CHAPTER 13: BRAIN AND CRANIAL NERVES

I. THE BRAIN AS AN ORGAN

A. Weight: ______________; Metabolism:

B. Coverings (Fig. 13.12)

C. Cerebrospinal Fluid (Fig. 13.13; 13.14)
   1. Function
   2. Components
   3. Source
   4. Flow: Produced within lateral ventricles from choroid plexuses; flows through interventricular foramina to third ventricle; through cerebral aqueduct to fourth ventricle; out lateral and median apertures to subarachnoid space; around brain and spinal cord up to arachnoid granulations; into superior sagittal sinus.
   5. Drainage
   6. Clinical importance Internal hydrocephalus

                                  External Hydrocephalus

D. Oxygen and Nutrition

   1. Oxygen Hypoxia
   2. Glucose Hypoglycemia
3. Other nutrients

4. Percent of cardiac output to brain:

5. "Stroke" (p.502 [508-9])
   a. Ischemic
   b. Hemorrhagic
   c. Symptoms
   d. Treatment

F. The blood-brain barrier (See p. 457 [459])

1. Anatomical evidence (Fig. 11.6):
   a. Most capillaries:
   b. Brain capillaries:

2. Physiological evidence:
   a. Many substances pass poorly from blood to brain cells
      Ex.: Insulin
           Proteins
           Many drugs
   b. Others pass rapidly
      Ex:
II. SUMMARIZED BRAIN FUNCTIONS

A. Brain stem (Fig. 13.1)

1. Medulla
   a. Site of decussation (left-right crossover) of many sensory and motor pathways
   b. Contains control centers for vital functions:
      - Cardiac center
      - Respiration
      - Vasomotor area (blood pressure control)
   c. Contains control centers for non-vital functions
      - Vomiting
      - Swallowing
      - Coughing and sneezing
      - Equilibrium
   d. Cranial nerves VIII-XII originate in the medulla

2. Pons
   a. Provides neural connections with cerebellum and medulla and upper brain stem
   b. Contains control centers for respiration
   c. Cranial nerves V-VIII originate in the pons

3. Midbrain
   Neural connections between spinal cord and higher centers
Diencephalon (Fig. 13.1)

1. **Thalamus**
   a. Relay station for many sensory neurons (except smell) from periphery to cerebral cortex
   b. Relay station for some motor neurons
   c. Crude interpretation of some general sensations (ex., pain, temperature, touch, pressure)

2. **Hypothalamus**
   a. Controls all pituitary hormones
   b. Controls the autonomic nervous system
   c. Controls body temperature, food intake, fluid volume, thirst
   d. Receives signals of emotional stress from the cerebral center and responds to them via ANS and pituitary

C. **Cerebrum** (Fig. 13.1; 13.8)

1. **Basal nuclei** (Fig. 13.10)
   a. Control tone and subconscious movements of skeletal muscles

2. **Corpus callosum** allows communication between hemispheres

3. **Cerebral cortex** (Fig. 14.11)
   a. Anatomical pattern: gray matter over white matter
   b. Contains 75% of all neuron cell bodies
c. Sensory areas (Fig. 14.11)

Primary somatic sensory cortex localizes general sensations from the entire body (Fig. 14.12)

Somatic sensory association area allows for interpretation of meaning of the general sensations, and sensory memory

Visual cortex interprets shape and color of objects

Visual association area is responsible for recognition of meaning of visual stimuli

Primary auditory cortex interprets pitch and volume

Auditory association area interprets the meaning of sound

Taste (gustatory) area interprets taste

d. Motor Areas (Fig. 14.11)

Primary motor cortex controls specific skeletal muscle movements (Fig. 14.13)

Premotor area controls skilled motor movements

Broca's area initiates muscle movements involved in speech

e. Prefrontal area (Fig. 14.11) is the site of motivation, foresight, regulation of emotion and mood (personality)

D. Cerebellum (Fig. 13.1): Subconscious control of skeletal muscle

1. Maintenance of muscle tone
2. Equilibrium (balance)
3. Sequencing of muscle contractions
4. Muscle "preset"
5. Dampening of incidental limb movements