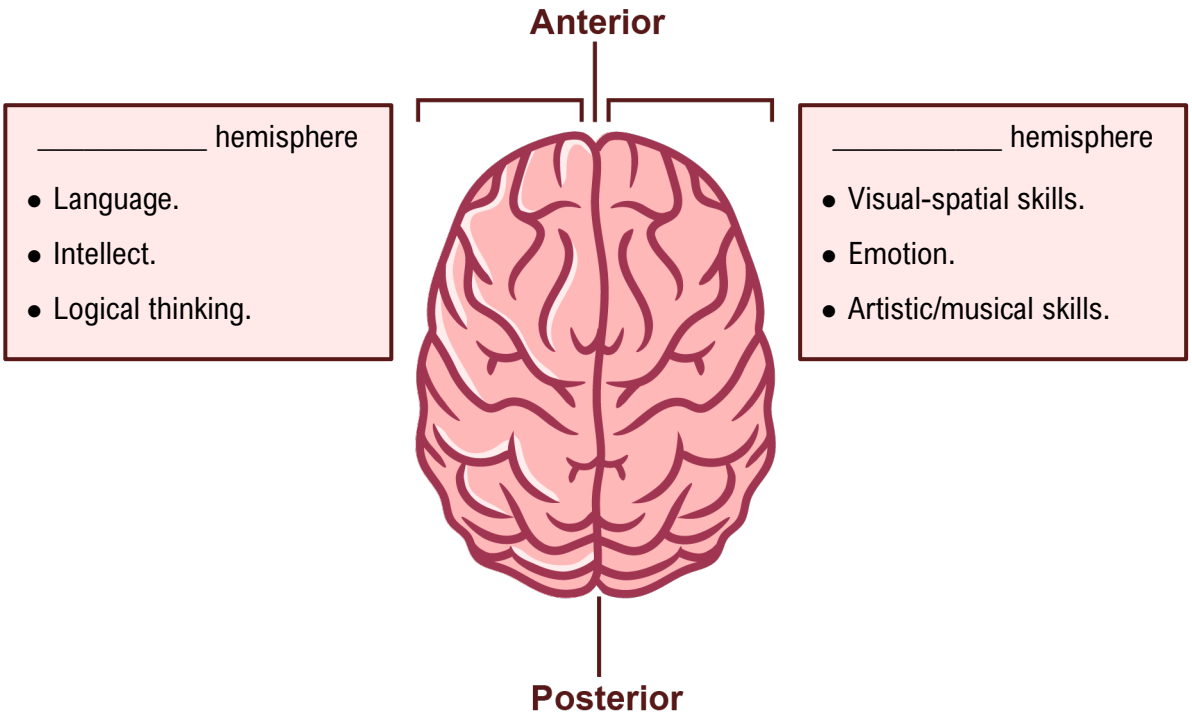
**TOPIC:** THE CEREBRUM

- Consists of 2 cerebral _____spheres, making up the superior portion of the brain.
  - Responsible for many complex functions.
- **Lateralization:** Phenomenon of each hemisphere being specialized for certain functions.
- **Cerebral Dominance**: Designates hemisphere dominant for _____.
- **Contralateral Control:** Each hemisphere controls the _____ side of the body.




**EXAMPLE:** Aphasia is a condition that often prevents people from being able to talk. For most people, this means there is an issue with the _____ hemisphere of their brain. Sometimes people with aphasia can communicate by singing, as this primarily uses the _____ hemisphere of their brain.

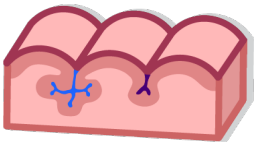
a) Left, right.

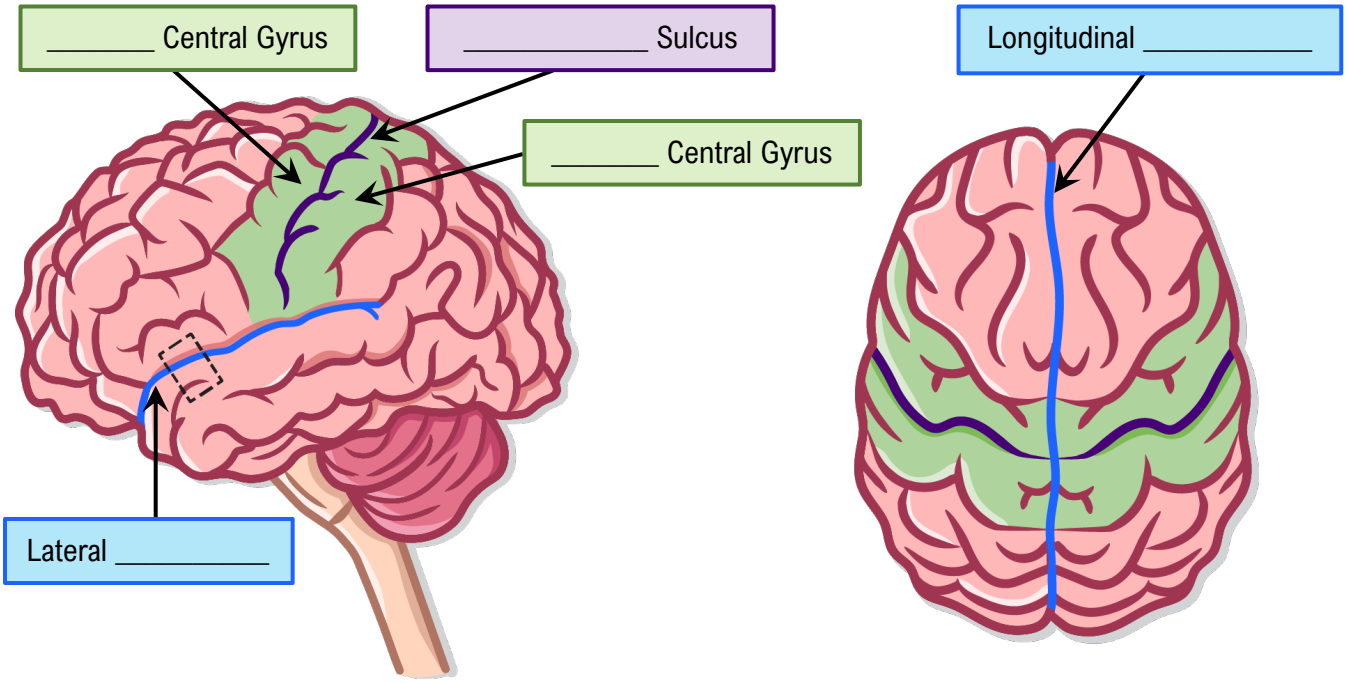
b) Right, left.

**TOPIC**: THE CEREBRUM

**Important Features of the Cerebrum**

- The surface of the cerebrum features prominent grooves and ridges, giving the brain its distinct "wrinkled" look.
  - **Gyrus** (plural: gyri): Elevated _____ of tissue on the surface of the brain.
  - **Sulcus** (plural: sulci): Shallow _____ of tissue that separates gyri.
  - **Fissure:** _____ groove of tissue that separates larger regions of the brain.






**EXAMPLE:** Which type of matter is present in gyri and sulci on the surface of the cerebrum?

a) Gray matter only.

b) White matter only.

c) A combination of gray and white matter.

**PRACTICE:** The brain is divided into two cerebral hemispheres by the _____.

a) Central sulcus.

b) Lateral fissure.

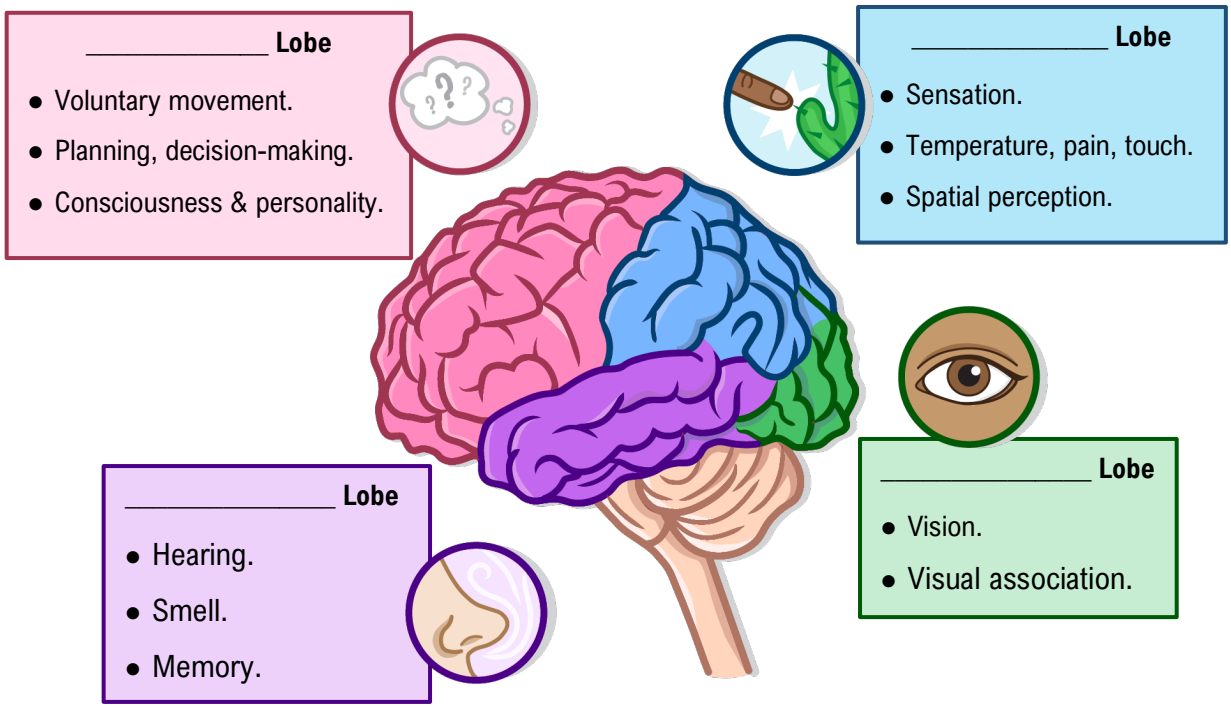
c) Longitudinal fissure.

d) Precentral gyrus.

**TOPIC:** THE CEREBRUM

**Lobes of the Cerebrum**

- The cerebrum consists of _____ lobes, which are named after the respective cranial bones that overlie them:




**EXAMPLE:** Use the words in the word-bank to fill in the blanks and complete the sentences:

| **Word-Bank:** | Temporal | Occipital | Frontal | Parietal |
|---|---|---|---|---|

Your _____ lobe allows you to sense pain after you accidentally cut yourself, then your _____ lobe makes the decision to put on a bandage and initiates the movement to do so. The _____ lobe allows you to see where the cut is and your _____ lobe helps you remember the incident so that you can avoid cutting yourself again.

**PRACTICE:** The occipital lobe is found at the _____ of the brain, while the parietal lobe is found at the _____.

a) Back, front.

b) Bottom, top.

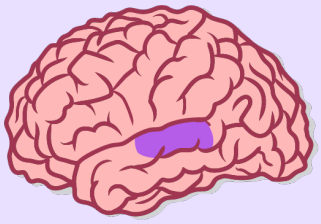
c) Back, top.

d) Top, front.

**TOPIC:** THE CEREBRUM

**Functional Areas of the Cerebral Cortex**

- Recall: The cortex is the area around the _____ edge of the brain.
- There are ____ types of functional areas in the cortex:

| _____ Areas | _____ Areas | Association Areas |
|---|---|---|
|   |   |   |
| Voluntary _____. | Process _____ signals. | _____ processing. |

- Motor & sensory areas are chiefly concerned with functions on the _____ side of the body.

**EXAMPLE:** Terence has suffered a brain injury and now struggles to recognize familiar faces and objects. Which type of functional area is injured, and how do you know?

a) A sensory area because there is a problem with his vision.

b) An association area because he's struggling to associate visual stimuli with memories.

c) A sensory area because this area is responsible for processing incoming signals.

d) An association area because this injury has reduced his intellectual capacity.

**TOPIC:** THE CEREBRUM

**PRACTICE:** A spinal reflex is a rapid, involuntary response to a stimulus. Tala has an issue with motor areas of her brain. Will her spinal reflexes still function?

a) No, because the motor areas control all movement.

b) No, because an issue with the motor areas is likely to prohibit the sensory areas from working.

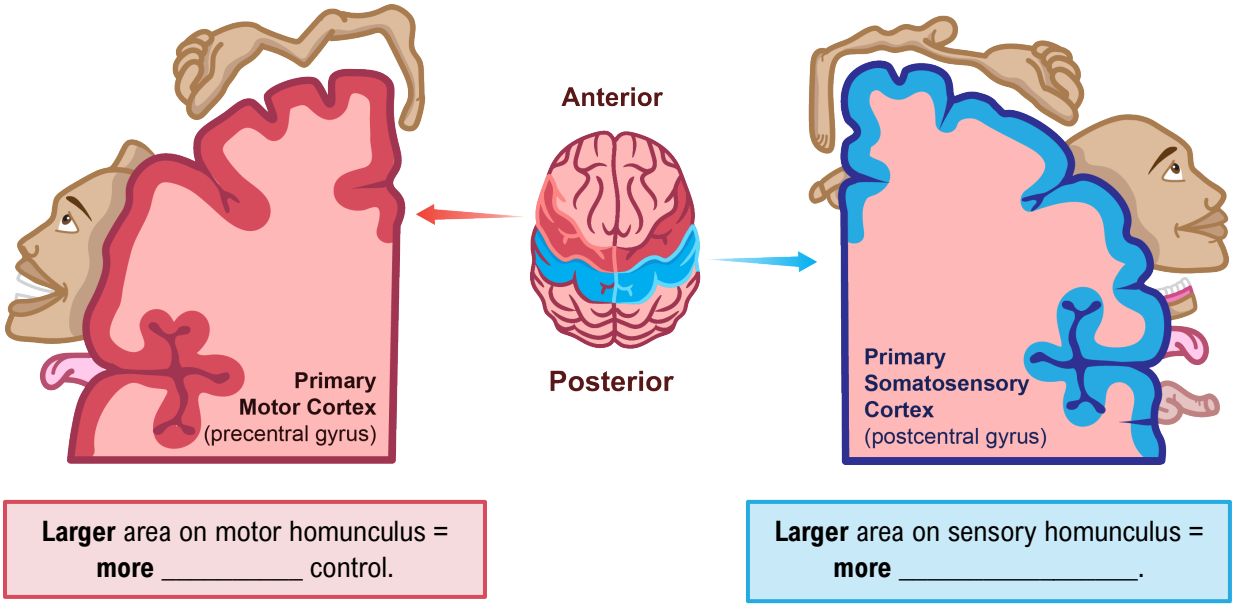
c) Yes, because the sensory and association areas can initiate movement when motor areas are injured.

d) Yes, because spinal reflexes are involuntary, and the motor areas are responsible for voluntary movement.

**TOPIC:** THE CEREBRUM

**Primary Motor Cortex & Primary Somatosensory Cortex**

- **Primary motor cortex:** in the _____ gyrus
  - Responsible for initiating voluntary _____.
- **Primary somatosensory cortex:** in the _____ gyrus
  - Receives incoming signals from sensory receptors in skin, skeletal muscles, and joints.
- **Homunculus:** size of body parts is _____ to number of neural connections




**Larger** area on motor homunculus = **more** _____ control.

**Larger** area on sensory homunculus = **more** _____.

**EXAMPLE:** The area of the primary somatosensory cortex concerned with the foot is larger than the area of the primary motor cortex concerned with the foot. What does this mean functionally?

a) The foot is not particularly sensitive, and we do not have precise motor control over it.

b) The foot is very sensitive, and we have very precise motor control over it.

c) We have more motor connections with the foot than sensory connections.

d) We have more sensory connections with the foot than motor connections.

**PRACTICE:** Which of the following body parts would you expect to have the greatest size difference between its area on the motor homunculus and its area on the sensory homunculus?

a) Hand.

b) Tongue.

c) Stomach.

d) Shoulder.

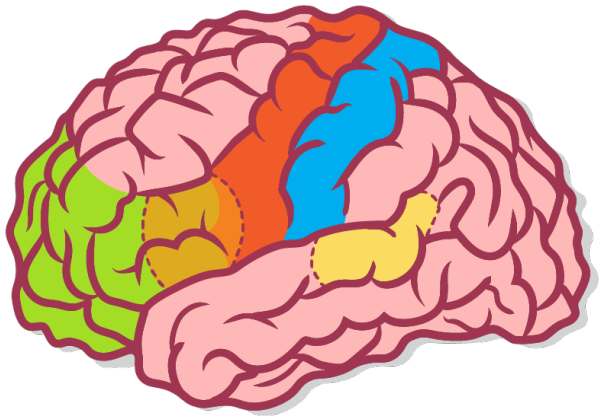
**TOPIC:** THE CEREBRUM

**Important Areas of the Cerebral Cortex**

- There are many specialized areas of the cerebral cortex; here are some that will be useful for you to know:

**Prefrontal Cortex**

- Most _____ part of cerebrum.
- Intellect, cognition, personality, reasoning, planning.



**Wernicke's Area**

- Associated with language _____.
- Found in the _____ lobe.

**Broca's Area**

- Associated with speech _____.
- Found in the _____ lobe.

**EXAMPLE:** When someone asks you "what time is it?", the soundwaves enter your ear and information is sent to the auditory cortex in the temporal lobe. _____ area allows you to understand what the person is saying to you. Then, you use your _____ cortex to make the decision to check your watch. Finally, _____ area controls your mouth and tongue as you answer the question.

a) Broca's, prefrontal, Wernicke's.
b) Wernicke's, prefrontal, Broca's.
c) Prefrontal, primary motor, Broca's.
d) Wernicke's, primary motor, Broca's.

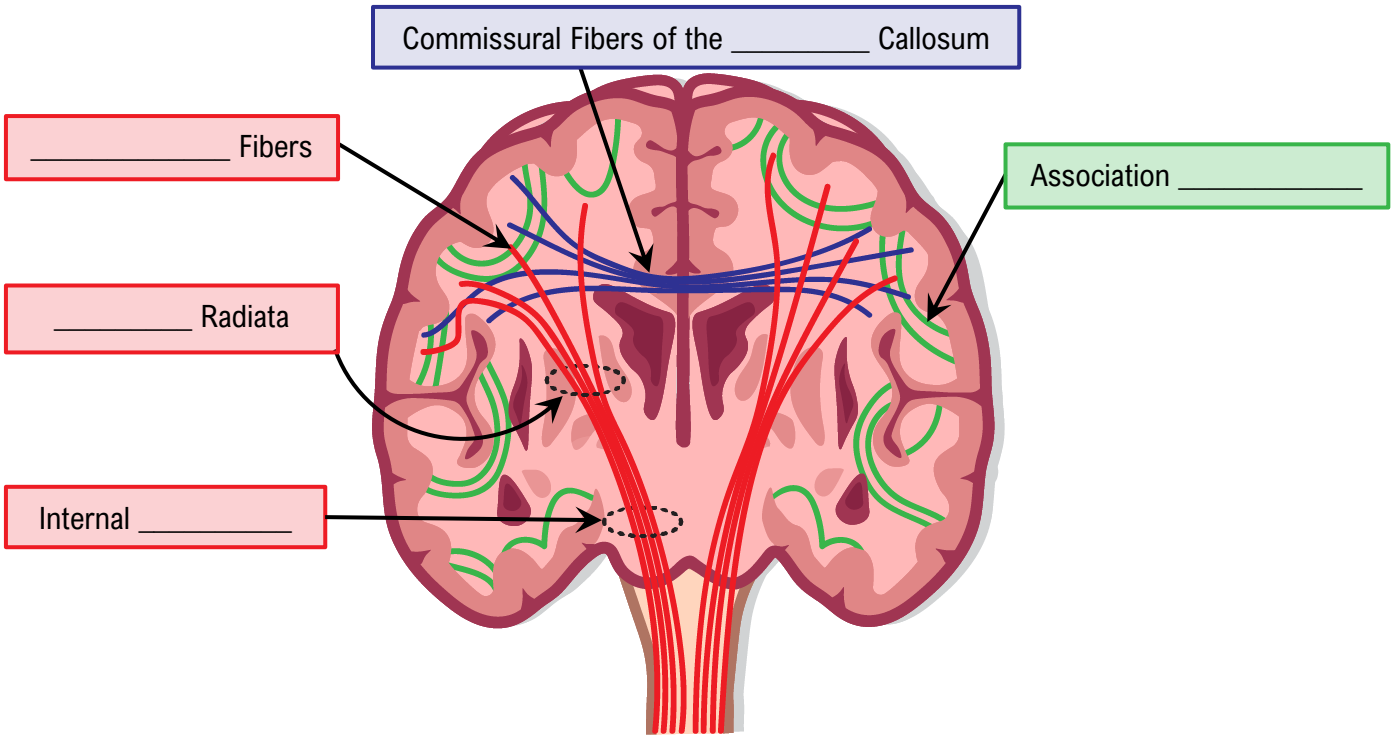
**PRACTICE:** The prefrontal cortex & Wernicke's area can both be classified as association areas, while Broca's area is classified as a motor area.

a) True.
b) False.

**TOPIC:** THE CEREBRUM

**Cerebral White Matter**

- Responsible for _____ between cerebral areas and lower CNS centers.
- Classified into _____ groups based on direction they run:
  - **Association Fibers**: restricted to one hemisphere – connect cortical _____.
  - **Commissural Fibers**: connect left and right hemispheres.
    - Largest is the *corpus callosum*.
  - **Projection Fibers**: Connect _____ within one hemisphere, and parts of brain to spinal cord. Form the:
    - Corona radiata and internal capsules




**EXAMPLE:** Which of the following is accurate regarding association fibers?

a) They form ascending tracts that allow the cortex to communicate with the spinal cord.

b) They are mainly used for long distance communication in the CNS.

c) They connect different areas of the brain across hemispheres (e.g., the left and right parietal lobe).

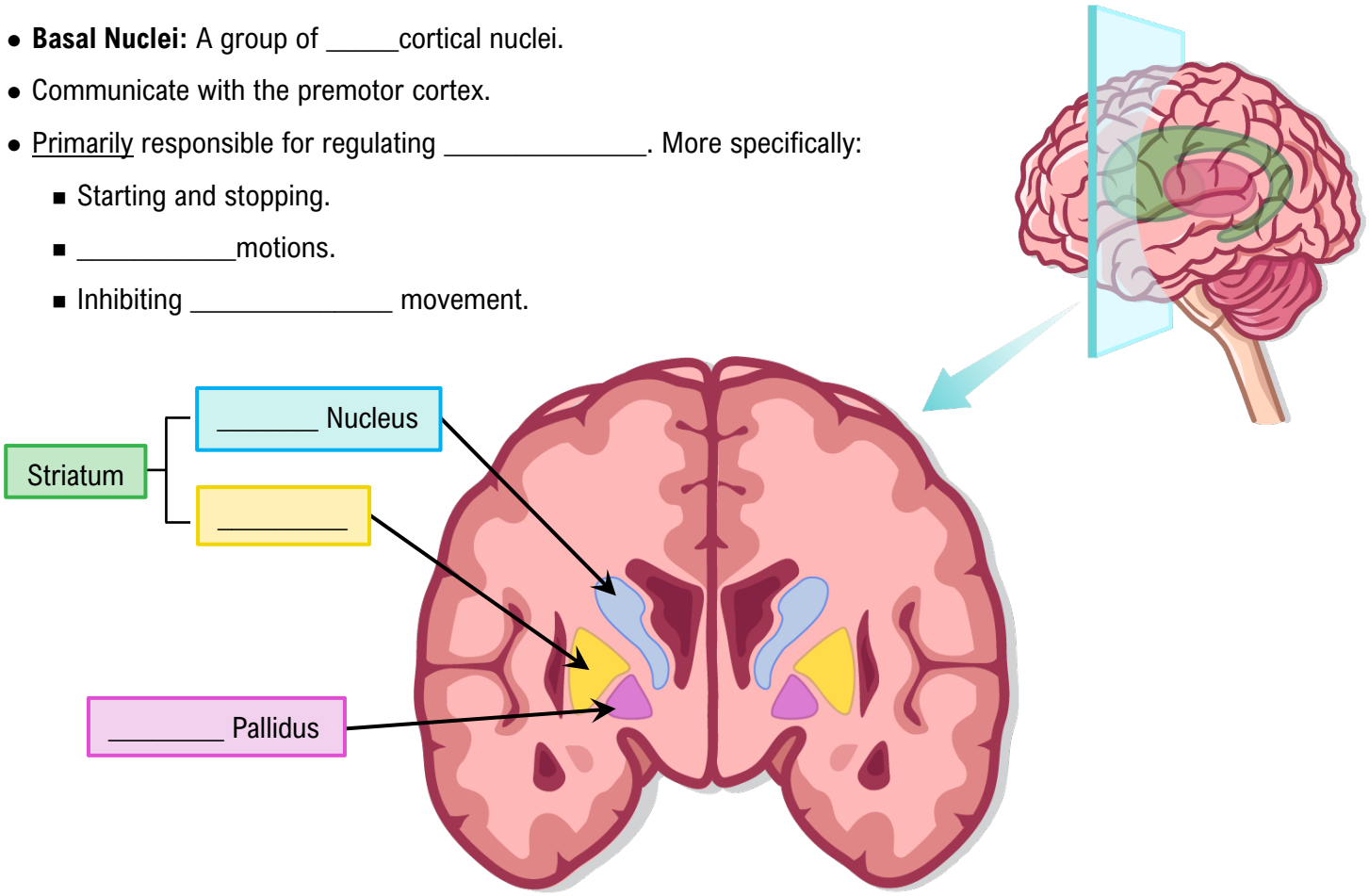
d) They connect different areas of the brain within the same hemisphere (e.g., left temporal lobe to left prefrontal cortex).

**TOPIC:** THE CEREBRUM

**Basal Nuclei**

**Note:** Basal nuclei are commonly called ***basal ganglia***.

- *Recall*: Nuclei are clusters of neuron cell bodies.
- **Basal Nuclei:** A group of _____cortical nuclei.
- Communicate with the premotor cortex.
- Primarily responsible for regulating _____. More specifically:
  - Starting and stopping.
  - _____motions.
  - Inhibiting _____ movement.




**EXAMPLE:** Which of the following statements is false?

a) Basal nuclei are found exclusively in the cerebrum.

b) Basal nuclei are part of the cortex.

c) Basal nuclei coordinate with the cortex to produce smooth movement.

d) Basal nuclei are also known as basal ganglia.

**PRACTICE:** Which of the following diseases would you expect might result from a dysfunction of the basal nuclei?

a) Multiple sclerosis (MS).

b) Guillain-Barré Syndrome.

c) Parkinson's Disease.

d) Alzheimer's Disease.