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CORRECT ANSWERS ARE LOCATED IN THE 2ND HALF OF THIS DOC.

TRUE/FALSE - Write 'T' if the statement is true and 'F' if the statement is false.

1) Canadian actor Michael J. Fox has been diagnosed with an early on-set case of Alzheimer's disease.
   - ◎ true
   - ◎ false

2) The preliminary symptoms of Parkinson's disease include tremors, rigidity, and slow movement that deteriorate over time.
   - ◎ true
   - ◎ false

3) As many as 1 in 10 individuals diagnosed with the Parkinson's disease is under the age of 40.
   - ◎ true
   - ◎ false

4) Mirror neurons suggest that the capacity of even young children to imitate others may be an inborn behaviour.
   - ◎ true
   - ◎ false

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5) Dendrites physically hold neurons in place by entangling with each other.
   - ◎ true
   - ◎ false

6) A neuron's resting state has a negative electrical charge of about 10 millivolts (a millivolt is one one-thousandth of a volt).
   - ◎ true
   - ◎ false

7) The speed with which an action potential moves down the axon is determined by the axon's size and the thickness of its myelin sheath.
   - ◎ true
   - ◎ false

8) Neurotransmitters are always consistent in their actions. They perform in an identical manner regardless of their location in the nervous system.
   - ◎ true
   - ◎ false

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9) The longer and thicker the axon the more rapid the impulse.
- ◎ true
- ◎ false

10) In the nervous system, neurotransmitters are stored in the neuron's dendrites.
- ◎ true
- ◎ false

11) Acetylcholine and serotonin are both excitatory neurotransmitters in the central nervous system.
- ◎ true
- ◎ false

12) The abilities to regulate or suppress pain and to experience pleasure are influenced by endorphins.
- ◎ true
- ◎ false

13) Research shows that trauma cannot be passed from one generation to the next.
- ◎ true
- ◎ false

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14) The fMRI scan also has the potential to treat some psychological disorders.
- ◎ true
- ◎ false

15) The advantage of transcranial magnetic stimulation (TMS) is that it has the potential to treat certain kinds of psychological disorders.
- ◎ true
- ◎ false

16) Research has shown that the central core, or the primitive brain, is very similar in all vertebrates.
- ◎ true
- ◎ false

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17) The limbic system contains three primary components: the thalamus, hypothalamus, and hippocampus.
- ◎ true
- ◎ false

18) The limbic system consists of a series of doughnut-shaped structures that are involved in self-preservation, learning memory, and the experience of pleasure.
- ◎ true
- ◎ false

19) The association areas of the brain control executive functions, which are complex cognitive abilities relating to planning, goal setting, judgment, and impulse control.
- ◎ true
- ◎ false

20) Motor neurons carry information from the brain to the muscle groups, and sensory neurons carry information from the sensory organs to the brain.
- ◎ true
- ◎ false

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21) Neurons that connect sensory and motor neurons carrying messages between the two are called complimentary neurons.
- ◎ true
- ◎ false

22) The nervous system is divided into three main parts: the spinal cord, the central nervous system, and the peripheral nervous system.
- ◎ true
- ◎ false

23) Sensory neurons are also known as efferent neurons.
- ◎ true
- ◎ false

24) Behavioural genetics holds the promise of developing new diagnostic and treatment techniques for genetic deficiencies that can lead to physical and psychological difficulties.
- ◎ true
- ◎ false

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25) The endocrine system is a chemical communication network that sends messages via the bloodstream.
- ◎ true
- ◎ false

MULTIPLE CHOICE - Choose the one alternative that best completes the statement or answers the question.

26) Which analogy describes the function of myelin?
- A) Insulation packed around a hot water pipe
- B) A portable battery charger
- C) Jumper cables used to boost a dead battery
- D) A vitamin taken to supply necessary nutrients.

27) Surgeons have found that implanting a device in the brain that delivers weak electric shocks to areas of the brain that control movement and abnormal nerve signals may offer relief for people living with which of the following?
- A) Asperger's syndrome
- B) Klinefelter's syndrome
- C) Parkinson's disease
- D) Alzheimer's disease

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28) Kris is experiencing preliminary symptoms of Parkinson's disease which include _____.
- A) hallucinations
- B) loss of memory
- C) breathlessness and anxiety
- D) rigidity and slow movement

29) Dr. Jennings studies the biological basis of behaviour; Dr. Jennings is a _____.
- A) neuropsychologist
- B) neurosurgeon
- C) behavioural surgeon
- D) neuroscientist

30) The dendrite of a neuron performs which role?
- A) Receives information from other neurons
- B) Performs the cell's metabolic activities
- C) Passes information along to other neurons
- D) Releases neurotransmitters into the synapse

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31) Which of the following defines another name for a biopsychologist?
- A) Psychic practitioner
- B) Clinical diagnostician
- C) Medical psychologist
- D) Behavioural neuroscientist

32) The speed of transmission in a neuron will occur fastest if the myelin sheath around the axon is which of the following?
- A) very thick
- B) of medium thickness
- C) sheer
- D) absent

33) What type of cells is the nervous system made up of?
- A) Glial cells
- B) Neurons
- C) Afferent cells
- D) Efferent cells

34) Which feature of the neuron makes it distinct from other cells in the body?
- A) Its rapid rate of reproduction
- B) Its ability to function well without oxygen
- C) The fact that it has a nucleus
- D) Its ability to communicate with other cells

35) What is a neuron?
- A) The sensory apparatus involved in balance
- B) A chemical substance transmitted in the bloodstream
- C) One of many kinds of muscles found in the motor system
- D) The basic element of the nervous system

36) What term describes the small bulges at the ends of axons?
- A) Glial buttons
- B) Myelin buttons
- C) Terminal buttons
- D) End buttons

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37) A neuroscientist would be most interested in which of these questions?
- A) How does learning style affect language development in young children?
- B) Can the causes of behavioural disorders be linked to biological factors?
- C) How do personality differences relate to romantic attraction?
- D) In what ways does culture influence perceptual abilities?

38) Research suggests that there is a positive correlation between the thickness of an axon's myelin sheath and which of the following?
- A) Size of the neurotransmitters in the terminal buttons
- B) The number of dendrites that receive messages
- C) The speed at which neural messages are transmitted
- D) Neuron's excitatory or inhibitory nature

39) All of the following statements describe Michael J. Fox EXCEPT which one?
- A) Fox began his very public crusade to find a cure for Parkinson disease.
- B) Times Magazine nominated Fox as one of the world's top 100 heroes and pioneers.
- C) Fox's early onset of Parkinson's Disease is extremely rare, affecting 1 in 500 people.
- D) The Michael J. Fox Foundation has raised more than $750 million for research and treatment of Parkinson's disease.

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40) The myelin sheath wraps around which of the following?
- A) Cell bodies
- B) Synapses
- C) Dendrites
- D) Axons

41) Damaged or insufficient myelin sheath would cause which of the following?
- A) Slowed nerve impulses
- B) Rapid nerve impulses
- C) Accelerated nerve impulses
- D) Normal nerve impulses, as the myelin sheath has nothing to do with their transmission.

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42) The 02-01 describes the case of Canadian Michael J. Fox, who fought privately and secretly a disease for seven years. Fox was experiencing the beginning stages of which of the following?
   A) Parkinson's disease
   B) Alzheimer's disease
   C) Asperger's syndrome
   D) Klinefelter's syndrome

43) To acknowledge Michael J. Fox for his crusade to find a cure for this disease, the University of British Columbia bestowed upon him an honorary degree. Michael J. Fox was a crusader for which of the following?
   A) Parkinson's disease.
   B) Alzheimer's disease
   C) Asperger's syndrome
   D) Klinefelter's syndrome

44) Which structure of the neuron receives chemical signals from other neurons?
   A) Dendrite
   B) Synapse
   C) Axon
   D) Terminal button

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45) In what order do neural impulses travel?
   A) Dendrites to dendrites
   B) Dendrites to axon
   C) Axon to dendrites
   D) Axon to axon

46) People like Michael J. Fox, who was described in the 02-01, are finding relief from the symptoms of Parkinson's disease by implanting a device in the brain that delivers weak electric shocks to areas of the brain that control movement and abnormal nerve signals. Which of the following describes what this procedure is known as?
   A) Motor cortex ablation
   B) Deep brain stimulation
   C) Endovascular surgery
   D) Neuro-pituitary surgery

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47) What is the nervous system, including the brain composed of?
A) Action fibres
B) Muscles
C) Excitatory potentials
D) Neurons

48) What is the approximate negative electrical charge of a neuron's resting state?
A) 30 millivolts
B) 70 millivolts
C) 100 millivolts
D) 150 millivolts

49) Regardless of how strong a stimulus is, neurons still fire with the same amount of electrical impulse. Which of the following describes this law?
A) All-or-none law
B) Dendrite-axon law
C) Excitatory-inhibitory law
D) Stimulus-response law

50) Which of the following is taking place when a neuron is at its resting state?
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A) There are more negative ions inside the neuron than outside it.
B) There are more negative ions outside the neuron than inside it.
C) There is an equal number of positive and negative ions inside the neuron.
D) There is an equal number of positive and negative ions outside the neuron.

51) Ted is experiencing problems walking and controlling his muscles. His doctor thinks he may have multiple sclerosis, a disease that occurs when which of the following takes place?
A) A neuron's dendrites shrink in size.
B) The deterioration of the myelin sheath.
C) Too much dopamine is released into the synapse.
D) Too little serotonin is being released into the synapse.

52) The "all-or-none law" refers to which fact about the nervous system?
A) Neurons will die if they do not have enough blood supply.
B) People cannot function if parts of their brains are removed.
C) Neurons are either "on" or "off"; there is no in-between.
D) More intense stimuli provoke stronger action potentials.

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53) Which of the following statements describe an action potential?
- A) Through the same neuron, impulses can move at different strengths.
- B) Through the same neuron, impulses can move at different speeds.
- C) Neurons differ in the frequency of impulses they communicate.
- D) All neurons have the same frequency of impulses they communicate.

54) During what period does a neuron require more stimulation than usual to be able to send a signal?
- A) Absolute refractory period
- B) Relative refractory period
- C) Negative refractive period
- D) Positive refractory period

55) Mike has been diagnosed with Autism Spectrum Disorder (ASD); what neurons in Mike are disrupted?
- A) Afferent neurons
- B) Efferent neurons
- C) Interneurons
- D) Mirror neurons

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56) Where are neurotransmitters stored?
- A) Inside the myelin sheath
- B) In terminal buttons
- C) In the cell body
- D) At the end of the dendrites

57) What is the synapse?
- A) A gap between the dendrites of two or more neurons.
- B) A gap between the axon terminals of two neurons.
- C) A gap between an axon's terminal button and another neuron's dendrite.
- D) A gap between two or more neurotransmitters.

58) Which of the following principles about neural communication is correct?
- A) Messages travel electrically within a neuron, and they move chemically between neurons.
- B) Messages travel chemically within a neuron, and they move electrically between neurons.
- C) All neural messages, within and between neurons, travel electrically.
- D) All neural messages, within and between neurons, travel chemically.

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59) The neurotransmitter acetylcholine has a major role in which behavioural function?
A) Sexual arousal
B) Mood control
C) Pleasurable feelings
D) Cognition

60) A neurotransmitter affects particular neurons but not others, depends upon whether the:
A) Receiving neuron has a suitable receptor site.
B) Receiving neuron expects a message to arrive.
C) Receiving neuron is in its resting state.
D) Nerve impulse acts according to the all-or-none law.

61) Which neurotransmitter is found in the parasympathetic nervous system as well as in the central nervous system?
A) Gamma-aminobutyric acid (GABA)
B) Dopamine (DA)
C) Norepinephrine
D) Acetylcholine (Ach)

62) Messages travel in _____ form within a neuron, and in _____ form between neurons.
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A) electrical; electrical
B) chemical; chemical
C) chemical; electrical
D) electrical; chemical

63) Which of the following is the primary inhibitory neurotransmitter in the nervous system?
A) Gamma-aminobutyric acid (GABA)
B) Dopamine (DA)
C) Norepinephrine
D) Acetylcholine (Ach)

64) Which of the following substances serves as a neurotransmitter at the nerve-muscle junction and also in the central nervous system?
A) Acetylcholine (Ach)
B) Dopamine
C) Curare
D) Gamma-amino butyric acid (GABA)

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65) Although too much dopamine is thought to be involved in _____, having too little of it in certain parts of the brain is involved in _____.
A) depression; Alzheimer's disease
B) movement; alcoholism
C) aggression; eating disorders
D) schizophrenia; Parkinson's disease

66) Jason suffers from the symptoms of depression. Some psychologists believe that his depression could be caused by a deficiency of which neurotransmitter?
A) GABA
B) Serotonin
C) Dopamine
D) Endorphins

67) Long-distance runners sometimes report a natural high and a reduction in pain sensitivity associated with the release of which of the following?
A) Acetylcholine
B) Dopamine
C) Endorphins
D) Norepinephrine

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68) Which of the following describes the chemical substances that communicate information from one neuron to another?
A) Synaptic fluid
B) Cellular proteins
C) Hormones
D) Neurotransmitters

69) How would the symptoms of Alzheimer's disease be affected under these situations?
A) Be unaffected by ACh levels.
B) Be improved by boosting the levels of endorphins.
C) Improve if ACh levels are increased.
D) Worsen if ACh levels are reduced.

70) What do excitatory messages received across the synapse do?
A) Cause the axon to vibrate physically.
B) Have no effect on the receiving neuron.
C) Stimulate the neuron to prevent an action potential.
D) Prompt the receiving neuron to trigger an action potential.

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71) Which of the following processes is an example of chemical recycling?
A) Reuptake
B) Inhibition
C) Attachment
D) Pruning

72) Which statement describes a neurotransmitter?
A) A chemical substance that carries information in the nervous system.
B) The part of the neuron that receives information from other neurons.
C) A brain disease that results in loss of memory and motor control.
D) The part of the brain that controls speech and language functions.

73) What describes endorphins that are created by the body when Kris is experiencing pleasurable feelings?
A) Excitatory substance
B) Inhibitory substance
C) Endogenous
D) Exogenous

74) What describes drugs Kris introduces into the to experience pleasurable feelings?
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A) Excitatory substance
B) Inhibitory substance
C) Endogenous
D) Exogenous

75) 10-month-old Baby Niko is experiencing a naming explosion; what changes are taking place in the language centres of baby Niko's brain?
A) Neurons are multiplying
B) Neurons are getting bigger
C) Neurons are being pruned
D) Neurons are getting myelinated

76) What term describes the process of reorganizing the brain to make functions more efficient?
A) Myelination
B) Pruning
C) Neuronal multiplication
D) Neuronal growth

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77) If Dr. White wants to view the work of the brain as it processes different words being seen and heard, which of the following will he use?
A) An electroencephalogram to record electrical wave patterns.
B) A positron emission tomography scans to see the intensity of work in parts of the brain.
C) Functional magnetic resonance imaging for a structural view.
D) Transcranial magnetic stimulation to see the effects of a "virtual lesion."

78) A group of Canadian researchers examine the effects of introducing a strong magnetic field in a small area of the brain. They want to see how such a "virtual lesion" changes normal brain functioning. What type of scan is the research group using?
A) EEG
B) TMS
C) PET
D) fMRI

79) To study the brain wave activity of different areas of the brain, researchers use which of the following techniques?
A) EEG (electroencephalogram)
B) CAT scan (computerized axial tomography)
C) PET scan (positron emission tomography)
D) NMR scan (nuclear magnetic resonance)

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80) Monica's doctor has requested a test that will show the amount and location of activity in her brain just after she is injected with a radioactive (but safe) liquid. Which of the following procedures will be used?
A) CAT scan
B) EEG
C) TMS
D) PET scan

81) What can transcranial magnetic stimulation (TMS) do?
A) Produce a picture of electrical activity in the brain.
B) Provide diagnostic information and treat brain disease or injury.
C) View and remove dysfunctional brain area.
D) Produce pictures of the brain and spinal cord.

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82) The medulla is critical for survival since it controls which of the following?
A) Breathing and heartbeat
B) Thoughts and decision making
C) Body rhythms
D) Vision

83) After a serious auto accident, your friend has difficulty sitting securely in her chair, and she often drops her fork or misses her mouth as she tries to feed herself. She may have suffered damage to which area of the brain?
A) Reticular formation
B) Pons
C) Cerebellum
D) Adrenal cortex

84) Which term describes the part of the brain which consists of a bundle of nerve fibres connecting the halves of the cerebellum?
A) Medulla
B) Reticular formation
C) Thalamus
D) Pons

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85) If a person's cerebellum were damaged in an accident, you would expect that person to have problems with which of the following?
A) Breathing
B) Seeing and hearing
C) Speaking
D) Muscle coordination

86) While watching her favourite podcast, Laura falls fast asleep. Even though her boyfriend Rob tries to wake her. Which part of Laura's brain is Rob trying to activate?
A) Reticular formation
B) Wernicke's area
C) Sensory cortex
D) Thalamus

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87) Dr. Tan used the analogy of an ever-vigilant guard that can be aroused immediately. Which part of the brain is he referring to?
A) Pons
B) Frontal lobe
C) Cerebellum
D) Reticular formation

88) Sally is a skilled gymnast whose specialty is the balance beam. Which part of her brain is most responsible for her ability to perform?
A) Cerebellum
B) Reticular formation
C) Hypothalamus
D) Limbic system

89) If you hear a sudden, loud noise, which of the following can immediately activate other parts of the brain to produce general bodily arousal?
A) Hypothalamus
B) Medulla
C) Reticular formation
D) Thalamus

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90) Sydney Crosby started playing hockey at age three. He shoots the hockey pucks with ease that gives the appearance that his muscles and balance system are on "automatic pilot." This advanced level of coordination and control is probably the work of which of the following?
A) Thalamus
B) Hypothalamus
C) Cerebellum
D) Pons

91) Roberta began to learn how to play soccer in second grade. She remembered how awkward she felt running and trying to control the ball at the same time. In high school, she became an expert at soccer dribbling. During a game she feels her muscles and balance system are on "automatic pilot." This advanced level of coordination and control is probably the work of which of the following?
A) Thalamus
B) Hypothalamus
C) Cerebellum
D) Pons

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92) Injury to which of the following would leave a person with serious handicaps in both vision and hearing?
A) Cerebellum
B) Hypothalamus
C) Thalamus
D) Reticular formation

93) Which statement describes why the function of the hypothalamus is so important?
A) It is responsible for maintenance of the body temperature.
B) Ensures a person's sense of physical balance.
C) Distinguishing foreground from background vision.
D) Regulates heart rate.

94) Taylor is thirsty and gets a glass of water to feel comfortable again. What part of the brain caused an imbalance in Taylor's internal state, that initiated a drink of water?
A) Thalamus
B) Hypothalamus.
C) Amygdala
D) Hippocampus

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95) Information from the eyes, ears, and skin which must be communicated to higher brain levels travels through which of the following?
A) Cerebellum
B) Ventricles
C) Thalamus
D) Sensory cortex

96) Although "pleasure centres" are found at many brain sites, where is the most common place to find them?
A) In the association areas of the cerebral cortex
B) In the cerebellum
C) The medulla
D) The limbic system

97) Which of the following best describes the functions of the hypothalamus?
A) Cortical arousal
B) Motor coordination
C) Information processing
D) Basic survival

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98) Which area of the brain is primarily associated with basic functions relating to emotions and self-preservation, such as eating and reproduction?
A) Thalamus
B) Cerebral cortex
C) Cerebellum
D) Limbic system

99) What is the motor area of the cortex responsible for?
A) Vision
B) Hearing
C) Involuntary muscle movements
D) Voluntary muscle movements

100) If a particular behaviour is associated with a small portion of the motor area, then it must be:
A) A large-scale behaviour, like waving your arms.
B) A precise behaviour, like threading a needle with your fingers.
C) A facial behaviour, like smiling or frowning.
D) Unknown-we know very little about how behaviours map onto the motor area.

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101) Which of the following is NOT a primary region in the sensory area of the cortex?
A) A region related to body sensations.
B) A region related to vision.
C) A region related to sexual behaviour.
D) A region related to hearing.

102) Where is the higher mental function located that distinguish human brains from other species?
A) In the limbic system
B) In the cerebral cortex
C) In the cerebellum
D) In the thalamus and hypothalamus

103) What happened to railroad worker Phineas Gage, whose case study is presented in the chapter on biology and behaviour?
A) An explosive accident blasted a spike through his brain.
B) After a severe fall that injured most of his brain, he received a transplant.
C) A surgical accident left him with a permanent memory defect.
D) He was born with only half a brain, yet he was able to live a normal life.

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104) Broca's area is primarily responsible for which function?
A) Speech comprehension
B) Emotions
C) Memory
D) Speech production

105) What is the language disorder in which speech sounds fluent, but makes no sense?
A) Apraxia
B) Broca's aphasia
C) Split-brain syndrome
D) Wernicke's aphasia

106) All of the following describe brain functioning EXCEPT which one?
A) Neurons in the central nervous system cannot be replaced; once they die, they are gone forever.
B) Stimulating the brain's production of dopamine may help to reduce the symptoms of Parkinson's disease.
C) The issue of stem cell research is a controversial, ethical issue that produces varied opinions-even among psychologists.
D) Removing diseased areas of the brain can sometimes help relieve seizures.

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107) The concept of neuroplasticity is best described by which statement?
A) The brain ceases to create changes after the age of one year.
B) People who have injured their brain in adulthood cannot regain their lost functions.
C) The neurons and synapses in the brain reorganize themselves throughout life.
D) Each hemisphere has a specialized function not shared by the other hemisphere.

108) Sequential information processing is a characteristic of the _____ hemisphere, and the recognition of patterns and drawings is characteristic of the _____ hemisphere.
A) left; right
B) right; left
C) right; right
D) left; left

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109) Which statement describes why it is difficult to study the specialized abilities of the left and right cerebral hemispheres in the brains of normal individuals?
A) The left side of the brain controls the right side of the body, and vice versa.
B) People won't submit for unnecessary brain surgery.
C) It is difficult to identify the boundary between the two hemispheres.
D) The two hemispheres share information quickly and completely.

110) Which describes the lateralization of language ability?
A) It cannot be compared between the two genders.
B) It is equal between men and women.
C) It is stronger in women than in men.
D) It is stronger in men than in women.

111) What can be concluded about the causes of gender differences?
A) Causes of male/female gender differences cannot be identified with certainty because the data are correlational and descriptive.
B) The differences are caused by innate biological factors rather than learning or social experiences.
C) The differences are caused by differences in the early social experiences of girls and boys.
D) The differences are caused equally by biological/genetic factors and by early childhood experiences.

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112) Research with split-brain patients has shown which of the following?
A) Mental stimulation can reunite the halves of their brain.
B) An object shown to the left hemisphere only will not be seen at all.
C) The temporal lobe is not needed for hearing if the occipital lobe is intact.
D) An object shown to the right hemisphere only will be seen but cannot be named.

113) A person who has difficulty naming objects that appear only in the right visual field most likely has which of the following conditions?
A) Split brain
B) Wernicke's aphasia
C) Dyslexia
D) Broca's aphasia

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114) Behaviour that is reflexive, or automatic and involuntary, is generally regulated by which of the following?
A) Brain
B) Peripheral nervous system
C) Somatic nervous system
D) Spinal cord

115) Which of the following describes the neurons that transmit information from the perimeter of the body to the central nervous system?
A) Spinal neurons
B) Sensory (afferent) neuron
C) Motor (efferent) neurons
D) Interneurons

116) You can move your pen skilfully across the page and do the latest dance step thanks to the functioning of which division of your nervous system?
A) Somatic
B) Sensory
C) Sympathetic
D) Parasympathetic

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117) The central nervous system (CNS) consists of which of the following?
A) The brain and spinal cord.
B) Neurons located in sensory organs or that contact muscles.
C) The brain structures located centrally in the brain, covered by other neural tissue.
D) All neurons whose axons are covered by myelin sheath.

118) The sympathetic portion of the nervous system controls which aspect of behaviour?
A) The voluntary muscular reactions.
B) The automatic, emotional responses.
C) The conscious decision making.
D) The memory and thought processes.

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119) The fact that your heart is beating reflects that the _____ division of the peripheral nervous system is operating; reading this question and selecting the correct answer reflects the operation of the _____ division.

A) autonomic; somatic
B) somatic; autonomic
C) sympathetic; parasympathetic
D) parasympathetic; sympathetic

120) The parasympathetic nervous system is responsible for which aspect of behaviour?

A) The integration of sensory information.
B) Preparing the body for emergencies.
C) Taking care of the body's functions after emergencies.
D) Facilitation of newly learned actions.

121) Which of the following describes the likely consequence of a disabling injury to a man's sympathetic autonomic nervous system?

A) Inability to walk without a cane or other aid.
B) Difficulty detecting sensory signals.
C) Frustration at not achieving orgasm during intercourse.
D) Intermittent drowsiness, with naps needed throughout the day.

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122) Which of the following does the activation of the autonomic nervous system require?

A) Conscious, deliberate action
B) Stimulation by the somatic system
C) Reflexive reactions of the spinal cord
D) No conscious or voluntary action

123) The sympathetic and parasympathetic autonomic divisions have opposing effects on the behaviours they control. What is the most likely consequence of this arrangement?

A) The body's level of emergency preparedness can be quickly changed.
B) The person will often be left in a state of confusion.
C) Sensation and movement will sometimes become confused.
D) Afferent and efferent neurons will sometimes exchange their roles.

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124) Which of the following describes the important function of the autonomic nervous system?
A) Handling simple reflexes
B) Successfully resolving emergencies
C) Planning for the future
D) Maintaining alert consciousness

125) Randy has lost voluntary muscle movement below the neck due to an accident. What is such an injury called?
A) paraplegia
B) aphasia
C) apraxia
D) quadriplegia

126) What does the hierarchical organization of the nervous system explain?
A) Why most primitive regions of the brain are no longer associated with important functions.
B) Why lower regions of the brain control higher regions of the nervous system.
C) Why oldest regions of the brain are associated with more advanced functioning.
D) Why more recently evolved regions of the brain are associated with advanced functioning.

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127) Psychology students were in a heated discussion. One group maintained that attention deficit disorder was a result of poor child rearing, while the other group believed that it stemmed from genetic traits beyond the control of parents and teachers. The students were discussing a question regarding which of the following?
A) The role of drug treatments in reducing hyperactivity.
B) Nature verses nurture.
C) Chemical agency as opposed to genetic changes.
D) Intolerance of activity level based on changes in the demands of social structures.

128) Adriana and David are fraternal twins. Adriana is exceptionally outgoing and friendly, and David is extremely shy. What would behavioural geneticists most likely attribute their personality differences to?
A) Equal influence of environmental and inheritance factors
B) Environmental factors
C) Inherited factors
D) Neither environmental nor inheritance factors

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129) Which area of study focuses on the effects of heredity on behaviour?
A) Behavioural genetics
B) Evolutionary psychology
C) Neurological psychology
D) Environmental biology

130) The field of behavioural genetics is concerned with which aspect of psychological functioning?
A) The treatment of neurological disorders.
B) The effects of heredity on psychological characteristics.
C) The impact of hormones on mood.
D) The connection between brain measures and thoughts.

131) Dr. Smith has identified the location of hereditary material that could be the cause of schizophrenia in Dr. Smith's patient. What has been identified the location of which can be linked to the patient's disorder?
A) Chromosomal markers
B) Neural markers
C) Genetic markers
D) Hormonal markers

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132) In the endocrine system, a hormone is defined as a(n) _____.
A) electrical messenger
B) micro-nutrient
C) chemical messenger
D) macronutrient

133) Which of the following describes why the pituitary gland is called the "master gland"?
A) Regulates the response of the brain to an internal imbalance
B) Is solely responsible for homeostasis
C) Has sufficient power to defend against micro-organisms
D) Controls the endocrine system

134) What does the hypothalamus and pituitary gland control when they are working together?
A) Metabolic rate
B) Emotional reactions
C) Homeostasis
D) Sugar metabolism

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135) In the endocrine system, which organ controls the pituitary gland?
A) Adrenal gland
B) Hypothalamus
C) Parathyroid gland
D) Thymus

136) People who are unusually short or tall may have abnormalities in which endocrine gland?
A) Thymus
B) Pancreas
C) Pituitary
D) Testis

137) Shirley has no desire to breastfeed her new-born daughter, and she seems uninterested in her partner's offer to cuddle. Her doctor may want to consider low levels of which of the following as one explanation for Shirley's low desire?
A) Estrogen
B) Oxytocin
C) Somatotropin
D) Thyroxine

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138) All the following statements describe hormones EXCEPT which one?
A) Most health experts now encourage menopausal women to undergo hormone replacement therapy.
B) The hormone oxytocin may be beneficial for social interactions, leading to greater trust among individuals.
C) Steroid use has been associated with heart attacks, strokes, and cancer.
D) Hormones secreted by the pituitary gland control growth.

139) Which organ of the endocrine is considered the "master gland"?
A) Thyroid
B) Ovary
C) Testes
D) Pituitary

140) What brain structure interacts most closely with the pituitary gland?
A) Pons
B) Cerebral cortex
C) Thalamus
D) Hypothalamus

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141) If estrogen can be used to replace the missing hormone in women, could testosterone be used for older men? A physician would probably advise which of the following?

A) That testosterone builds muscles and good health in older men.
B) That testosterone can increase risk of heart attacks, strokes, cancer, and aggressive behaviour in older men.
C) That all hormones are beneficial.
D) That most men maintain high testosterone levels throughout life.

142) Which of the following describes how hormones differ from neurotransmitters?

A) They are more robust and effective in escalating behaviour.
B) Conserve more energy as needed.
C) They travel throughout the body and move at a slower speed.
D) Exchange chemical make up more readily.

143) Which organ in the endocrine system is also part of the nervous system?

A) Parathyroid
B) Ovary
C) Thymus
D) Hypothalamus

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SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

144) Why do psychologists study the brain and nervous system, and what is this field of study generally referred to?

145) Draw a typical neuron and label its major parts accurately. Briefly describe the functions of the parts labelled on your diagram.

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146) A neuron contains three primary structures: the cell body, axon, and dendrites. What are the functions of each of these structures?

147) Briefly explain how one neuron sends a message to another neuron.

148) Briefly describe the functions of dopamine and acetylcholine, including what happens when levels of these neurotransmitters are too high and/or too low.

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149) Describe how scientists use MRI, TMS, and PET techniques to study the brain.

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150) What is aphasia, and what is the difference between Broca's aphasia and Wernicke's aphasia?

151) Identify the major functions of these three brain structures: hypothalamus, cerebellum, and the reticular formation.

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152) You have been asked to prepare a summary for your school's newspaper that describes research on the differences between the left and right hemispheres. What would you generally say in this summary?

153) How could a right-handed patient recovering from split brain surgery be unable to describe an object placed in their left hand while blindfolded?

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154) Briefly describe the peripheral nervous system and its four divisions.

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155) Describe some of the major contributions in the field of behavioural genetics that further our understanding of the nature and nurture debate in psychology.

156) Compare and contrast between hormones and neurotransmitters.

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Answer Key

Test name: Chapter 02

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

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37) B
38) C
39) C
40) D
41) A
42) A
43) A
44) A
45) B
46) B
47) D
48) B
49) A
50) A
51) B
52) C
53) C
54) B
55) D
56) B
57) C
58) A
59) D
60) A
61) D
62) D
63) A
64) A
65) D
66) B
67) C
68) D
69) C
70) D
71) A
72) A
73) C
74) D
75) D
76) B

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77) B
78) B
79) A
80) D
81) B
82) A
83) C
84) D
85) D
86) A
87) D
88) A
89) C
90) C
91) C
92) C
93) A
94) B
95) C
96) D
97) D
98) D
99) D
100) A
101) C
102) B
103) A
104) D
105) D
106) A
107) C
108) A
109) D
110) D
111) A
112) D
113) A
114) D
115) B
116) A

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117) A
118) B
119) A
120) C
121) C
122) D
123) A
124) B
125) D
126) D
127) B
128) C
129) A
130) B
131) C
132) C
133) D
134) C
135) B
136) C
137) B
138) A
139) D
140) D
141) B
142) C
143) D
144) Short Answer
Psychologists who specialize in considering the ways in which the biological structures and functions of the body affect behaviour are known as behavioural neuroscientists (or biopsychologists).
They seek to answer several key questions: How does the brain control the voluntary and involuntary functioning of the body? How does the brain communicate with other parts of the body? What is the physical structure of the brain, and how does this structure affect behaviour? What biological and neurological phenomena reflect psychological experiences like learning and sleep? Are psychological disorders caused by biological factors, and how can such disorders be treated?

145) Short Answer

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The drawing should contain: (a) dendrites, which should appear as clusters of branchlike extensions from the cell body; (b) the cell body, which should appear as a roundish structure in the centre of the diagram; (c) the axon, which should appear as a long tube extending from the cell body; and (d) myelin sheath, which should appear bracketing portions of the axon. The diagram should also include a terminal button, a bulblike ending to the axon.

146) Short Answer

A neuron is the basic building block of the nervous system, and it contains three primary structures. The first structure is the cell body: it contains the nucleus and houses inherited information that governs how the neuron functions. Thus, the cell body directs the growth and nourishment of the neuron. One of the most important and distinct features of the neuron is its ability to communicate to other nerve cells. The axon, the second structure, is important in this communication process. The axon is a tube-like extension of the cell body, and it is responsible for carrying messages away from the cell body of one neuron and toward other neurons. Axons vary in length, and they contain terminal buttons that send messages to other neurons via neurotransmitters. Dendrites represent the final structure, and they are also critical for interneuron communication. They are fibres along the outside of the cell body, and these fibres receive chemical messages from other neurons. Damage to any of these structures can lead to the neuron's inability to sustain itself or to communicate effectively.

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147) Short Answer

When neurons are at rest, the resting state, they have a negative electrical charge of about -70 millivolts. When a message is received from another neuron, the neuron becomes more positive. As the charge reaches a critical level of positivity, an action potential occurs and the electrical message travels along the neuron's axon. Once the message passes any point of the axon, that section becomes negatively charged once again, and the neuron is unable to fire again immediately, the absolute refractory period. There then follows a period in which, though it is possible for the neuron to fire, a stronger stimulus is needed than would be needed if the neuron had reached its normal resting state. This is the relative refractory period. When a nerve impulse reaches the end of the axon, the terminal buttons on the ends of the axon release neurotransmitters into the synapse. Dendrites of nearby neurons receive messages from the neurotransmitters that "fit" onto their specific receptor sites. If the concentration of excitatory neurotransmitters that have been received is higher, then the neuron fires. If the concentration of inhibitory neurotransmitters that have been received is higher, then the neuron will not fire.

148) Short Answer

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Dopamine generates excitatory messages and is typically found in the brain. It is responsible for movement, attention, and learning. When the level of dopamine in the brain is too high, then it is not unusual for a person to exhibit behaviours that are associated with schizophrenia or other severe mental disorders. When the level of dopamine is too low, a person is likely to manifest such symptoms of Parkinson's disease as shaky and uncoordinated movement.
Acetylcholine can be found throughout the central and peripheral nervous systems. Within the brain and autonomic nervous system, it generates excitatory messages; it produces inhibitory messages elsewhere. Acetylcholine plays an important function in muscle control and movement, communicating between the skeletal muscles and the nervous systems. Memory is also affected by acetylcholine levels. Lower levels of acetylcholine have been correlated with the development of Alzheimer's disease.

149) Short Answer
An MRI (Magnetic Resonance Imaging) scan takes images from multiple angles like a CT scan, but instead of using x-rays, the MRI uses pulses from a large electromagnet to detect various substances in an object based on their reaction to these pulses. An MRI scan gives a very precise three-dimensional image that shows where the blood vessels, neurons, sinuses, and other soft tissues are. Transcranial magnetic stimulation (TMS) is one of the newest types of scans. By exposing a tiny region of the brain to a strong magnetic field, TMS causes a momentary interruption of electrical activity. Researchers then can note the effects of this interruption on normal brain functioning. TMS has the potential to treat certain kinds of psychological disorders, such as depression and schizophrenia, by shooting brief magnetic pulses through the brain.
Positron emission tomography (PET) scans show biochemical activity within the brain at a given moment. PET scans begin with the injection of a radioactive (but safe) liquid into the bloodstream, which makes its way to the brain. By locating radiation within the brain, a computer can determine which are the more active regions, providing a striking picture of the brain at work. PET scans may be used in cases of memory problems, seeking to identify the presence of brain tumours.

150) Short Answer

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The term aphasia generally refers to problems with language, and there are two major forms of aphasia. Broca's aphasia is associated with laboured speech that often does not follow the rules of grammar. For example, all the words they want to say are spoken, but they are spoken in a disorganized and grammatically inappropriate way. Often, though, people with this form of aphasia struggle to find the words they want to say, and their speech is broken and incomplete. Wernicke's aphasia is associated with problems in understanding what other people are saying, as well as with problems in producing language. People who suffer from this form of aphasia often speak quite fluently, showing no gaps between words or ideas. However, the content of their speech does not make sense, potentially leading to frustration in the audience trying to understand what is being said.

151) Short Answer

The hypothalamus is a small structure in the brain that maintains the body's internal balance or homeostasis. For example, the hypothalamus works to keep the body at a constant temperature, triggering perspiration when the body is hot and shivers when the body is cold. The hypothalamus is also involved in basic behaviours such as eating, self-protection, and sexual behaviour. The cerebellum is found just above the medulla and behind the pons. Without the help of the cerebellum, we would be unable to walk a straight line without staggering and lurching forward, for it is the job of the cerebellum to control body balance. It constantly monitors feedback from the muscles to coordinate their placement, movement, and tension. In fact, drinking too much alcohol seems to depress the activity of the cerebellum, leading to the unsteady gait and movement characteristic of alcohol inebriation. The cerebellum is also involved in several intellectual functions, ranging from the analysis and coordination of sensory information to problem solving. The reticular formation extends from the medulla through the pons, passing through the middle section of the brain—or midbrain—and into the front-most part of the brain, called the forebrain. Like an ever-vigilant guard, the reticular formation is made up of groups of nerve cells that can activate other parts of the brain immediately to produce general bodily arousal. If, for example, we are startled by a loud noise, the reticular formation can prompt a heightened state of awareness to determine whether a response is necessary. The reticular formation serves a different function when we are sleeping, seeming to filter out background stimuli to allow us to sleep undisturbed.

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152) Short Answer

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Research on lateralization and split-brain patients has shown that the left and right hemispheres do specialize in different types of information and functions. The left hemisphere appears to specialize in skills that relate to verbal competence (e.g., speaking, thinking, and reasoning), and the right hemisphere specializes in nonverbal tasks (e.g., music and emotional expression). Although there does appear to be differences in the specialization of the brain's hemispheres, these differences are small. And such lateralization can vary across culture. For example, language functions are often specialized in men's left hemisphere. For women, in contrast, language functions are more equally distributed between both hemispheres. As another example, when native speakers of Japanese process information about vowel sounds, there is greater activity in the left hemisphere. Among North and South Americans and Europeans, the activity is primarily in the right hemisphere. What psychologists do not agree on, however, is why those differences exist or where they come from. The degree of specialization varies across individuals, and it is likely the case that the left and right hemispheres work together much of the time to process information that the brain receives.

153) Short Answer

Stimulus tactile stimulus of the object in the left hand is sent to the somatosensory cortex in the right hemisphere. Most right-handed people use the left hemisphere for speech. Although the right hemisphere may have the information, it cannot send it to the left hemisphere due to the surgery.

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154) Short Answer

The peripheral nervous system (PNS) extends from the central nervous system (brain and spinal cord) to the extremities of the body through a system of neurons with long axons and dendrites. The two major divisions of the PNS are the somatic and autonomic divisions. The somatic division is responsible for voluntary movements and for the transmission of information to and from such areas as the eyes, ears, and fingers. The autonomic division regulates organs that are necessary for survival, like the heart and lungs. It operates even without our awareness, because it would be disastrous if we forget to remind ourselves to breathe or our heart to beat. The autonomic division is further subdivided into the sympathetic and parasympathetic divisions, and these subdivisions are most noticeable during emergencies. The sympathetic division prepares the body for emergencies and helps us to either fight stressors or to flee from them. If you were inside a burning house, for example, the sympathetic division would produce the necessary arousal that would allow you to either run out of the house for safety, or to find a fire extinguisher to help battle the blaze. The parasympathetic division restores the body to its resting state once an emergency has ended. Once it is clear that your house was not on fire, your breathing and heart rate return to normal, and you eventually feel a sense of calm. The parasympathetic system is also responsible for storing nutrients and oxygen for the body to use should another emergency arise.

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155) Short Answer

Behavioural geneticists study the ways in which behaviour and cognition are affected by heredity. That is, they approach the understanding of human behaviour and cognition from a nature perspective, arguing that much of what psychologists study can be understood by understanding a person's genetic makeup. Our genetic makeup predisposes us to act in particular ways to our environment, or to even prefer one kind of environment over another. Behavioural geneticists do not contend that heredity is the only influence on behaviour and cognition, but they do believe heredity is very important.

Research in behavioural genetics has substantially contributed to our understanding of how humans behave and think. For example, research has shown that there may be a genetic component to cognitive abilities, personality traits (e.g., novelty-seeking and sociability), sexual orientation, and disorders (e.g., schizophrenia and autism). Research has also revealed strategies for identifying, treating, or coping with inherited behaviours. Gene therapy has allowed scientists to explore ways of treating genetic diseases, and genetic counselling has helped people understand the kinds of risks they may pass on to their offspring. Behavioural genetics is a relatively new subfield in psychology, and its popularity and importance will continue to grow.

156) Short Answer

Both hormones and neurotransmitters communicate chemical messages to cells in the body. However, they vary in how quickly they travel and in their modes of transmission. Whereas neurotransmitters move between neurons very rapidly (less than a second), hormones require several minutes to reach their target cells and to have their intended effect. Neurotransmitters travel to specific neurons in a network; hormones, in contrast, flow in the bloodstream and move throughout the whole body. Only those cells that are receptive to the hormone's message will be activated. Finally, the messages that hormones transmit relate closely to growth in the body. The endocrine system is responsible for producing hormones, a primary component of which is the pituitary gland. The pituitary releases hormones that regulate growth, and people with extreme deviations from normal height often have abnormalities in this gland. Without neurotransmitters and hormones, the various systems of the body would be unable to function effectively, leading to many problems in behaviour and cognition.

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CHAPTER 2 NEUROSCIENCE AND BEHAVIOUR

LECTURE OPENER SUGGESTIONS:

Opening artworks:
Michelangelo Buonaroti (1475–1564), *The Creation of Adam* (Sistine Chapel ceiling), 1508–1512 (the fingers of Adam and God resemble the gap in the synapse).
Mary Pudlat (1923–), *Joyful singing*, 1995 (symmetrical female forms, looks like two halves of the brain).

Opening quotes:
"The brain is wider than the sky." Emily Dickinson, 1830–1886
"Great spirits have always encountered violent opposition from mediocre minds." Albert Einstein, 1879–1955

OPENING THEMES

Many students have encountered the material in this unit before, either in biology or in high school psychology. The trick, then, is to make this material clear but also different enough in orientation from what they have learned earlier so that it will engage their interest. To the extent that you are comfortable, enhance your lectures with material that has clinical relevance, such as brain disorders, psychological disorders involving neurotransmitter abnormalities, and applications to areas such as child development, aging, or gender differences.

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Begin by pointing out that the early lectures in the course focus on biology, including human anatomy and physiology of the nervous and related systems. Unlike a biology course, however, this course will emphasize the connections between biology and behaviour.

CONNECT

The following are assignable via Connect:

PRACTICE QUIZZES

- Pre-Test
- Post-Test

CONCEPT CLIPS

- The Structure of Neurons
- How Neurons Work
- Mirror Neurons
- Nervous System
- Brain Structures and Functions

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- The Four Lobes
- The Hindbrain
- The Midbrain
- The Forebrain

VIDEOS

- Neural Communication
- Neuroscience of Language
- Split Brain

INTERACTIVITIES

- Structure of Neurons
- Brain Activity and Communication

LABELING/CLASSIFICATION EXERCISES

- Sympathetic and Parasympathetic Nervous System
- The Synapse
- Central and Peripheral Nervous Systems
- Structures of the Human Brain
- Cerebral Cortex Lobes and Association Areas

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NEWSFLASH

- New Brain Imaging Techniques Could Ease Chronic Pain
- Learn a New Sport, Stretch the Brain
- Unlocking the Treatment Potential of Neuroplasticity

COURSE-WIDE CONTENT

- Psychology at Work Videos (assignments)
- Scientific Reasoning Exercises (assignments)
- Power of Process Readings (from main assignment page)
- Psychology Relevancy Modules (ebook, SmartBook, assignments)

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MODULE 5: NEURONS - THE BASIC ELEMENTS OF BEHAVIOUR

The Structure of the Neuron
How Neurons Fire
Applying Psychology in the Real World: Mirror Mirror on the Wall, Mirror Neurons in the Brain
Where Neurons Meet: Bridging the Gap
Neurotransmitters: Multitalented Chemical Couriers
Indigenous Perspectives: Intergenerational Trauma: The Soul Wound

LEARNING OBJECTIVES:

Key Concept 5–1: Why do psychologists study the brain and nervous system?
Key Concept 5–2: What are the basic elements of the nervous system?
Key Concept 5–3: How does the nervous system communicate electrical and chemical messages from one part to another?

At the end of this module students should be able to:

5–1 Understand the significance of the biology that underlies behaviour and identify reasons why psychologists study these biological underpinnings, especially the brain and the nervous system.
5–2 Describe the structure of the neuron and its parts.
5–3 Describe the all-or-none law of neural transmission, the resting state and action potential of the neuron.
5–4 Describe the complete transmission of a message from initial stimulation to transmission across the synapse.
5–5 Name key neurotransmitters and their functions and describe their known or suspected roles in behaviour as well as in illnesses.

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Student Assignments:

The Study of the Nervous System in Psychology

Ask students the following questions about the study of the nervous system:

1. Why does a course on psychology begin by examining the structures and function of the nervous system?
2. Research cases of famous people who suffered from nervous system disorders (such as Michael J. Fox (Parkinson's Disease) or Lou Gehrig (Amyotrophic Lateral Sclerosis). Describe the nature of their disorder and how it affected their behaviour when alive as well as whether it caused them to die prematurely.
3. What is your interpretation of the quote "The brain is wider than the sky"?

The Neuron and the Synapse

Ask students the following questions:

1. What are the implications of the fact that neurons communicate across synapses rather than being directly hard-wired?
2. What are the advantages in the nervous system of having neurons fire according to the all-or-none law?

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Lecture Ideas:

Parts of the Neuron

In the section on the neuron, you should clearly describe the parts of the neuron. The following are some helpful hints that will make it easier for students to remember the parts of the neuron**:**

Dendrites: These structures resemble the branches of a tree.

Cell Body: This structure is similar to parts of all other cells in the body.

Axon: The length of this structure can vary greatly: although most are several millimeters in length, some can be as long as 3 feet.

Terminal Buttons: These are small bulges that look like the name of the structure.

Myelin Sheath: This is a protective coating of fat and protein. The thicker it is the faster the speed of transmission down the axon.

All-or-None Law

Discuss the implications of the all-or-none law, in that intense stimuli do not result in *higher* peaks but *more frequent* impulses. To cover the synapse, show the portion of the InPsych animation that covers synaptic transmission. It is especially important to point out the significance of the fact that the synapse is not a hard-wired connection between neurons. This means that neurons can be more flexible, but it also means that more can "go wrong" in the nervous system, such as if there is too much neurotransmitter present in the synapse (as is true when cocaine stimulates dopamine receptors), too little (as is true with dopamine in Parkinson's disease), or too much activity of reuptake enzymes (as is the case with serotonin and psychological disorders such as depression and anxiety). Emphasize the importance of the receptor sites on the postsynaptic surface. Talk about the variety of neurotransmitters and the functions they serve in the nervous system, and the fact that some neurotransmitters can have different effects (excitatory vs. inhibitory) depending on the area of the nervous system in which they are acting.

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MODULE 6: THE BRAIN

Studying the Brain's Structure and Functions: Spying on the Brain
The Hindbrain: Our Reptilian Brain
The Midbrain
The Forebrain
Neuroplasticity and the Brain
The Specialization of the Hemispheres: Two Brains or One?
The Split Brain: Exploring the Two Hemispheres
Exploring Diversity: Sex and the Brain

LEARNING OBJECTIVES:

Key Concept 7–1: How do researchers identify the major parts and functions of the brain?
Key Concept 7–2: What are the major parts of the brain, and for what behaviours is each part responsible?
Key Concept 7–3: How do the halves of the brain operate interdependently?

At the end of this module, students should be able to:

7–1 Name the techniques used to map and study the brain.
7–2 Name the components of the hindbrain and describe the functions of its individual parts.
7–3 Name the major areas of the midbrain and describe the roles of each area in behaviour.
7–4 Name the major areas of the cerebral hemispheres of the forebrain, especially the lobes and the cortex areas, and describe the roles of each area in behaviour.
7–5 Understand the concept of neuroplasticity and the fact that the brain can repair itself throughout life.
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7–6 Discuss the issues involved with brain specialization, brain lateralization, and the split-brain operation, including what has been learned about the two hemispheres from that procedure.
7–7 Discuss differences in brain lateralization as influenced by gender.

Student Assignments:

Parts of the Brain

Handouts 2–3 and 2–4 contain assignments on the parts of the brain.

General Questions about the Brain

Ask students the following questions:

1. What are the possibilities for artificial intelligence (AI)?
2. What might be the importance of the fact that the amygdala and the hippocampus, the centers for emotion and memory, are located close together and are both part of the "old brain"?
3. How might the findings on neuroplasticity be applied to such issues as retraining older workers or helping brain-injured individuals recover lost functions?

Left-Right Brain Questionnaire

Have students complete Handout 2–5 on whether they are "right brain" or "left brain."

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Lecture Ideas:

Brain imaging techniques

Begin by describing the methods of brain imaging. Particularly important in the last few years is the use of functional MRIs, which allow researchers to examine brain functioning in particular areas of the brain when subjects complete specific psychological tasks.

Parts of the brain

Go over the individual areas of the brain, from the brainstem through the cortex. Emphasize that although parts of the brain have specific functions, there is also considerable redundancy. This is another factor that accounts for plasticity—people are able to recover from brain damage by using alternative parts of their brains when one area is injured.

Use these definitions for the parts of the brain:

Medulla	Controls critical body functions, including breathing and heartbeat.
Pons	Transmits motor information. Coordinates muscles and integrates movement between the right and left halves of the body. Involved in the control of sleep.
Cerebellum	Helps maintain balance by monitoring feedback from the muscles to coordinate their placement, movement, and tension. Also involved in some cognitive functions.
Reticular formation	Activates other parts of the brain to produce general bodily arousal. During sleep, filters out background stimuli.
Thalamus	Relay station for information concerning the senses. Integrates information from higher parts of the brain to send to the cerebellum and medulla.
Hypothalamus	Maintains a steady internal environment for the body. Produces and regulates behaviour critical to the survival of the species, such as eating, self-protection, and sex.
Limbic system (amygdala, hippocampus, fornix)	Serves basic functions relating to emotions and self-preservation, such as eating, aggression, and reproduction. Plays an important role in learning and memory.

Parts of the cortex

Use these definitions for the parts of the cortex:

Visual cortex	Raw sensory input of images from the eyes is received in this area of the brain and transformed into meaningful stimuli.
Primary auditory cortex	Responsible for the sense of hearing. Stimulation of this area results in the experience of sounds such as clicks or hums.
Primary somatosensory cortex	Specific locations associated with the ability to perceive touch and pressure in a particular area of the body.

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Primary motor cortex	Responsible for the body's voluntary movement.
Broca's area	Responsible for production of speech.
Wernicke's area	Responsible for comprehension of speech.
Frontal lobe	Responsible for planning and judgment.

Here are some hints to give students to help them remember the terms:

Medulla Without breathing, you would be very "dull."

Cerebellum You need this for balance—Cere-bal (ance)-um

Reticular formation Like a military formation, sends messages up and down within the brain.

Thalamus You would **th**row a ball during a relay race. The thalamus is a relay station.

Hypothalamus Sounds like "homeostasis," the state of stability in the body's internal environment.

Limbic system When you dance the Limbo, you feel happy (emotion function), and later you remember having a good time (memory function).

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Broca's area Think of Tom Brokaw, the newscaster. Without speech, he wouldn't be able to announce the news.

Wernicke's area Wernicke begins with the letter "w" – think double-"u"; "u" is for understanding.

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Media Presentation Ideas:

Popular movies illustrating the limbic system

A very funny scene that students will enjoy is the medulla oblongata scene from the movie *The Water Boy,* when the protagonist argues with his professor about the role of the brain in behaviour. This is a short scene that will definitely lighten the lecture. It is also a good scene to show because it is actually incorrect—when they discuss the "medulla oblongata" as having a role in aggression and happiness, they are actually referring to the amygdala!

Other, older movies illustrating people who must cope with brain damage are *Regarding Henry* and *Rocky V*.

Biography of Roger Sperry (from Pettijohn's "Connectext")

Roger Sperry was born August 20, 1913, in Hartford, Connecticut. He was awarded a Nobel prize in physiology and medicine in 1981 for his more than 40 years of research on the brain. The prize was given specifically for his work on the "split-brain," in which he discovered that the two cerebral hemispheres of the brain had distinct functions. The left, usually the dominant

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side, is involved in reasoning, language, writing, and reading, while the right, or less dominant side, is more involved in nonverbal processes, such as art, music, and creative behaviour.

In one of his most important studies, Sperry asked subjects who had undergone split-brain surgery to focus on the center of a divided display screen. The word "key" was flashed on the left side of the screen, while the word "ring" was projected on the right side. When asked what they saw, the split-brain patients answered "ring", but denied that any other word was also projected onto the screen. Only the word "ring" went to the speech center in the left hemisphere. Although the right hemisphere cannot verbalize the information (the word "key") that was projected on the left side of the screen, subjects are able to identify the information nonverbally. Sperry asked subjects to pick up the object just named without looking at it. If subjects were told to use their left hand, they could easily identify a key. However, if asked what they had just touched, they would respond "ring."

Sperry received his Ph.D. from the University of Chicago in 1941. He did his early research at the Yerkes Primate Laboratory and the National Institute of Health before joining the staff of the California Institute of Technology in 1954 as Hixon Professor of Psychobiology. He originally studied cats, and found that the corpus callosum, or nerve bundle connecting the two cerebral hemispheres, was necessary for the transfer of information from one side of the brain to the other.

Sperry next began to study epileptic patients whose corpus callosum had been severed to prevent seizures. His research on the "syndrome of hemisphere deconnection" has contributed valuable information to the treatment of various brain disorders.

Sperry continued to be an active researcher until his death in 1994.

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Background on Split Brain

Go to http://www.macalester.edu/psychology/whathap/UBNRP/Split_Brain/Split_Brain_Consciousness.html, which documents various aspects of the split-brain phenomenon including procedures for testing patients with split brains.

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MODULE 7: THE NERVOUS SYSTEM AND THE ENDOCRINE SYSTEM: COMMUNICATING WITHIN THE BODY

The Nervous System
The Endocrine System: Of Chemicals andGlands

LEARNING OBJECTIVES:
Key Concept 6–1: How are the structures of the nervous system linked?
Key Concept 6–2: How does the endocrine system affect behaviour?

At the end of this module, students should be able to:

6–1 Describe the major divisions of the nervous system, including the central and the peripheral, the autonomic and somatic, and the sympathetic and parasympathetic divisions.
6–2 Outline the major developments in the evolution of the nervous system and describe the associated fields of evolutionary psychology and behavioural genetics.
6–3 Describe the function of the endocrine system, including the relationship to the hypothalamus and the functions of the pituitary glands.

Student Assignments:

The Endocrine System
Have students complete Handout 2–2 on the parts of the endocrine system.

How the Endocrine System Functions
Ask students to answer these questions:

1. What is meant by "negative feedback"? How does the endocrine system ensure that hormones do not reach too high a level in our bodies?
2. What do you think the significance is that the hypothalamus is a structure in both the nervous and endocrine systems?
3. In times of stress, how do the endocrine and autonomic nervous systems work together?

Lecture Ideas:
Functional Divisions of the Nervous System
Summarize the functional divisions of the nervous system in a manner that shows how the parts of the nervous system work in concert to organize our interpretation of the world and prepare a response. Explain each component of the nervous system.

Here are some hints to give students to help them remember the terms:

Autonomic nervous system Think of "automatic." This part of the nervous system controls actions that we do not think about and that happen without our control.

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Sympathetic nervous system Think of "sympathetic." When we get emotional ("sympathetic"), we experience arousal and stimulation, exactly the actions of this part of the autonomic nervous system.

Parasympathetic nervous system Think of "peace." When your parasympathetic nervous system is aroused, it brings you back to a state of peace.

Somatic nervous system *Soma* stands for "body." The somatic nervous system is the "bodily" nervous system, meaning that it translates information received through the bodily senses and gives instructions to the muscles and glands (a long explanation but if they remember "body," it will help them remember the term).

The Organs of the Endocrine System
Describe the endocrine system organs.

Negative Feedback in the Endocrine System
Describe the process of hormone secretion in terms of a negative feedback loop. The hypothalamus-pituitary axis regulates hormone production in the other glands in the endocrine system when blood levels of a hormone become too low or when the hypothalamus is triggered to release a hormone that in turn will increase the production of hormones by other glands. The pancreas operates on a separate dimension that regulates glucose metabolism.

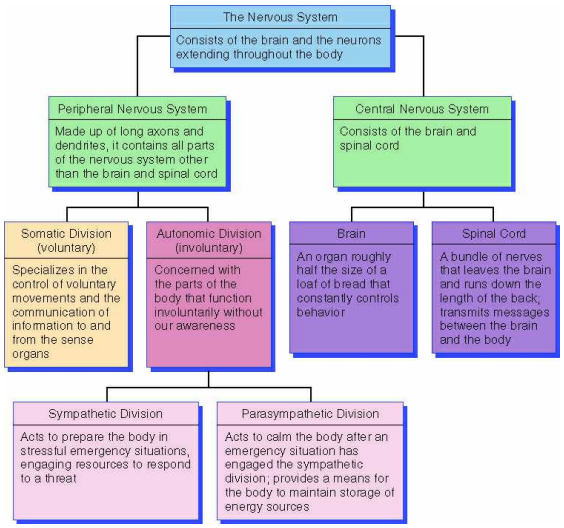
Hormonal Supplements
Ask students what they think of hormonal supplements such as steroids for body builders and athletes and estrogen for women going through the menopause. Some aging "baby boomers" are turning to growth hormone as the key to maintaining their youthful vitality. However, all of these strategies carry risks. Are the dangers of steroid replacement and supplement worth possible harmful effects?

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Presentation Ideas:

Nervous System Structure
This chart illustrates the organization of the nervous system:



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