The Human Brain

1. Match the letters on the diagram of the human brain (right lateral view) to the appropriate terms listed at the left:

<table>
<thead>
<tr>
<th>Letter</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>h</td>
<td>1. frontal lobe</td>
</tr>
<tr>
<td>b</td>
<td>2. parietal lobe</td>
</tr>
<tr>
<td>j</td>
<td>3. temporal lobe</td>
</tr>
<tr>
<td>f</td>
<td>4. precentral gyrus</td>
</tr>
<tr>
<td>c</td>
<td>5. parieto-occipital sulcus</td>
</tr>
<tr>
<td>a</td>
<td>6. postcentral gyrus</td>
</tr>
<tr>
<td>i</td>
<td>7. lateral sulcus</td>
</tr>
<tr>
<td>g</td>
<td>8. central sulcus</td>
</tr>
<tr>
<td>e</td>
<td>9. cerebellum</td>
</tr>
<tr>
<td>l</td>
<td>10. medulla</td>
</tr>
<tr>
<td>d</td>
<td>11. occipital lobe</td>
</tr>
<tr>
<td>k</td>
<td>12. pons</td>
</tr>
</tbody>
</table>

2. In which of the cerebral lobes would the following functional areas be found?
   - auditory area
   - olfactory area
   - primary motor area
   - visual area
   - primary sensory area
   - Broca’s area

3. Which of the following structures are not part of the brain stem? (Circle the appropriate response or responses.)
   - cerebral hemispheres
   - pons
   - midbrain
   - cerebellum
   - medulla
   - diencephalon

4. Complete the following statements by writing the proper word or phrase on the corresponding blanks at the right.

   A(n) _1_ is an elevated ridge of cerebral tissue. The convolutions seen in the cerebrum are important because they increase the _2_. Gray matter is composed of _3_. White matter is composed of _4_. A fiber tract that provides for communication between different parts of the same cerebral hemisphere is called a(n) _5_, whereas one that carries impulses to the cerebrum from, and from the cerebrum to, lower CNS areas is called a(n) _6_ tract. The lentiform nucleus along with the amygdaloid and caudate nuclei are collectively called the _7_.

<table>
<thead>
<tr>
<th>Number</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>gyrus</td>
</tr>
<tr>
<td>2</td>
<td>surface area</td>
</tr>
<tr>
<td>3</td>
<td>neuron cell bodies</td>
</tr>
<tr>
<td>4</td>
<td>myelinated fibers</td>
</tr>
<tr>
<td>5</td>
<td>association tract</td>
</tr>
<tr>
<td>6</td>
<td>projection</td>
</tr>
<tr>
<td>7</td>
<td>basal nuclei</td>
</tr>
</tbody>
</table>
5. Identify the structures on the following sagittal view of the human brain by matching the numbered areas to the proper terms in the list.

18. a. cerebellum
15. b. cerebral aqueduct
1. c. cerebral hemisphere
14. d. cerebral peduncle
10. e. choroid plexus
13. f. corpora quadrigemina
2. g. corpus callosum
4. h. fornix
16. i. fourth ventricle
6. j. hypothalamus
8. k. mammillary bodies
7. n. optic chiasma
17. q. pons
5. l. massa intermedia
12. o. pineal body
3. r. septum pellucidum
19. m. medulla oblongata
9. p. pituitary gland
11. s. thalamus

6. Using the terms from item 5, match the appropriate structures with the descriptions given below:

j 1. site of regulation of body temperature and water balance; most important autonomic center

1 2. consciousness depends on the function of this part of the brain

f 3. located in the midbrain; contains reflex centers for vision and audition

a 4. responsible for regulation of posture and coordination of complex muscular movements

s 5. important synapse site for afferent fibers traveling to the sensory cortex

m 6. contains autonomic centers regulating blood pressure, heart rate, and respiratory rhythm, as well as coughing, sneezing, and swallowing centers

g 7. large commissure connecting the cerebral hemispheres

h 8. fiber tract involved with olfaction

b 9. connects the third and fourth ventricles

s 10. encloses the third ventricle
7. Embryologically, the brain arises from the rostral end of a tubelike structure that quickly becomes divided into three major regions. Groups of structures that develop from the embryonic brain are listed below. Designate the embryonic origin of each group as the hindbrain, midbrain, or forebrain.

<table>
<thead>
<tr>
<th>Forebrain</th>
<th>Hindbrain</th>
<th>Forebrain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. the diencephalon, including the thalamus, optic chiasma, and hypothalamus</td>
<td>2. the medulla, pons, and cerebellum</td>
<td>3. the cerebral hemispheres</td>
</tr>
</tbody>
</table>

8. What is the function of the basal nuclei? *They are involved in the regulation, modulation, and refinement of voluntary motor activity.*

9. What is the corpus striatum, and how is it related to the fibers of the internal capsule? *The fibers of the internal capsule pass between the basal nuclei, giving them a striped appearance; therefore, a striped body or corpus striatum.*

10. A brain hemorrhage within the region of the right internal capsule results in paralysis of the left side of the body. Explain why the left side (rather than the right side) is affected. *Because most of the motor fibers cross over to the opposite side at the level of the medulla oblongata.*

11. Explain why trauma to the base of the brain is often much more dangerous than trauma to the frontal lobes. *(Hint: Think about the relative functioning of the cerebral hemispheres and the brain stem structures. Which contain centers more vital to life?)*

*Trauma to the base of the brain might damage the medulla oblongata, which contains vital respiratory, cardiac, and vasomotor centers. Also, the reticular activating system, which helps to maintain consciousness, spans the length of the brain stem.*

12. In “split brain” experiments, the main commissure connecting the cerebral hemispheres is cut. First, name this commissure:

*Corpus callosum*

Then, describe what results (in terms of behavior) can be anticipated in such experiments. *(Use an appropriate reference if you need help with this one!)*

*The disconnection of verbal naming and mathematical functions of the left side of the brain from the spatial recognition abilities of the right side (i.e. associating names with faces); some patients report that they no longer dream; isolated patients are mute for a brief time after surgery and have difficulty controlling the left side of the body.*
Meninges of the Brain

13. Identify the meningeal (or associated) structures described below:

1. outermost meninx covering the brain; composed of tough fibrous connective tissue
2. innermost meninx covering the brain; delicate and highly vascular
3. structures instrumental in returning cerebrospinal fluid to the venous blood in the dural sinuses
4. structure that forms the cerebrospinal fluid
5. middle meninx; like a cobweb in structure
6. its outer layer forms the periosteum of the skull
7. a dural fold that attaches the cerebrum to the crista galli of the skull
8. a dural fold separating the cerebrum from the cerebellum

Cerebrospinal Fluid

14. Fill in the following flowchart by delineating the circulation of cerebrospinal fluid from its formation site (assume that this is one of the lateral ventricles) to the site of its reabsorption into the venous blood:

Lateral ventricle → interventricular foramen → Third ventricle → median foramen

Cerebral aqueduct → fourth ventricle → lateral foramen

Subarachnoid space → arachnoid villi → dural sinuses (containing venous blood)

Now label appropriately the structures involved with circulation of cerebrospinal fluid on the accompanying diagram. (These structures are identified by leader lines.)
Cranial Nerves

15. Using the terms below, correctly identify all structures indicated by leader lines on the diagram.

a. abducens nerve (VI)  j. longitudinal fissure  s. pituitary gland
b. accessory nerve (XI)  k. mammillary body  t. pons
c. cerebellum  l. medulla oblongata  u. spinal cord
d. cerebral peduncle  m. oculomotor nerve (III)  v. temporal lobe of cerebral hemisphere
e. decussation of the pyramids  n. olfactory bulb  w. trigeminal nerve (V)
f. facial nerve (VII)  o. olfactory tract  x. trochlear nerve (IV)
g. frontal lobe of cerebral hemisphere  p. optic chiasma  y. vagus nerve (X)
h. glossopharyngeal nerve (IX)  q. optic nerve (II)  z. vestibulocochlear nerve (VIII)
i. hypoglossal nerve (XII)  r. optic tract
16. Provide the name and number of the cranial nerves involved in each of the following activities, sensations, or disorders:

1. shrugging the shoulders
   - accessory (XI)

2. smelling a flower
   - olfactory (I)

3. raising the eyelids; focusing the lens of the eye for accommodation; and pupillary constriction
   - oculomotor (III)

4. slows the heart; increases the mobility of the digestive tract
   - vagus (X)

5. involved in Bell’s palsy (facial paralysis)
   - facial (VII)

6. chewing food
   - trigeminal (V)

7. listening to music; seasickness
   - vestibulocochlear (VIII)

8. secretion of saliva; tasting well-seasoned food
   - facial (VII)

9. involved in “rolling” the eyes (three nerves—provide numbers only)
   - III, IV, VI

10. feeling a toothache
    - trigeminal (V)

11. reading Mad magazine
    - optic (II)

12. purely sensory in function (three nerves—provide numbers only)
    - I, II, VIII

Dissection of the Sheep Brain

17. In your own words, describe the firmness and texture of the sheep brain tissue as observed when cutting into it.

Very soft; much like thickened oatmeal in consistency.

Because formalin hardens all tissue, what conclusions might you draw about the firmness and texture of living brain tissue? It must be very soft and fragile.

18. Compare the relative sizes of the cerebral hemispheres in sheep and human brains?

The cerebral hemispheres are much larger in humans.

What is the significance of these differences? Evolution of the cerebral hemispheres in humans has encompassed higher functions; i.e. speech, reasoning, etc.

19. Compare the sizes of the brain stems in sheep and human brains.

They are similar in size.

What is the significance? The brain stem is responsible for automatic behavior necessary for survival. These functions are similar in sheep and humans.

20. Why are the olfactory bulbs much larger in the sheep brain than in the human brain?

The sense of smell is an important survival sense (food finding, recognition of predators) in sheep. This is not true in humans.