Figure 9-1

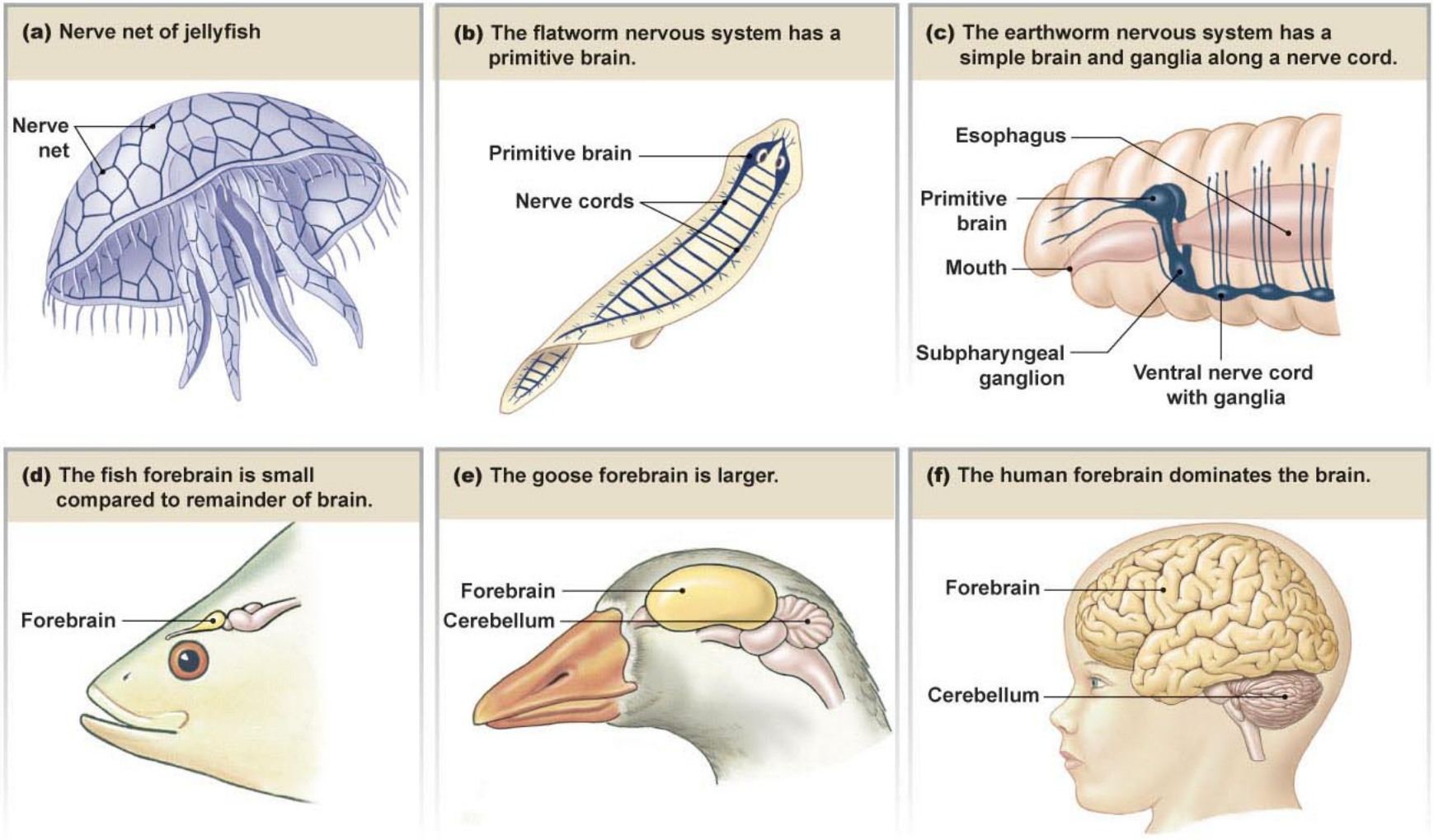
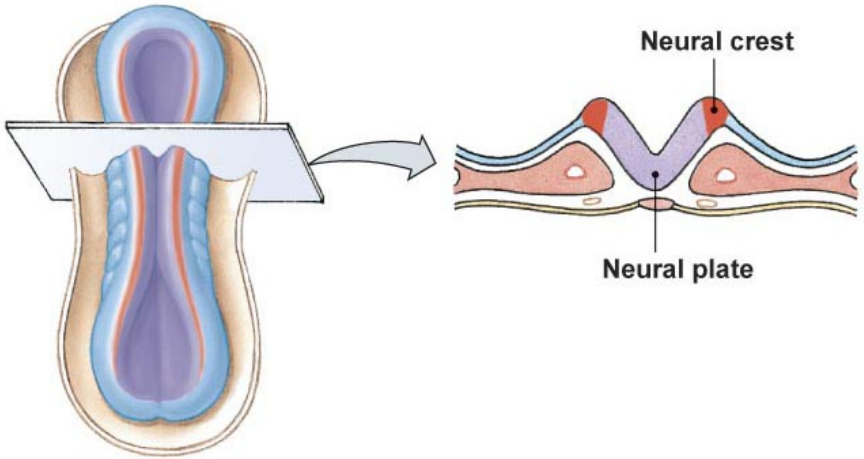
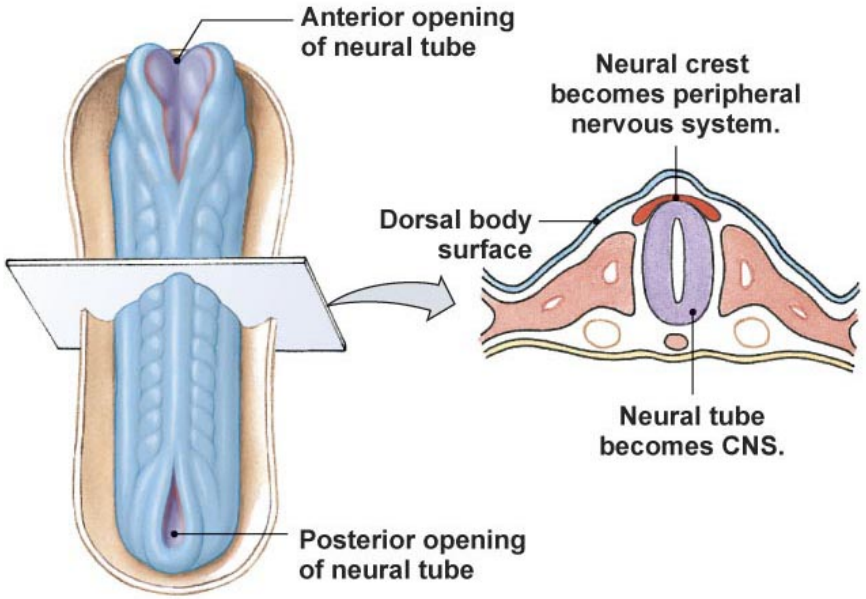


Figure 9-2



(a) In the 20-day embryo (dorsal view), neural plate cells (purple) migrate toward the midline. Neural crest cells migrate with the neural plate cells.



(b) By day 23 of embryonic development, neural tube formation is almost complete.

Figure 9-3

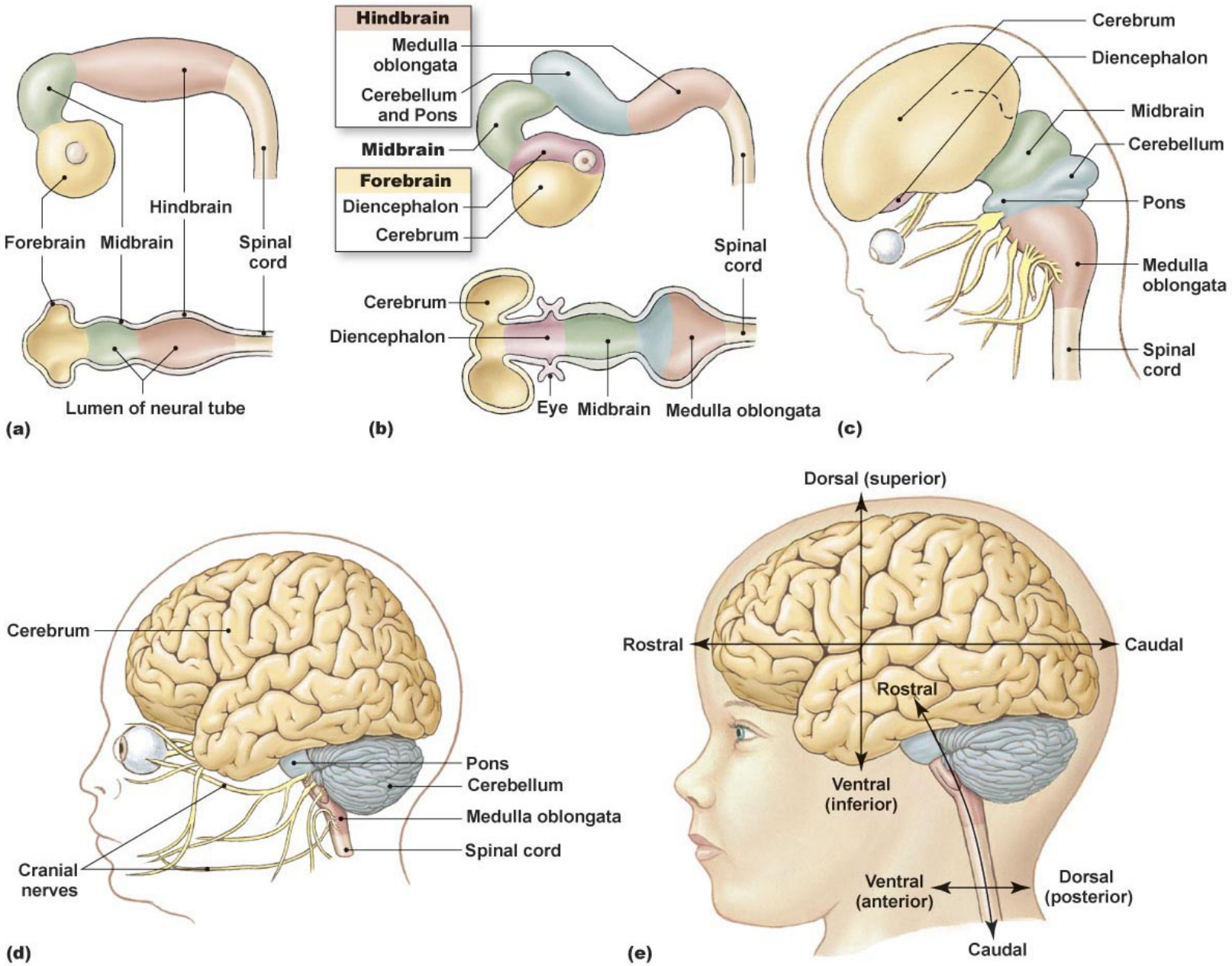


Figure 9-4, overview

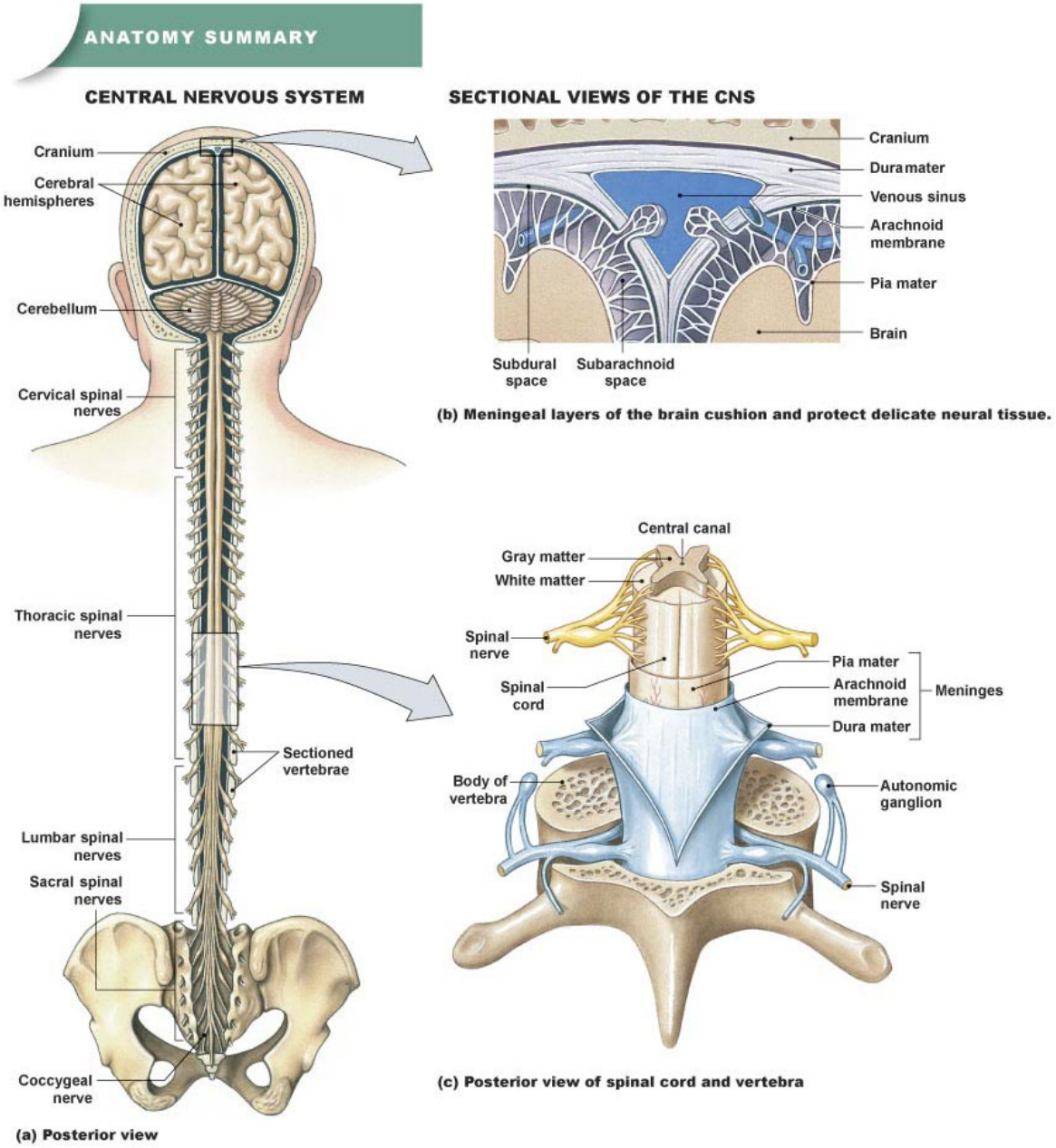


Figure 9-5a

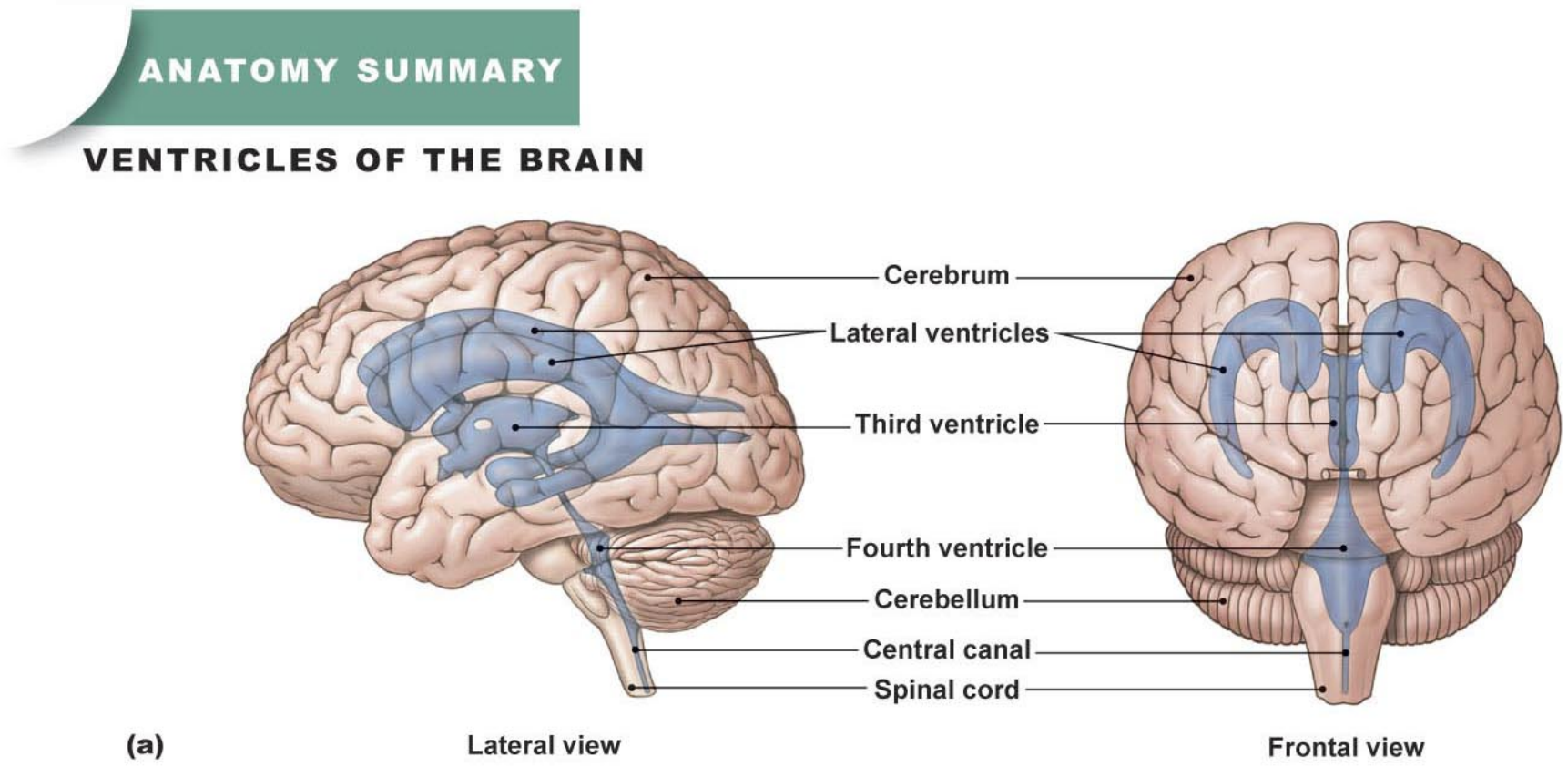


Figure 9-5bc

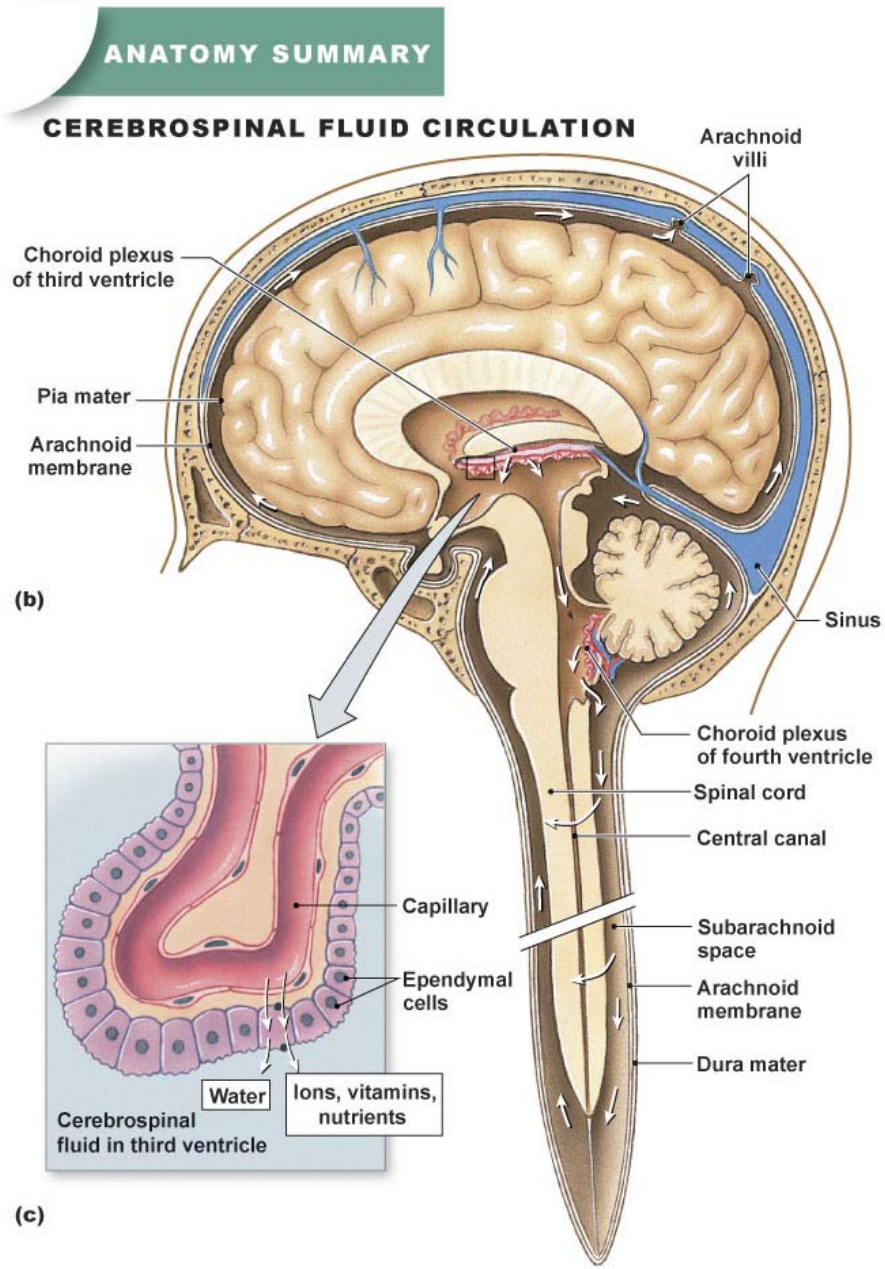


Figure 9-5bd

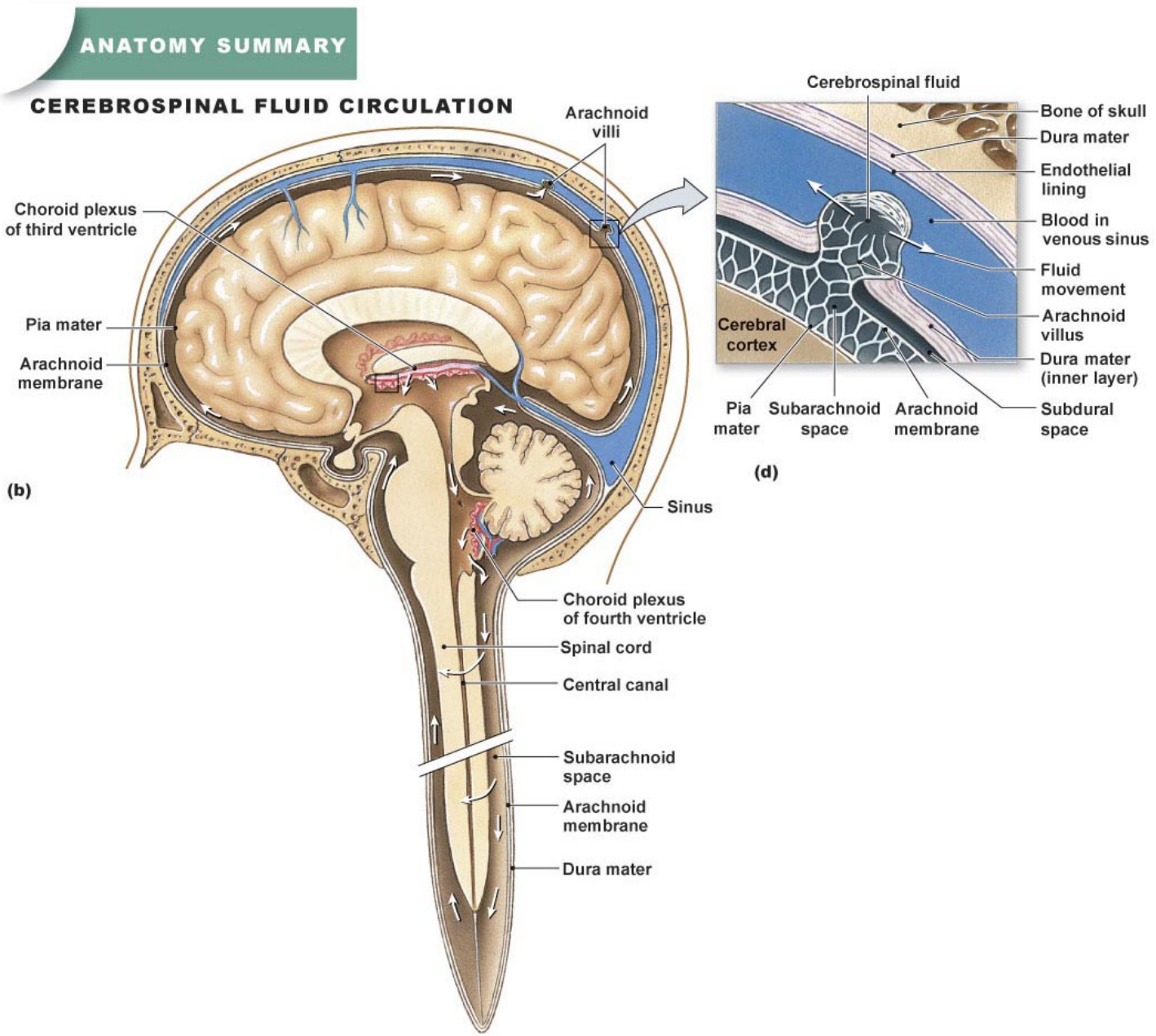


Figure 9-6

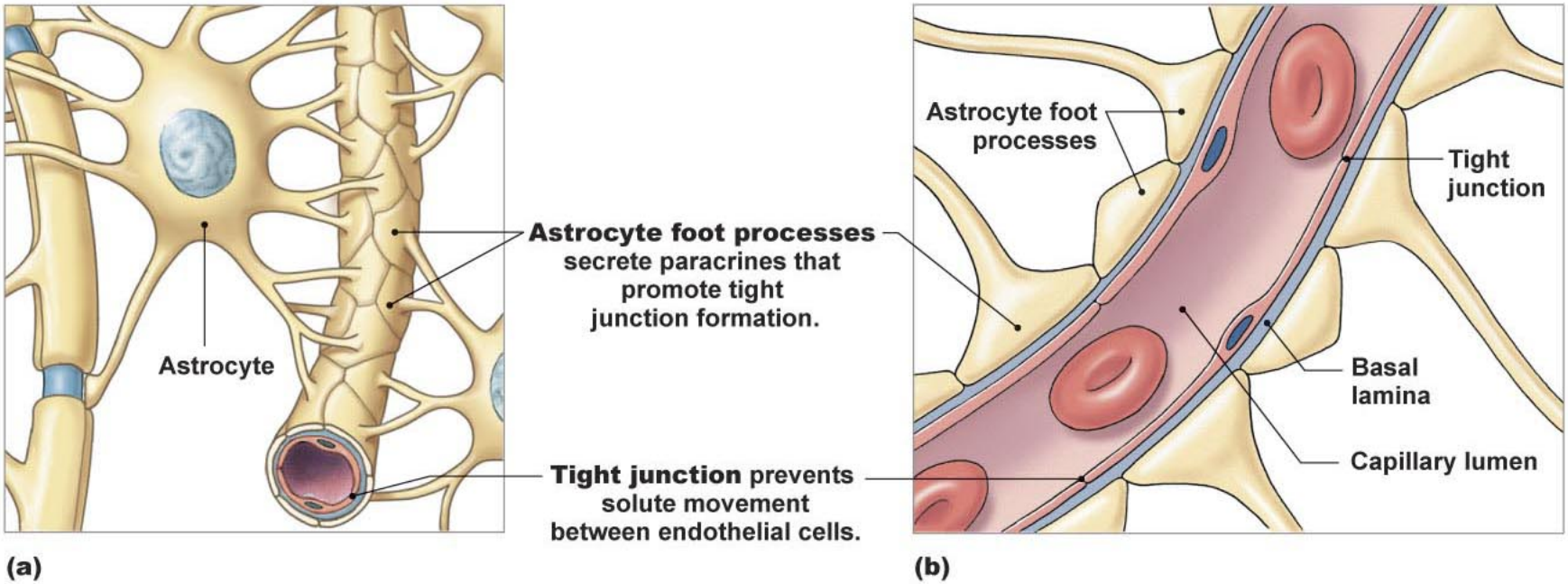
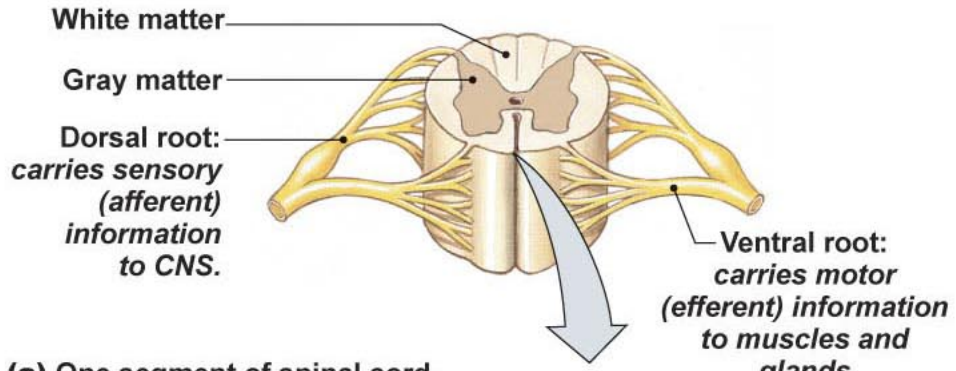
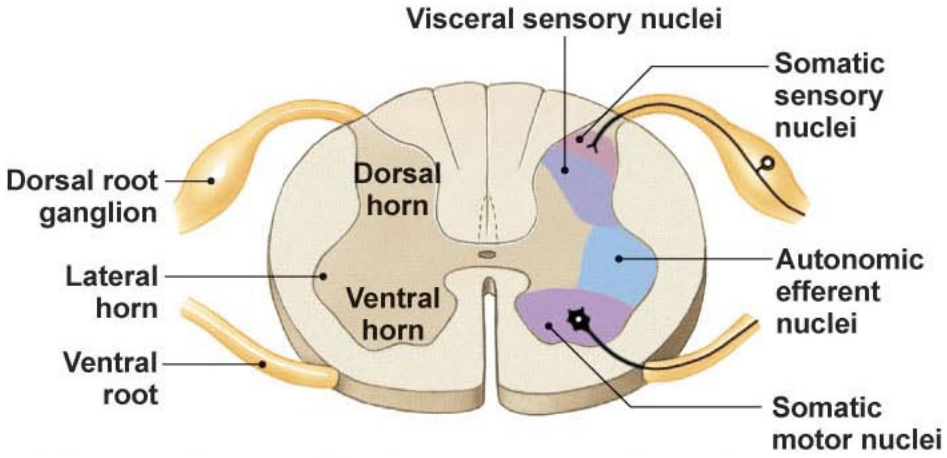


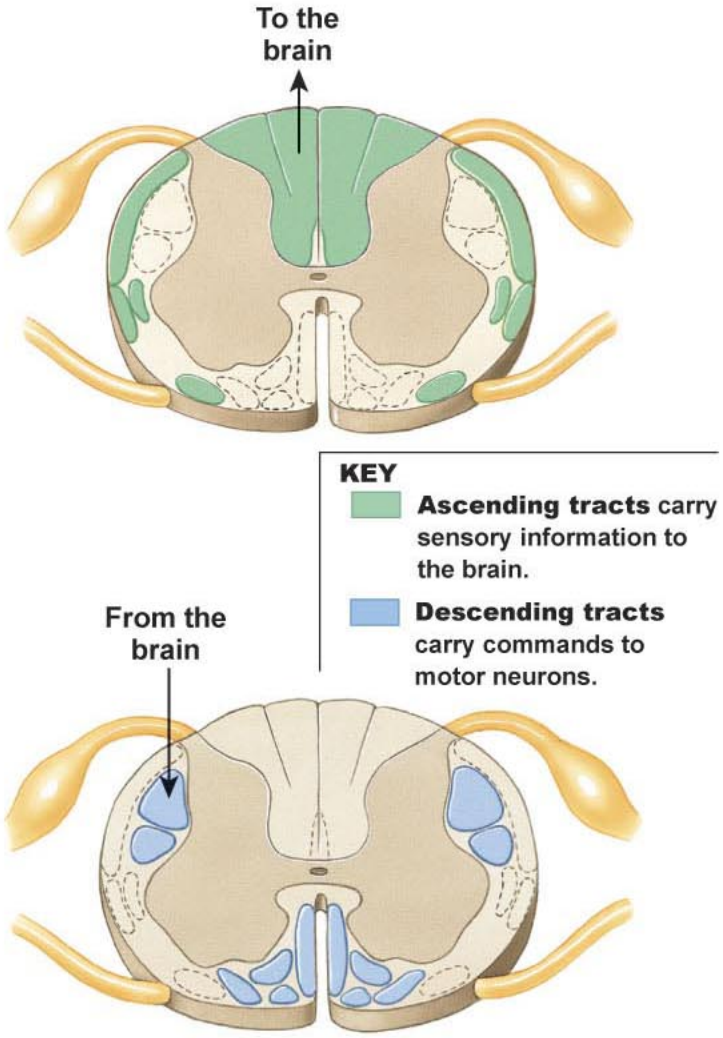
Figure 9-7



(a) One segment of spinal cord, ventral view, showing its pair of nerves.



(b) Gray matter consists of sensory and motor nuclei.



(c) White matter in the spinal cord consists of axons carrying information to and from the brain.

Figure 9-8

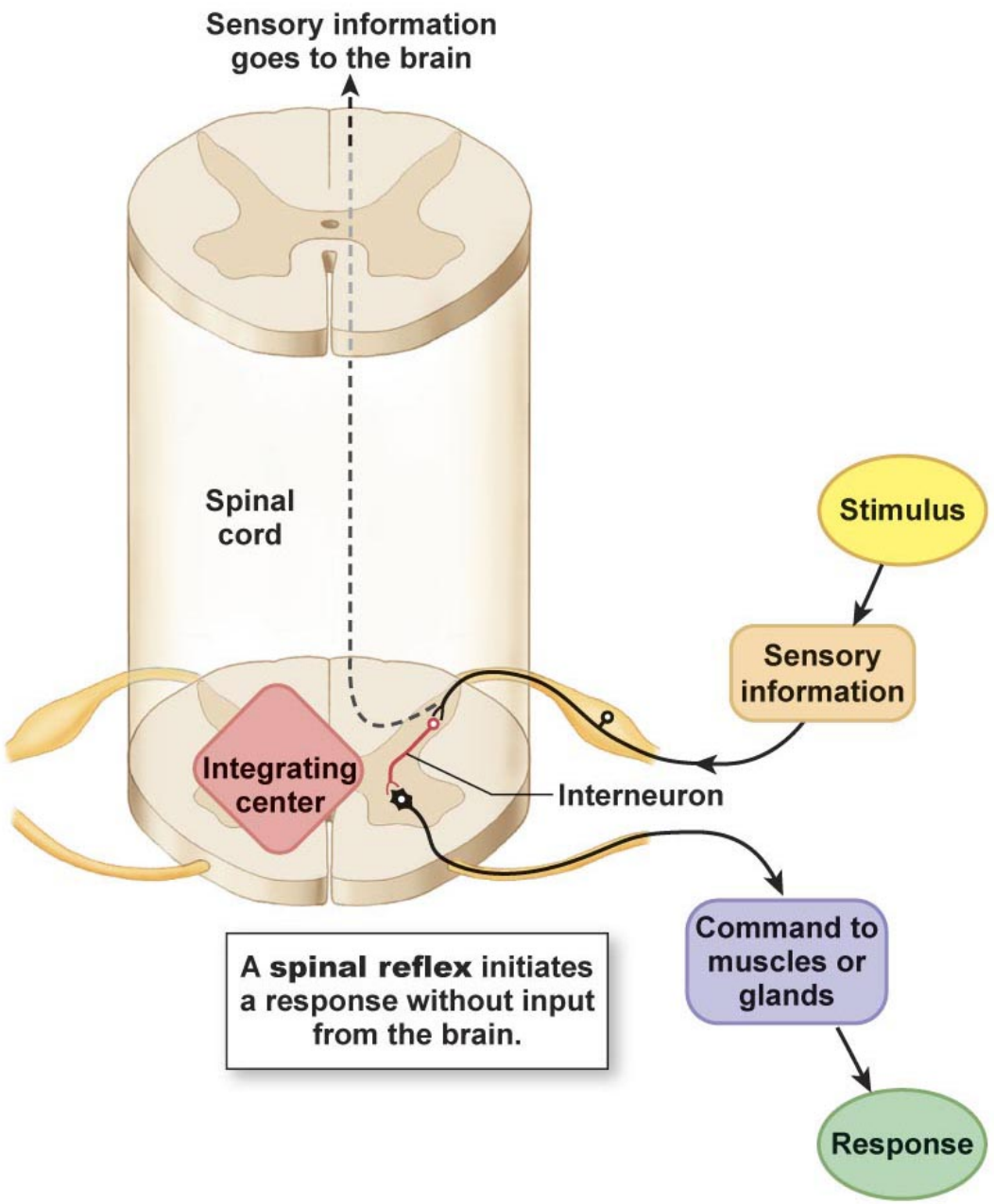


Figure 9-9, overview

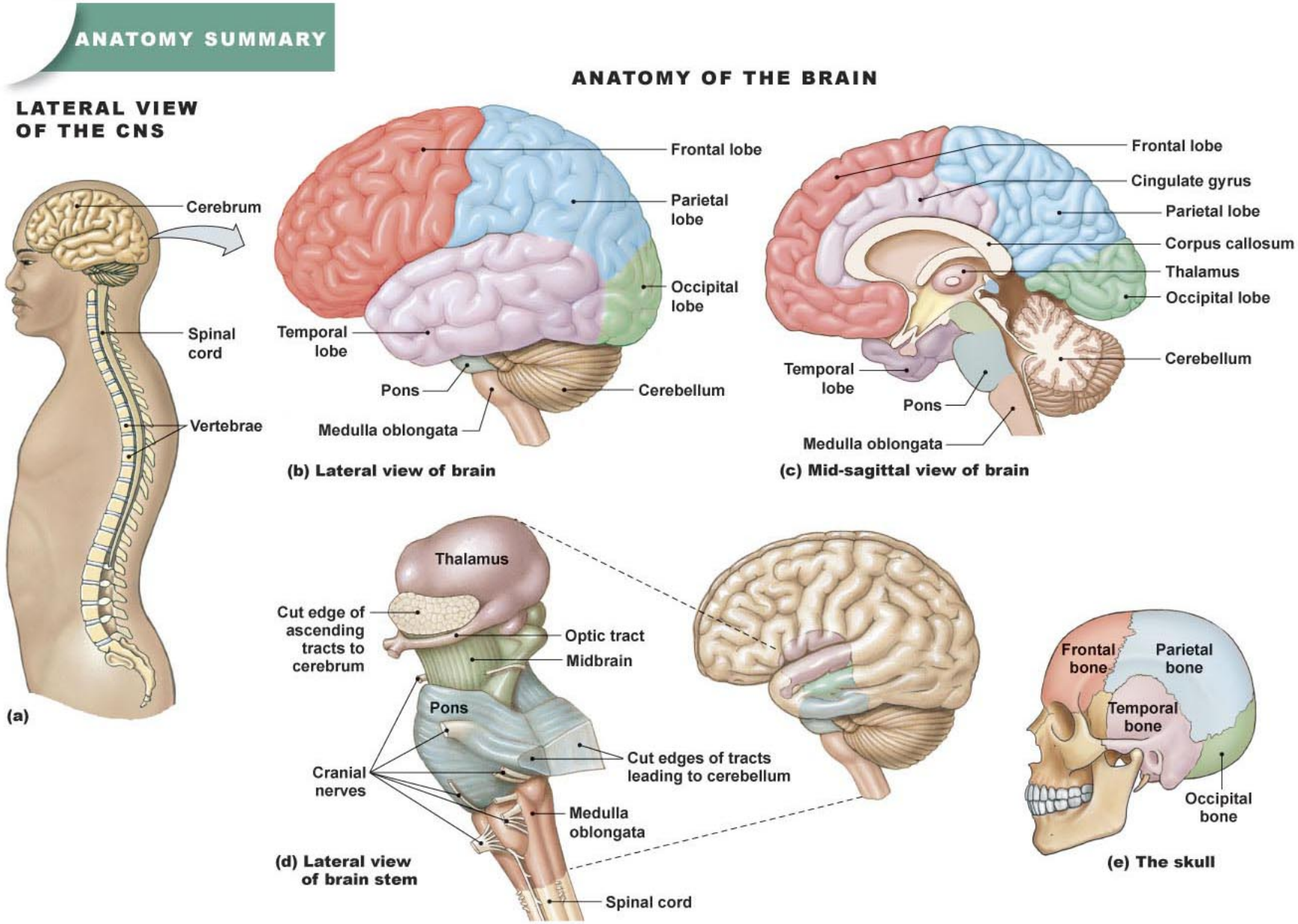


Figure 9-9-1

ANATOMY SUMMARY

FUNCTIONS OF THE BRAIN

REGION	FUNCTION
Cerebrum (Frontal, Parietal, Occipital, and Temporal lobes)	
• Cerebral cortex (See Fig. 9.15)	
Sensory fields	Perception
Motor areas	Skeletal muscle movement
Association areas	Integration of information and direction of voluntary movement
• Basal ganglia (See Fig. 9-11)	Movement
• Limbic system (See Fig. 9-13)	
• Amygdala	Emotion and memory
• Hippocampus	Learning and memory

REGION	FUNCTION
Diencephalon (See Fig. 9-10)	
Thalamus	Integrating center and relay station for sensory and motor information
Hypothalamus	Homeostasis and behavioral drives (See Table 9-2)
Pituitary	Hormone secretion
Pineal gland	Melatonin secretion
Cerebellum	Movement coordination
Brain stem	
Midbrain	Eye movement
Pons	Relay station between cerebrum and cerebellum; coordination of breathing
Medulla oblongata	Control of involuntary functions
Reticular formation (See Fig. 9-19)	Arousal, sleep, muscle tone, pain modulation

Figure 9-10

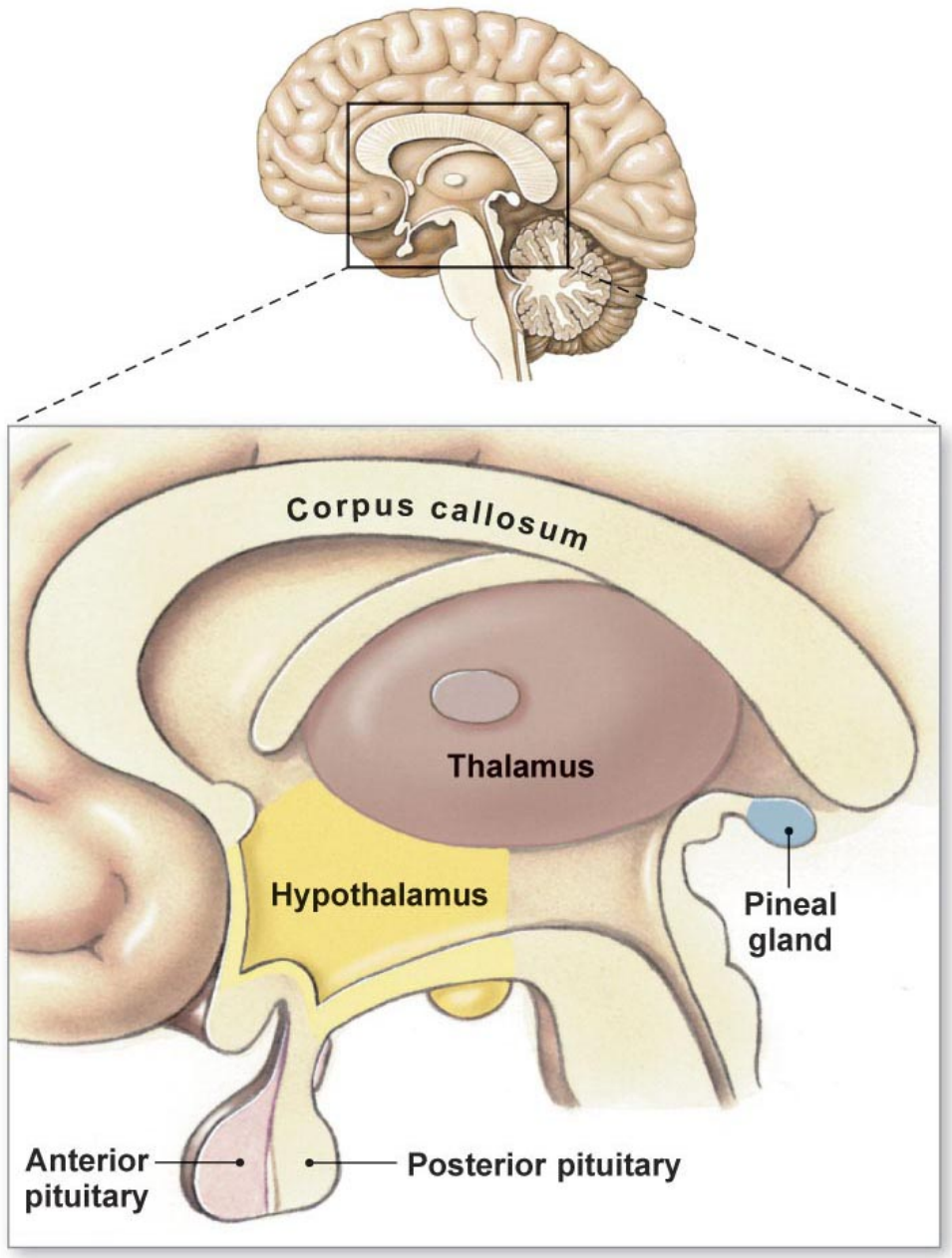


Table 9-2

TABLE 9-2 Functions of the Hypothalamus

1. Activates sympathetic nervous system
   - Controls catecholamine release from adrenal medulla (as in fight-or-flight reaction)
   - Helps maintain blood glucose concentrations through effects on endocrine pancreas
2. Maintains body temperature
   - Stimulates shivering and sweating
3. Controls body osmolarity
   - Motivates thirst and drinking behavior
   - Stimulates secretion of vasopressin [p. XXX]
4. Controls reproductive functions
   - Directs secretion of oxytocin (for uterine contractions and milk release)
   - Directs trophic hormone control of anterior pituitary hormones FSH and LH [p. XXX]
5. Controls food intake
   - Stimulates satiety center
   - Stimulates feeding center
6. Interacts with limbic system to influence behavior and emotions
7. Influences cardiovascular control center in medulla oblongata
8. Secretes trophic hormones that control release of hormones from anterior pituitary gland

Figure 9-11

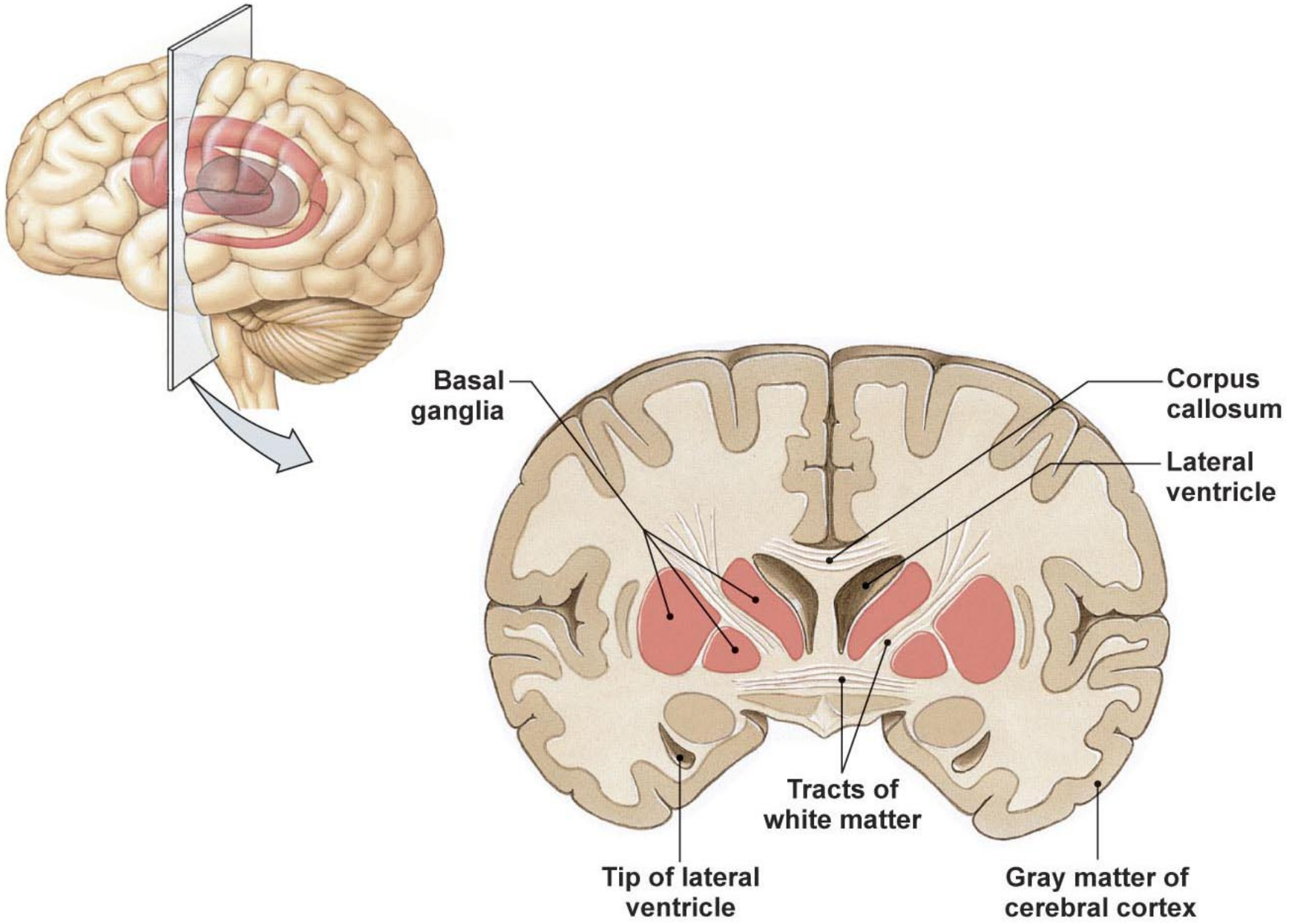


Figure 9-13

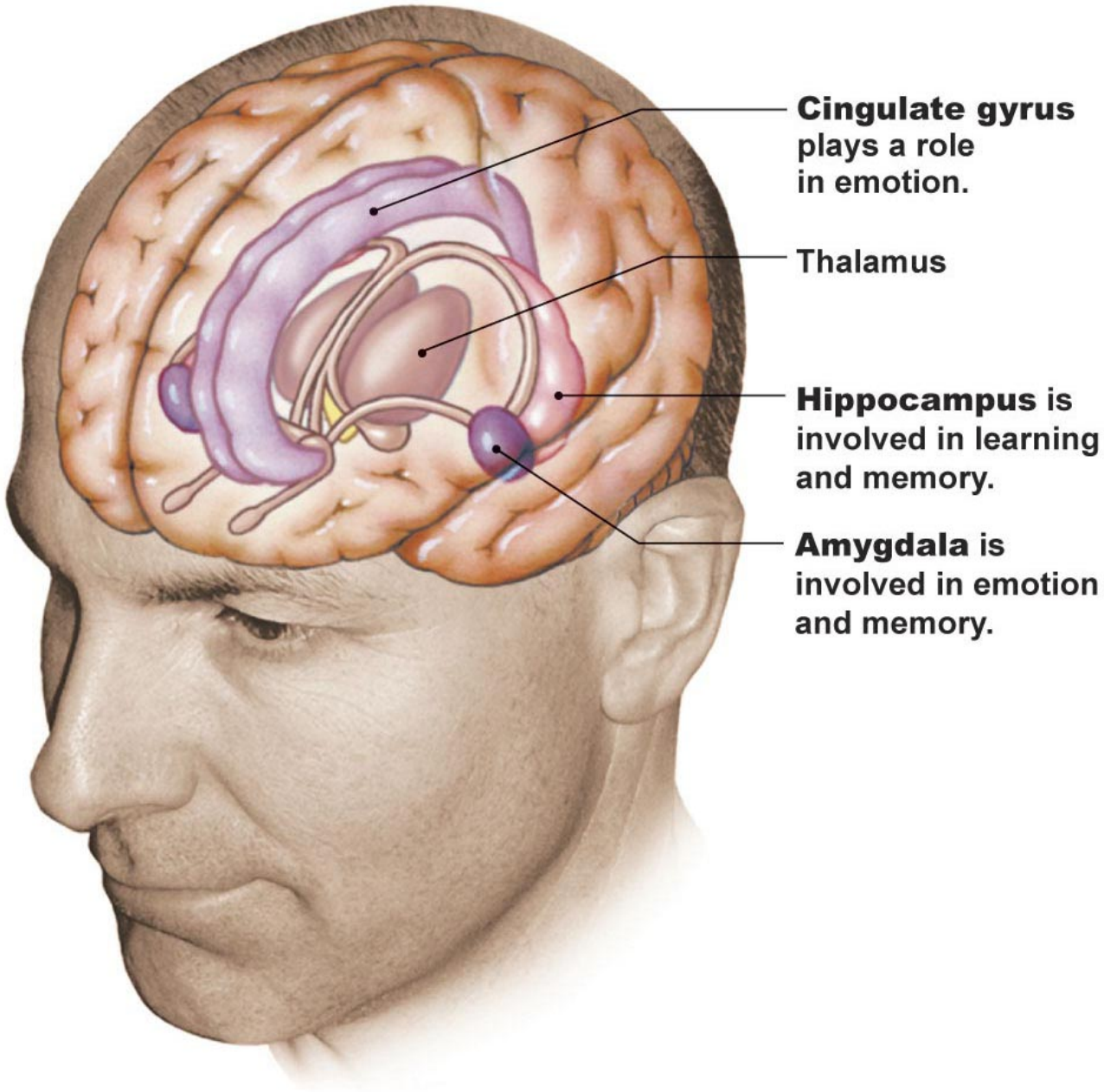
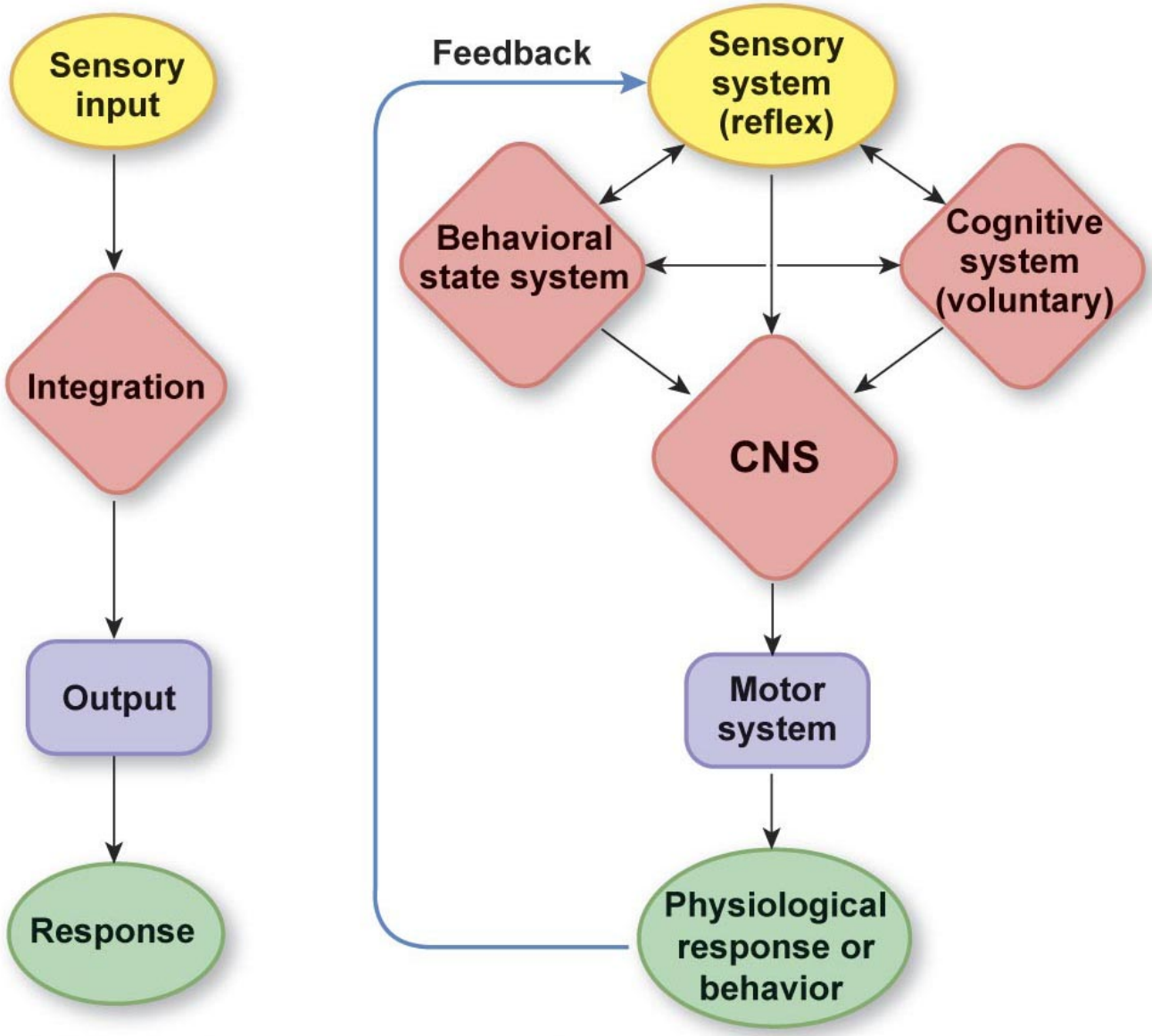


Figure 9-14



(a) A simple neural reflex

(b) Behavioral state and cognition influence brain output.

Figure 9-15

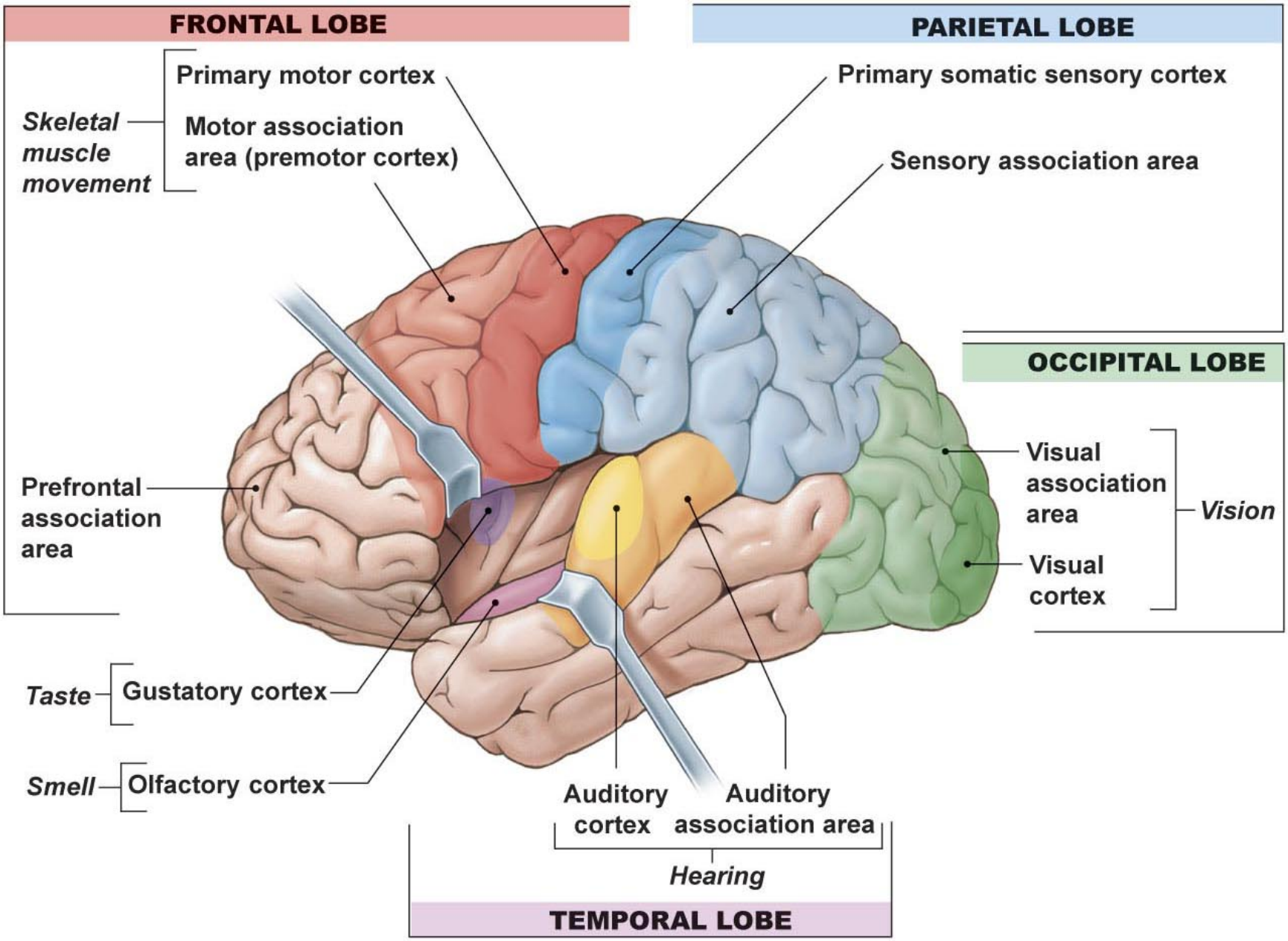


Figure 9-16

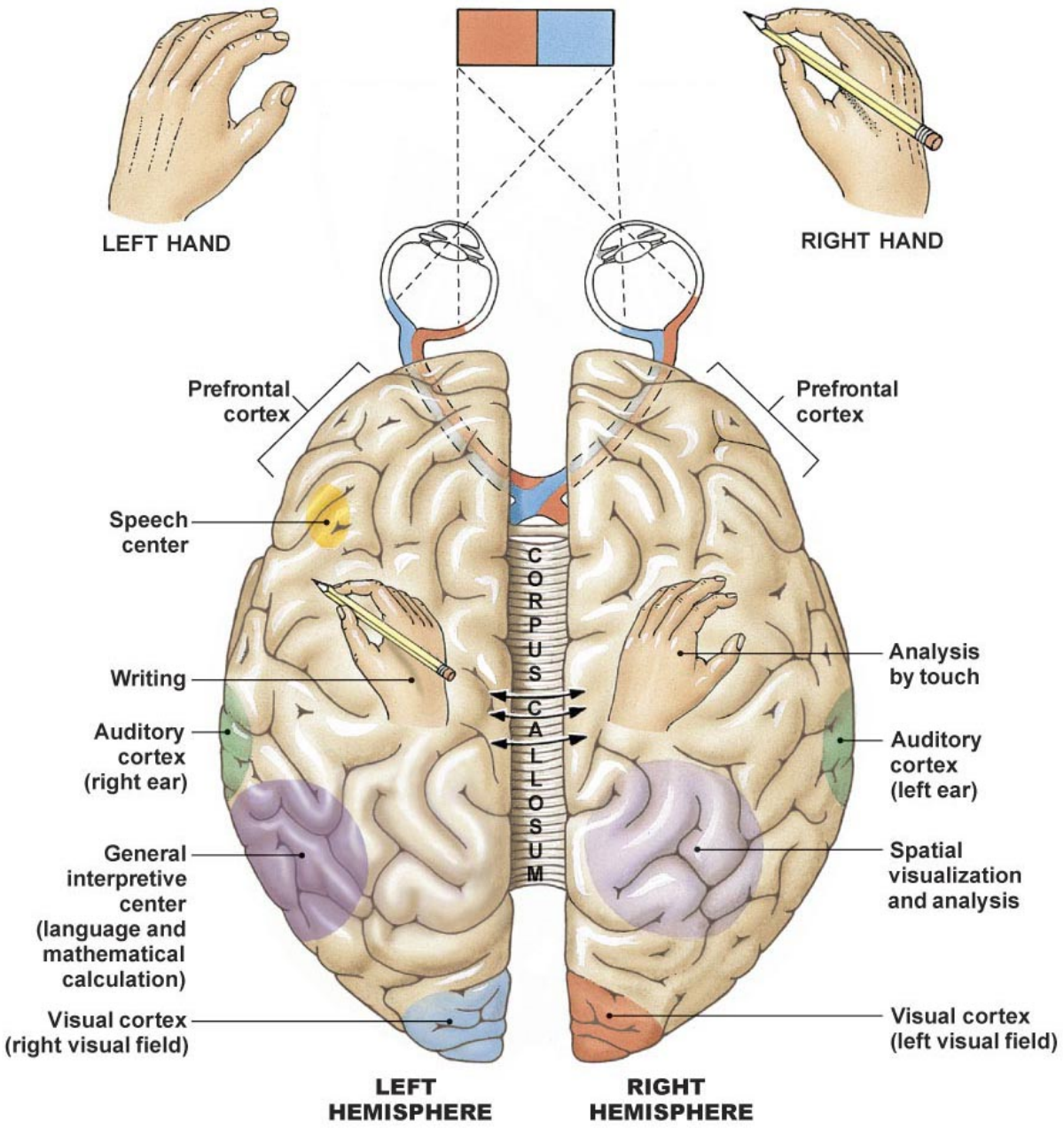


Figure 9-17

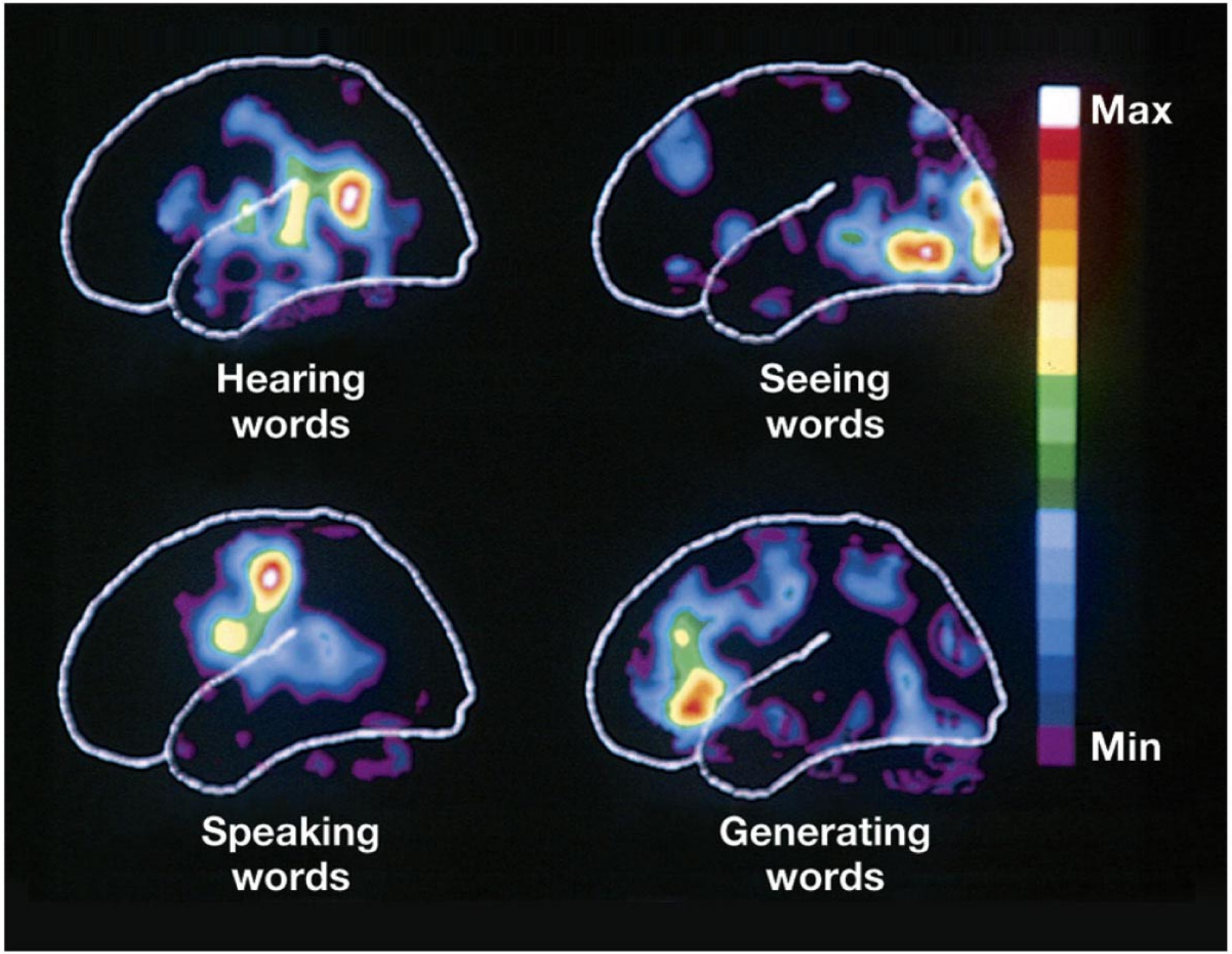
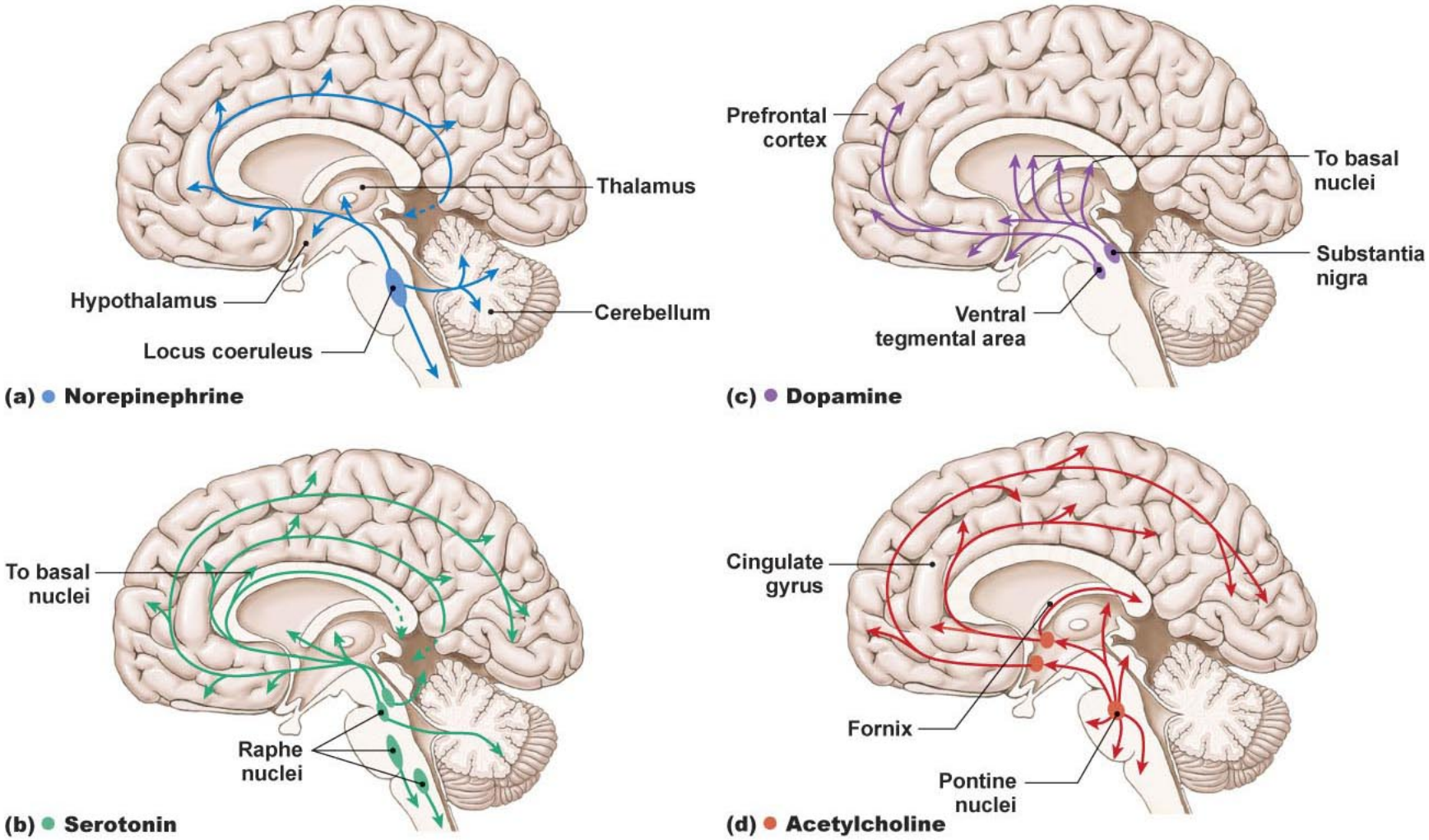


Figure 9-19



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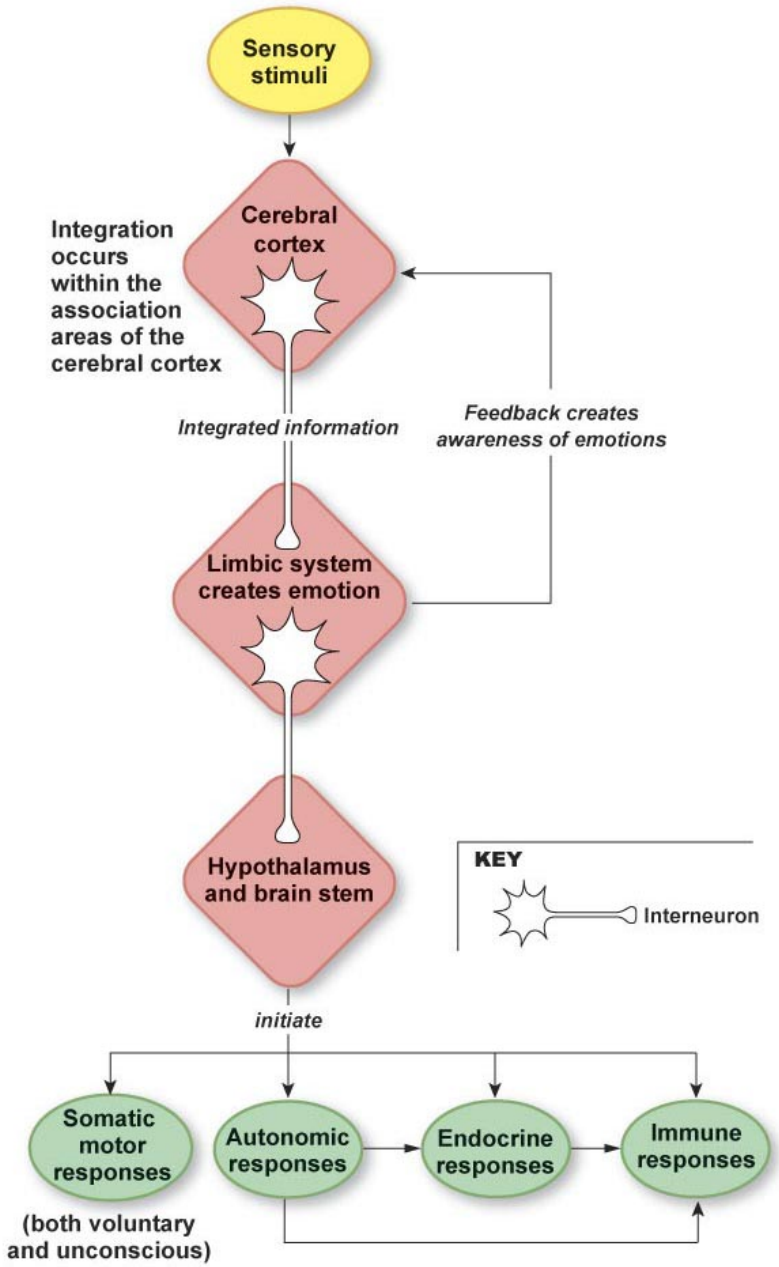

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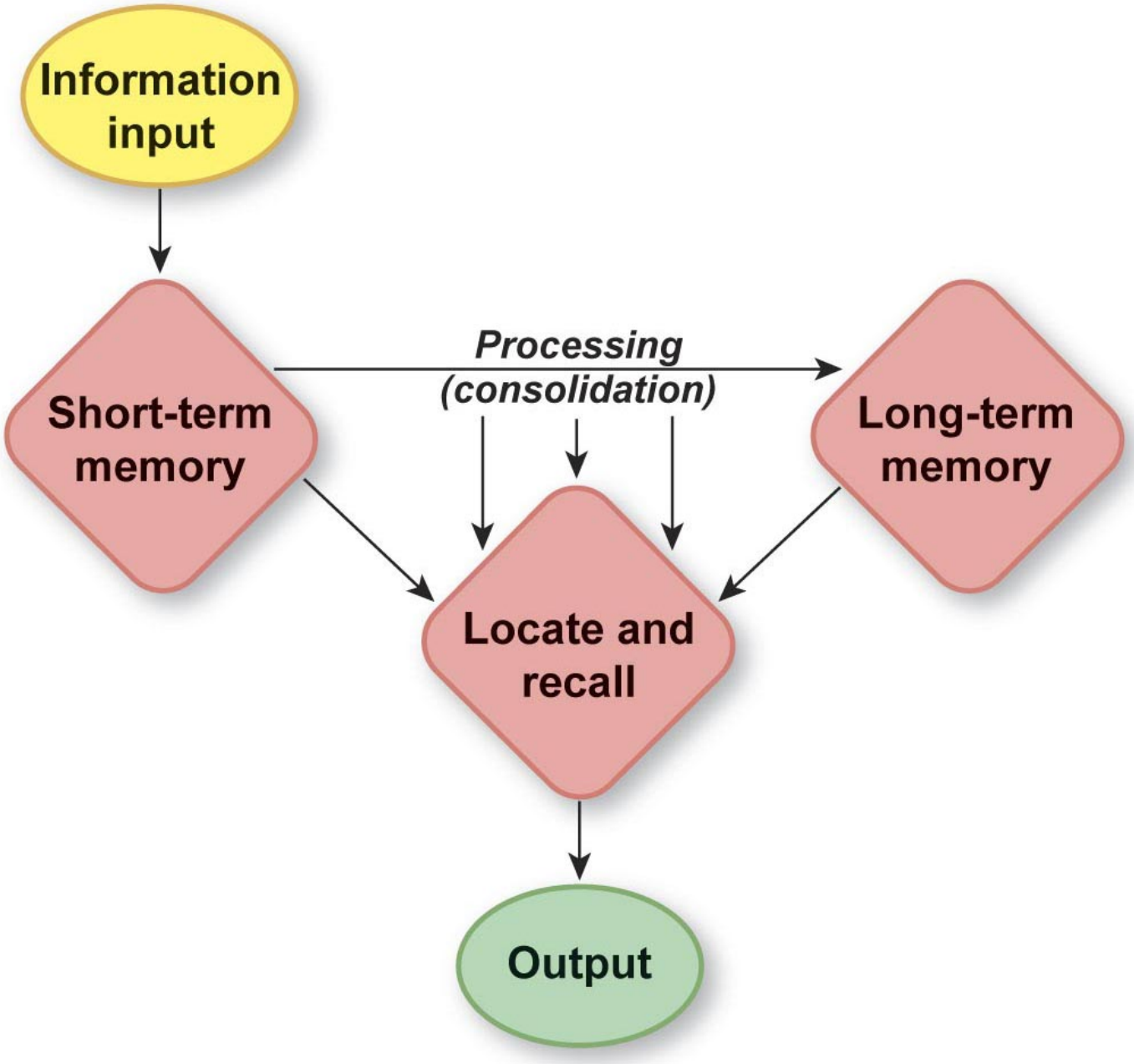

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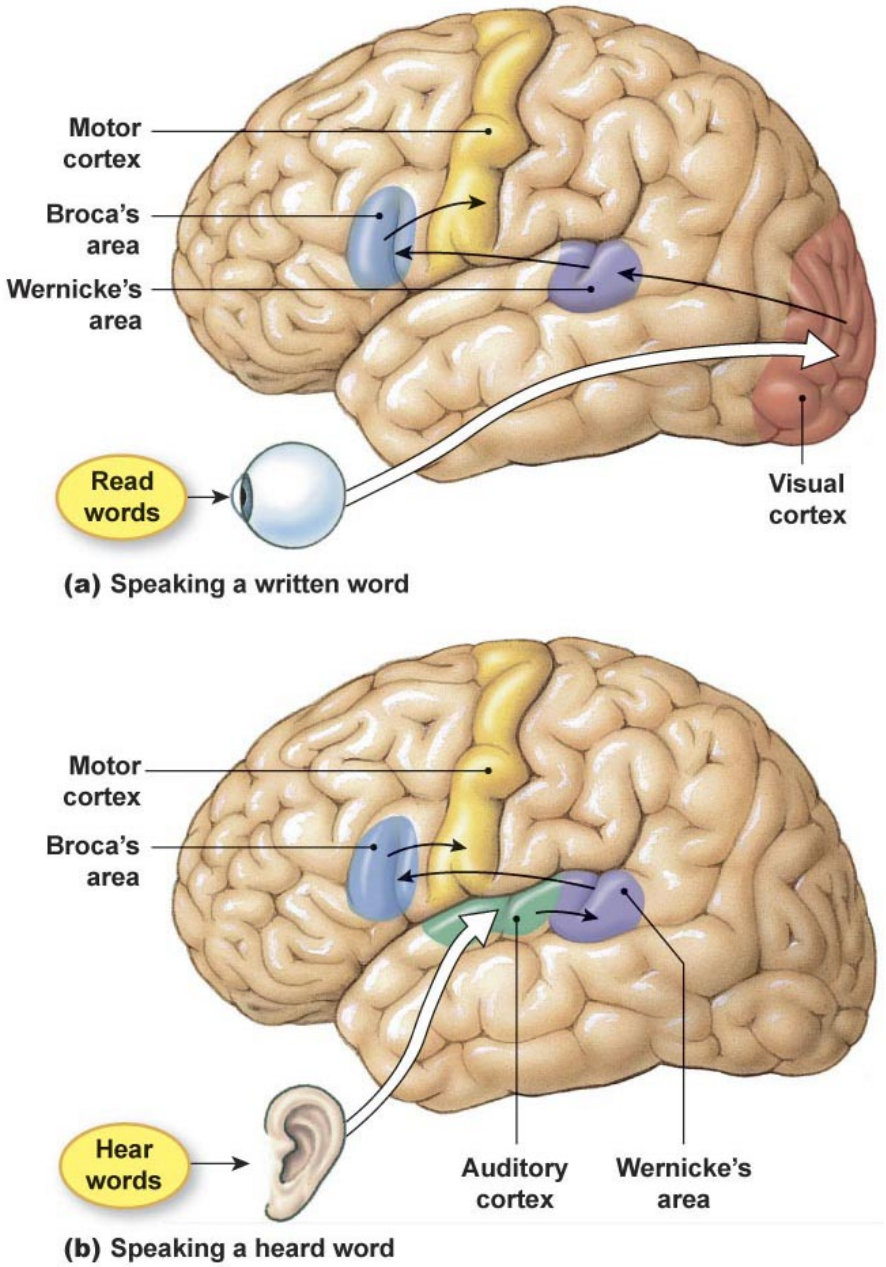

Table 9-1

TABLE 9-1 The Cranial Nerves

NUMBER	NAME	TYPE	FUNCTION
I	Olfactory	Sensory	Olfactory (smell) information from nose
II	Optic	Sensory	Visual information from eyes
III	Oculomotor	Motor	Eye movement, pupil constriction, lens shape
IV	Trochlear	Motor	Eye movement
V	Trigeminal	Mixed	Sensory information from face, mouth; motor signals for chewing
VI	Abducens	Motor	Eye movement
VII	Facial	Mixed	Sensory for taste; efferent signals for tear and salivary glands, facial expression
VIII	Vestibulocochlear	Sensory	Hearing and equilibrium
IX	Glossopharyngeal	Mixed	Sensory from oral cavity, baro- and chemoreceptors in blood vessels; efferent for swallowing, parotid salivary gland secretion
X	Vagus	Mixed	Sensory and efferents to many internal organs, muscles, and glands
XI	Spinal accessory	Motor	Muscles of oral cavity, some muscles in neck and shoulder
XII	Hypoglossal	Motor	Tongue muscles

Table 9-4

TABLE 9-4 Types of Long-Term Memory

REFLEXIVE (IMPLICIT) MEMORY	DECLARATIVE (EXPLICIT) MEMORY
Recall is automatic and does not require conscious attention	Recall requires conscious attention
Acquired slowly through repetition	Depends on higher-level thinking skills such as inference, comparison, and evaluation
Includes motor skills and rules and procedures	Memories can be reported verbally
Procedural memories can be demonstrated	