

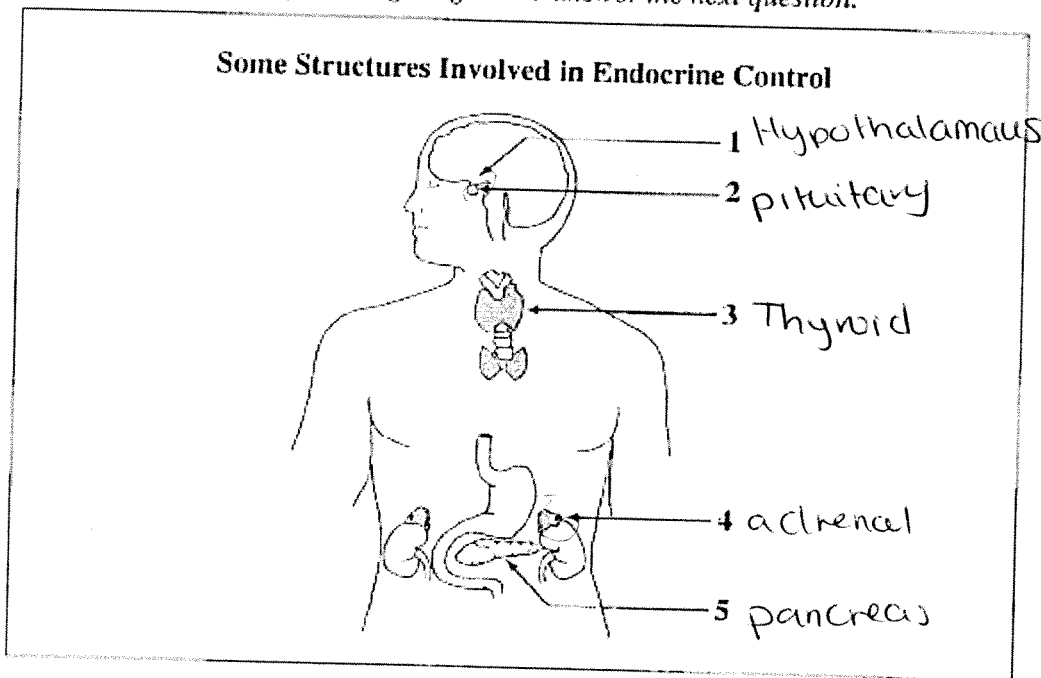
Multiple Choice #1

Which of the following rows identifies the source of cortisol, the hormone that stimulates the release of cortisol, and an effect of cortisol?

Row	Source	Hormone	Effect
A	Adrenal gland	ACTH	Increased conversion of amino acids to glucose
B	Pituitary gland	ACTH	Increased protein synthesis
C	Adrenal gland	ADH	Increased conversion of glycogen to glucose
D	Pituitary gland	ADH	Increased water reabsorption

Numerical Response #1

Use the following diagram to answer the next question.

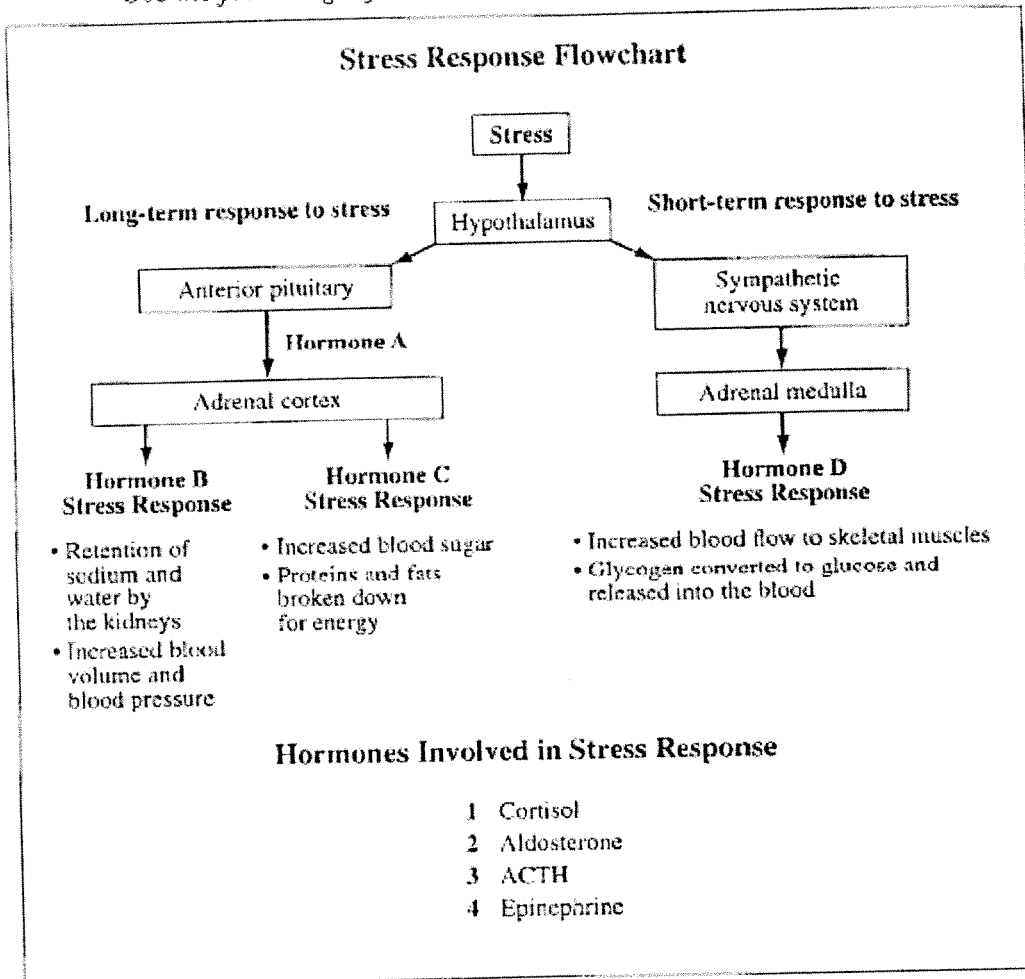


The three structures in the diagram above involved in the normal feedback control of cortisol secretion are numbered _____, _____, and _____.

(Record all **three digits** of your answer in **lowest-to-highest numerical order** in the numerical-response section on the answer sheet.)

Numerical Response #2

Use the following information to answer the next two questions.



Match each of the hormones involved in the stress response with the hormones represented in the flowchart above.

Hormone Number: _____
 Flowchart Letter: Hormone A Hormone B Hormone C Hormone D

(Record your four-digit answer in the numerical-response section on the answer sheet.)

Multiple Choice #2

The short-term response to stress occurs faster than the long-term response to stress because the

- A blood from the adrenal medulla travels faster than does the blood from the adrenal cortex
- B adrenal medulla responds to nervous stimulation, which is faster than hormonal stimulation
- C adrenal medulla is controlled by the hypothalamus whereas the adrenal cortex is controlled by the pituitary
- D hormone from the adrenal medulla acts on cells more quickly than the hormones from the adrenal cortex

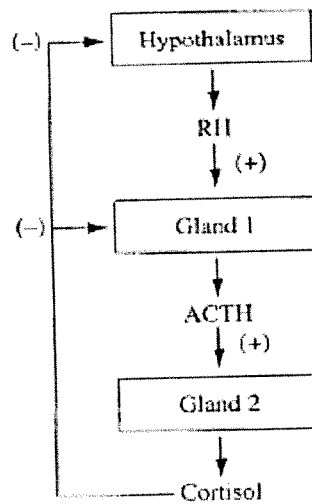
Multiple Choice #3

Use the following information to answer the next two questions.

Researchers suggest that the brain has a daily "internal clock" that is controlled by the endocrine and nervous systems. The hormone ACTH helps to regulate the nervous system and gives the body the ability to respond to changes in sleep patterns. The release of ACTH is suppressed during sleep but increases before a person awakes.

The feedback loop below illustrates part of the regulatory hormonal control of the internal clock.

Regulatory Hormone Feedback Loop



The secretion of ACTH is suppressed during sleep as a result of

- A increased activity of the pituitary gland
- B decreased secretion of RH by the hypothalamus
- C decreased secretion of cortisol by the adrenal cortex
- D increased nervous system input to the medulla oblongata

Multiple Choice #4

Use the following additional information to answer the next question.

In a study in which the brain's internal clock was investigated, two groups of volunteers were awakened at 6:00 A.M. One group had been told that they would be awakened at 6:00 A.M., and the other group had been told that they would be awakened at 9:00 A.M. The group expecting to be awakened at 6:00 A.M. had increased levels of ACTH at 5:00 A.M., but the level of ACTH remained low in the group expecting to sleep later.

—based on Born, Jan, Kirsten Hansen, Lisa Marshall, Matthias Mölle, and Horst L. Fehm. 1999. Timing the end of nocturnal sleep. *Nature* 397 (January): 29.

The results of this study indicate that the sleep-wake cycle is

- variable, because the adrenal cortex responded to an anticipated event
- variable, because the hypothalamus responded to an anticipated event
- not variable, because the adrenal cortex cannot respond to an anticipated event
- not variable, because the hypothalamus cannot respond to an anticipated event

Multiple Choice #5

Use the following information to answer the next two questions.

Thyroid cancer can develop slowly over many months or even years. Because the symptoms are frequently overlooked, diagnosis is often delayed. However, thyroid cancer is usually treated successfully with a combination of surgery, radioactive iodine, and thyroid medication.

Surgical removal of the thyroid gland results in

- a decrease in thyroxine levels and TSH levels
- an increase in thyroxine levels and TSH levels
- an increase in thyroxine levels and a decrease in TSH levels
- a decrease in thyroxine levels and an increase in TSH levels

Multiple Choice #6

Following the removal of the thyroid gland, thyroid medication is prescribed in order to

- increase sodium reabsorption and water retention
- decrease sodium reabsorption and water retention
- increase the rate of metabolism and the rate of heat production
- decrease the rate of metabolism and the rate of heat production

Multiple Choice #7

Use the following information to answer the next question.

Chemicals found in alcohol and tea have a diuretic effect. Diuretics cause the body to produce greater-than-normal volumes of urine.

Diuretic chemicals counteract the effect of the hormone

- ADH
- insulin
- cortisol
- prolactin

Multiple Choice #8

Which of the following hormones plays a role in returning the salt concentration in the blood to homeostatic levels following heavy exercise?

- A Cortisol
- B Thyroxine
- C Aldosterone
- D Epinephrine

Multiple Choice #9

Low levels of calcium ions in the blood cause

- A decreased secretion of PTH and increased deposition of calcium in the bones
- B decreased secretion of calcitonin and increased deposition of calcium in the bones
- C increased secretion of PTH and movement of calcium from the bones to the blood
- D increased secretion of calcitonin and movement of calcium from the bones to the blood

Multiple Choice #10

The release of thyroxine from the thyroid is directly regulated by

- A TSH
- B TRH
- C iodine
- D thyroxine

Multiple Choice #11

A characteristic symptom of hyperthyroidism is

- A lethargy
- B weight loss
- C intolerance to cold
- D slowed mental processes

Multiple Choice #12

Parathormone and calitonin are hormones that work antagonistically. Two other hormones that work antagonistically are

- A TSH and thyroxine
- B insulin and glucagon
- C ADH and aldosterone
- D prolactin and oxytocin

Multiple Choice #13

Diabetes insipidus is a disorder in which the body fails to produce sufficient ADH. One symptom of this disorder that is directly related to ADH secretion is

- A the production of large amounts of dilute urine
- B a decrease in the glucose concentration in the blood
- C an increase in the glucose concentration in the urine
- D the production of small amounts of concentrated urine

Multiple Choice #14

Use the following information to answer the next two questions.

Drinking coffee may protect a person against Parkinson disease, a neurological disorder resulting from reduced production of the neurotransmitter dopamine by affected cells in the brain. In an experiment, mice were given caffeine in an amount equivalent to approximately one cup of coffee for a human. The mice were then given MPTP, a chemical that destroys dopamine-producing neurons, thus causing symptoms similar to those of Parkinson disease. These mice showed a much smaller reduction in dopamine levels than mice that were not given caffeine before being given MPTP.

The manipulated variable in the experiment described above was the

- ingestion of MPTP
- ingestion of caffeine
- secretion of dopamine
- destruction of dopamine-producing neurons

Multiple Choice #15

In a well-designed experiment, variables that would be kept the same in both the experimental and control groups of mice are the

- diet and health of the mice
- amounts of caffeine and MPTP ingested
- age of the mice and amount of caffeine ingested
- size of the mice and amount of dopamine produced

Multiple Choice #16

Use the following information to answer the next question.

Chorionic gonadotropin is similar to thyroid-stimulating hormone (TSH) and can bind to TSH receptors in the thyroid gland, thereby stimulating the thyroid gland. Some women develop temporary hyperthyroidism during pregnancy when chorionic gonadotropin levels are at their highest.

Which of the following rows indicates the effect of a high level of chorionic gonadotropin on thyroxine secretion and on TSH secretion?

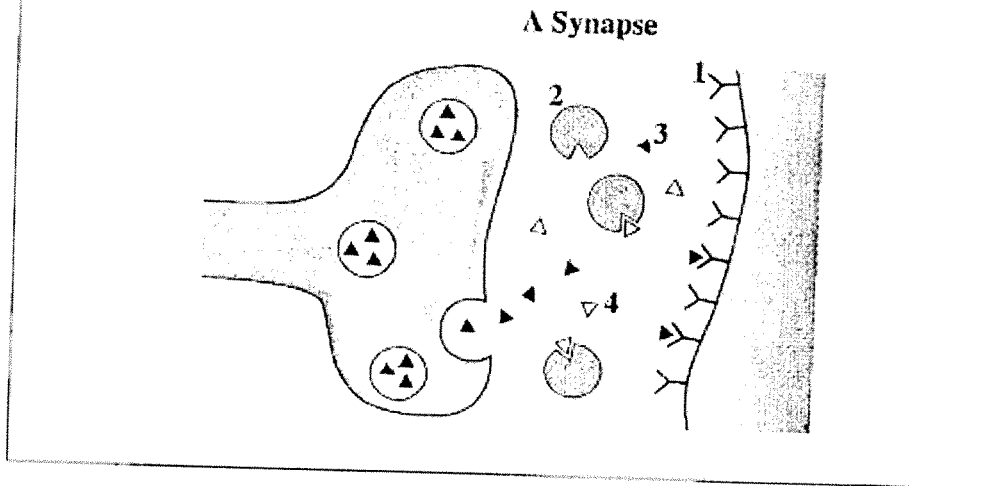
Row Thyroxine Secretion TSH Secretion

- | | |
|------|------|
| Low | Low |
| Low | High |
| High | Low |
| High | High |

Multiple Choice #17

Use the following information to answer the next two questions.

Alzheimer disease is caused by a decrease in the production of the neurotransmitter acetylcholine in the brain. Cholinesterase inhibitors, such as the drug donepezil, can slow the development of symptoms in the early-to-middle stages of Alzheimer disease, but they cannot stop the progression of the disease. The donepezil molecule has a shape that allows it to attach to the active site on cholinesterase, thereby preventing the cholinesterase from binding to acetylcholine.



In the diagram above, acetylcholine and donepezil are numbered

- A 1 and 2 respectively
- B 2 and 1 respectively
- C 3 and 4 respectively
- D 4 and 3 respectively

Multiple Choice #18

How does donepezil affect synaptic transmission?

- A Donepezil breaks down acetylcholine so that less acetylcholine is available in the synapse.
- B Donepezil replaces cholinesterase so that more acetylcholine is available in the synapse.
- C Donepezil blocks the release of acetylcholine so that less acetylcholine is available in the synapse.
- D Donepezil prevents the breakdown of acetylcholine so that more acetylcholine is available in the synapse.

Numerical Response #3

Another symptom of MS is an exaggerated pupillary light reflex. Some of the events that occur during this reflex are listed below.

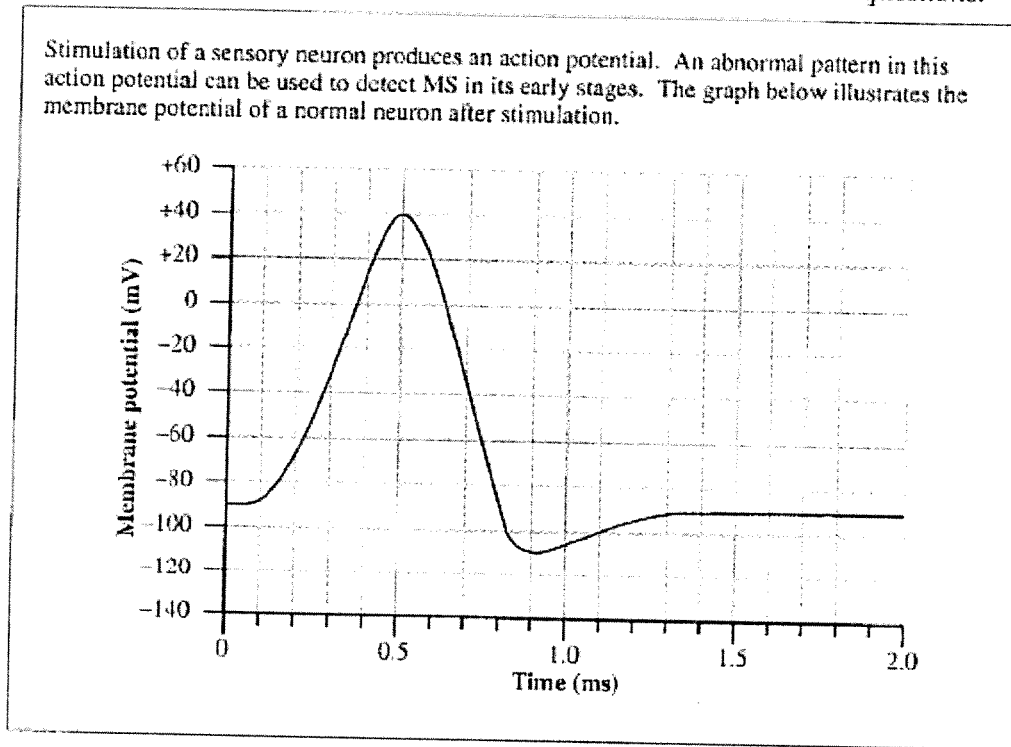
- 1 Motor neuron depolarizes
- 2 Sensory neuron depolarizes
- 3 Interneuron depolarizes
- 4 Light receptors stimulated

The order in which the events listed above occur during a pupillary light reflex is _____, _____, and _____.

(Record all four digits of your answer in the numerical-response section on the answer sheet.)

Numerical Response #4

Use the following additional information to answer the next three questions.



What is the resting membrane potential for this neuron, expressed to two digits, and what is the maximum membrane potential during depolarization, expressed to two digits? (Record your answers as absolute values.)

Answers: _____ , _____
Membrane Potential: Resting , Maximum
During
Depolarization

(Record all four digits of your answer in the numerical-response section on the answer sheet.)

Multiple Choice #19

Which of the following types of ion movement across an axon membrane would cause the action potential to change during the interval from 0.2 ms to 0.4 ms?

- A Sodium ions moving into the axon
- B Sodium ions moving out of the axon
- C Potassium ions moving into the axon
- D Potassium ions moving out of the axon

Multiple Choice #20

On the graph, the period from 0.5 ms to 1.0 ms represents the neuron's

- A refractory period, which is when repolarization occurs
- B refractory period, which is when minimum depolarization occurs
- C threshold period, which is when repolarization occurs
- D threshold period, which is when minimum depolarization occurs

Multiple Choice #21

Use the following information to answer the next question.

After accidentally hitting your thumb with a hammer, you immediately withdraw your hand. You do not feel pain for a short period of time.

This sequence of events may be explained by the fact that the

- A threshold of the receptor has been so greatly exceeded that the neuron does not pass the message to the brain
- B neural impulse is so large that the brain is unable to interpret the signal because it is beyond the range of tolerance
- C neural processing occurred in the spinal cord first, which caused you to quickly remove your thumb from further damage
- D sensory receptors in the thumb were damaged by the blow and are unable to initiate a stimulus to the sensory nerve

Multiple Choice #22

Use the following information to answer the next question.

Individuals know that touching a hot stove can be painful. When an individual accidentally touches a hot stove, a reflex arc is initiated, which causes the person to withdraw his or her hand before he or she senses the pain.

Which of the following lists identifies the neural pathway in a reflex arc?

- A Receptor, sensory neuron, effector, motor neuron
- B Motor neuron, interneuron, sensory neuron, effector
- C Sensory neuron, receptor, interneuron, motor neuron
- D Receptor, sensory neuron, interneuron, motor neuron

Multiple Choice #23

Use the following information to answer the next five questions.

Multiple sclerosis (MS), a disease of the nervous system, typically has symptoms of uncontrolled muscle responses, weakness, paralysis, and vision difficulties. Researchers believe that MS occurs as a result of the body's immune system destroying the myelin sheath that surrounds the axon of a nerve cell. The result is a scarring of brain tissue or of spinal cord tissue.

Damage to the myelin sheath of an optic neuron affects the speed of neural transmission to the visual centre, which is found in which lobe of the cerebrum?

- A Frontal lobe
- B Parietal lobe
- C Occipital lobe
- D Temporal lobe

Multiple Choice #24

Which of the following rows indicates events that would result from stimulation of sympathetic motor neurons in the heart, skin, and liver?

Row	Heart	Skin	Liver
A	Increased heart rate	Decreased blood flow	Conversion of glycogen to glucose
B	Increased heart rate	Increased blood flow	Conversion of glucose to glycogen
C	Decreased heart rate	Decreased blood flow	Conversion of glycogen to glucose
D	Decreased heart rate	Increased blood flow	Conversion of glucose to glycogen

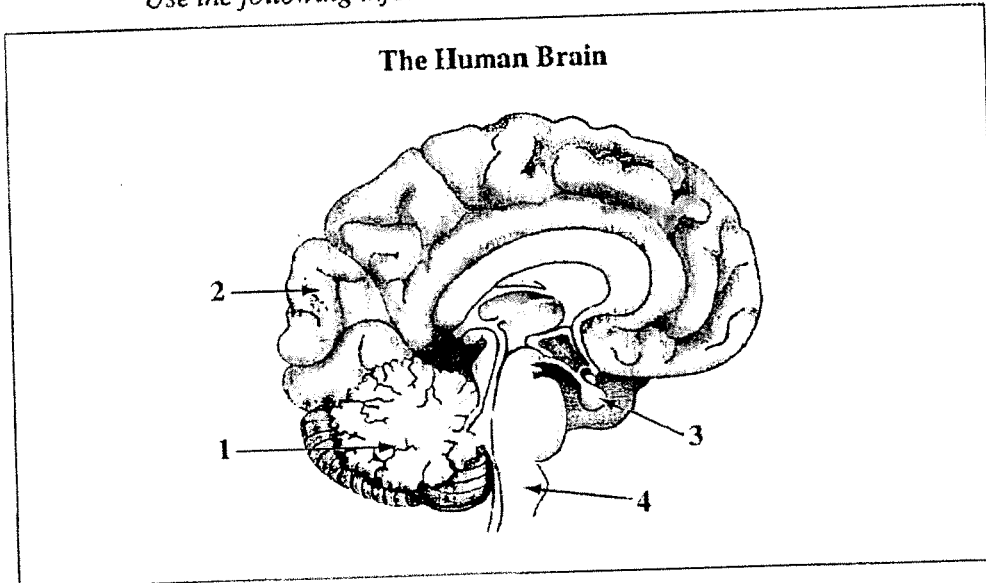
Multiple Choice #25

The brain stem is the region of the brain that is composed of the pons and medulla oblongata. Functions of the brain stem include the

- A control of breathing and heart rate
- B control of body temperature and blood pressure
- C interpretation of auditory and visual information
- D relay of information between the cerebral hemispheres

Multiple Choice #26

Use the following information to answer the next question.



The area of the brain that controls the sympathetic and parasympathetic nervous systems is labelled

- A 1
- B 2
- C 3
- D 4

Multiple Choice #27

Use the following information to answer the next two questions.

Between seven and 12 months of age, infants begin to display a marked fear of strangers. Infants also begin to socially reference their responses during the same period. Some research indicates that extremely fearful children often have very anxious parents.

The division of the nervous system that is directly responsible for physiological responses to fear is the

- A sensory nervous system
- B somatic nervous system
- C sympathetic nervous system
- D parasympathetic nervous system

Multiple Choice #28

Use the following additional information to answer the next question.

Biofeedback consists of conscious efforts to control body responses that are normally involuntary. This technique can be used to control abnormal fear.

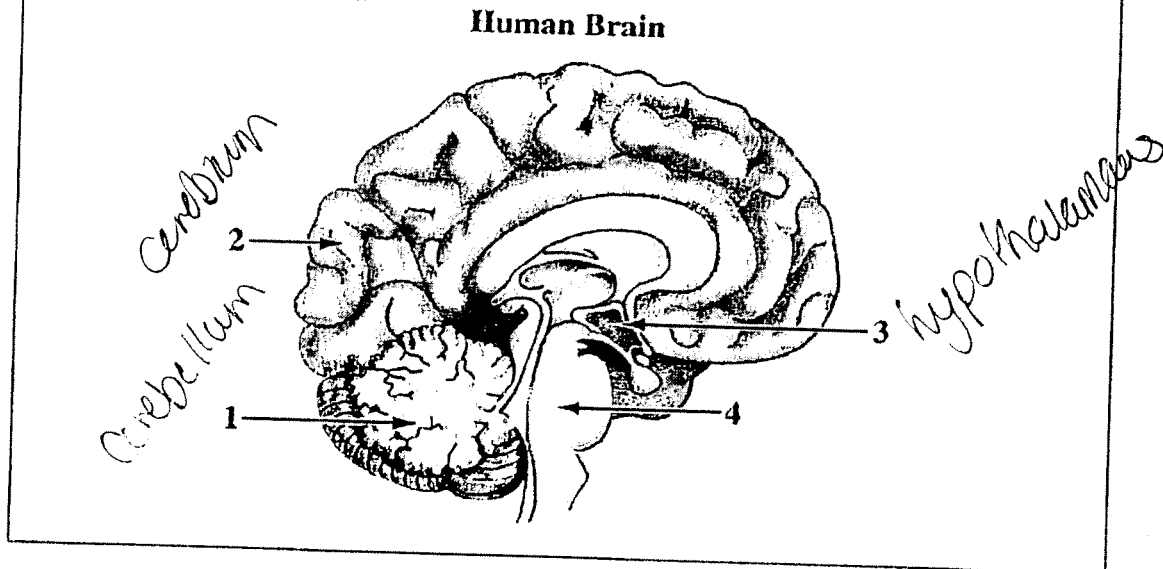
Conscious efforts to control body responses through biofeedback originate in the

- medulla
- cerebrum
- cerebellum
- hypothalamus

Multiple Choice #29

Use the following information to answer the next two questions.

Individuals with Refsum disease cannot metabolize phytanic acid, which results in a buildup of phytanic acid in body tissues and impairs the development of the myelin sheath on neurons. Symptoms of Refsum disease include hearing and vision loss, decreased muscle coordination, and a reduced sense of smell.



In the diagram above, two areas of the brain whose function can be affected in a person with Refsum disease are numbered

- 1 and 2
- 1 and 4
- 2 and 3
- 3 and 4

Multiple Choice #30

Use the following information to answer the next question.

In a research study on the detection of odours, individuals were asked to smell gradually decreasing concentrations of specific familiar chemicals. Women of reproductive age were more able to detect weak odours than were men, children, and postmenopausal women. The researchers concluded that female sex hormones might increase sensitivity to familiar odours.

The **most likely** inference that can be made from this study is that, in comparison with men, children, and postmenopausal women, women of reproductive age have

- more receptors for odour detection
- a lower threshold level for familiar odours
- the ability to interpret odours more quickly
- the ability to adapt to familiar odours more quickly

Multiple Choice #31

Symptoms of vision loss in individuals with Refsum disease include cataracts and impaired night vision. Which of the following rows identifies the structure of the eye that is affected by cataracts and the cells that, when damaged, result in night vision loss?

Row	Cataracts	Night Vision Loss
	Retina	Rod cells
	Lens	Rod cells
	Lens	Cone cells
	Retina	Cone cells

Numerical Response #5

Use the following information to answer the next question.

Structures of Sensory Perception

- 1 Optic nerve
- 2 Proprioceptor
- 3 Photoreceptor
- 4 Occipital lobe
- ~~5 Temporal lobe~~
- ~~6 Auditory nerve~~

After light enters the eye, the structures of sensory perception listed above that are stimulated are _____, _____, and _____.



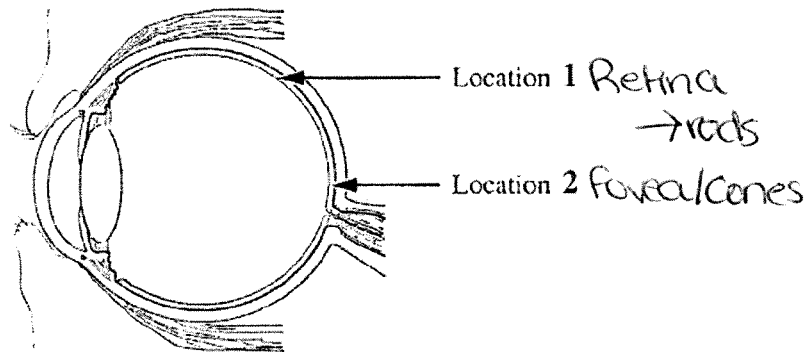
(Record all three digits of your answer in lowest-to-highest numerical order in the numerical-response section on the answer sheet.)

Multiple Choice #32

Use the following information to answer the next question.

Erectile dysfunction, which is defined as the inability to maintain an erection, can sometimes be treated with the drug sildenafil citrate. A side effect of sildenafil citrate is that it can result in temporary difficulties in distinguishing between the colours blue and green.

The Human Eye



The cells in the eye that are affected by sildenafil citrate and the primary location of these cells, as labelled above, are, respectively,

- A rod cells and location 1
- B rod cells and location 2
- C cone cells and location 1
- D cone cells and location 2

Numerical Response #6

Use the following information to answer the next question.

Researchers have linked the release of airbags in cars to impaired hearing. When an airbag is released, there is a rapid increase in air pressure, which can damage the inner ear.

Structures of the Human Ear

- 1 Ossicles
- 2 Cochlea
- 3 Auditory canal
- 4 Tympanic membrane

The sequence in which the highly compressed pressure waves created by the release of an airbag travel through the structures of the human ear is _____, _____, and _____.

(Record all four digits of your answer in the numerical-response section on the answer sheet.)

Multiple Choice #33

Use the following information to answer the next three questions.

The Norwegian military has developed a Personal Active Radio/Audio Terminal (PARAT) earpiece that blocks unwanted noise while allowing other sound to come through clearly. The PARAT is contained in a sealed unit that physically blocks most sound while the tiny computer inside the unit analyzes which sounds it will filter through into the ear.

The structure of the ear that converts the vibrations transmitted by the PARAT into electrochemical impulses and the structure that carries these impulses to the brain are, respectively, the

- A cochlea and the optic nerve
- B cochlea and the auditory nerve
- C semicircular canals and the optic nerve
- D semicircular canals and the auditory nerve

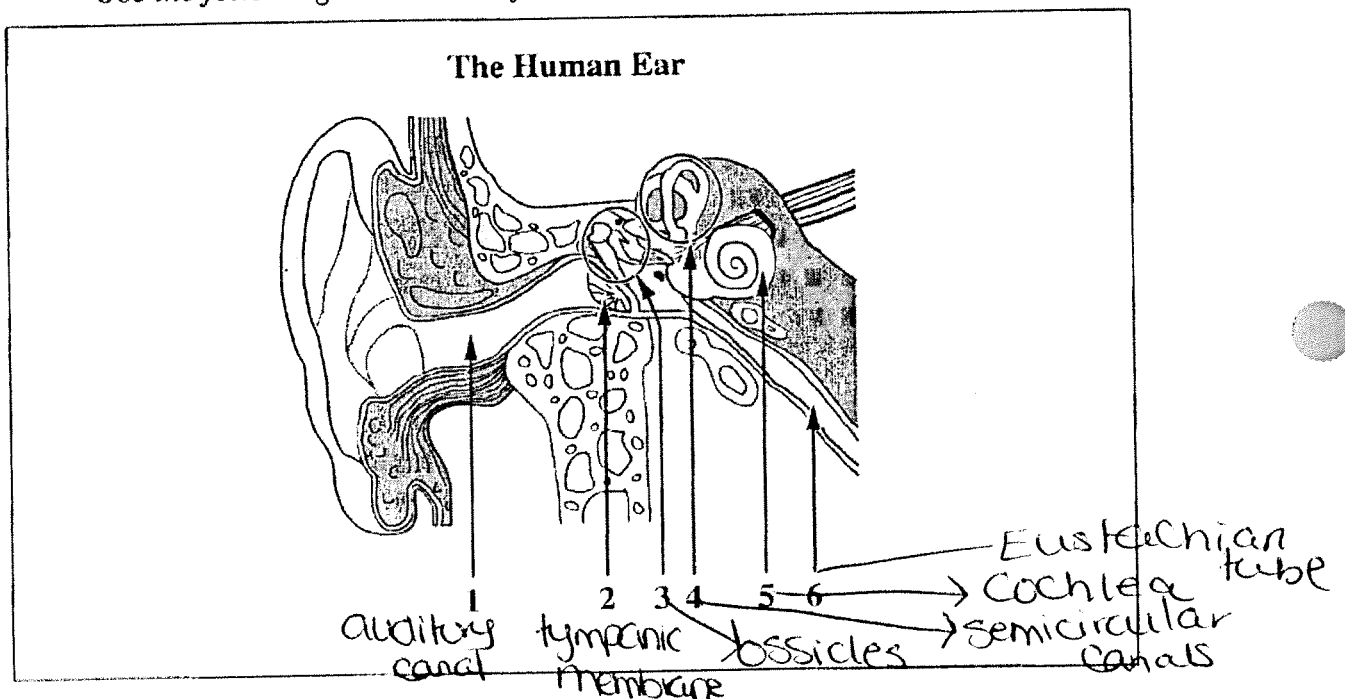
Multiple Choice #34

The sound transmitted to the ear by the PARAT earpiece is first analyzed by the brain in the

- A frontal lobe
- B parietal lobe
- C temporal lobe
- D occipital lobe

Numerical Response #7

Use the following additional information to answer the next question.



In the diagram above, the four structures of the ear through which sound vibrations pass as they travel from the PARAT to the sensory nerve are _____, _____, _____, and _____.

(Record all four digits of your answer in lowest-to-highest numerical order in the numerical-response section on the answer sheet.)

Multiple Choice #35

In the human ear, sounds are translated into nerve impulses in the

- A ossicles
- B oval window
- C organ of Corti
- D semicircular canals

Numerical Response #8

Use the following information to answer the next question.

Using various mixtures of nutrients and other growth factors, scientists can encourage stem cells to differentiate into any type of cell. Neuroreceptor disorders could potentially be treated with cells produced from stem cells. Listed below are some cell types and some neuroreceptor disorders.

Some Cell Types

- 1 Rod cells
- 2 Cone cells
- 3 Olfactory cells
- 4 Taste receptor cells
- 5 Basilar membrane cells
- 6 Semi-circular canal hair cells

Neuroreceptor Disorders and Descriptions

Anosmia—the inability to detect odours as a result of injury to the nasal cavity

Colourblindness—a genetic disorder that results in the inability to detect certain colours of light

Neural Deafness—the inability to detect sound as a result of damage to sensory structures in the inner ear

Permanent vertigo—a severe balance disorder that usually results from physical trauma to the ear

Match four of the cell types numbered above with the disorder that the cell could treat, as given below

Cell Type:	_____	_____	_____	_____
Neuroreceptor Disorder:	Anosmia	Colourblindness	Neural deafness	Permanent vertigo

(Record all four digits of your answer in the numerical-response section on the answer sheet.)

Multiple Choice #36

Use the following information to answer the next two questions.

Meniere syndrome is a debilitating disorder characterized by periods of vertigo (dizziness), tinnitus (ringing in the ear), a sensation of pressure in the ear, and progressive hearing loss. In most people affected with Meniere syndrome, the nerve associated with balance has reduced responsiveness to stimulation.

The structure of the ear that is associated with vertigo is the

- A cochlea
- B auditory canal
- C Eustachian tube
- D semicircular canal

Multiple Choice #37

Reduced responsiveness of the nerve associated with balance could indicate

- A an increased threshold level
- B an increased action potential
- C increased myelination of the nerve
- D increased repolarization of the nerve

Answer Key
Unit A Questions

Multiple Choice

1. A
2. B
3. B
4. B
5. D
6. C
7. A
8. C
9. C
10. A
11. B
12. B
13. A
14. B
15. A
16. C
17. C
18. D
19. A
20. A
21. C
22. D
23. C
24. A
25. A
26. D
27. C
28. B
29. A
30. B
31. A
32. D
33. B
34. C
35. C
36. D
37. A

Numerical Response

1. 124
2. 3214
3. 4231
4. 9040
5. 134
6. 3412
7. 1235
8. 3256

FSH - stimulates estrogen

estrogen builds endometrium

- follicular phase .

progesterone maintains endometrium

↳ once luteal phase occurs

LH - ovulation

FSH - matures ova