The BRAIN

I. The Anatomy of the Brain - 4 regions

A. Brain Stem
1. Medula Oblongata - HR, BP & breathing
2. Pons - bridge
3. Midbrain – conducts various nerve impulses

B. Cerebellum – governs posture, balance, coordination & skilled movement

C. Diencephalon
1. Thalamus – major relay station for sensory impulses & the regulation of consciousness, sleep, and alertness.
2. Hypothalamus – major regulator of homeostatsis. Key functions include:
    a. control of ANS
    b. production of hormones (link to endocrine system/pituitary)
    c. regulation of eating & drinking
    d. regulation of emotional & behavioral patterns
    e. control of body temperature
    f. regulation of circadian rhythms & states of consciousness
3. Epithalamus
    a. pineal gland – secretes the hormone melatonin, thought to promote sleepiness
    b. habenular nuclei – emotional response to odo
4. Subthalamus – helps control body movements

D. Cerebrum
1. Seat of intelligence – reading, writing, speaking, performing calculations, composing music, remembering the past, planning for the future & imagining possibilities
2. Contains folds (gyri) and deep groves between folds (fissures). The longitudinal fissure separates the R & L hemisphere. The two sides are connected internally by the corpus collosum
3. R hemisphere - facial recognition, music & art; L hemisphere - reasoning, math, science, written & spoken language
4. Lobes: frontal, parietal, temporal, & occipital
5. Limbic System - the "emotional brain" (pain, pleasure, docility, affection, & anger)
    a. hippocampus – memory (works with other parts of the cerebrum)
    b. amygdala – stimulate it = rage; remove it = no fear

II. Related Brain Facts

A. Blood Flow
1. The carotid and vertebral arteries supply the blood to the brain

2. The __jugular____ vein returns blood from the head to the heart
3. The brain is only about 2% of total body weight, but consumes __20%__ of the oxygen and glucose the body uses at rest. Even a slight slowing of blood flow can cause unconsciousness, interruption of the blood flow for 1-2 minutes causes impairment, total deprivation for __4___ minutes causes permanent injury or death. Since the brain has no stored __glucose____ it needs a constant supply. Low glucose levels lead to confusion, dizziness, and __convulsions__ .

B. Blood-Brain Barrier
1. Provides __protection____ from harmful substances and pathogens by preventing their passage from the blood into the brain
2. Special guard cells (gate keepers) near capillaries, allow only __selective___ entry
3. Trauma, __toxins____, and inflammation break down the BBB

C. Cerebrospinal Fluid
1. __Mechanical___ protection – shock absorption; the brain "floats"
2. __Chemical____ protection – creates optimal environment for neuronal signaling
3. Circulation – exchanges nutrients (carries O_2 & glucose to neurons & neuroglia)
4. Is continuously formed and reabsorbed into blood in subarachnoid space. __Hydrocephalus__ - when drainage is blocked (injury, infection, tumor, etc.)

III. Circadian Rhythms – a 24 hour cycle of wakefulness & __sleep____; part of the integrative function of the cerebrum

A. Need __7-8__ hours of sleep on average (teens - __9 +__ hours)

B. Need periods of deep sleep (NREM) & 3-5 episodes of REM sleep (90-120 min.)

C. Lack of sleep impairs attention, __learning____, memory & performance

IV. Common Brain Injuries

A. __Concussion___ – a blow to the head causes abrupt, temporary loss of consciousness (seconds to hours)

B. __Contusion____ – bruising due to trauma, usually in the frontal lobe; may include loss of consciousness or reflexes, low BP, & temp. cessation of respiration

C. __Laceration____ – tearing of the brain or rupture of blood vessels, due to skull fracture or gunshot wound; may cause cerebral hematoma, edema, or increased intracranial pressure

D. __Stroke_____ – part of the brain is deprived of O_2, due to clot, aneurysm, etc.; damage depends on the location of the stroke & other factors, including gender