

## 7.1.2 Human Brain

*Is reflex action the only function of the spinal cord? Obviously not, since we know that we are thinking beings. Spinal cord is made up of nerves which supply information to think about. Thinking involves more complex mechanisms and neural connections. These are concentrated in the brain, which is the main coordinating centre of the body. The brain and spinal cord constitute the central nervous system. They receive information from all parts of the body and integrate it.*

*We also think about our actions. Writing, talking, moving a chair, clapping at the end of a programme are examples of voluntary actions which are based on deciding what to do next. So, the brain also has to send messages to muscles. This is the second way in which the nervous system communicates with the muscles. The communication between the central nervous system and the other parts of the body is facilitated by the peripheral nervous system consisting of cranial nerves arising from the brain and spinal nerves arising from the spinal cord. The brain thus allows us to think and take actions based on that thinking. As you will expect, this is accomplished through a complex design, with different parts of the brain responsible for integrating different inputs and outputs. The brain has three such major parts or regions, namely the fore-brain, mid-brain and hind-brain.*

# Nervous System

## Central Nervous System (CNS)

## Peripheral Nervous System (PNS)

### Brain

Receives and processes sensory information, initiates responses, stores memories, generates thoughts and emotions

### Spinal cord

Conducts signals to and from the brain, controls reflex activities

### Motor Neurons

CNS to muscles and glands

### Sensory Neurons

Sensory organs to CNS

### Somatic Nervous System

Controls voluntary movements

### Autonomic Nervous System

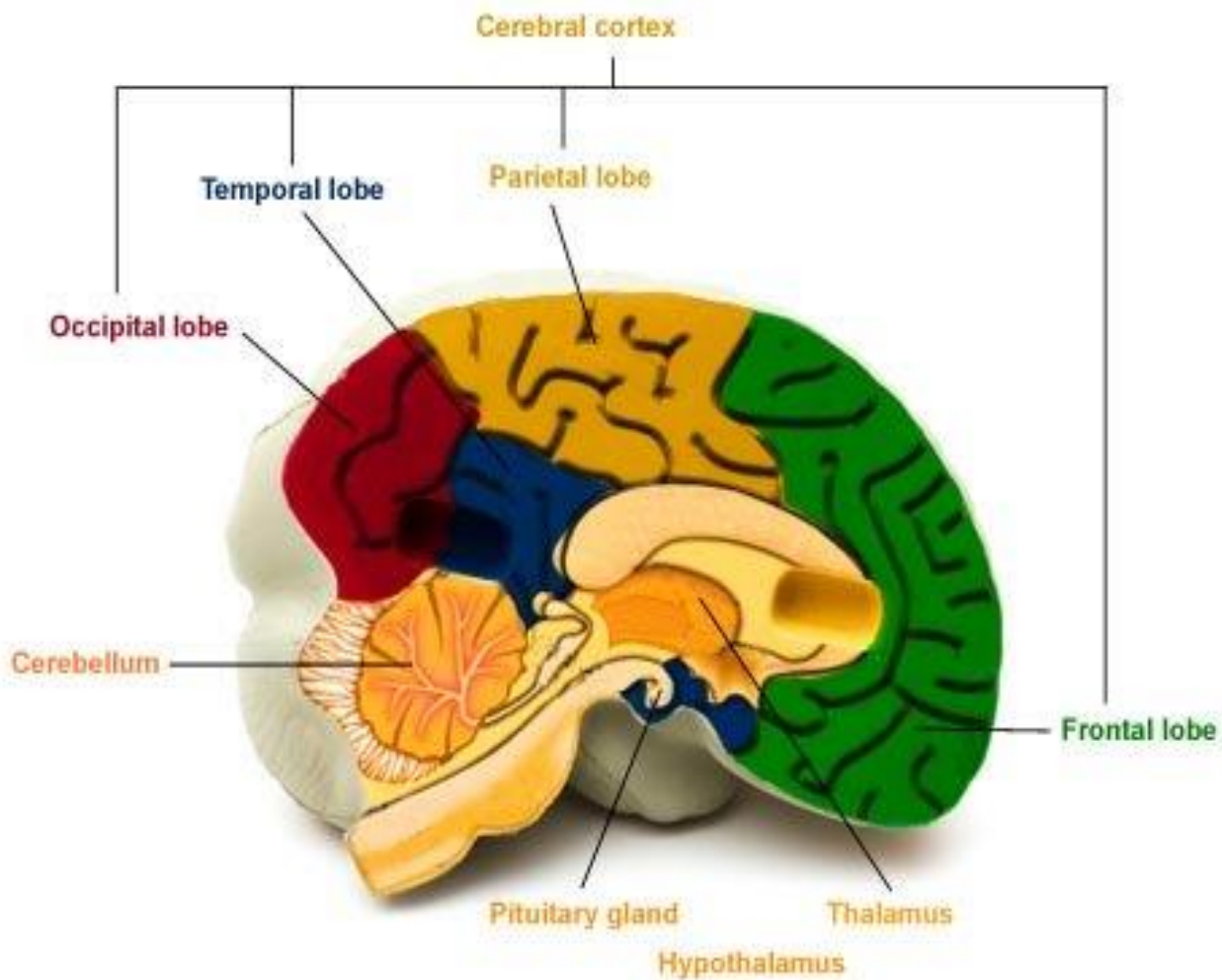
Controls involuntary responses

### Sympathetic Division

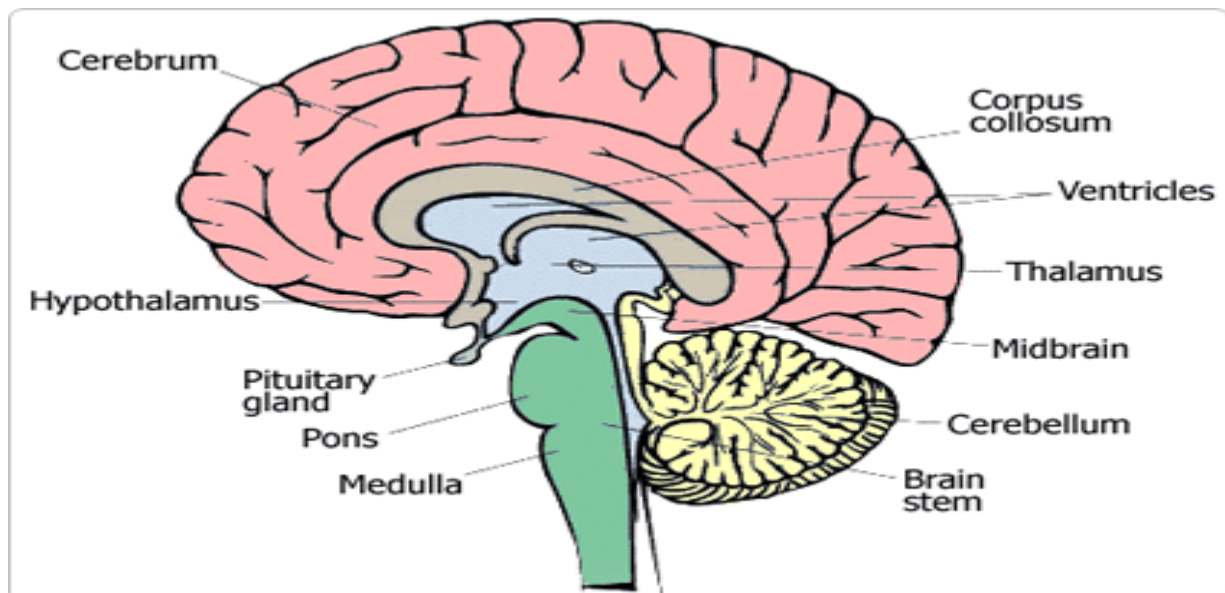
"Fight or Flight"

### Parasympathetic Division

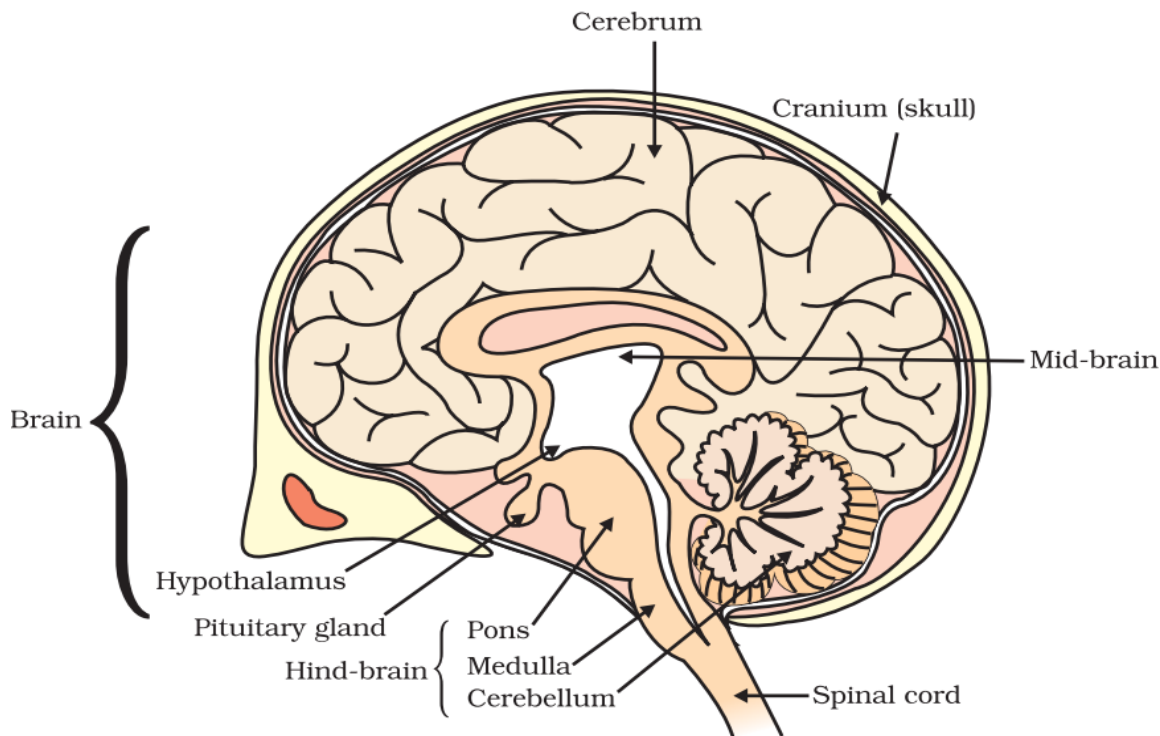
"Rest or Digest"



The fore-brain is the main thinking part of the brain. It has regions which receive sensory impulses from various receptors. Separate areas of the fore-brain are specialised for hearing, smell, sight and so on. There are separate areas of association where this sensory information is interpreted by putting it together with information from other receptors as well as with information that is already stored in the brain. Based on



all this, a decision is made about how to respond and the information is passed on to the motor areas which control the movement of voluntary muscles, for example, our leg muscles. However, certain sensations are distinct from seeing or hearing, for example, how do we know that we have eaten enough? The sensation of feeling full is because of a centre associated with hunger, which is in a separate part of the fore-brain.



**Figure 7.3** Human brain

Study the labelled diagram of the human brain. We have seen that the different parts have specific functions. Can we find out the function of each part?

Let us look at the other use of the word 'reflex' that we have talked about in the introduction. Our mouth waters when we see food we like without our meaning to. Our hearts beat without our thinking about it. In fact, we cannot control these actions easily by thinking about them even if we wanted to. Do we have to think about or remember to breathe or digest food? So, in between the simple reflex actions like change in the size of the pupil, and the thought out actions such as moving a chair, there is another set of muscle movements over which we do not have any thinking control. Many of these involuntary actions are controlled by the mid-brain and hind-brain. All these involuntary actions including blood pressure, salivation and vomiting are controlled by the medulla in the hind-brain.

Think about activities like walking in a straight line, riding a bicycle, picking up a pencil. These are possible due to a part of the hind-brain called the cerebellum. It is responsible for precision of voluntary actions and maintaining the posture and balance of the body. Imagine what would happen if each of these events failed to take place if we were not thinking about it.

# assignment 13 control and coordination:

1. Name the components of central nervous system.
2. Name the nerves which are arising from brain and spinal cord.
3. What do you mean by voluntary and involuntary action of nerves?
4. Name the different parts of brain.
5. Which parts of central nervous system control thinking process and reflex action?