculate nuclei on both sides of the brain.
    D. Segregation of left-eye and right-eye inputs to layer 4 of the cortex begins about 1 month after birth.
    E. Both A and B are true
12. Select the best answer concerning the effects of a severe cataract in the left eye of a newborn:
   A. If the cataract is not removed, axons from some layers of the lateral geniculate will develop smaller arbors than axons from the other layers of the lateral geniculate.
   B. If the cataract is not removed, most, but not all, of the cells in the striate cortex will become unresponsive to the left eye.
   C. If the cataract is not removed, inhibitory circuits and NMDA receptors will fail to develop in the left eye's ocular dominance columns.
   D. Early unilateral cataract disrupts binocularity by preventing any geniculocortical axons from synapsing in layer 4.
   E. Both A and B are true.

1. E
2. A
3. E
4. D
5. B
6. D
7. A
8. C
9. C
10. D
11. B
12. E
29-32. The diagram on the right shows the **VISUAL FIELDS** for the left and right eyes. 1) Shade in the appropriate areas of the visual fields in the right column that correspond to the lesion named in the left column. 2) In the spaces provided in the left column indicate **ONE** place in the visual pathway where a lesion would produce that deficit. **Be sure to indicate the side of the lesion.** (2 points ea)

**Name: Bitemporal Hemianopsia**

29.Location: ____________________________

**Name: Left Contralateral Homonymous Hemianopsia**

30.Location: ____________________________

**Name: Right Upper Homonymous Quadrantanopsia**

31.Location: ____________________________

**Name: Right Contralateral Homonymous Hemianopsia with Macular Sparing**

32.Location: ____________________________
VESTIBULAR AND AUDITORY SYSTEMS

1. Neurons in the vestibular ganglion synapse directly on all of the following EXCEPT:
   A. hair cells of the macula
   B. vestibular nuclei
   C. flocculus and nodulus
   D. hair cells of the semicircular canals
   E. ventral horn motoneurons

2. Choose the best answer concerning the auditory system.
   A. A loud tone of 300 Hz depolarizes more hair cells than does a quiet tone of 300 Hz.
   B. Current cochlear prostheses detect the depolarization of the hair cells and transmit that
      information to electrodes implanted in the cochlear nucleus.
   C. Some inner hair cells are rapidly adapting whereas other inner hair cells are slowly
      adapting.
   D. Calcification of the basilar membrane is a common cause of hearing loss.
   E. Both A and B are true.

3. Choose the best answer concerning the auditory system.
   A. The characteristic amplitude of a cell in the eighth nerve is the size of its response to
      appropriate frequencies.
   B. A sound of 250,000 Hz will excite some cells in the cochlear nucleus and will inhibit
      others.
   C. Both sides of the brain contain some cells that fire when a tone of 2000 Hz is
      presented.
   D. A lesion in the primary auditory cortex on the right side of the brain will make it more
      difficult to localize the origin of sound coming from the right side.
   E. Both A and B are true.

4. Choose the best answer concerning the vestibular system:
   A. One of the functions of perilymph is to help bend hair bundles of the semicircular
      canals during head rotation.
   B. When the head is tilted to the left, some eighth nerve axons in the utricle will fire more
      slowly than when the head is upright.
   C. Bending the hair bundle generates an action potential in the hair cell.
   D. First-order axons from the semicircular canals always fire action potentials while the
      head is rotating.
   E. Both A and B are true

5. Choose the best answer concerning the vestibular system:
   A. Ions such as potassium in the endolymph enter hair cells through mechanoreceptor-
      type channels in the stereocilia.
   B. The firing rate of CN VIII axons from the utricle signals both the direction and
      magnitude of tilt.
   C. Cells in the vestibular nuclei on the left side of the brainstem respond to head motion
      only to the left and not to the right.
   D. Adjacent stereocilia in a hair bundle move independently of one another.
   E. Both A and B are true.
6. Which of the following statements about the vestibular apparatus is **FALSE**:
   A. vestibular hair cells contain a kinocilium at their apical ends
   B. in the crista ampullares, stereocilia project into the otolithic membrane
   C. the membranous labyrinth is filled with endolymph
   D. the cupula is important in transduction of angular rotation of the head
   E. hair cells are innervated by bipolar neurons

7. A lesion of the lateral lemniscus on the left side of the rostral pons would result in:
   A. loss of tactile sensation on the right side of the body
   B. loss of hearing on the right side
   C. loss of hearing on the left side
   D. little or no deficit

1. E
2. A
3. C
4. B
5. E
6. B
7. D