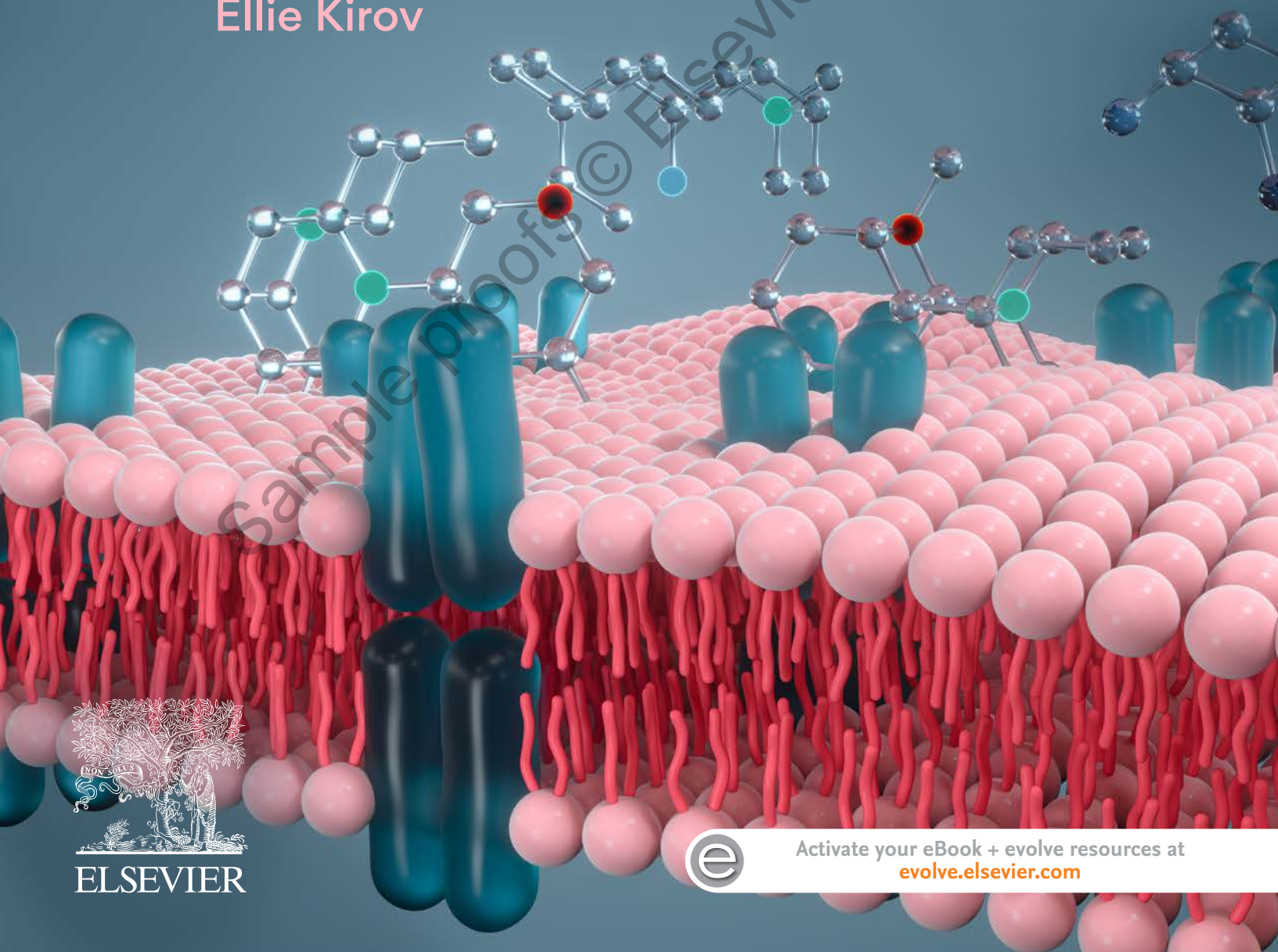
STUDY GUIDE

Herlihy's The Human Body in Health and Illness

Barbara Herlihy
Ellie Kirov

AUSTRALIA AND NEW ZEALAND EDITION



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Australia and New Zealand edition

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Elsevier Australia. ACN 001 002 357
(a division of Reed International Books Australia Pty Ltd)
Tower 1, 475 Victoria Avenue, Chatswood, NSW 2067

Study Guide for The Human Body in Health and Illness, Seventh edition

ISBN: 978-0-323-71125-8

This adaptation of Study Guide for The Human Body in Health and Illness, 7e, by Barbara Herlihy was undertaken by Elsevier Australia and is published by arrangement with Elsevier Inc.

Herlihy's The Human Body in Health and Illness—Study Guide, Australia and New Zealand edition

ISBN: 978-0-7295-4373-6

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National Library of Australia Cataloguing-in-Publication Data

A catalogue record for this book is available from the National Library of Australia

Senior Content Strategist: Natalie Hunt
Content Project Manager: Kritika Kaushik
Edited by Margaret Trudgeon
Proofread by Tim Learner
Cover by Georgette Hall
Internal design: SD 36
Index by SPI Global
Typeset by GW Tech
Printed in Singapore by KHL

Last digit is the print number: 9 8 7 6 5 4 3 2 1

Dedication

To those that inspire, motivate and pave the way for scientific investigation . . .

To those that strive, delve and thirst for knowledge and wisdom . . .

To those that search, enquire and express curiosity in phenomena unknown . . .

. . . to you, this book is warmly dedicated.

Dr Ellie Kirov

Preface

Herlihy's The Human Body in Health and Illness—Study Guide Australia and New Zealand edition is designed to help you learn the basic concepts of anatomy and physiology through persistent questioning. Each chapter in the Study Guide corresponds to a chapter in the textbook. Some questions are easy and require simple recall; other exercises are more difficult and are designed to help synthesise and integrate basic concepts. A strategy that is helpful is to ask the same question in several different ways. This requires you to view the content from several different perspectives and encourages you to think critically and to integrate many seemingly unrelated facts.

It is recommended that you work through all the exercises in every chapter. Working in groups reduces isolation, encourages learning and makes the learning process more enjoyable. More importantly, student-to-student interaction encourages active learning.

ORGANISATION

The Study Guide chapters are divided into two parts: Part I: Mastering the Basics, contains matching, ordering, colour and drawing, diagram examination, table completion, filling in the blanks and determining similars and dissimilars for each content area in the corresponding textbook chapter, helping you learn basic anatomy and physiology knowledge; Part II: Putting It All Together, contains multiple-choice practice questions, case studies and puzzles that integrate the chapter content.

Throughout the Study Guide, there is a concerted effort to use the medical terminology introduced in the textbook and to be used in clinical situations. For example, words such as diagnosis, hypokalaemia and hyperglycaemia are used frequently and require mastery. As in the textbook, pathophysiology is used when it serves to explain normal anatomy and physiology.

Throughout the Study Guide, section references from the textbook are provided to assist you in answering the questions. An Answer Key has been provided for instructors.

Part I: Mastering the Basics

Matching

The matching exercises ask you to match the words or terms in one column with descriptions and explanations in a second column.

Ordering

The ordering exercises ask you to arrange a series of events or structures in the correct order. This may include ordering structures based on their sequence through a functional pathway or ordering a sequence of events within a particular functional system.

Colour and Draw

Many of the illustrations that appear in the textbook are reproduced in the Study Guide. You will need to label the figure and, in some instances, colour a particular part of it. Colouring helps to focus your attention on important anatomical structures.

Examine the Diagram

These exercises ask you to interpret illustrations from the textbook and are accompanied by questions that promote understanding of a particular function or process.

Complete the Table

These exercises provide you with a table containing incomplete information and ask you to fill in the missing information to complete the table. The information in the tables may relate to structures, functions or processes.

Fill in the Blanks

These exercises provide you with scenarios or statements for which information is missing. You are asked to fill in the blanks and complete the statements using a list of provided terms, or by referring to a diagram to help complete the missing information.

Similars and Dissimilars

These exercises will provide you with four words and you are asked to identify the word that is least related to the other three words.

Part II: Putting It All Together

Multiple Choice Questions

The multiple choice questions relate to the content provided in each chapter of the textbook and consider anatomical and physiological reasoning.

Case Studies

The case studies provide a scenario which needs to be evaluated. You are then asked a number of multiple choice questions based on the scenario.

Puzzles

The puzzles are integrative and instructive. You are asked to eliminate anatomical terms until you discover the answer. A hint appears in the title.

Acknowledgements

As with the textbook, the creation and publication of this *Study Guide* involved the combined efforts of many people, all of whom are talented, competent, highly professional and exceedingly understanding.

A special thank you to the staff of Elsevier Australia, in particular, Natalie Hunt, Kritika Kaushik and Sukanthi Sukumar for their expertise, support and patience during the writing and development process. You are a fantastic team to work with.

Many thanks also to Margaret Trudgeon for her close attention to detail, profound editing skill and genuine approachability.

A final thank you to all my nearest and dearest who have been so kind, patient and supportive. It was such a rewarding experience sharing thoughts and ideas during the development of the final product.

Contents

11 Nervous System: The Spinal Cord and Peripheral Nerves

Answer Key: Textbook references are provided as a guide for answering these questions. A complete answer key is provided for instructors.

OBJECTIVES

1. Describe the anatomy of the spinal cord and list its three functions.
2. Distinguish between knee-jerk and withdrawal reflex arcs and list the components of each.
3. List and describe the functions of the 12 pairs of cranial nerves.
4. Identify the classification of spinal nerves.
5. List the functions of the three major plexuses.
6. Describe a dermatome.
7. Provide the functional classification of the peripheral nervous system.

Part I: Mastering The Basics

MATCHING

Nerve Tracts

Directions: In the spaces provided, indicate whether the following are sensory (S) or motor (M) structures or functions. See text, Section 11.1.

1. _____ Descending tracts
2. _____ Carries information for touch, pressure and pain
3. _____ Corticospinal tract
4. _____ Pyramidal tract
5. _____ Ascending tracts
6. _____ Electrical signal arises in the precentral gyrus of the frontal lobe
7. _____ Carries information to the parietal lobe
8. _____ Most neurons decussate in the medulla oblongata
9. _____ Extrapyramidal tracts
10. _____ Spinothalamic tract
11. _____ Feeling pain in the little finger
12. _____ Wiggling the toes
13. _____ Feeling cold
14. _____ Winking
15. _____ Hearing voices
16. _____ Spinocerebellar
17. _____ Afferent fibres
18. _____ Efferent fibres

MATCHING

Reflexes

Directions: Match the following terms to the most appropriate definition by writing the correct letter in the space provided. See text, Section 11.3.

A. Babinski response
B. Achilles tendon reflex
C. gag reflex
D. baroreceptor reflex
E. patellar tendon reflex
F. withdrawal reflex
G. pupillary reflex

1. _____ A protective reflex; quickly moves a finger away from a hot object
2. _____ This reflex helps maintain a standing posture; also called the *knee-jerk reflex*
3. _____ This reflex helps the body maintain a normal blood pressure
4. _____ This reflex is elicited by stroking the sole of the foot; plantar flexion and curling of the toes are normal responses in an adult
5. _____ This reflex causes the pupils of the eyes to constrict (become smaller) in response to light
6. _____ A stretch reflex; tapping this tendon in the heel normally causes plantar flexion of the foot; also called the *ankle-jerk reflex*
7. _____ This reflex involves the glossopharyngeal nerve and helps prevent food and water from going down the wrong way

EXAMINE THE DIAGRAM

Reflex Arc

Directions: Referring to Fig. 11.4 in the textbook, fill in the spaces with the correct numbers. Some numbers may be used more than once. See text, Section 11.3.

1. _____ Result of the contraction of the quadriceps femoris
2. _____ Receptors in the thigh muscles are stimulated
3. _____ Motor neuron
4. _____ Sensory neuron
5. _____ Afferent neuron
6. _____ Efferent neuron
7. _____ Extension of the leg
8. _____ Information travels from the spinal cord to the muscle
9. _____ Information travels from receptors in the muscle to the spinal cord

MATCHING

Cranial Nerves

Directions: Match the following terms to the most appropriate definition by writing the correct letter in the space provided. Some terms may be used more than once. See text, Section 11.4.

A. olfactory
B. vestibulocochlear
C. vagus
D. accessory
E. optic
F. hypoglossal
G. oculomotor
H. trigeminal
I. facial

1. _____ Senses hearing and balance
2. _____ The wanderer; widely distributed throughout the thoracic and abdominal cavities
3. _____ Helps control the movements of the tongue; cranial nerve XII
4. _____ Allows you to shrug your shoulders
5. _____ Damage to this nerve causes blindness
6. _____ Sense of smell
7. _____ Tic douloureux, a condition characterised by extreme facial and jaw pain, is caused by inflammation of this nerve
8. _____ A dilated and fixed pupil is caused by pressure on this nerve
9. _____ Inflammation of this nerve causes Bell's palsy, a paralysis of one side of the face
10. _____ Nerve that supplies most of the extrinsic eye muscles; primary function is the movement of the eyeballs
11. _____ Carries sensory information from the retina of the eyes to the occipital lobe of the brain
12. _____ In addition to moving the eyeball, this nerve raises the eyelid and constricts the pupil of the eye
13. _____ Anosmia
14. _____ Cranial nerve VIII
15. _____ Ototoxicity
16. _____ Ptosis of the lids
17. _____ Cranial nerve II
18. _____ Vertigo
19. _____ Cannot smile, wrinkle forehead, secrete tears or close eyes (on the affected side)
20. _____ Cranial nerve X

MATCHING

Spinal Nerves

Directions: Match the following terms to the most appropriate definition by writing the correct letter in the space provided. Some terms may be used more than once. See text, Section 11.4.

A. sciatic
B. axillary
C. radial
D. common peroneal
E. femoral
F. cauda equina
G. phrenic
H. plexus(es)

1. _____ Wristdrop is caused by damage to this nerve
2. _____ Crutch palsy is caused by damage to this nerve
3. _____ Nerve that supplies the diaphragm, an important breathing muscle
4. _____ Spinal nerves are grouped and sorted here
5. _____ This large nerve leaves or emerges from the distal end of the spinal cord and supplies the buttocks and posterior thighs
6. _____ Nerve groupings that are described as cervical, brachial and lumbosacral nerves
7. _____ Severing of this nerve requires the use of a ventilator

8. _____ Group of nerves that emerge from the distal end of the spinal cord; horse's tail
9. _____ Innervates the inner thigh area
10. _____ If damaged, causes footdrop
11. _____ Must administer an intramuscular injection in the upper outer quadrant of the buttocks to avoid injuring this nerve

SIMILARS AND DISSIMILARS

Directions: Circle the word in each group that is least similar to the others. Indicate the similarity of the three words on the line below each question.

1. descending sensory corticospinal pyramidal

_____

2. ascending motor spinothalamic sensory

_____

3. motor efferent descending spinothalamic

_____

4. spinal nerves 12 pairs mixed nerves 31 pairs

_____

5. phrenic diaphragm motor gag reflex

_____

6. CN VIII hearing vestibulocochlear facial nerve

_____

7. CN II blindness ptosis of the lid optic

_____

8. CN I CN III CN VIII CN II

_____

9. optic sciatic olfactory oculomotor

_____

10. ulnar dermatome radial median

_____

11. vagus ptosis of the lid CN X 'wanderer' nerve

_____

12. cervical reflex arc thoracic lumbar

_____

13. vagus sciatic common peroneal femoral

_____

14. foramen magnum cervical lumbosacral brachial

_____

15. anosmia footdrop wristdrop crutch palsy

_____

16. CN I vision motor olfactory

_____

17. CN III aphasia ptosis of the lid fixed-dilated pupil

_____

18. hemi- meningo- para- quadra-

_____

19. CN VII optic nerve weak blink orbicularis oculi

_____

20. CN IX glossopharyngeal Babinski response gag reflex

_____

Part II: Putting It All Together

MULTIPLE CHOICE

Directions: Circle the correct answer.

1. Which of the following is most descriptive of a descending tract?
   a. Afferent
   b. Sensory
   c. Spinothalamic
   d. Motor

2. Which of the following is most likely to experience ototoxicity?
   a. A furniture mover who strained his back
   b. A person who was diagnosed with a tumour involving the second cranial nerve
   c. A person who took an antibiotic drug that injured CN VIII
   d. A person with Bell's palsy

3. The pyramidal tract is:
   a. the major motor tract that originates in the precentral gyrus
   b. an ascending tract
   c. a sensory tract
   d. also called the spinothalamic tract

4. A student nurse is instructed to administer an intramuscular injection in the upper outer quadrant of the buttocks to:
   a. prevent ototoxicity
   b. minimise systemic effects of the drug
   c. avoid penetration of the subarachnoid space
   d. avoid injury to the sciatic nerve

5. Which of the following is a function of the spinal cord?
   a. Secretes hormones that regulate blood glucose
   b. Is the seat of our emotions
   c. Acts as an important reflex centre
   d. Carries sensory information but not motor information

6. Which of the following is least related to the others?
   a. Pyramidal tract
   b. Extrapyramidal tract
   c. Spinothalamic tract
   d. Corticospinal tract

7. What is the purpose of myelination?
   a. Increases the speed of the nerve impulse
   b. Secretes cerebrospinal fluid
   c. Increases the phagocytic activity of the glia
   d. Separates neurons from the surrounding glia

8. Which of the following is least descriptive of the vagus nerve?
   a. CN X
   b. Distributed throughout the chest and abdomen
   c. Inflamed vagus nerve causes Bell's palsy
   d. Affects the function of the digestive tract

9. Which of the following is a true statement?
   a. The olfactory nerve is a motor nerve
   b. The CN II is a sensory nerve
   c. The phrenic, sciatic and axillary nerves are cranial nerves
   d. The vagus nerve is confined to the cranium

10. Which of the following is most descriptive of the cauda equina?
    a. Spinal nerves that emerge from the tail end of the spinal cord
    b. Cells that secrete cerebrospinal fluid
    c. Glial cells that form the blood–brain barrier
    d. Meninges

11. Diagnostically, a needle is inserted between the third and fourth lumbar vertebrae into the subarachnoid space to:
    a. relieve intracranial pressure from a closed head injury
    b. obtain a sample of cerebrospinal fluid
    c. administer blood
    d. assess the withdrawal reflex

12. These nerves supply voluntary skeletal muscles, causing movement.
    a. Somatic motor nerves
    b. CNs I, II, VIII
    c. Optic nerve
    d. Vestibulocochlear nerve

13. A mixed nerve is one that:
    a. only transmits information for pain
    b. only transmits information that originates in the precentral gyrus
    c. contains both sensory and motor fibres
    d. only affects organs that are in the abdominal cavity

14. Which involuntary response to a stimulus is accomplished by these four structures: receptor, sensory neuron, motor neuron, effector organ?
    a. Action potential
    b. Decussation
    c. Reflex arc
    d. Saltatory conduction

15. What is the effector organ in the knee-jerk or patellar tendon reflex?
    a. Quadriceps tendon
    b. Quadriceps femoris muscle
    c. Spinal cord
    d. Gastrocnemius

16. Which of the following is least descriptive of the oculomotor nerve?
    a. CN III
    b. Controls the movement of the eyeball
    c. Increased intracranial pressure compresses this nerve; causes ptosis of the eyelid
    d. Carries sensory information from the eye to the occipital lobe (vision)

17. Which of the following is a consequence of damage to the glossopharyngeal nerve?
    a. Inability to shrug the shoulders and move the upper extremities
    b. Blindness
    c. Loss of the gag reflex and aspiration of food or water into the lungs
    d. Loss of balance

18. The phrenic nerve:
    a. is a cranial nerve
    b. exits the spinal cord at the level of T12
    c. innervates the major breathing muscle
    d. is classified exclusively as ascending and sensory

19. The first three cranial nerves:
    a. are all sensory
    b. innervate the eye
    c. are all motor
    d. are the olfactory, optic and oculomotor nerves

20. Which of the following is true of the spinothalamic tract?
    a. It is a descending tract
    b. It is also called the pyramidal tract
    c. It carries the somatic motor neurons
    d. It is an ascending tract that carries information about temperature, pain, touch and pressure

21. Which of the following is least descriptive of the cauda equina?
    a. Spinal nerves
    b. Brachial plexus
    c. Distal spinal cord
    d. Innervates lower torso and lower extremities

22. Myel/o refers to the:
    a. glial cells that secrete cerebrospinal fluid
    b. spinal cord
    c. vertebrae
    d. herniation of the brain stem

23. The pyramidal tracts decussate at the medulla oblongata. Which of the following words best describe decussation?
    a. Depolarisation/repolarisation
    b. Plexuses (cervical, brachial, lumbosacral)
    c. Curvatures (cervical, thoracic, lumbar, sacral)
    d. Crossover

24. A person suffers a stroke to the left cerebral hemisphere and suffers a right-sided hemiparalysis. Which of the following words describes the reason for the paralysis of the right side of the body?
    a. Cerebral lateralisation
    b. Anosmia
    c. Saltatory conduction
    d. Decussation

25. Which of the following relates to a response elicited by stroking the sole of the foot?
    a. Broca
    b. Cy Attica
    c. Achilles
    d. Babinski response

CASE STUDY

Julian and his friends were picnicking near a river. Julian dived into the river, hitting his head on a submerged rock. When he was pulled from the river by his friends, Julian was conscious but unable to move his body. There was no feeling in his upper or lower extremities. The paramedics stabilised his neck and spinal cord and transported him to the nearest trauma centre. He had sustained a fracture at the C6 vertebra.

1. Which of the following is indicated by the paralysis?
    a. The break was accompanied by haemorrhage and severe blood loss
    b. An infection developed at the fracture site
    c. The spinal cord had been severed or compressed
    d. Severe brain damage had occurred

2. Which of the following words best describe Julian's loss of function?
    a. Subdural haematoma
    b. Increased intracranial pressure
    c. Quadriplegia
    d. Poliomyelitis

3. Which statement is true regarding Julian's long-term recovery?
    a. Complete recovery is likely within a 3-month period
    b. He will regain all motor activity but will not regain any sensory function
    c. He will require a ventilator to breathe and should regain full use of his upper and lower extremities within 3 months
    d. It is unlikely that he will regain full use of either his upper or his lower extremities

4. Which statement best explains the reason for the above answer?
    a. Neurons within the CNS do not regenerate
    b. The reticular activating system reacts to trauma by closing down; a deep coma ensues
    c. Severe injury stops the formation of cerebrospinal fluid
    d. Injured neurons regenerate but take several months to do so

PUZZLE

Hint: Egyptian Motor Tract

Directions: Perform the following functions on the Sequence of Words that follows. When all the functions have been performed, you are left with a word or words related to the hint. Record your answer in the space provided.

Functions: Remove the following:

1. CN II, sensory, vision
2. Innervates the diaphragm
3. Three nerve plexuses
4. Consequences of severing CNs II and VIII
5. Nerve damaged with crutch palsy
6. Nerves that carry information towards the CNS
7. Nerves that carry information from the CNS towards the effector organs, such as the muscles
8. Mapping of the skin indicating specific innervation
9. Nerve damaged in carpal tunnel syndrome
10. Clinical effects of inflammation of CN VII
11. Damage to this nerve impairs the ability to extend the hip and flex the knee
12. A diagnostic procedure performed by inserting a needle between L3 and L4
13. The reflex described with stroking of the lateral side of the foot from heel to toe, the toes curl, with slight inversion of the foot
14. CN IX, gag reflex
15. CN VIII, sensory, hearing, balance
16. CN I, smell
17. CN X, wanderer
18. CN III, fixed and dilated, ptosis of the eyelid
19. Another name for the knee-jerk reflex
20. Another name for the ankle-jerk reflex

Sequence of Words

S C I A T I C D E R M A T O M E D E A F N E S S P
A T E L L A R T E N D O N B R A C H I A L A X I L
L A R Y C E R V I C A L V E S T I B U L O C O C H L
E A R P H R E N I C S E N S O R Y B A B I N S K I P
Y R A M I D A L B E L L S P A L S Y L U M B A R P
U N C T U R E O P T I C M E D I A N O C U L O M O
T O R G L O S S O P H A R Y N G E A L L U M B O
S A C R A L V A G U S B L I N D N E S S A C H I L L
E S T E N D O N O L F A C T O R Y M O T O R

Answer: _____ _____