I. Brainstem
   A. Midbrain (mesencephalon)
      1. corpora quadrigemina on roof
         a. superior colliculi
         b. inferior colliculi
      2. nuclei
         a. eye movements
         b. pupil and lens of eye
      3. substantia nigra
         a. relay to basal nuclei and thalamus
         b. coordination of body movements
      4. cerebral peduncles
         ascending and descending fiber tracts
      5. red nucleus

B. Pons (from metencephalon)
   1. ascending and descending nerve tracts
      a. surface fibers to cerebellum
      b. deeper fibers “throughway”
   2. nuclei
      a. CN: V-VIII
      b. some shared function with medulla

C. Cerebellum
   1. balance and coordination
      a. receives sensory input from sense organs in muscles
      b. receives cortical fibers for vision, hearing, equilibrium
   2. comparator
      a. receives input from cerebral cortex
      b. receives sensory input from proprioceptors
      c. compares actual movements with intended movements
      d. sends out action potentials to “correct” discrepancies
3. smooth coordinated movements

4. no descending fibers
   a. “indirect” influence on motor control
   b. all Purkinje cell output is inhibitory

5. some cognitive functions

D. Medulla oblongata (from myelencephalon)
   1. continuous inferiorly with spinal cord
   2. ascending and descending nerve tracts

3. important nuclei
   a. vasomotor
   b. cardioinhibitory
   c. respiratory center
   d. vomiting, coughing, sneezing
   e. CN’s: VIII - XII

4. pyramids
   a. anterior
   b. descending motor tracts

E. Reticular formation
   1. scattered groups of nuclei (complex network of ascending and descending branches)

   2. reticular activating system or extrathalamic cortical modulatory system
      a. arousal, consciousness, alertness
      b. sleep/wake cycle
      c. inhibit for anesthesia

3. autonomic control
   cardiovascular and respiratory centers

4. motor input from cerebral cortex
   - reticulospinal tracts

5. pain modulation

II. Spinal Cord Tracts
   A. Spinal Cord
1. H of gray matter
dorsal and ventral horns
2. white matter
   a. ascending
      - spinothalamic tracts
      - dorsal columns (fasciculus gracilis and cuneatus)
      - spinocerebellar tracts
   b. descending
      - corticospinals

B. Ascending tracts
1. crossed
2. synapse in thalamus

C. Descending tracts (upper motor neurons)
1. corticospinals
   a. direct connections to lower motor neurons
   b. cell bodies primarily in precentral gyrus
   c. most decussate in pyramids of medulla

2. reticulospinal tracts
   - control muscles for maintaining tonus, balance, and posture

3. vestibulospinal tracts
   a. originate in nucleus receiving input from inner ear (vestibule)
   b. motor for balance