



## The Nervous System - Structure and Function

### Brain Regions

Major Region	Structure	Localization/Shape	Characteristics
	Thalamus	Egg-shaped, forming the central core of the brain's interior	Relay station for conduction of sensory impulses to cerebrum for interpretation. Also receives impulses from and to motor cortex and motor centers. Involved in memory processing.
	Pituitary Gland	A protrusion hanging as a stalk at the bottom of the hypothalamus	Body's "master gland" – secretes several hormones that affect many other endocrine glands
	Hypothalamus	Below the thalamus	Regulation of body temperature, food intake, water balance, thirst, biological rhythms. Endocrine organ
	Amygdala	Two almond-shaped neural clusters located medial to temporal lobe	Evaluates sensory information for emotional importance (fear, aggression, rage) and assesses dangers or threats
	Hippocampus	Shaped like a seahorse	Learning and new memory processing. Acts as a "gateway" to all memory functions.
	Pons	Between the midbrain and the medulla oblongata	Cooperates with the respiratory center/rhythm of breathing. Relay station for communication between motor cortex and cerebellum. Involved in sleeping, waking and dreaming.
	Medulla oblongata	Between the pons and the spinal cord	Cardiovascular center (heart rate), respiratory center (breathing rate), vomiting, coughing.
	Reticular activating system (RAS)	Network of nerves extending upward from brainstem into centre of	Acts as a screen by filtering out information that is important needing attention and information that is unimportant and can be ignored. The gateway to

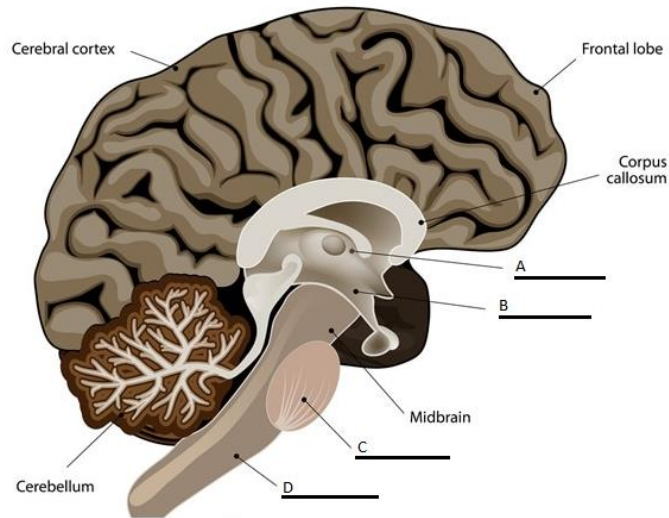


		brain	conscious awareness.
Cerebellum		Dorsal to the pons and medulla. Cauliflower-like.	Processes information leading to a proper balance and posture, resulting in the smooth coordination of skeletal muscle. Involved in remembering certain simple skills and acquired tasks including complex cognitive tasks.
	Parietal Lobe	Top of the brain	Contains the somatosensory cortex where information about pressure, pain, temperature and touch throughout the body is processed.
	Temporal Lobe	Sides of the brain	Involved in memory, perception, and emotion. Contains the auditory cortex and Wernicke's area which process sounds and language comprehension respectively.
	Frontal Lobe	Front of the brain	Involved in executive tasks (prefrontal cortex) including making plans, judgements, thinking creatively and taking initiative. Contains the motor cortex which controls the 600 muscles of the body for voluntary movement. Also contains the Broca's area which enables speech production.
	Occipital Lobe	Lower back of the brain	Contains the visual cortex where visual information is processed. Receives information from the opposite visual field.
	Corpus Callosum	Approximately 10 cm in length and shaped like a C	A broad band of myelinated nerve fibres that connects the two cerebral hemispheres. Allows information from one side of the brain to communicate with the other side.
	Right Hemisphere	Right side of brain	Spatial ability, perceptual, tasks, patterns and multi-tasks. Involved in intuitive, creative, holistic thought.
	Left Hemisphere	Left side of brain	Verbal, language, sequential processing of information, logical. Involved in rational and analytical thought.



### Questions:

- 1) Identify the following brain structures (A-D) on the diagram below and include a brief description of main functions.



- 2) Damage to which of the following brain structures would have the greatest effect on walking on a straight line?
  - a) Frontal lobe
  - b) Hippocampus
  - c) Pons
  - d) Cerebellum
  - e) Cerebrum
- 3) A phobia is “an extreme or irrational fear of or aversion to something.” Researchers often use PET and fMRI neuroimaging techniques to pinpoint brain structures involved in various

disorders, including phobias. Which brain region is expected to show prominent activity in these neuroimaging scans and why?

- 4) One of the most common symptoms of Alzheimer’s disease is memory loss and the inability to form new memories due to brain degeneration. Which of the following structure is responsible for not being able to form new memories?
  - a) Temporal lobe
  - b) Hippocampus
  - c) Hypothalamus
  - d) Amygdala
  - e) Occipital lobe
- 5) Why is the pituitary gland often called the body’s “master gland”

### Answers:

- 1a) Thalamus b) Hypothalamus c) Pons d) Medulla Oblongata
- 2) D - Cerebellum – this structure is responsible for coordinating fine movements and balance, something that would be required for walking in a straight line.
- 3) The amygdala. The processing of danger, threats and fear all take place within the amygdala. If something is fearful or dangerous it will then pass on the message to other regions of the brain to initiate a response (i.e. avoid, fight, flight etc.)
- 4) B – the hippocampus acts as a “gateway” and decides whether information should be passed onto long term memory. Degeneration of this structure will result in information failing to reach the long term memory storage and hence new memories cannot be made.
- 5) The pituitary gland is often called the “master gland” because many of the body’s endocrine secretions are controlled by the pituitary gland. It regulated when certain hormones should be release and when certain hormones should be inhibited, including hormones of the thyroid, adrenal glands, ovaries and testes.

