Bio 30 Nervous System
Practice Exam

1. Sensory and motor neurons of the peripheral nervous system transmit impulses between muscles and the
   - **A.** parasympathetic nervous system
   - **B.** sympathetic nervous system
   - **C.** central nervous system
   - **D.** endocrine system

2. Which sequence correctly shows the path of sound transmission in the ear?
   - **A.** Tympanic membrane → eustachian tube → semicircular canals → cochlea
   - **B.** Tympanic membrane → semicircular canals → eustachian tube → cochlea
   - **C.** Auditory canal → ossicles → tympanic membrane → organ of Corti
   - **D.** Auditory canal → tympanic membrane → ossicles → organ of Corti

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

> More than 4 000 Gulf War veterans complain of illness (Gulf War Syndrome). The veterans' symptoms include joint pain, shortness of breath, attention and memory problems, and chronic fatigue. During the war, most of the veterans took anti-nerve-gas pills. These pills contain pyridostigmine bromide, a drug that inhibits cholinesterase. Pyridostigmine bromide is also used to treat patients with *myasthenia gravis*, an inherited disorder characterized by weakness of skeletal muscles.

3. The role of cholinesterase in neural transmission is to
   - **A.** increase the rate of nerve impulse transmission
   - **B.** promote the breakdown of a neurotransmitter
   - **C.** increase the sensitivity of neural membranes
   - **D.** promote the synthesis of a neurotransmitter

4. Considering that the symptoms of Gulf War Syndrome include attention and memory problems, it is likely that pyridostigmine bromide has an effect on the
   - **A.** cerebrum
   - **B.** cerebellum
   - **C.** hypothalamus
   - **D.** medulla oblongata

5. In *myasthenia gravis*, a malfunction of neuromuscular synapses occurs. The information presented above indicates that the muscular weakness associated with this disorder occurs because
   - **A.** neurons secrete excess acetylcholine
   - **B.** neurons secrete insufficient acetylcholine
   - **C.** of increased permeability of membranes to sodium ions
   - **D.** of decreased permeability of membranes to potassium ions

Use the following information to answer the next question.

> Certain compounds known as opiates (opium, morphine, and codeine) are addictive drugs. Scientists have found that opiates work by binding to specific sites in the brain that interpret perceptions of pleasure and pain.

6. A likely explanation of how receptors in the human brain are stimulated by opiates is that opiates

   A. bind to neurotransmitters
   B. act in the same way as cholinesterase
   C. increase the strength of action potentials
   D. have molecular shapes similar to a neurotransmitter

Use the following information to answer the next question.

> Sensory hair cells in the inner ear can be damaged by excessive noise or certain drugs. This may cause deafness or balance disorders. Research suggests that these cells have the ability to regenerate. In one study, the damaged inner ear tissue of guinea pigs was cultured in a dish. The damaged tissue produced new sensory hair cells.
> _from *Gutin*

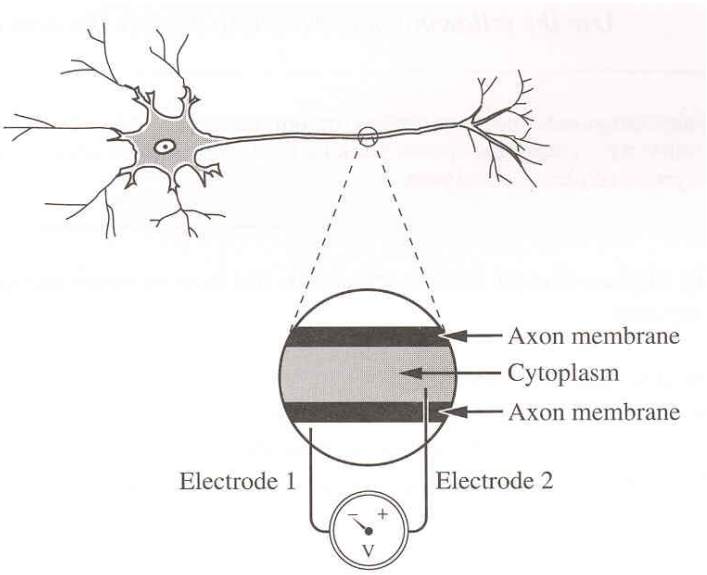
7. Which parts of the ear contain these sensory hair cells?
   A. Auditory nerve and cochlea
   B. Eardrum and auditory nerve
   C. Eustachian tube and eardrum
   D. Cochlea and semicircular canals

8. Jogging will cause heart rate to change because of
   A. increased sympathetic and decreased parasympathetic impulses
   B. decreased sympathetic and increased parasympathetic impulses
   C. increased sympathetic and decreased central nervous system impulses
   D. decreased sympathetic and increased central nervous system impulses

Use the following information to answer the next two questions.

Measuring the Membrane Potential of a Spinal Neuron

A microelectrode can be inserted into the axon of a neuron in order to measure the differences in charge between the outside and inside of the cell. A specialized, sensitive voltmeter is used to measure this difference. Electrode 1 is placed on the outside of the cell membrane and Electrode 2 is placed on the inside of the cell membrane.



9. The neuron in an experiment was taken from a spinal cord. The propagation of an action potential in the neuron was slower than the 24 m/s that is typical with sensory neurons. Why?
   - **A.** Myelination was absent in this spinal neuron.
   - **B.** Axon length is much longer in sensory neurons.
   - **C.** The Nodes of Ranvier were absent in sensory neurons.
   - **D.** The neurotransmitters were blocked in this spinal neuron.

10. Relative to inside of a neuron, the extracellular fluid immediately outside a resting neuron's cell membrane is
   - **A.** positive and the sodium ion concentration is less
   - **B.** negative and the sodium ion concentration is less
   - **C.** positive and the sodium ion concentration is greater
   - **D.** negative and the sodium ion concentration is greater

Use the following information to answer the next question.

Morphine is a drug obtained from the opium plant. It is routinely given to postoperative patients on a short-term basis for pain. At high doses, it causes breathing and heart contraction to become suppressed.

11. What area of the brain is affected by high doses of morphine?

A. Pituitary
B. Cerebrum
C. Cerebellum
D. Medulla oblongata

Use the following information to answer the next question.

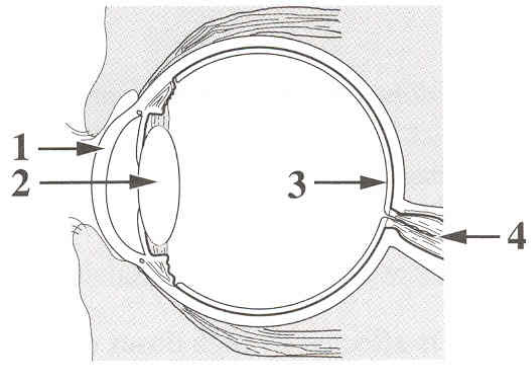
A high percentage of purebred dogs have genetic defects. Some examples of these defects follow.

1 Hip dysplasia, a defect in the hip joints that can cripple a dog, occurs in 60% of golden retrievers.
2 Hereditary deafness, due to a recessive autosomal disorder, occurs in 30% of Dalmatians.
3 Retinal disease, which may cause blindness, occurs in 70% of collies.
4 Hemophilia, an X-linked recessive disorder, is common in Labrador retrievers. Dwarfism is also common in this breed of dog.

—from *Lemonick, 1994*

Use the following additional information to answer the next question.

Cross-Section of a Normal Eye



12. The structure that degenerates and causes blindness in collies is

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

Monoamine oxidase (MAO) is an enzyme that breaks down the neurotransmitters dopamine, serotonin, and norepinephrine. Individuals who are involved in extreme sports, such as rock climbing, generally have low levels of MAO and, therefore, higher-than-normal levels of these neurotransmitters.

Dopamine and serotonin are linked to pleasurable feelings. Norepinephrine is released in the fight-or-flight response. One hypothesis for why individuals participate in extreme sports is that in order for individuals with high resting levels of these neurotransmitters to achieve a pleasurable sensation, they require a greater surge of these chemicals than do other people.

—from *Zorpette, 1999*

13. The site in the neural pathway where MAO is active is the
    - **A.** axon
    - **B.** synaptic cleft
    - **C.** cell body
    - **D.** Schwann cell

Use the following information to answer the next question..

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.

14. 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

15. A person who occasionally experienced paralysis was examined and found to have very low levels of potassium in the blood and other tissues. The paralysis likely resulted because of the inability of
    - **A.** capillaries to provide adequate blood flow
    - **B.** axon terminals to break down acetylcholine
    - **C.** neurons to repolarize during the refractory period
    - **D.** neurons to remove acetylcholine from the synapse

Use the following information to answer the next question.

Processes That Occur at a Neuromuscular Junction (A Type of Synapse)

1 Muscle fibres contract when sodium gates open allowing sodium ions to diffuse into the muscle cytoplasm.
2 Acetylcholine is released from the axon terminal.
3 Acetylcholine binds to the receptors on the muscle cell.
4 Cholinesterase breaks down acetylcholine, and the sodium gates close.

—from *Guyton*

Numerical Response 1

An impulse arrives at an axon terminal that synapses with a muscle cell. Record the processes in the order that they occur at the synapse.

(Record your **four-digit answer** in the numerical-response section of the answer sheet.)
Answer: _____2314__

Numerical Response 2

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.

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 __4___, __2___, __3___, and __1___.

Some Cell Types

1 Rod cells
2 Cone cells
3 Cochlea hair cells
4 Taste receptor cells
5 Semi-circular canal hair cells

Some Disorders

Colour-blindness—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

Numerical Response #3

Match three of the cell types numbered above with the disorder that is **most closely** associated with each cell type.

Number:	_____	_____	_____
Disorder:	**Colour-blindness**	**Neural deafness**	**Permanent vertigo**
	2	3	5

The pupillary reflex is a reflex that occurs in response to varying intensities of light entering the eye.

Some Events in the Pupillary Reflex

1 Pupil diameter changes
2 Motor neuron depolarizes
3 Light receptors stimulated
4 Sensory neuron depolarizes

Numerical Response #4

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

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

3, 4, 2, 1.