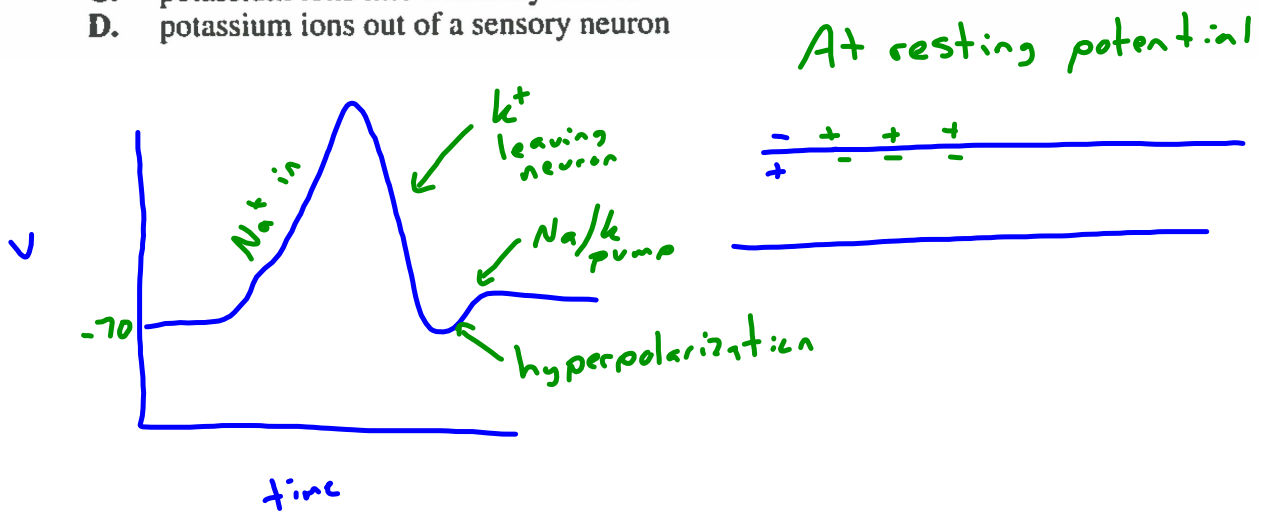


Use the following information to answer the first two questions.

Olfaction is the sense that enables organisms to distinguish and interpret odours. An action potential is initiated when a chemical interacts with an odour-receptor protein in the cell membrane of a sensory neuron in the nasal cavity.

1. The interaction of a chemical with an odour-receptor protein first causes the movement of
- A. sodium ions into a sensory neuron
  - B. sodium ions out of a sensory neuron
  - C. potassium ions into a sensory neuron
  - D. potassium ions out of a sensory neuron

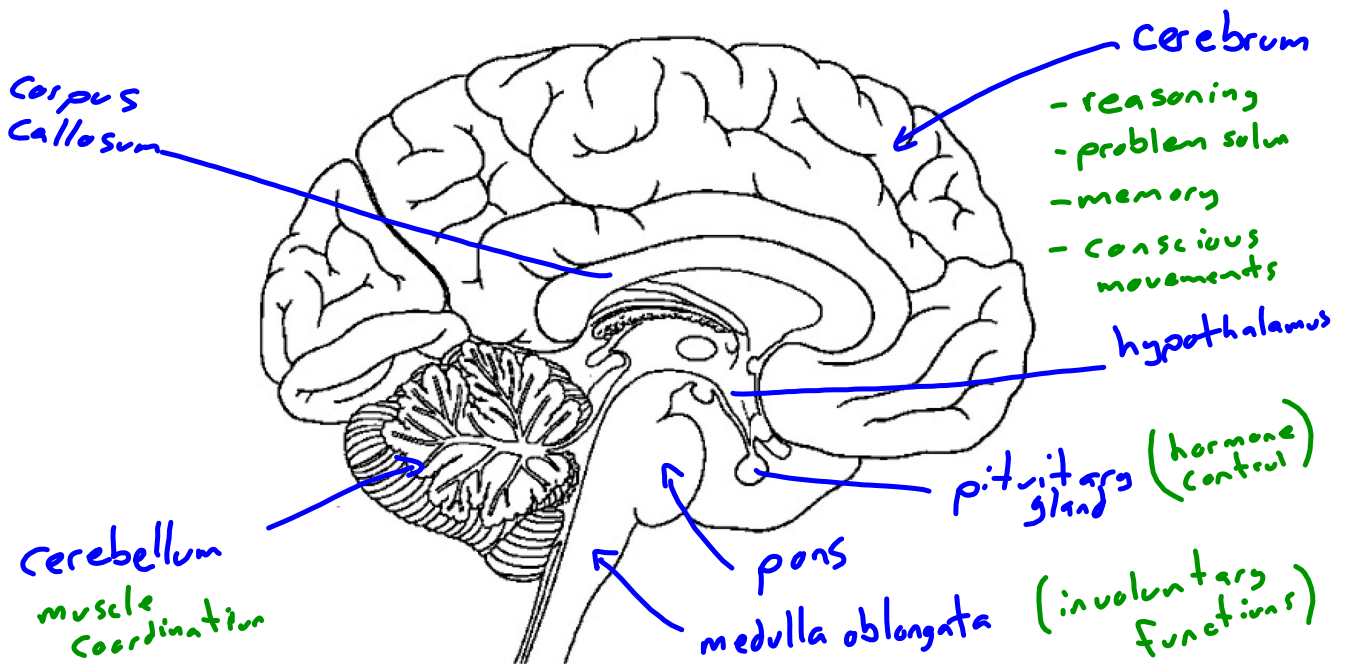


Sensory neuron - carries info to CNS  
(brain / spinal cord)

motor neuron - carry info away from CNS

2. The area of the brain where odours are interpreted is the

- A. cerebrum
- B. cerebellum - muscle coordination
- C. hypothalamus - controls endocrine system
- D. medulla oblongata - basic involuntary functions



Use the following information to answer the next two questions.

Neurofibromatosis is a genetic disorder characterized by the growth of tumours called neurofibromas around some neurons. Neurofibromas result from the uncontrolled growth of cells that produce the myelin sheath.

3. The structures that are affected by neurofibromas are the
- A. axons of neurons in grey matter
  - B. axons of neurons in white matter
  - C. dendrites of neurons in grey matter
  - D. dendrites of neurons in white matter

myelin sheath - membrane that surrounds axons

myelinated axons make up white matter  
unmyelinated axons make up grey matter

Schwann cells - produce myelin sheath

function of myelin sheath:

- speeds up action potential
- prevents loss of ions from axon

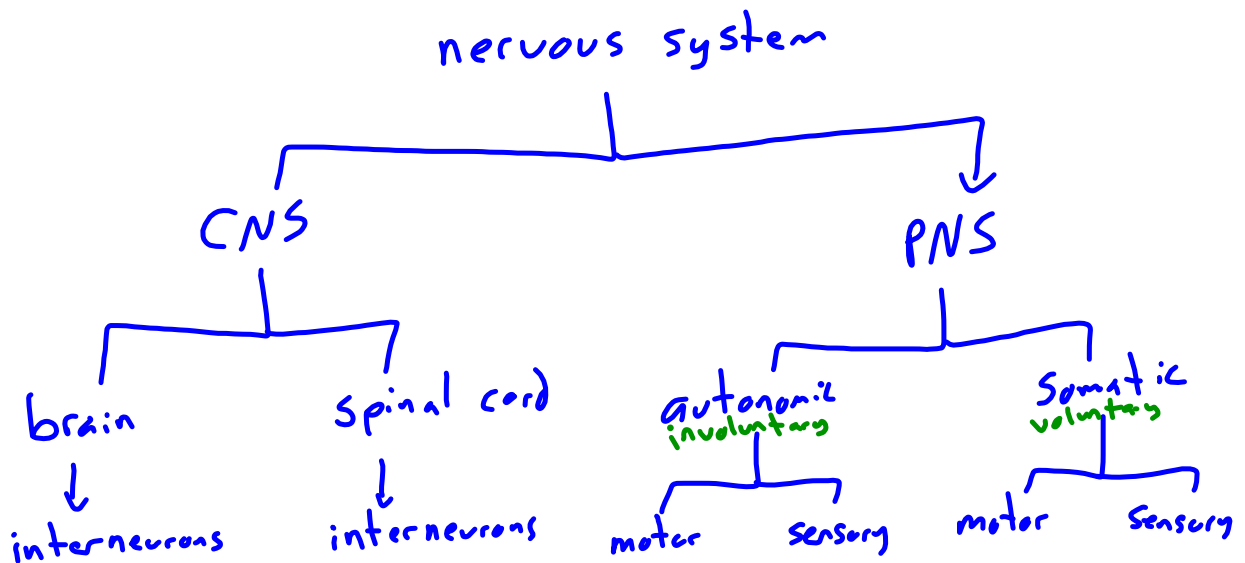
Nodes of Ranvier

Use the following additional information to answer the next question.

Two types of neurofibromatosis have been identified. In type 1 neurofibromatosis, tumours form around nerves in the peripheral nervous system.

4. The neurons that are affected in type 1 neurofibromatosis are

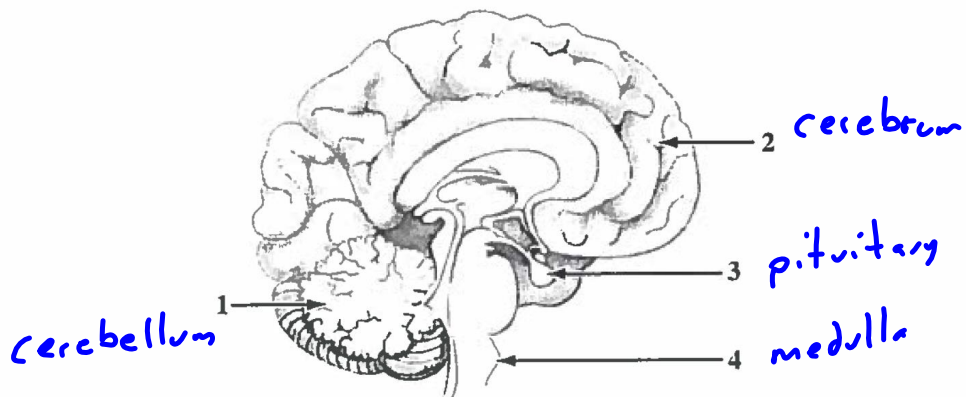
- A. autonomic neurons and ~~interneurons~~
- B. neurons in the ~~brain~~ and ~~interneurons~~
- C. autonomic neurons and somatic neurons
- D. neurons in the ~~brain~~ and somatic neurons



Use the following information to answer the next two questions.

Ataxia, which has many different forms and causes, is a condition characterized by a decreased ability to coordinate muscle movements. One form of ataxia affects the part of the nervous system that controls balance and coordination.

The Human Brain



5. In the diagram above, the part of the brain that is affected in the form of ataxia described above is numbered

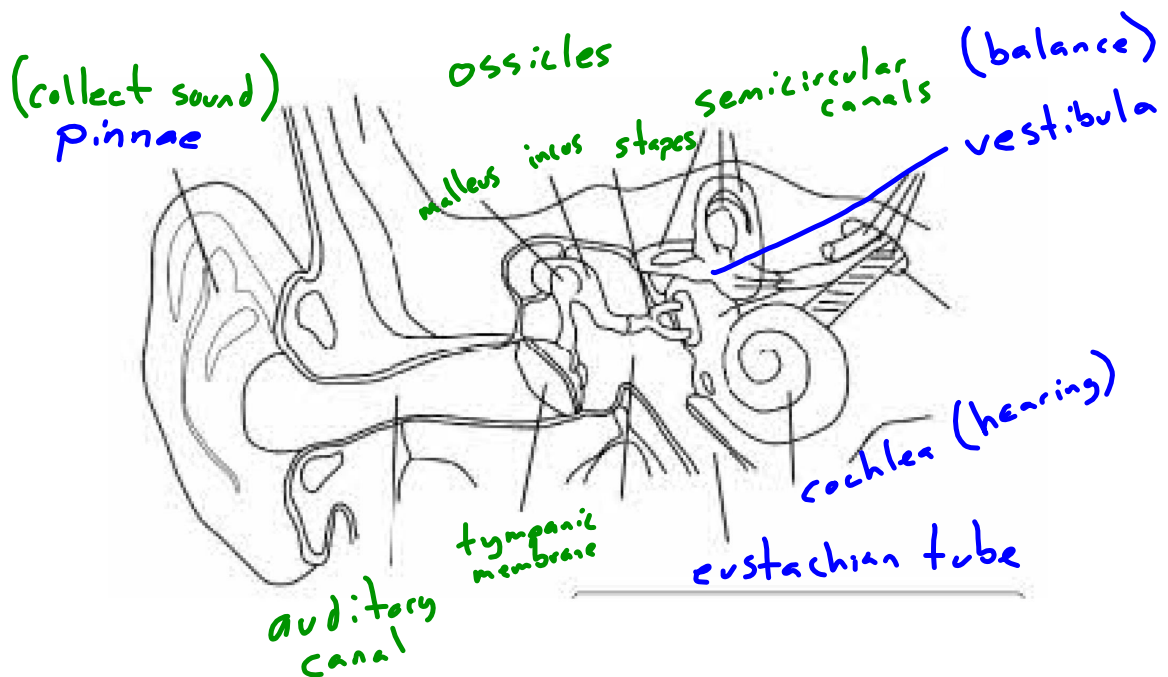
- A. 1
- B. 2
- C. 3
- D. 4

Use the following additional information to answer the next question.

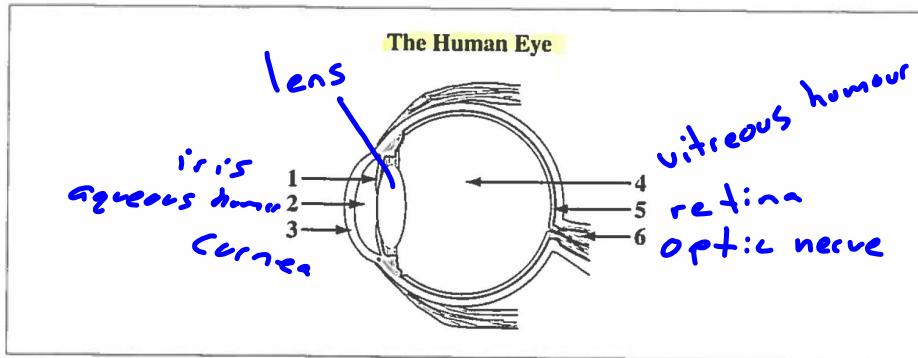
Another form of ataxia is caused by the abnormal functioning of structures in the ear that play a role in **balance**.

6. The structures of the ear that could be affected in a person with ataxia are the

- A. ossicles
- B. auditory canals
- C. cochlear hair cells - hearing
- D. semicircular canals - balance**



Use the following diagram to answer the next question.



**Numerical Response**

1. Match four of the numbers in the diagram above with the names of the structures given below.

Number: 5      1      3      6  
 Name: Retina      Iris      Cornea      Optic nerve

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

retina - captures light converts to action potential  
 optic nerve - carries signals to brain (occipital lobe)  
 cornea - allows light to pass into eye and focuses light  
 iris - controls how much light gets into eye  
 lens - focus light on retina (macula/fovea)

Use the following information to answer the next question.

Pituitary dwarfism is an inherited condition that occurs in some dog breeds. A dog with pituitary dwarfism frequently has decreased secretion of several pituitary hormones, which results in abnormal functioning of other endocrine glands.

—based on *Canine Inherited Disorders Database*, 2010

Canine Inherited Disorders Database. 2010. Inherited endocrine disorders: Pituitary dwarfism (Hypopituitarism). *Canine Inherited Disorders Database*. <http://www.upei.ca/cidd/intro.htm>.

7. Two expected symptoms of pituitary dwarfism in dogs are

- A. hypothyroidism and decreased metabolic rate
- B. hyperthyroidism and increased metabolic rate
- C. hypoparathyroidism and decreased metabolic rate
- D. hyperparathyroidism and increased metabolic rate

— too little TSH  
— too much TSH

## pituitary hormones

- TSH - thyroid stimulating hormone  
- stimulates thyroid gland

- GH - growth hormone  
- stimulates lengthening of bone/muscle

ACTH - adreno cortico tropic hormone  
- stimulates adrenal cortex

anterior  
pituitary

ADH - antidiuretic hormone

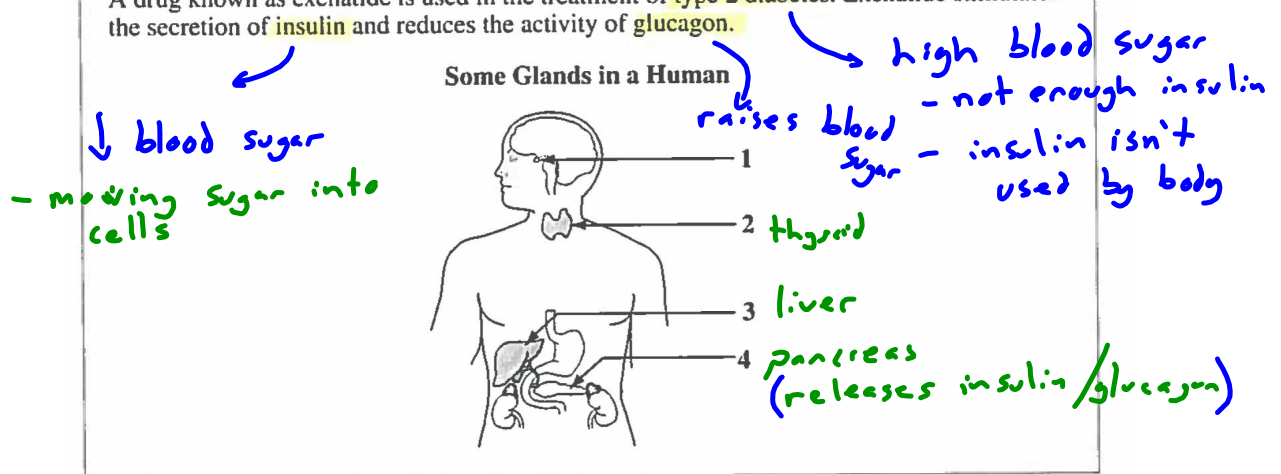
- causes collecting ducts (kidneys) to reabsorb water

oxytocin - causes uterine/mammary gland contractions



Use the following information to answer the next two questions.

A drug known as exenatide is used in the treatment of type 2 diabetes. Exenatide stimulates the secretion of insulin and reduces the activity of glucagon.



8. In the diagram above, the gland that is targeted by exenatide is labelled

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

9. Exenatide causes blood glucose levels to

- A. ~~increase~~ by causing an increase in the permeability of cells to glucose
- B. ~~increase~~ by causing a decrease in the permeability of cells to glucose
- C. decrease by causing an increase in the permeability of cells to glucose
- D. decrease by causing a decrease in the permeability of cells to glucose

Use the following information to answer the next two questions.

A man had high blood pressure and experienced muscle weakness and paralysis. These symptoms were caused by long-term exposure to licorice root, which the man consumed in his daily tea. Licorice root contains a substance that mimics the effects of high amounts of aldosterone and cortisol.

—based on Lin et al., 2003

Lin, Shih-Hua, Sung-Sen Yang, Tom Chau, and Mitchell L. Halperin. 2003. An unusual cause of hypokalemic paralysis: Chronic licorice ingestion. *American Journal of the Medical Sciences* 325 (3): 153–156.

10. The man's symptoms were caused by a substance that mimics the effects of hormones secreted by the

- A. thyroid gland
- B. hypothalamus
- C. adrenal glands
- D. pituitary gland

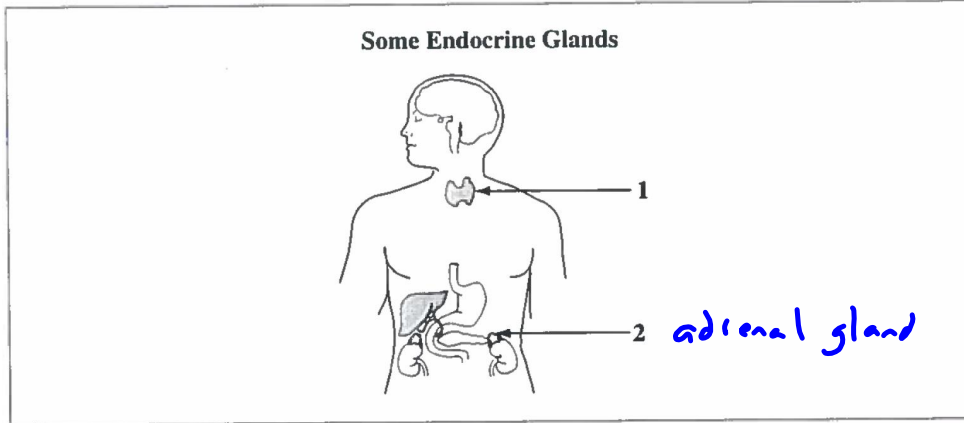
aldosterone - adrenal cortex  
- ↑ Na<sup>+</sup> absorption  
in kidneys

11. A higher-than-normal amount of aldosterone causes

- A. increased sodium reabsorption by the kidneys
- B. decreased sodium reabsorption by the kidneys
- C. decreased water reabsorption by the kidneys
- D. increased glucose reabsorption by the kidneys

cortisol - adrenal cortex  
- increases blood glucose  
by breaking down of fats/  
protein

Use the following diagram to answer the next question.



12. In the diagram above, the gland that releases a hormone in response to **short-term stress** is numbered
- A. ~~1~~ and it releases the hormone after being stimulated by the nervous system
  - B. 2**, and it releases the hormone after being stimulated by the nervous system
  - C. ~~1~~ and it releases the hormone after being stimulated by the endocrine system
  - D. 2, and it releases the hormone after being stimulated by the endocrine system

short-term - nervous system

- triggers sympathetic nervous system  
(branch of autonomic system)

- sends signals to adrenal medulla

- adrenal medulla releases epinephrine

long term - endocrine system

- causes ↑ ACTH

causes ↑ cortisol

adrenal cortex  
which

