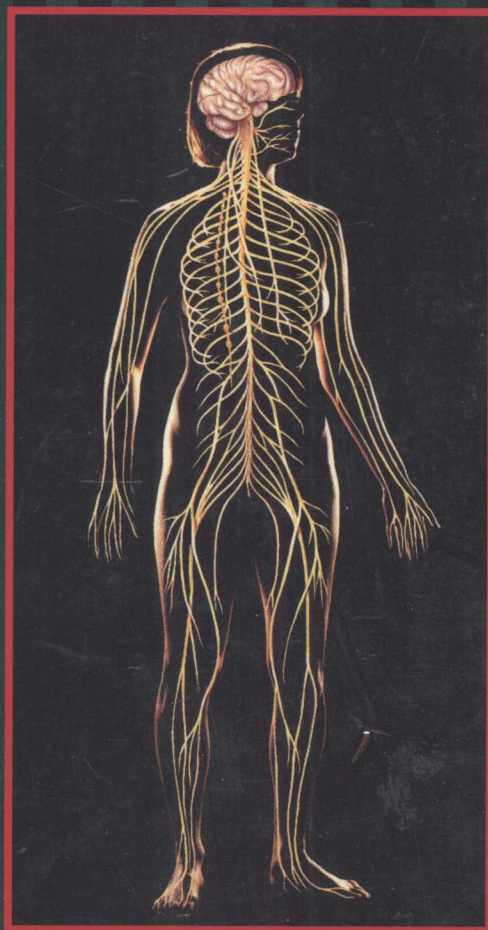

STUDY GUIDE
TO
**NEUROLOGICAL
REHABILITATION**

THIRD EDITION



Study Guide
to
Neurological Rehabilitation,
3rd Edition

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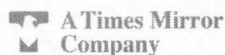


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Preface

This Study Guide to accompany the 3rd edition of Darcy Ann Umphred's *Neurological Rehabilitation* is based on current higher education theories of learning. The most essential of these applied theories are the well-known principles of active learning (learning through involved application, as opposed to mere reader/listener responses) and collaborative apprenticeship learning (problem-solving in both student-teacher interactions and student-student interactions).

In the classroom, these principles are easily applied, using a three-step technique that medical, nursing, and allied health faculty have already used for decades out of sheer practicality. The three steps are as follows:

- **Step One:** Allowing the student to benefit from practical interactions with the instructor, learning through direct communication and application, sometimes together, sometimes alone. This happens every day in the classroom as instructors move between lecture, demonstration, and then discussion —eliciting student response in the classroom and then providing immediate feedback.
- **Step Two:** Allowing the student to approach a learning challenge independently based on former learning; this part is accomplished through the student's completion of workbook exercises and homework —anything done independently by the student that reinforces what has been learned in the classroom.
- **Step Three:** Providing the student with authoritative feedback and reinforcement in response to each independent endeavor. You and your instructor will use the essay questions and Case Studies in each core chapter to establish a dialogue. That's why we ask you to answer all of these in a separate notebook, rather than jotting down answers in the workbook. Maintaining a separate notebook for the essay and Case Study applications enables you to set up a dialectical journal with the instructor.

You will find that this study guide provides answers only for objective questions (e.g., multiple-choice or true-false). We have sought to make this workbook a Step Three tool, providing the student with authoritative feedback and response. This does *not* mean providing *all* the answers! Instead, to enable the student to use reinforcement and apply principles of *active* learning, we have chosen not to reproduce answers from the text for any long-answer, essay, Critical Thinking, or Case Study questions; instead, we have provided page number references for long-answer and essay questions so that the student may find answers on their own. Case Study questions and Critical Thinking questions often involve integration of material from the entire chapter and so need no specific ranges of page numbers. After all, it's not truly critical thinking or problem solving if, in the end, *the answer is provided at the back of the book!* Independent recall and an independent search for material is strong reinforcement for learning. It also allows instructors to use this as a Step Three instrument, as the text itself more directly reinforces student endeavors as the student is forced to interact with the primary text once again.

Finally, this approach allows the instructor the option of assigning Critical Thinking questions or Case Studies as structured homework, since no one can simply copy the answers without some effort.

So where does active and collaborative work come into play in this workbook? In two ways: First, through the dialectical journal and, second, through optional collaborative projects with other students.

The Dialectical Journal

Keep a log book in which you and the instructor can carry on a continuous, ongoing dialogue throughout the semester. We have designed our *essay questions* and *Case Studies* to fit this format. *It is these two types of questions that are geared more toward critical thinking or problem solving.* Keeping a log of your responses, *as well as any questions or comments of your own*, establishes a collaborative apprenticeship relationship with your instructor. Your instructor may collect all these journals periodically, or you may want to hand them in whenever you're struggling with a specific concept. At

the end of each chapter, brainstorm ways you might apply each chapter objective to the clinical field. This will not only help you zero in on key concepts, but will also help both you and your instructor identify concepts you might be missing out on.

How do you get started? We suggest the following easy format:

- Simply draw a vertical line down the center of each page.
- Write your responses to assigned Critical Thinking questions (these are identified in the workbook by the Critical Thinking icon) in the left-hand column. We encourage you to not only respond to all essay questions, but to interject your own reflections or questions, like the following: "I didn't realize that the therapist could not . . ." "Doesn't the third paragraph on page___ seem a little contradictory in comparison to the discussion of this same issue in the previous section of the chapter?" "I'm a little unsure of how to apply this. Does the text mean that we should . . ."
- Take full advantage of the dialectical journal. As you read and take notes on the text, incorporate as many of your own notes, diagrams, and —especially— reflections or questions about the text itself into the journal to receive feedback from your instructor in a way that tailors the journal to fit your needs. As you alter your views, gain additional insights, or correct any of your own initial misconceptions, respond to these in the right-hand column.
- Your instructor can respond to your questions or comments as they arise in the right-hand column of the page.
- Finally, review your questions and your instructor's responses regularly. Because you have responded to questions in a more reflective way, establishing a collaborative relationship with your instructor, and because you have been able to keep this ongoing correspondence in one book, you will have a map of your learning process and your growing understanding of the neurological rehabilitation process and its effect on therapy.

Collaborative Projects

A second application is the implementation of collaborative learning strategies. Some students find they learn faster and better in hands-on applications done in cooperation with others who are tackling the same material. For those interested in collaborating on projects in small groups, select any of the identified Critical Thinking questions and Case Studies throughout this workbook. Any of these can be expanded into collaborative action projects.

We hope that this Study Guide will be used to both reinforce learning and check the student's progress in mastering the principles of neurological rehabilitation.

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A Note to the Instructor

We all have unique teaching styles. This workbook embraces the concepts of critical thinking and problem solving, as well as collaborative and active learning —concepts clearly not new to medical fields in general. However, while some instructors enjoy a lot of student collaboration projects, still others prefer teacher-student dialectical settings, while still others prefer a more traditional lecture–demonstration–individual application approach.

All of these teaching styles can accommodate critical thinking and problem solving skills. Since we are so varied in our approaches, the challenge, then, has been to write a workbook that encourages critical thinking and concept exploration while still allowing for those who demand a more structured approach —as well as those who prefer variety. For this reason, we have developed a wide array of question types. The more traditional kinds of questions (multiple-choice, true/false, etc.) are making more of a comeback than ever as more schools are purchasing or developing test bank computer software as well as CD-ROM testing mechanisms. But it is absolutely essential that we not forget that physical and occupational therapy are frequently conceptual in their applications.

For all these reasons, then, we have developed a well-rounded workbook with a wide array of question types. Each chapter also has more questions, as a rule, than any instructor has time to make use of. We suggest that you concentrate on the essay, Critical Thinking, and Case Study questions (available in every core chapter). Use these to build on and expand your emphasis on teaching from the key objectives for each chapter. Those that are particularly geared toward critical thinking/problem solving have been marked with a Critical Thinking icon. You will note, too, that we have offered, in the preface of this workbook, a way to apply problem solving and conceptual tasks to a dialectical journal. This is an option fairly new in medical education as we continue to learn more and more about the part that writing and dialectical feedback play in learning abstractions and concepts. Use of the dialectical journal is fully detailed in the student's preface.

For those who would like to add yet another layer of learning style, all Critical Thinking questions in this workbook can also lend themselves to student collaboration. We have suggested in our preface that students working in pairs or small groups can take any of the Critical Thinking questions in this workbook and turn them into a team project. In turn, you can allow class time for selected student “teams” to present their applications (particularly to Case Studies) to the rest of the class. Another option is to assign a student team to read ahead and write together a case study for a chapter to come. In this way they can actually write Critical Thinking questions for the rest of the class to solve. The presenting team, you will find, learns even more than the rest of the class, and the variety in presentations and the creativity that comes out in some of the student case studies are often entertaining, sometimes funny. Even the presenting team's possible errors become an opportunity for collaborative problem solving for the entire class.

Finally, of course, the more traditional question types can be used for individual review or pooled as self-generated software or CD test bank material. While they can be very useful for chapters with a lot to remember, we recommend that you not let these become the central focus of each chapter. Instead, guide students to concentrate on the Critical Thinking and Case Study applications.

This book's goal, then, is that the wide array of questions, the singling out of critical thinking applications, and the suggestions for use of team presentations, collaborative student projects, and the use of the dialectical journal will enable you to experiment with such choices, tailoring the course to your students' needs and your unique teaching style.

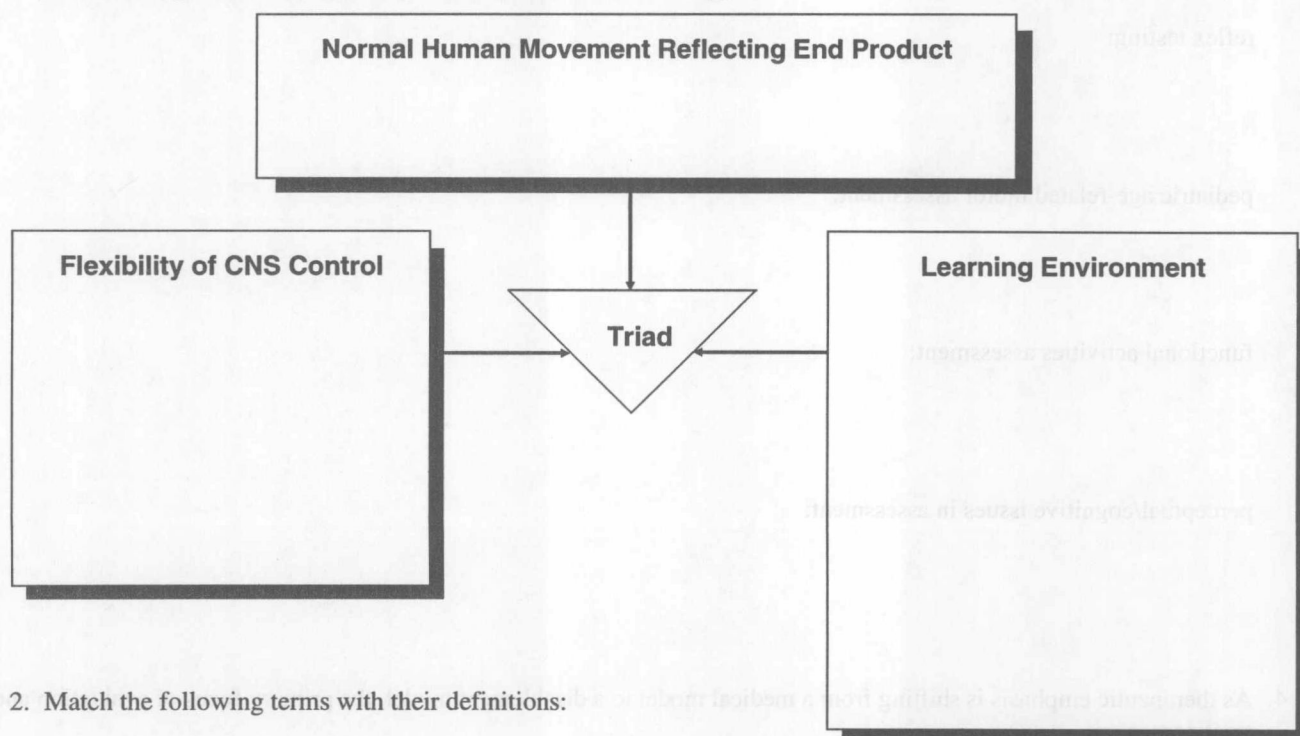
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CHAPTER 1 Introduction and Overview

1. **The Clinical Triad.** As you proceed through the rest of the questions in this chapter, fill in as many points in each of the boxes below as you can, reflecting key aspects of each quality of the clinical triad. Don't feel you have to fill it out all at once. As each question highlights a specific trait of each of the three facets of the clinical triad, add that trait to your model. In this way, you can accomplish the author's goal of developing a gestalt, or image of the client as a total human being, rather than focusing on only one aspect of therapy.



2. Match the following terms with their definitions:

- | | | |
|--------------------------------------|-------|---|
| A. statistical model | _____ | based on successful treatment procedures as identified through observations |
| B. diagnostic model | _____ | evaluates motor performance based on functional activities, which range from simple movement patterns such as rolling to complex patterns such as step aerobics |
| C. visual-analytical problem solving | _____ | emphasizes impairment (systems interactions) and how these systems interactions affect functional outcomes |
| D. philosophical model | _____ | based on number crunching or gross quantitative measurements |
| E. systems approach model | _____ | measures dynamic interactive components, relating whole to part to whole; can be overlaid on any other model, separately or when they are interconnected |
| F. behavior model | _____ | correlates clinical signs and patient history to set expectations of improvement |
| G. disablement model | _____ | looks at a complex array of stimuli, identifies critical attributes, and develops strategies for resolution |



3. Offer strategies for making best use of the following motor/movement evaluation tools:

sensory testing:

motor performance evaluation:

reflex testing:

pediatric age-related motor assessment:

functional activities assessment:

perceptual/cognitive issues in assessment:

4. As therapeutic emphasis is shifting from a medical model to a disablement model, the primary focus of evaluation and treatment is on:
- A. an accurate sequence of motor control as it relates to developmental stages.
 - B. how one activity will automatically lead to another.
 - C. impairment, or systems interactions, and how systems interactions affect functional outcomes.
 - D. appropriate diagnosis and prognosis, providing support for emotional adaptation to prognosis.
5. Which of the following is true?
- A. A patient must gain function over all movement patterns that a child assumed before developing the desired skill.
 - B. The key to successful treatment and therapy is developmental sequencing.
 - C. The motor plans needed to carry out a functional activity depend on establishing a hierarchy of movements that will automatically lead to the desired movement.
 - D. The motor plans needed to carry out a functional activity are specific to that activity.
6. Identify three things that an assessment of the cognitive, affective, or motor systems tells us about a client's learning needs.

7. Establish the order in which the following therapeutic steps should be taken, numbering them from 1 to 6:
 - _____ Determine steps to optimize goal attainment.
 - _____ Analyze desired movement activities in regard to motor control components.
 - _____ Remove external/contrived treatment and allow the client to practice the activity with variations.
 - _____ Identify functional activities the client wishes to achieve.
 - _____ Determine whether success can be attained.
 - _____ Determine which factors assist and which prevent regaining motor control.
8. What five issues must the clinician investigate and understand in order to provide an optimum learning environment for each client?

9. Explain the effects that each of the four distinct components of the learning environment (Fig. 1-6) have on the learning process.

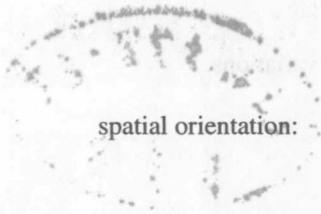
10. Identify six clinically significant learning concepts relevant to clinical performance.

11. When forming the client profile, by coincidence the three systems to be assessed—**cognitive**, **affective**, and **motor**—can each be broken into four specific subcomponents. Match the subcomponents on the right with their larger systems on the left by assigning each the appropriate system initial (C, A, or M):

Cognitive	_____ level of adjustment to disability
Affective	_____ perceptual awareness and development
Motor/sensorimotor	_____ level of motor performance
	_____ degree of cortical override
	_____ sensory input
	_____ level of emotional control
	_____ functional skills
	_____ social adjustment
	_____ abnormal patterns
	_____ attitude
	_____ level of cognition
	_____ preferential higher-order cognitive systems

12. Briefly describe each of the following steps in the visual-analytical problem-solving sequence:

visual recognition:



spatial orientation:

spatial transformation:



Critical Thinking Application

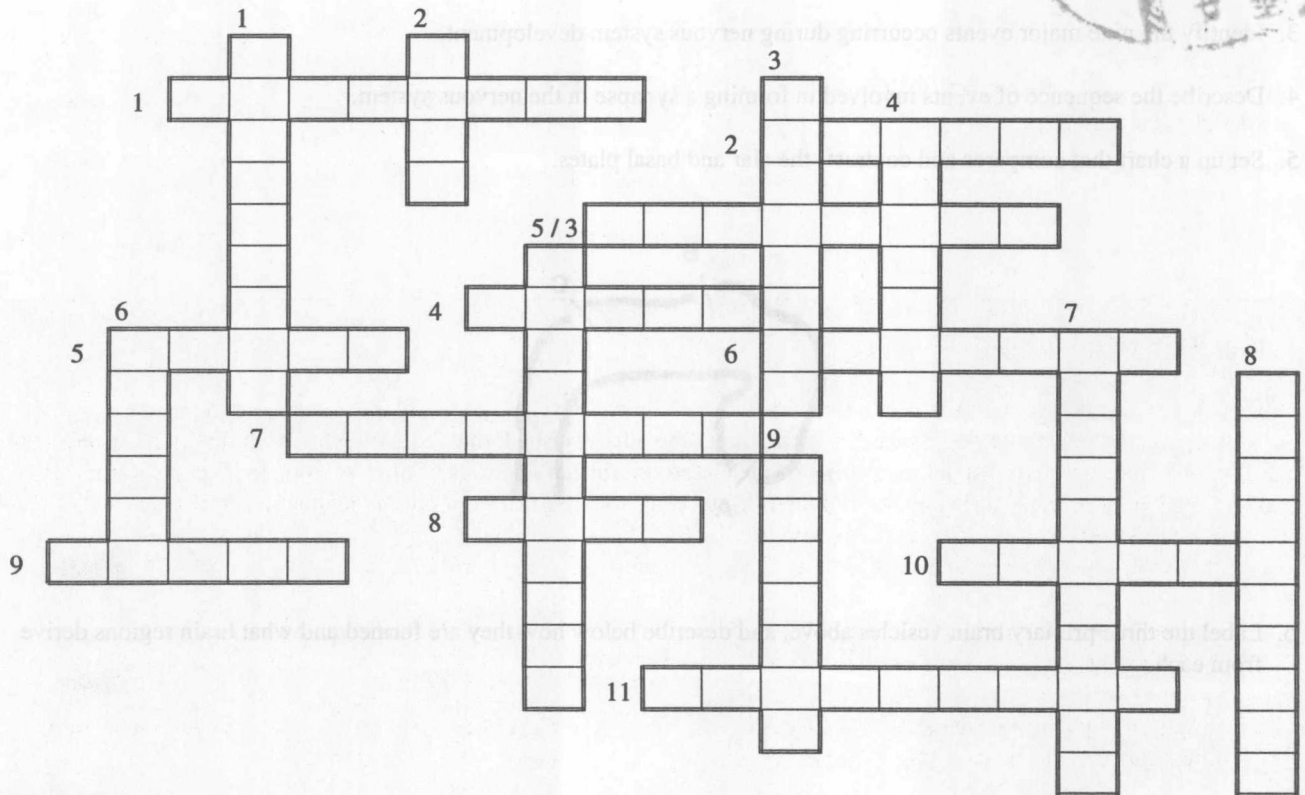
Dr. Allison Smythe, a history professor, comes to your clinic complaining of back pain that is aggravated by walking and standing and that wakes her up at night. She tells you she knows exactly why her problem occurred: "I got it," she says, "from standing in front of the classroom for long periods of time without so much as a stool to sit on. I'm absolutely furious. I've told them for months now to get a stool put in that classroom! I tend to stand for long periods and after about 20 minutes my back begins to ache.

"I don't think you'll ever be able to fix this. Back problems run in my family."

1. Approach Dr. Smythe's problem from three different assessment models; then suggest different evaluation tools you might use. How would they differ in their approach?
2. Suggest ways to link the cognitive, affective, and sensorimotor domains to provide a productive clinical learning environment for you and Dr. Smythe.

CHAPTER 2

Normal Sequential Behavioral and Physiological Changes Throughout the Developmental Arc



ACROSS

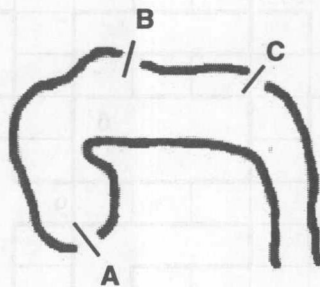
1. In late neurogenesis, the _____ zone of the telencephalon forms layer I of the cerebral cortex.
2. An Apgar subtest measures respiratory _____.
3. Upper layer of the embryonic disk; differentiates into the nervous system, as well as other tissues.
4. Fertilized ovum.
5. Cells thought to arise from germinal cells of the neural tube's ventricular zone.
6. Primitive oral reflex disappearing around 9 months of age.
7. Prenatal physical development proceeds in a _____-to-distal gradient.
8. The number of Golgi type I neurons in the brain seems to be correlated with body _____.
9. Myelin formation is the major source of growth of _____ matter in the CNS.
10. Large _____ type _____ neurons make up the major afferent and efferent pathways.
11. Type of ganglia derived from neural crest.

DOWN

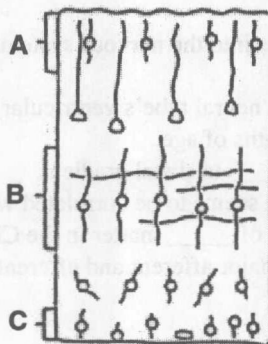
1. Glioblasts give rise to all of the _____.
2. Fingerlike projections emerging from the growth cones are called _____podia.
3. Third or middle layer of the embryonic disk; differentiates into muscles, skeleton, and other tissues.
4. Early fetal response to tactile stimulation.
5. Major brain developmental event occurring chiefly at birth through 10 or more years of age; continues into adulthood.
6. Elongation of axons and dendrites occurs at the _____ cone.
7. Formation of the neural tube from the neural plate.
8. Neuron with many short dendritic processes; the most frequently encountered neuron in the mature brain.
9. Establishment of a chemically mediated functional contact between neurons is referred to as _____genesis.

Answer the following questions on separate paper:

1. Create a mini-table that maps out the three main phases of prenatal development, their key characteristics, and the age ranges they occupy.
2. List the seven main phases of postnatal development and the age ranges they occupy. Browse ahead through future chapters to predict how neurological dysfunction may disrupt aspects of normal development. Save your predictions and compare them with applicable sources later.
3. Identify the nine major events occurring during nervous system development.
4. Describe the sequence of events involved in forming a synapse in the nervous system.
5. Set up a chart that compares and contrasts the alar and basal plates.



6. Label the three primary brain vesicles above, and describe below how they are formed and what brain regions derive from each.



7. Label each of the neural tube zones above, and describe below their development. Include the significance or functions of C.

8. List the major neuronal systems controlling motor movement via the lower motor neuron.

9. Much of fetal movement appears to be _____ movement (i.e., endogenously generated by the nervous system).

10. For each of the following ages, identify at least one key development associated with normal sequential nervous system development:

8 weeks' gestation: _____

10 weeks' gestation: _____

12-14 weeks' gestation: _____

16 weeks' gestation: _____

20 weeks' gestation: _____

29-30 weeks' gestation: _____

8 months' gestation: _____



Critical Thinking Application

As you review the chapter, compare the stages of motor, language, and cognitive development, integrating various sensory systems' development, and pointing out how each of these affect the behavior and learning stages.

CHAPTER 3

Overview of the Structure and Function of the Central Nervous System

1. The function of the nervous system is to _____, _____, and _____.
2. A key function of the CNS is anticipating _____.
3. Match the following units with their functions/capabilities:

A. afferent or sensory neurons	_____ interneurons linking several segments in a rostral or caudal direction
B. efferent or motor neurons	_____ capable of entering one segment and sending collaterals to adjacent segments
C. preganglionic autonomic neurons	_____ basic units of behavior
D. commissural fibers	_____ provide discriminative data about the environment
E. afferent fibers	_____ generally carry sensory information
F. projection fibers	_____ innervate postganglionic autonomic neurons
G. ascending pathways	_____ generally involved in coordinating efferent activity
H. descending pathways	_____ conduct impulses from the peripheral system to the CNS
I. exteroception	_____ axons that link right and left halves of the CNS
J. motor units	_____ innervate glands and muscles
4. Analyze the difference between postural- and movement-oriented patterns and their interrelationships. Speculate on how a dysfunction in one might affect the other.
5. Briefly describe briefly the purpose of the reticular activating system.
6. How does feedback alter or modify feed-forward movement through CNS synthesis of that information? Predict what might happen if CNS synthesis is impaired. Save your answer to compare with discoveries you make later in this text.


7. Identify signs and symptoms associated with peripheral nerve lesions and lesions involving the central component of the afferent or efferent limb.
8. Because the autonomic and somatic sensorimotor systems function together, any somatic sensorimotor act has an accompanying _____.
9. Name the three high-threshold nociceptors that take in stimuli from the external environment, and describe how external information is relayed from them.
10. Describe possible inappropriate responses and adaptive responses that might be seen in response to a disturbance in the CNS.
11. Identify and describe the functions of each of the three sensory systems that provide information about body posture.
12. Use Figures 3-6 through 3-8 to describe three ways a descending interneuron can influence a motor neuron.
13. It is the sum of all synaptic events, both _____ and _____, that determines whether the next neuron will fire.
14. All responses are produced ultimately through _____, and it most often involves these neurons and _____ muscles.
15. Explain Sherrington's concept of reciprocal innervation.
16. Match the following components of the movement model with their contributions. Components are used more than once.

A. spinal cord and brain stem	_____	receives data regarding the motor program generator's intentions
B. motor cortex	_____	monitors the program to ensure that movement is in accord with the motor program generator's intentions
C. cerebellar hemispheres	_____	facilitate progravity muscles at the segmental level
	_____	homeostasis
	_____	coordinate and time movements

- _____ regulates force and speed
- _____ “whole organism” protective responses
- _____ inhibit brain stem level centers that facilitate antigravity muscles
- _____ receive information about ongoing segmental activity

17. Briefly describe the most common signs and adaptive responses seen with loss of function to systems involved in producing motor programs.

18. Suggest the first strategy a therapist should take if the interneurons are the source of *negative* signs and the first strategy a therapist should take if the interneurons are the source of *abnormal* or *adaptive* signs.

 19. Briefly describe hemispheric specialization, pointing out the differences between right and left processes.



Critical Thinking Application

Explain the interrelationship of homeostasis, posture, goal-oriented movement, and higher cortical processing. Why can't we address these as four separate units when evaluating patients' needs? Reflecting on this interrelatedness, how do you suggest that the therapist facilitate the nervous system's adaptation to adjusted sets of external and internal parameters?