Unit A · Diploma-style practice key

This is the key. Each answer has the reason and the lesson it comes from.

Multiple choice

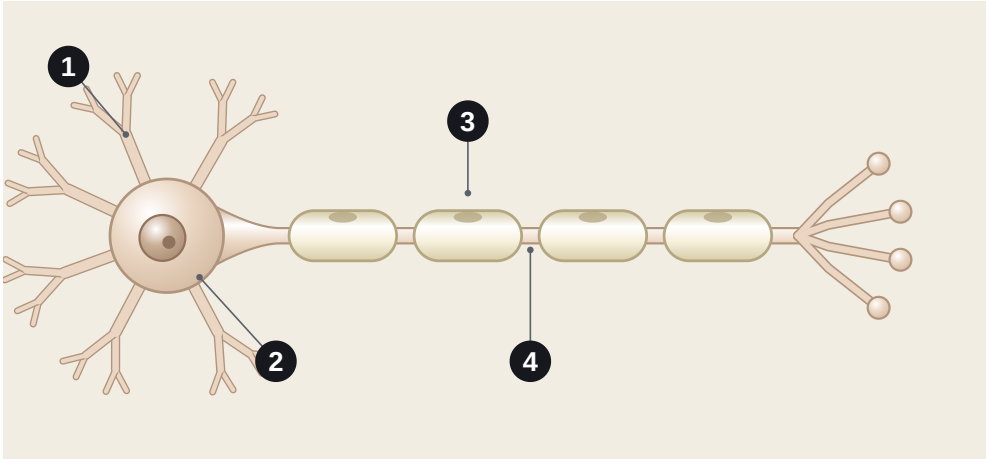
Choose the one best answer.

1. In a reflex arc, a nerve impulse passes through three kinds of neuron. Which row gives them in the correct order?

Answer: B. Sensory neuron, interneuron, motor neuron

A receptor starts the nerve impulse in a sensory neuron. An interneuron in the spinal cord passes it to a motor neuron. (Lesson A1)

Use the following diagram to answer the next question.



On the diagram: 1 dendrite; 2 cell body; 3 myelin sheath; 4 node of Ranvier.

2. Which number marks a node of Ranvier?

Answer: D. 4

A node of Ranvier is a gap between two segments of the myelin sheath. Number 3 is the myelin sheath itself. (Lesson A1)

3. Which statement describes the ions around the membrane of a resting neuron?

Answer: A. Sodium ions are mostly outside and potassium ions are mostly inside.

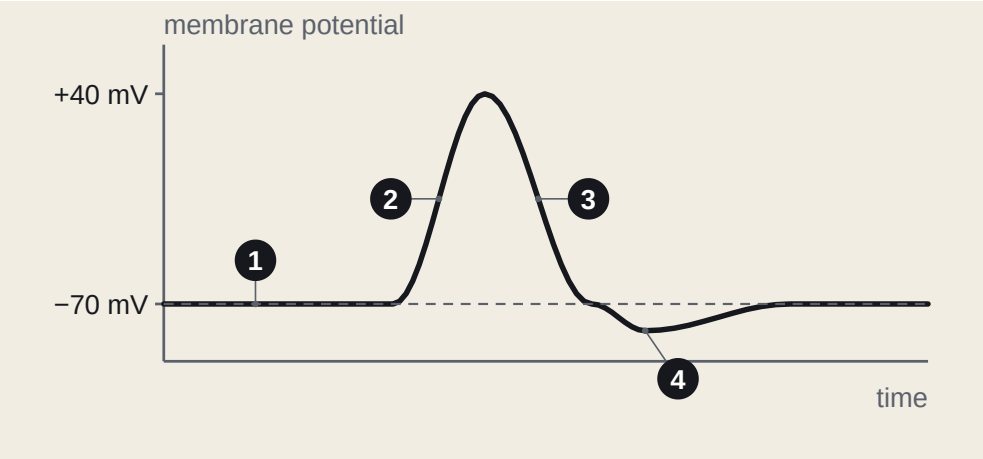
The sodium-potassium pump keeps sodium ions outside and potassium ions inside. (Lesson A2)

4. The sodium-potassium pump moves ions by

Answer: C. active transport, with sodium ions moving out and potassium ions moving in

The pump moves each ion to the side that already has more. That needs energy, so it is active transport. (Lesson A2)

Use the following diagram to answer the next question.



On the diagram: 1 resting potential; 2 depolarization; 3 repolarization; 4 hyperpolarization.

5. On the graph, which number marks repolarization?

Answer: C. 3

In repolarization the membrane potential falls from +40 mV back toward −70 mV. Number 2 is depolarization and number 4 is hyperpolarization. (Lesson A3)

Use the following information to answer the next question.

Stimulus X just reaches the threshold level of a sensory neuron. Stimulus Y is three times as strong as stimulus X.

6. Compared with the action potentials caused by stimulus X, the action potentials caused by stimulus Y are

Answer: A. the same size and more frequent

The response is all-or-none, so every action potential is the same size. A stronger stimulus gives a higher frequency. (Lesson A3)

7. During repolarization, the membrane potential returns toward the resting potential because

Answer: D. potassium ions diffuse out of the neuron

Sodium channels close and potassium channels open. Potassium ions carry positive charge out of the neuron. (Lesson A3)

Use the following information to answer the next question.

An insecticide blocks the enzyme cholinesterase.

8. What is the most likely effect of the insecticide at a synapse between a motor neuron and a skeletal muscle?

Answer: B. Acetylcholine stays in the synaptic cleft, so the muscle keeps contracting.

Cholinesterase breaks down acetylcholine. With the enzyme blocked, acetylcholine stays on the receptors and the sodium channels stay open. (Lesson A4)

9. An inhibitory neurotransmitter binds to receptors on a postsynaptic neuron. The inside of this neuron becomes

Answer: A. more negative, so it is less likely to reach the threshold level

Potassium channels open and potassium ions leave. The membrane potential moves away from the threshold level. (Lesson A4)

10. Which row gives two effects of the sympathetic nervous system?

Answer: B. Heart rate rises and peristalsis slows.

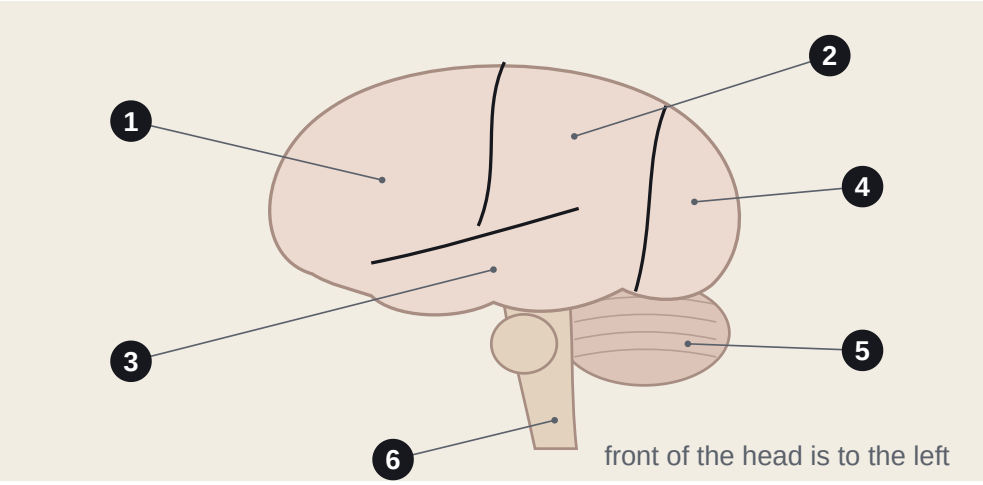
The sympathetic nervous system prepares the body for stress: the heart rate rises, the pupils dilate and digestion slows. (Lesson A5)

11. A student chooses to raise a hand in class. The motor neurons to the arm muscles are part of the

Answer: D. sensory-somatic nervous system

These neurons are outside the brain and spinal cord, and skeletal muscle is under voluntary control. (Lesson A5)

Use the following diagram to answer the next question.



On the diagram: 1 frontal lobe; 2 parietal lobe; 3 temporal lobe; 4 occipital lobe; 5 cerebellum; 6 medulla oblongata.

12. Which number marks the lobe that receives and interprets information from the ears?

Answer: C. 3

The temporal lobe, at the side of the cerebrum near the ear, is the lobe for hearing. (Lesson A6)

13. Which part of the brain controls breathing rate and heart rate?

Answer: D. Medulla oblongata

The medulla oblongata controls involuntary actions such as breathing and heart rate. (Lesson A6)

Use the following information to answer the next question.

A patient with a brain tumour staggers and cannot make smooth movements. The patient sees, hears and thinks normally.

14. The tumour is most likely pressing on the

Answer: A. cerebellum

The cerebellum controls balance and coordinated movement. The senses and thinking are jobs of the cerebrum. (Lesson A6)

15. Which observation is an example of sensory adaptation?

Answer: C. A person stops noticing the feel of a watch on the wrist.

With a constant stimulus, the receptors become used to it and their sensory neurons stop firing. (Lesson A7)

16. To focus on a near object, the _____ changes the shape of the _____.

Answer: B. ciliary muscle; lens

This is accommodation. The ciliary muscle makes the lens thicker for a near object. (Lesson A8)

17. Which row describes myopia and the lens that corrects it?

Answer: C. The eyeball is too long; a concave lens

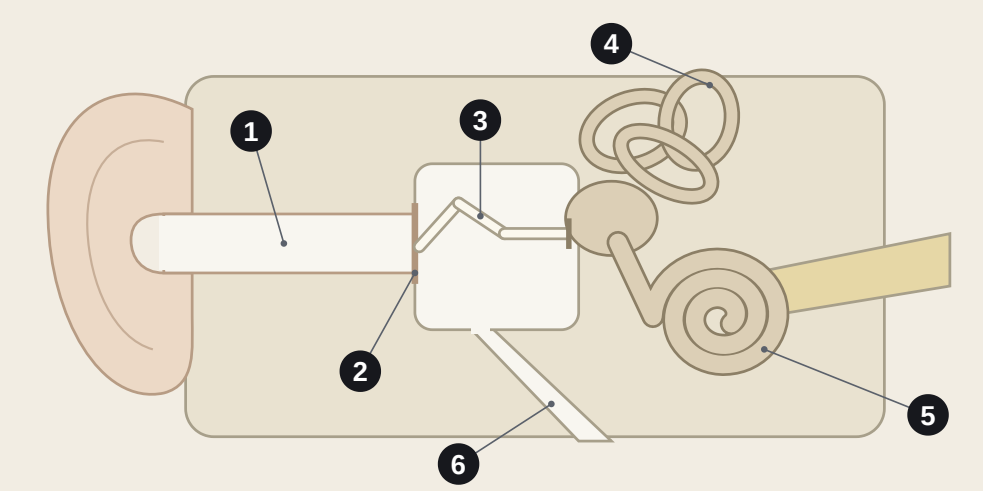
In myopia light meets in front of the retina. A concave lens spreads the light so that it meets on the retina. (Lesson A8)

18. Compared with the cones of the retina, the rods

Answer: D. work in dim light and do not detect colour

Rods work in dim light and give vision in black and white. Cones need bright light and detect colour. (Lesson A8)

Use the following diagram to answer the next question.



On the diagram: 1 auditory canal; 2 tympanum; 3 ossicles; 4 semicircular canals; 5 cochlea; 6 Eustachian tube.

19. Which number marks the part that vibrates when sound waves reach the end of the auditory canal?

Answer: B. 2

The tympanum is a thin sheet at the end of the auditory canal. Sound waves make it vibrate. (Lesson A9)

20. Which structure detects a turning movement of the head?

Answer: A. Semicircular canals

Fluid in the three semicircular canals moves when the head turns and bends the hairs of the hair cells. (Lesson A9)

Use the following information to answer the next question.

A person has eaten almost no iodine for many months. The thyroid gland of this person makes very little thyroxine.

21. Compared with normal, the level of TSH in this person's blood is

Answer: B. high, because little thyroxine is present to inhibit the pituitary gland

This is negative feedback. With little thyroxine, the hypothalamus and the pituitary gland are not inhibited, so more TSH is released. (Lesson A11)

22. When blood calcium falls below normal, the body releases

Answer: C. PTH, and the bones release calcium

PTH from the parathyroid glands raises blood calcium. Calcitonin has the opposite effect. (Lesson A11)

23. ACTH acts on the _____, which then releases _____.

Answer: A. adrenal cortex; cortisol

ACTH from the pituitary gland makes the adrenal cortex release cortisol in the long-term stress response. (Lesson A12)

24. One hour after a large meal, the pancreas of a healthy person releases

Answer: D. insulin from the beta cells, and the liver stores glucose as glycogen

Blood sugar is high after a meal. Insulin from the beta cells lowers it. (Lesson A13)

Numerical response

Record your answer as digits. Start in the left-hand box.

1. Four events of an action potential are numbered below. Record the numbers in the order in which the events happen.

1 Potassium channels open
2 The threshold level is reached
3 Sodium ions rush into the neuron
4 The sodium-potassium pump restores the resting potential

Answer: 2314

Threshold level, then depolarization (sodium ions in), then repolarization (potassium ions out), then the refractory period. (Lesson A3)

Use the following information to answer the next question.

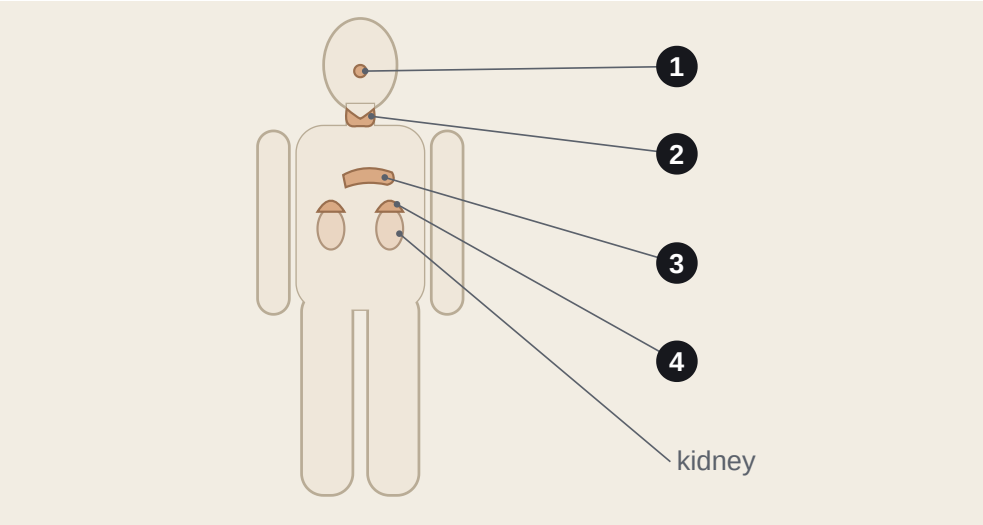
The blood sugar of a healthy person is 5.0 mmol/L before a meal. It reaches 9.5 mmol/L forty minutes after the meal.

2. Calculate the rise in blood sugar, in mmol/L.

Answer: 4.5

9.5 − 5 = 4.5 mmol/L. Insulin then brings blood sugar back down. (Lesson A13)

Use the following diagram to answer the next question.



On the diagram: 1 pituitary gland; 2 thyroid gland; 3 pancreas; 4 adrenal gland.

3. Record the number of the gland that releases ADH, then the gland that releases insulin, then thyroxine, then cortisol.

Answer: 1324

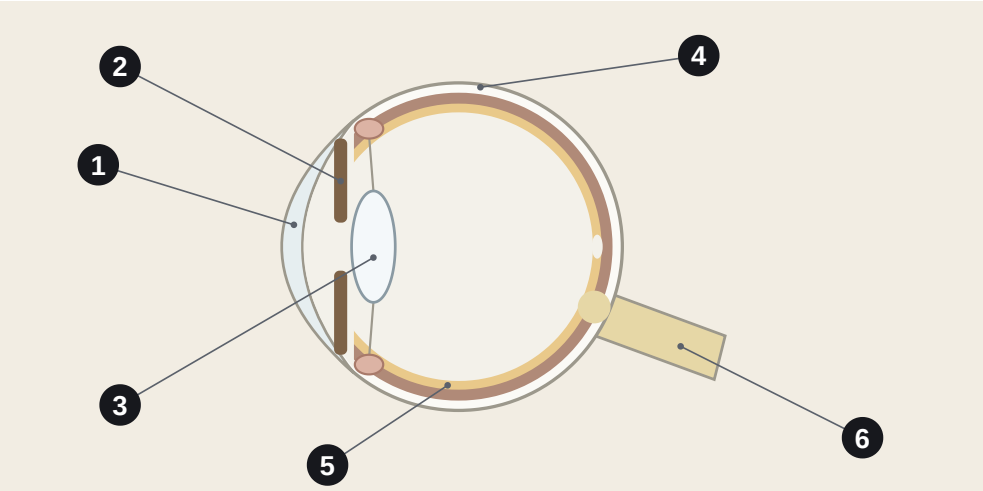
ADH: pituitary gland, posterior lobe (1). Insulin: pancreas (3). Thyroxine: thyroid gland (2). Cortisol: adrenal gland, its cortex (4). (Lesson A10)

4. A runner loses a lot of water as sweat. Record the numbers of the events below in the order in which they happen.
1 The posterior lobe of the pituitary gland releases ADH
2 The kidneys return more water to the blood
3 Osmoreceptors in the hypothalamus detect concentrated blood
4 The osmotic pressure of the blood returns to normal

Answer: 3124

The osmoreceptors detect the change, ADH is released, the kidneys respond, and the blood returns to normal. (Lesson A14)

Use the following diagram to answer the next question.



On the diagram: 1 cornea; 2 iris; 3 lens; 4 sclera; 5 retina; 6 optic nerve.

5. Record the number of the part that bends light as it enters the eye, then the part that controls the size of the pupil, then the part that holds the rods and cones, then the part that carries action potentials to the brain.

Answer: 1256

The cornea (1) bends light. The iris (2) controls the pupil. The retina (5) holds the rods and cones. The optic nerve (6) goes to the brain. (Lesson A8)

6. Record the numbers of the structures below in the order in which sound passes through them.
1 Cochlea
2 Ossicles
3 Auditory canal
4 Tympanum

Answer: 3421

Sound travels down the auditory canal to the tympanum. The ossicles pass the vibrations to the cochlea. (Lesson A9)