9: Memory

CHAPTER OVERVIEW

Chapter 9 explores human memory as a system that processes information in three steps. Encoding refers to the process of putting information into the memory system. Storage is the purely passive mechanism by which information is maintained in memory. Retrieval is the process by which information is accessed from memory through recall or recognition.

Chapter 9 also discusses the important role of meaning, imagery, and organization in encoding new memories, how memory is represented physically in the brain, and how forgetting may result from failure to encode or store information or to find appropriate retrieval cues. The final section of the chapter discusses the issue of memory construction. How "true" are our memories of events? A particularly controversial issue in this area involves suspicious claims of long-repressed memories of sexual abuse and other traumas that are "recovered" with the aid of hypnosis and other techniques. As you study this chapter, try applying some of the memory and studying tips discussed in the text.

NOTE: Answer guidelines for all Chapter 9 questions begin on page 248.

CHAPTER REVIEW

First, skim this section, noting headings and boldface items. After you have read the section, review each objective by completing the sentences and answering the questions that follow it. As you proceed, evaluate your performance by consulting the answers beginning on page 248. Do not continue with the next section until you understand each answer. If you need to, review or reread the section in the textbook before continuing.

The Phenomenon of Memory (pp. 349–353)

> David Myers at times uses idioms that are unfamiliar to some readers. If you do not know the meaning of any of the following words, phrases, or expressions in the context in which they appear in the text, refer to pages 256–257 for an explanation: . . . *mind's storehouse, the reservoir; the roots and fruits; medal winners in a memory Olympics; memory feats; shine the flashlight beam of our attention on.*

Objective 1: Define *memory,* and explain how flashbulb memories differ from other memories.

1. Learning that persists over time indicates the existence of _____ for that learning.
2. Memories for surprising, significant moments that are especially clear are called _____ memories. Like other memories, these memories _____ (can/cannot) err.

Objective 2: Describe Atkinson-Shiffrin's classic three-stage processing model of memory, and explain how the contemporary model of working memory differs.

3. Both human memory and computer memory can be viewed as _____-_____ systems that perform three tasks: _____, _____, and _____.

4. The classic model of memory has been Atkinson and Shiffrin's _____-_____ _____ model. According to this model, we first record information as a fleeting _____ _____, from which it is processed into _____-_____ memory, where the information is _____ through rehearsal into _____-_____ memory for later retrieval.
5. The phenomenon of short-term memory has been clarified by the concept of _____ memory, which focuses more on the processing of briefly stored information. This form of memory has both _____ and _____-_____ subsystems, which are coordinated by a _____ _____ processor that, with the help of the _____ buffer, allows us to process images and words _____.
6. Brain scans show that the _____ _____ are active during complex thinking, whereas areas in the _____ and _____ _____ are active when auditory and visual information is in working memory.

Encoding: Getting Information In

(pp. 353–361)

If you do not know the meaning of any of the following words, phrases, or expressions in the context in which they appear in the text, refer to pages 256–257 for an explanation: *boost; nonsense syllables; a raw script . . . finished stage production; mental snapshots; "talk until you are blue in the face"; "peg-word"; Motionless while learning the numbers.*

Objective 3: Describe the types of information we encode automatically.

1. Encoding that does not require conscious attention or effort is called _____ _____. Some processing requires effort at first but with _____ and _____ it becomes effortless. Give examples of material that is typically encoded with little or no effort.

Objective 4: Contrast effortful processing with automatic processing, and discuss the next-in-line effect, the spacing effect, and the serial position effect.

2. Encoding that requires attention and effort is called _____ _____.
3. With novel information, conscious repetition, or _____, boosts memory.
4. A pioneering researcher in verbal memory was _____. In one experiment, he found that the longer he studied a list of nonsense syllables, the _____ (fewer/greater) the number of repetitions he required to relearn it later.
5. After material has been learned, additional repetition, or _____, usually will increase retention.
6. When people go around a circle reading words, their poorest memories are for the _____ (least/most) recent information heard. This phenomenon is called the _____-_____-_____ effect.
7. Memory studies also reveal that distributed rehearsal is more effective for retention; this is called the _____ _____.
8. The tendency to remember the first and last items in a list best is called the _____ _____ _____. Following a delay, first items are remembered _____ (better/less well) than last items.

Objective 5: Compare the benefits of visual, acoustic, and semantic encoding in remembering verbal information, and describe a memory-enhancing strategy related to the self-reference effect.

9. Encoding the meaning of words is referred to as _____ encoding; encoding by

sound is called _____ encoding; encoding the image of words is _____ encoding.

10. Craik and Tulving's study comparing visual, acoustic, and semantic encoding showed that memory was best with _____ encoding.
11. Our excellent recall of information that relates to ourselves is called the _____ _____ effect.

Objective 6: Explain how encoding imagery aids effortful processing, and describe some memory-enhancing strategies that use visual encoding.

12. Memory that consists of mental pictures is based on the use of _____. Because they tend to be highly memorable, they aid _____ _____.
13. Concrete, high-imagery words tend to be remembered _____ (better/less well) than abstract, low-imagery words.
14. Memory for concrete nouns is facilitated when we encode them _____ and _____.
15. Our tendency to recall the high points of pleasurable events such as family vacations illustrates the phenomenon of _____ _____.
16. Memory aids are known as _____ devices. One such device involves forming associations between a familiar series of locations and to-be-remembered words; this technique is called the "_____ _____ _____."
17. Using a jingle, such as the one that begins "one is a bun," is an example of the "_____-_____" system.

Objective 7: Discuss the use of chunking and hierarchies in effortful processing.

18. Memory may be aided by grouping information into meaningful units called _____. An example of this technique involves forming words from the first letters of to-be-remembered words; the resulting word is called an _____.
19. In addition, material may be processed into _____, which are composed of a few broad concepts divided into lesser concepts, categories, and facts.

Storage: Retaining Information (pp. 361–370)

If you do not know the meaning of any of the following words, phrases, or expressions in the context in which they appear in the text, refer to pages 257–258 for an explanation: *lightning flashes; Sherlock Holmes; champion memorist; with tongue only partly in cheek; Arousal can sear certain events into the brain; mirror-image writing . . . jigsaw puzzle; London cabbie; Savoring.*

Objective 8: Contrast two types of sensory memory.

1. Stimuli from the environment are first recorded in _____ memory.
2. George Sperling found that when people were briefly shown three rows of letters, they could recall _____ (virtually all/about half) of them. When Sperling sounded a tone immediately after a row of letters was flashed to indicate which letters were to be recalled, the subjects were much _____ (more/less) accurate. This suggests that people have a brief photographic, or _____, memory lasting about a few tenths of a second.
3. Sensory memory for sounds is called _____ memory. This memory fades _____ (more/less) rapidly than photographic memory, lasting for as long as _____.

Objective 9: Describe the duration and working capacity of short-term memory.

4. Peterson and Peterson found that when _____ was prevented by asking subjects to count backward, memory for letters was gone after 12 seconds. Without _____ processing, short-term memories have a limited life.
5. Our short-term memory capacity is about _____ chunks of information. This capacity was discovered by _____ .
6. Short-term memory for random _____ (digits/letters) is slightly better than for random _____ (digits/letters), and memory for information we hear is somewhat _____ (better/worse) than that for information we see.
7. Both children and adults have short-term recall for roughly as many words as they can speak in _____ (how many?) seconds.

Objective 10: Describe the capacity and duration of long-term memory.

8. In contrast to short-term memory—and contrary to popular belief—the capacity of permanent memory is essentially _____ .
9. Penfield's electrically stimulated patients _____ (do/do not) provide reliable evidence that our stored memories are precise and durable.
10. Psychologist _____ attempted to locate memory by cutting out pieces of rats' _____ after they had learned a maze. He found that no matter where he cut, the rats _____ (remembered/forgot) the maze.
11. It is likely that forgetting occurs because new experiences _____ with our retrieval of old information, and the physical memory trace _____ with the passage of time.

Objective 11: Discuss the synaptic changes that accompany memory formation and storage.

12. Researchers believe that memory involves a strengthening of certain neural connections, which occurs at the _____ between neurons.
13. Kandel and Schwartz have found that when learning occurs in the sea snail *Aplysia*, the neurotransmitter _____ is released in greater amounts, making synapses more efficient.
14. After learning has occurred, a sending neuron needs _____ (more/less) prompting to fire, and the number of _____ _____ it stimulates may increase. This phenomenon, called _____-_____ _____ , may be the neural basis for learning and memory. Blocking this process with a specific _____ , or by genetic engineering that causes the absence of an _____ , interferes with learning. Rats given a drug that enhances _____ will learn a maze _____ (faster/more slowly).
15. Drugs that boost production of the protein _____ , or the neurotransmitter _____ , may enhance memory.
16. After LTP has occurred, an electric current passed through the brain _____ (will/will not) disrupt old memories and _____ (will/will not) wipe out recent experiences.

Objective 12: Discuss some ways stress hormones can affect memory.

17. Hormones released when we are excited or under stress often _____ (facilitate/impair) learning and memory.
18. Two emotion-processing clusters, the _____ , in the brain's _____ system increase activity in the brain's memory-forming areas.

19. Drugs that block the effects of stress hormones _____ (facilitate/disrupt) memories of emotional events. Stress that is prolonged, however, may cause an area of the brain (the _____) that is vital for laying down memories to _____ .

Objective 13: Distinguish between implicit and explicit memory, and identify the main brain structure associated with each.

20. The loss of memory is called _____ . Studies of people who have lost their memory suggest that there _____ (is/is not) a single unified system of memory.
21. Although amnesia victims typically _____ (have/have not) lost their capacity for learning, which is called _____ memory, they _____ (are/are not) able to declare their memory, suggesting a deficit in their _____ memory systems.
22. Amnesia patients typically have suffered damage to the _____ of their limbic system. This brain structure is important in the processing and storage of _____ memories. Damage on the left side of this structure impairs _____ memory; damage on the right side impairs memory for _____ designs and locations. The rear part of this structure processes _____ memory.
23. The hippocampus seems to function as a zone where the brain _____ (temporarily/permanently) stores the elements of a memory. However, memories _____ (do/do not) migrate for storage elsewhere. The hippocampus is active during _____-_____ sleep, as memories are processed for later retrieval. Recalling past experiences activates various parts of the _____ and _____ lobes.
24. The cerebellum is important in the processing of _____ memories. Humans and laboratory animals with a damaged cerebellum are incapable of simple _____-_____ conditioning. Those with damage to the _____ are incapable of _____ conditioning, indicating that this brain region is important in the formation of _____ memories.
25. The dual explicit-implicit memory system helps explain _____ amnesia. We do not have explicit memories of our first three years because the _____ is one of the last brain structures to mature.

Retrieval: Getting Information Out (pp. 370–375)

If you do not know the meaning of any of the following words, phrases, or expressions in the context in which they appear in the text, refer to page 258 for an explanation: *buoyant mood . . . rose-colored glasses; morph from devils into angels.*

Objective 14: Contrast the recall, recognition, and relearning measures of memory.

1. The ability to retrieve information not in conscious awareness is called _____ .
2. Bahrick found that 25 years after graduation, people were not able to _____ (recall/recognize) the names of their classmates but were able to _____ (recall/recognize) 90 percent of their names and their yearbook pictures.
3. If you have learned something and then forgotten it, you will probably be able to _____ it _____ (more/less) quickly than you did originally.

Objective 15: Explain how retrieval cues help us access stored memories, and describe the process of priming.

4. The process by which associations can lead to retrieval is called _____ .

5. The best retrieval cues come from the associations formed at the time we _____ a memory.

Objective 16: Cite some ways that context can affect retrieval.

6. Studies have shown that retention is best when learning and testing are done in _____ (the same/different) contexts.

Summarize the text explanation of the déjà vu experience.

Objective 17: Describe the effects of internal states on retrieval.

7. The type of memory in which emotions serve as retrieval cues is referred to as _____-_____ memory.
8. Our tendency to recall experiences that are consistent with our current emotional state is called _____-_____ memory.

Describe the effects of mood on memory.

9. People who are currently depressed may recall their parents as _____.

People who have recovered from depression typically recall their parents about the same as do people who _____ _____. Moods also influence how we _____ other people's behavior.

Forgetting (pp. 375–381)

If you do not know the meaning of any of the following words, phrases, or expressions in the context in which they appear in the text, refer to pages 258–259 for an explanation: *applause for memory; may lie poised on the tip of the tongue; mental attic; sheepishly; The words relit a blown-out candle in the mind.*

Objective 18: Explain why we should value our ability to forget, and distinguish three general ways our memory fails us.

1. Without the ability to _____, we would constantly be overwhelmed by information.
2. Memory researcher Daniel Schacter has identified the seven sins of memory, divided into three categories that identify the ways in which our memory can fail: the three sins of _____, the three sins of _____, and the one sin of _____.

Objective 19: Discuss the role of encoding failure in forgetting.

3. The first type of forgetting is caused by _____ failure.
4. This type of forgetting occurs because some of the information that we sense never actually _____.
5. One reason for age-related memory decline is that the brain areas responsible for _____ new information are _____ (more/less) responsive in older adults.

Objective 20: Discuss the concept of storage decay, and describe Ebbinghaus' forgetting curve.

6. Studies by Ebbinghaus and by Bahrick indicate that most forgetting occurs _____ (soon/a long time) after the material is learned.
7. This type of forgetting is known as _____ _____, which may be caused by a gradual fading of the physical _____ _____.
8. When information that is stored in memory temporarily cannot be found, _____ failure has occurred.

Objective 21: Contrast proactive and retroactive interference, and explain how they can cause retrieval failure.

9. Research suggests that memories are also lost as a result of _____, which is especially possible if we simultaneously learn similar, new material.
10. The disruptive effect of previous learning on current learning is called _____ _____. The disruptive effect of learning new material on efforts to recall material previously learned is called _____ _____.
11. Jenkins and Dallenbach found that if subjects went to sleep after learning, their memory for a list of nonsense syllables was _____ (better/worse) than it was if they stayed awake.
12. In some cases, old information facilitates our learning of new information. This is called _____ _____.

Objective 22: Summarize Freud's concept of repression, and state whether this view is reflected in current memory research.

13. Freud proposed that motivated forgetting, or _____, may protect a person from painful memories.
14. Increasing numbers of memory researchers think that motivated forgetting is _____ (less/more) common than Freud believed.
15. Emotions and their associated _____ hormones generally _____ memories.

Memory Construction (pp. 382–390)

If you do not know the meaning of any of the following words, phrases, or expressions in the context in which they appear in the text, refer to page 259 for an explanation: *reconstruction as well as reproduction; "hypnotically refreshed"; sincerely wrong.*

Objective 23: Explain how misinformation and imagination can distort our memory of an event.

1. Research has shown that recall of an event is often influenced by past experiences and present assumptions. The workings of these influences illustrate the process of memory _____.
2. When witnesses to an event receive misleading information about it, they may experience a _____ _____ and misremember the event. A number of experiments have demonstrated that false memories _____ (can/cannot) be created when people are induced to imagine nonexistent events; that is, these people later experience "_____ _____." People who believe they have recovered memories of alien abduction and child sex abuse tend to have _____ _____.

Describe what Loftus' studies have shown about the effects of misleading postevent information on eyewitness reports.

Objective 24: Describe source amnesia's contribution to false memories.

3. At the heart of many false memories is _____ _____, which occurs when we _____ an event to the wrong source.

Objective 25: List some differences and similarities between true and false memories.

4. Researchers compare memories to _____, noting that people's initial _____ of events influence their memories.
5. The persistence of a memory _____ (does/does not) reveal whether or not it derives from an actual experience. Whereas real memories have more _____, gist memories are more _____.
6. Eyewitnesses' confidence in their memories _____ (is/is not) related to the accuracy of those memories.
7. Memory construction explains why memories "refreshed" under _____ are often inaccurate.

Objective 26: Give arguments supporting and rejecting the position that very young children's reports are reliable.

8. Research studies of children's eyewitness recall reveal that preschoolers _____ (are/are not) more suggestible than older children or adults. For this reason, whether a child produces an accurate eyewitness memory depends heavily on how he or she is _____.
9. Children are most accurate when it is a first interview with a _____ person who asks _____ questions.

Objective 27: Discuss the controversy over reports of repressed and recovered memories of childhood sexual abuse.

10. Researchers increasingly agree that memories obtained under the influence of hypnosis or drugs _____ (are/are not) reliable.
11. Memories of events that happened before age _____ are unreliable. This phenomenon is called _____ _____.
12. Memory construction makes it clear that memory is best understood not only as a _____ and biological event, but also as a _____-_____ phenomenon.

Improving Memory (pp. 391–392)

> If you do not know the meaning of the following word in the context in which it appears in the text, refer to page 259 for an explanation: *Sprinkled.*

Objective 28: Explain how an understanding of memory can contribute to effective study techniques.

1. The SQ3R study technique identifies five strategies for boosting memory: _____, _____, _____, _____, and _____.

Discuss several specific strategies for improving memory.

PROGRESS TEST 1

Multiple-Choice Questions

Circle your answers to the following questions and check them with the answers beginning on page 250. If your answer is incorrect, read the explanation for why it is incorrect and then consult the appropriate pages of the text (in parentheses following the correct answer).

1. The three steps in memory information processing are:
   a. input, processing, output.
   b. input, storage, output.
   c. input, storage, retrieval.
   d. encoding, storage, retrieval.

2. Visual sensory memory is referred to as:
   a. iconic memory.
   b. echoic memory.
   c. photomemory.
   d. semantic memory.

3. Echoic memories fade after approximately:
   a. 1 hour.
   b. 1 minute.
   c. 1 second.
   d. 3 to 4 seconds.

4. Which of the following is *not* a measure of retention?
   a. recall
   b. recognition
   c. relearning
   d. retrieval

5. Our short-term memory span is approximately _____ items.
   a. 2
   b. 5
   c. 7
   d. 10

6. Memory techniques such as the method of loci, acronyms, and the peg-word system are called:
   a. consolidation devices.
   b. imagery techniques.
   c. encoding strategies.
   d. mnemonic devices.

7. One way to increase the amount of information in memory is to group it into larger, familiar units. This process is referred to as:
   a. consolidating.
   b. organization.
   c. encoding.
   d. chunking.

8. Kandel and Schwartz have found that when learning occurs, more of the neurotransmitter _____ is released into synapses.
   a. ACh
   b. dopamine
   c. serotonin
   d. noradrenaline

9. Research on memory construction reveals that memories:
   a. are stored as exact copies of experience.
   b. reflect a person's biases and assumptions.
   c. may be chemically transferred from one organism to another.
   d. even if long term, usually decay within about five years.

10. In a study on context cues, people learned words while on land or when they were underwater. In a later test of recall, those with the best retention had:
    a. learned the words on land, that is, in the more familiar context.
    b. learned the words underwater, that is, in the more exotic context.
    c. learned the words and been tested on them in different contexts.
    d. learned the words and been tested on them in the same context.

11. The spacing effect means that:
    a. distributed study yields better retention than cramming.
    b. retention is improved when encoding and retrieval are separated by no more than 1 hour.
    c. learning causes a reduction in the size of the synaptic gap between certain neurons.
    d. delaying retrieval until memory has consolidated improves recall.

12. Studies demonstrate that learning causes permanent neural changes in the _____ of animals' neurons.
    a. myelin
    b. cell bodies
    c. synapses
    d. all the above

13. In Sperling's memory experiment, research participants were shown three rows of three letters, followed immediately by a low, medium, or high tone. The participants were able to report:
    a. all three rows with perfect accuracy.
    b. only the top row of letters.
    c. only the middle row of letters.
    d. any one of the three rows of letters.

14. Studies of amnesia victims suggest that:
    a. memory is a single, unified system.
    b. there are two distinct types of memory.
    c. there are three distinct types of memory.
    d. memory losses following brain trauma are unpredictable.

15. Memory for skills is called:
    a. explicit memory.
    b. declarative memory.
    c. prime memory.
    d. implicit memory.

16. The eerie feeling of having been somewhere before is an example of:
    a. state dependency.
    b. encoding failure.
    c. priming.
    d. déjà vu.

17. When Gordon Bower presented words grouped by category or in random order, recall was:
    a. the same for all words.
    b. better for the categorized words.
    c. better for the random words.
    d. improved when participants developed their own mnemonic devices.

18. The three-stage processing model of memory was proposed by:
    a. Atkinson and Shiffrin.
    b. Herman Ebbinghaus.
    c. Loftus and Palmer.
    d. George Sperling.

19. Hypnotically "refreshed" memories may prove inaccurate—especially if the hypnotist asks leading questions—because of:
    a. encoding failure.
    b. state-dependent memory.
    c. proactive interference.
    d. memory construction.

20. Which area of the brain is most important in the processing of implicit memories?
    a. hippocampus
    b. cerebellum
    c. hypothalamus
    d. amygdala

21. Which of the following terms does *not* belong with the others?
    a. misattribution
    b. blocking
    c. suggestibility
    d. bias

Matching Items

Match each definition or description with the appropriate term.

Definitions or Descriptions

_____ 1. sensory memory that decays more slowly than visual sensory memory
_____ 2. the process by which information gets into the memory system
_____ 3. mental pictures that aid memory
_____ 4. the blocking of painful memories
_____ 5. the phenomenon in which one's mood can influence retrieval
_____ 6. memory for a list of words is affected by word order
_____ 7. "one is a bun, two is a shoe" mnemonic device
_____ 8. matching each of a series of locations with a visual representation of to-be-remembered items
_____ 9. new learning interferes with previous knowledge
_____ 10. a measure of memory
_____ 11. old knowledge interferes with new learning
_____ 12. misattributing the origin of an event
_____ 13. the fading of unused information over time
_____ 14. the lingering effects of misinformation
_____ 15. a memory sin of intrusion

Terms

a. repression
b. relearning
c. serial position effect
d. persistence
e. peg-word system
f. method of loci
g. proactive interference
h. transience
i. retroactive interference
j. source amnesia
k. suggestibility
l. imagery
m. mood-congruent memory
n. echoic memory
o. encoding

PROGRESS TEST 2

Progress Test 2 should be completed during a final chapter review. Answer the following questions after you thoroughly understand the correct answers for the section reviews and Progress Test 1.

Multiple-Choice Questions

1. Which of the following best describes the typical forgetting curve?
   a. a steady, slow decline in retention over time
   b. a steady, rapid decline in retention over time
   c. a rapid initial decline in retention becoming stable thereafter
   d. a slow initial decline in retention becoming rapid thereafter

2. Jenkins and Dallenbach found that memory was better in subjects who were:
   a. awake during the retention interval, presumably because decay was reduced.
   b. asleep during the retention interval, presumably because decay was reduced.
   c. awake during the retention interval, presumably because interference was reduced.
   d. asleep during the retention interval, presumably because interference was reduced.

3. Which of the following measures of retention is the least sensitive in triggering retrieval?
   a. recall
   b. recognition
   c. relearning
   d. They are equally sensitive.

4. Amnesia victims typically have experienced damage to the _____of the brain.
   a. frontal lobes
   b. cerebellum
   c. thalamus
   d. hippocampus

5. According to the serial position effect, when recalling a list of words you should have the greatest difficulty with those:
   a. at the beginning of the list.
   b. at the end of the list.
   c. at the end and in the middle of the list.
   d. in the middle of the list.

6. Experimenters gave people a list of words to be recalled. When the participants were tested after a delay, the items that were best recalled were those:
   a. at the beginning of the list.
   b. in the middle of the list.
   c. at the end of the list.
   d. at the beginning and the end of the list.

7. Craik and Tulving had research participants process words visually, acoustically, or semantically. In a subsequent recall test, which type of processing resulted in the greatest retention?
   a. visual
   b. acoustic
   c. semantic
   d. Acoustic and semantic processing were equally beneficial.

8. Lashley's studies, in which rats learned a maze and then had various parts of their brains surgically removed, showed that the memory:
   a. was lost when surgery took place within 1 hour of learning.
   b. was lost when surgery took place within 24 hours of learning.
   c. was lost when any region of the brain was removed.
   d. remained no matter which area of the brain was tampered with.

9. The disruption of memory that occurs when football players have been knocked out provides evidence for the importance of:
   a. consolidation in the formation of new memories.
   b. consolidation in the retrieval of long-term memories.
   c. nutrition in normal neural functioning.
   d. all of the above.

10. *Long-term potentiation* refers to:
    a. the disruptive influence of old memories on the formation of new memories.
    b. the disruptive influence of recent memories on the retrieval of old memories.
    c. our tendency to recall experiences that are consistent with our current mood.
    d. the increased efficiency of synaptic transmission between certain neurons following learning.

11. Repression is an example of:
    a. encoding failure.
    b. memory decay.
    c. motivated forgetting.
    d. all of the above.

12. Studies by Loftus and Palmer, in which people were quizzed about a film of an accident, indicate that:
    a. when quizzed immediately, people can recall very little, due to the stress of witnessing an accident.
    b. when questioned as little as one day later, their memory was very inaccurate.
    c. most people had very accurate memories as much as 6 months later.
    d. people's recall may easily be affected by misleading information.

13. Which of the following was *not* recommended as a strategy for improving memory?
    a. active rehearsal
    b. distributed study
    c. speed reading
    d. encoding meaningful associations

14. The process of getting information out of memory storage is called:
    a. encoding.
    b. retrieval.
    c. rehearsal.
    d. storage.

15. Amnesia patients typically experience disruption of:
    a. implicit memories.
    b. explicit memories.
    c. iconic memories.
    d. echoic memories.

16. Information is maintained in short-term memory only briefly unless it is:
    a. encoded.
    b. rehearsed.
    c. iconic or echoic.
    d. retrieved.

17. Textbook chapters are often organized into _____ in order to facilitate information processing.
    a. mnemonic devices
    b. chunks
    c. hierarchies
    d. recognizable units

18. Memory researchers are suspicious of long-repressed memories of traumatic events that are "recovered" with the aid of drugs or hypnosis because:
    a. such experiences usually are vividly remembered.
    b. such memories are unreliable and easily influenced by misinformation.
    c. memories of events happening before about age 3 are especially unreliable.
    d. of all of the above reasons.

19. It is easier to recall information that has just been presented when the information:
    a. consists of random letters rather than words.
    b. is seen rather than heard.
    c. is heard rather than seen.
    d. is experienced in an unusual context.

20. The misinformation effect provides evidence that memory:
    a. is constructed during encoding.
    b. is unchanging once established.
    c. may be reconstructed during recall according to how questions are framed.
    d. is highly resistant to misleading information.

21. According to memory researcher Daniel Schacter, blocking occurs when:
    a. our inattention to details produces encoding failure.
    b. we confuse the source of information.
    c. our beliefs influence our recollections.
    d. information is on the tip of our tongue, but we can't get it out.

True–False Items

Indicate whether each statement is true or false by placing *T* or *F* in the blank next to the item.

_____ 1. Studying that is distributed over time produces better retention than cramming.

_____ 2. Generally speaking, memory for pictures is better than memory for words.

_____ 3. Recall of childhood abuse through hypnosis indicates that memory is permanent, due to the reliability of such reports.

_____ 4. Most people do not have memories of events that occurred before the age of 3.

_____ 5. Studies by Ebbinghaus show that most forgetting takes place soon after learning.

_____ 6. The persistence of a memory is a good clue as to whether or not it derives from an actual experience.

_____ 7. Recall of newly acquired knowledge is no better after sleeping than after being awake for the same period of time.

_____ 8. Time spent in developing imagery, chunking, and associating material with what you already know is more effective than time spent repeating information again and again.

_____ 9. Although repression has not been confirmed experimentally, most psychologists believe it happens.

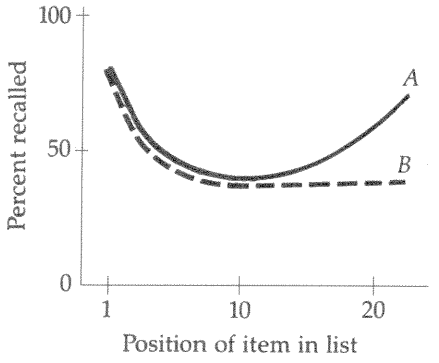
_____ 10. Overlearning material by continuing to restudy it beyond mastery often disrupts recall.

PSYCHOLOGY APPLIED

Answer these questions the day before an exam as a final check on your understanding of the chapter's terms and concepts.

Multiple-Choice Questions

1. Complete this analogy: Fill-in-the-blank test questions are to multiple-choice questions as:
   a. encoding is to storage.
   b. storage is to encoding.
   c. recognition is to recall.
   d. recall is to recognition.



2. The above figure depicts the recall of a list of words under two conditions. Which of the following best describes the difference between the conditions?
   a. In *A*, the words were studied and retrieved in the same context; in *B*, the contexts were different.
   b. In *B*, the words were studied and retrieved in the same context; in *A*, the contexts were different.
   c. The delay between presentation of the last word and the test of recall was longer for *A* than for *B*.
   d. The delay between presentation of the last word and the test of recall was longer for *B* than for *A*.

3. Darren was asked to memorize a list of letters that included *v*, *q*, *y*, and *j*. He later recalled these letters as *e*, *u*, *i*, and *k*, suggesting that the original letters had been encoded:
   a. automatically.
   b. visually.
   c. semantically.
   d. acoustically.

4. After finding her old combination lock, Janice can't remember its combination because she keeps confusing it with the combination of her new lock. She is experiencing:
   a. proactive interference.
   b. retroactive interference.
   c. encoding failure.
   d. storage failure.

5. Which of the following sequences would be best to follow if you wanted to minimize interference-induced forgetting in order to improve your recall on the psychology midterm?
   a. study, eat, test
   b. study, sleep, test
   c. study, listen to music, test
   d. study, exercise, test

6. Being in a bad mood after a hard day of work, Susan could think of nothing positive in her life. This is best explained as an example of:
   a. priming.
   b. memory construction.
   c. mood-congruent memory.
   d. retrieval failure.

7. In an effort to remember the name of the classmate who sat behind her in fifth grade, Martina mentally recited the names of other classmates who sat near her. Martina's effort to refresh her memory by activating related associations is an example of:
   a. priming.
   b. déjà vu.
   c. encoding.
   d. relearning.

8. Walking through the halls of his high school 10 years after graduation, Tom experienced a flood of old memories. Tom's experience showed the role of:
   a. state-dependent memory.
   b. context effects.
   c. retroactive interference.
   d. echoic memory.

9. The first thing Karen did when she discovered that she had misplaced her keys was to re-create in her mind the day's events. That she had little difficulty in doing so illustrates:
   a. automatic processing.
   b. effortful processing.
   c. state-dependent memory.
   d. priming.

10. Which of the following is the best example of a flashbulb memory?
   a. suddenly remembering to buy bread while standing in the checkout line at the grocery store
   b. recalling the name of someone from high school while looking at his or her yearbook snapshot
   c. remembering to make an important phone call
   d. remembering what you were doing on September 11, 2001, when terrorists crashed planes into the World Trade Center towers.

11. When Carlos was promoted, he moved into a new office with a new phone extension. Every time he is asked for his phone number, Carlos first thinks of his old extension, illustrating the effects of:
   a. proactive interference.
   b. retroactive interference.
   c. encoding failure.
   d. storage failure.

12. Elderly Mr. Flanagan, a retired electrician, can easily remember how to wire a light switch, but he cannot remember the name of the president of the United States. Evidently, Mr. Flanagan's _____ memory is better than his _____ memory.
   a. implicit; explicit
   b. explicit; implicit
   c. declarative; procedural
   d. explicit; declarative

13. Although you can't recall the answer to a question on your psychology midterm, you have a clear mental image of the textbook page on which it appears. Evidently, your _____ encoding of the answer was _____ .
   a. semantic; automatic
   b. visual; automatic
   c. semantic; effortful
   d. visual; effortful

14. At your high school reunion you cannot remember the last name of your homeroom teacher. Your failure to remember is most likely the result of:
   a. encoding failure.
   b. storage failure.
   c. retrieval failure.
   d. state-dependent memory.

15. Brenda has trouble remembering her new five-digit ZIP plus four-digit address code. What is the most likely explanation for the difficulty Brenda is having?
   a. Nine digits are at or above the upper limit of most people's short-term memory capacity.
   b. Nine digits are at or above the upper limit of most people's iconic memory capacity.
   c. The extra four digits cannot be organized into easily remembered chunks.
   d. Brenda evidently has an impaired implicit memory.

16. Lewis cannot remember the details of the torture he experienced as a prisoner of war. According to Freud, Lewis's failure to remember these painful memories is an example of:
   a. repression.
   b. retrieval failure.
   c. state-dependent memory.
   d. flashbulb memory.

17. Which of the following illustrates the constructive nature of memory?
   a. Janice keeps calling her new boyfriend by her old boyfriend's name.
   b. After studying all afternoon and then getting drunk in the evening, Don can't remember the material he studied.
   c. After getting some good news, elated Kareem has a flood of good memories from his younger years.
   d. Although elderly Mrs. Harvey, who has Alzheimer's disease, has many gaps in her memory, she invents sensible accounts of her activities so that her family will not worry.

18. To help him remember the order of ingredients in difficult recipes, master chef Giulio often associates them with the route he walks to work each day. Giulio is using which mnemonic technique?
   a. peg-word system
   b. acronyms
   c. the method of loci
   d. chunking

19. During basketball practice Jan's head was painfully elbowed. If the trauma to her brain disrupts her memory, we would expect that Jan would be most likely to forget:
    a. the name of her teammates.
    b. her telephone number.
    c. the name of the play during which she was elbowed.
    d. the details of events that happened shortly after the incident.

20. After suffering damage to the hippocampus, a person would probably:
    a. lose memory for skills such as bicycle riding.
    b. be incapable of being classically conditioned.
    c. lose the ability to store new facts.
    d. experience all of the above changes.

21. When he was 8 years old, Frank was questioned by the police about a summer camp counselor suspected of molesting children. Even though he was not, in fact, molested by the counselor, today 19-year-old Frank "remembers" the counselor touching him inappropriately. Frank's false memory is an example of which "sin" of memory?
    a. blocking
    b. transience
    c. misattribution
    d. suggestibility

Essay Question

Discuss the points of agreement among experts regarding the validity of recovered memories of child abuse. (Use the space below to jot down notes for your essay; then write the essay on a separate piece of paper.)

KEY TERMS

Writing Definitions

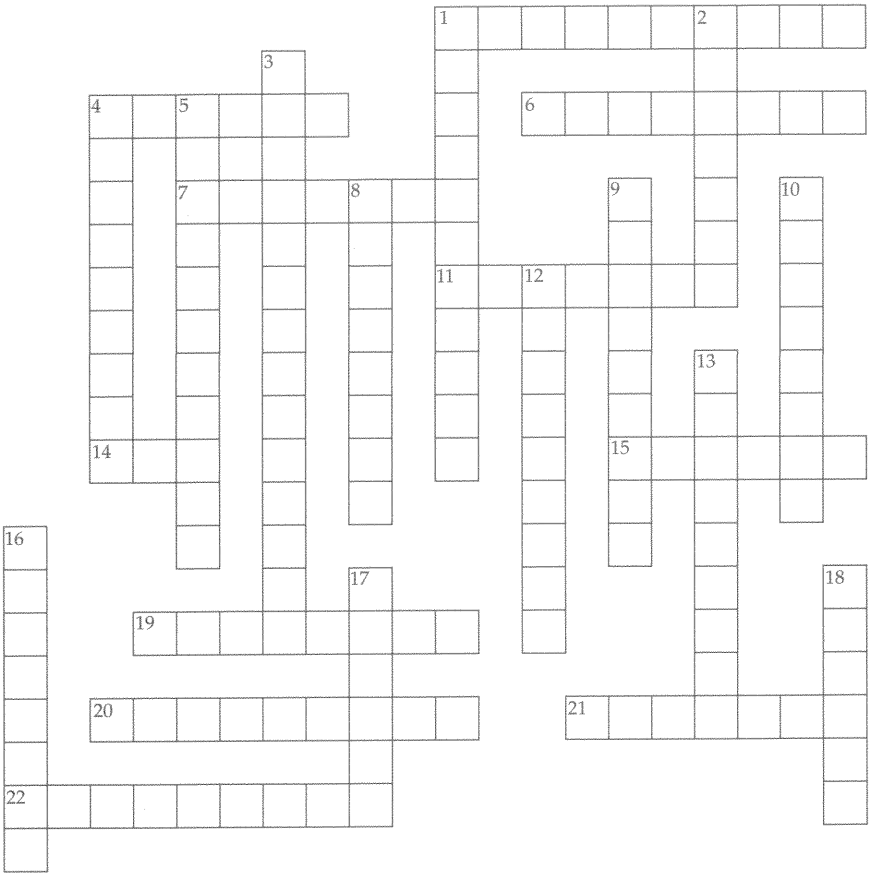
Using your own words, on a separate piece of paper write a brief definition or explanation of each of the following terms.

1. memory
2. flashbulb memory
3. encoding
4. storage
5. retrieval
6. sensory memory
7. short-term memory
8. long-term memory
9. working memory
10. automatic processing
11. effortful processing
12. rehearsal
13. spacing effect
14. serial position effect
15. visual encoding
16. acoustic encoding
17. semantic encoding
18. imagery
19. mnemonics
20. chunking
21. iconic memory
22. echoic memory
23. long-term potentiation (LTP)
24. amnesia
25. implicit memory
26. explicit memory
27. hippocampus
28. recall
29. recognition
30. relearning
31. priming
32. déjà vu

33. mood-congruent memory
34. proactive interference
35. retroactive interference
36. repression
37. misinformation effect
38. source amnesia

Cross-Check

As you learned in the Prologue, reviewing and overlearning of material are important to the learning process. After you have written the definitions of the key terms in this chapter, you should complete the crossword puzzle to ensure that you can reverse the process—recognize the term, given the definition.



ACROSS

1. Example of motivated forgetting.
4. Sensory memories of auditory stimuli.
6. Encoding of information according to its meaning.
7. Activating associations in order to retrieve a specific memory.
11. Mental pictures.
14. Believed to be the neural basis for learning and memory.
15. Visual sensory memory.
19. Organizing material into familiar, meaningful units.
20. Unusually vivid memory of an emotionally important moment.
21. Loss of memory.
22. Effortful repetition of information.

DOWN

1. A measure of retention that requires identifying previously learned material.
2. The immediate, initial recording of information in memory.
3. An effect in which eyewitnesses to an event incorporate misleading information in their memories.
4. Type of processing that requires attention and some degree of work.
5. Brain area that processes explicit memories for storage.
8. Type of memory of skills, preferences, and dispositions.
9. Memory aids.
10. Encoding of information into memory according to its sound.
12. Unconscious encoding of incidental information into memory.
13. Type of interference in which old knowledge interferes with new learning.
16. Relatively permanent memory that is unlimited in capacity.
17. Encoding that uses imagery to process information into memory.
18. The false sense of having already experienced a situation.

ANSWERS

The Phenomenon of Memory

1. memory
2. flashbulb; can

3. information-processing; encoding; storage; retrieval
4. three-stage processing; sensory memory; short-term; encoded; long-term
5. working; auditory; visual-spatial; central executive; episodic; simultaneously
6. frontal lobes; parietal; temporal lobes

Encoding: Getting Information In

1. automatic processing; practice; experience

Automatic processing includes the encoding of information about space, time, and frequency. It also includes the encoding of word meaning, a type of encoding that appears to be learned.

2. effortful processing
3. rehearsal
4. Ebbinghaus; fewer
5. overlearning
6. most; next-in-line
7. spacing effect
8. serial position effect; better
9. semantic; acoustic; visual
10. semantic
11. self-reference
12. imagery; effortful processing
13. better
14. semantically; visually
15. rosy retrospection
16. mnemonic; method of loci
17. peg-word
18. chunks; acronym
19. hierarchies

Storage: Retaining Information

1. sensory
2. about half; more; iconic
3. echoic; less; 3 or 4 seconds
4. rehearsal; active
5. 7; George Miller
6. digits; letters; better
7. 2
8. unlimited (limitless)
9. do not
10. Karl Lashley; cortexes; remembered
11. interfere; decays
12. synapses
13. serotonin
14. less; receptor sites; long-term potentiation; drug; enzyme; LTP; faster
15. CREB; glutamate
16. will not; will
17. facilitate
18. amygdala; limbic
19. disrupt; hippocampus; shrink
20. amnesia; is not
21. have not; implicit; are not; explicit
22. hippocampus; explicit; verbal; visual; spatial
23. temporarily; do; slow-wave; frontal; temporal
24. implicit; eye-blink; amygdala; fear; implicit
25. infantile; hippocampus

Retrieval: Getting Information Out

1. recall
2. recall; recognize
3. relearn; more
4. priming
5. encode
6. the same

The déjà vu experience is most likely the result of being in a context similar to one that we have actually been in before. If we have previously been in a similar situation, though we cannot recall what it was, the current situation may present cues that unconsciously help us to retrieve the earlier experience.

7. state-dependent
8. mood-congruent

When happy, for example, we perceive things in a positive light and recall happy events; these perceptions and memories, in turn, prolong our good mood. Moods also influence how we interpret other people's behavior.

9. rejecting, punitive, and guilt-promoting; have never suffered depression; interpret

Forgetting

1. forget
2. forgetting; distortion; intrusion
3. encoding
4. enters the memory system
5. encoding; less
6. soon
7. storage decay; memory trace
8. retrieval
9. interference
10. proactive interference; retroactive interference
11. better
12. positive transfer
13. repression
14. less
15. stress; strengthen

Memory Construction

1. construction
2. misinformation effect; can; imagination inflation; vivid imaginations

When people viewed a film of a traffic accident and were quizzed a week later, phrasing of questions affected answers; the word "smashed," for instance, made viewers mistakenly think they had seen broken glass.

3. source amnesia; misattribute
4. perceptions; interpretations
5. does not; details; durable
6. is not
7. hypnosis
8. are; questioned
9. neutral; nonleading
10. are not
11. 3; infantile amnesia
12. cognitive; social-cultural

Improving Memory

1. Survey; Question; Read; Rehearse; Review

Suggestions for improving memory include rehearsing material over many separate and distributed study sessions with the objective of overlearning material. Studying should also involve active rehearsal, rather than mindless repetition of information. Organizing information, relating material to what is already known, developing numerous retrieval cues, and using mnemonic devices that incorporate vivid imagery are helpful too. Frequent activation of retrieval cues, such as the context and mood in which the original learning occurred, can also help strengthen memory, as can recalling events while they are fresh, before possible misinformation is encountered. Studying should also be arranged to minimize potential sources of interference. Finally, self-tests in the same format (recall or recognition) that will later be used on the actual test are useful.

Progress Test 1

Multiple-Choice Questions

1. **d.** is the answer. Information must be encoded, or put into appropriate form; stored, or retained over time; and retrieved, or located and gotten out when needed. (p. 351)
2. **a.** is the answer. Iconic memory is our fleeting memory of visual stimuli. (p. 362)
   b. Echoic memory is auditory sensory memory.
   c. There is no such thing as photomemory.
   d. Semantic memory is memory for meaning, not a form of sensory memory.
3. **d.** is the answer. Echoic memories last 3 to 4 seconds. (p. 362)
4. **d.** is the answer. Retrieval refers to the *process* of remembering. (p. 370)
5. **c.** is the answer. (p. 362)
6. **d.** is the answer. (pp. 358–359)
   a. There is no such term as "consolidation techniques."
   b. & c. Imagery and encoding strategies are important in storing new memories, but mnemonic device is the general designation of techniques that facilitate memory, such as acronyms and the peg-word system.
7. **d.** is the answer. (p. 359)
   a. There is no such process of "consolidating."
   b. Organization *does* enhance memory, but it does so through hierarchies, not grouping.
   c. Encoding refers to the processing of information into the memory system.

8. **c.** is the answer. Kandel and Schwartz found that when learning occurred in the sea snail *Aplysia*, serotonin was released at certain synapses, which then became more efficient at signal transmission. (p. 365)

9. **b.** is the answer. In essence, we construct our memories, bringing them into line with our biases and assumptions, as well as with our subsequent experiences. (pp. 382–383)
a. If this were true, it would mean that memory construction does not occur. Through memory construction, memories may deviate significantly from the original experiences.
c. There is no evidence that such chemical transfers occur.
d. Many long-term memories are apparently unlimited in duration.

10. **d.** is the answer. In general, being in a context similar to that in which you experienced something will tend to help you recall the experience. (pp. 372–373)
a. & b. The learning environment per se—and its familiarity or exoticness—did not affect retention.

11. **a.** is the answer. (p. 354)
b. & d. The text does not suggest that there is an optimal interval between encoding and retrieval.
c. Learning increases the efficiency of synaptic transmission in certain neurons, but not by altering the size of the synapse.

12. **c.** is the answer. (p. 365)

13. **d.** is the answer. When asked to recall all the letters, participants could recall only about half; however, if immediately after the presentation they were signaled to recall a particular row, their recall was near perfect. This showed that they had a brief photographic memory—so brief that it faded in less time than it would have taken to say all nine letters. (p. 362)

14. **b.** is the answer. Because amnesia victims lose their fact (explicit) memories but not their skill (implicit) memories or their capacity to learn, it appears that human memory can be divided into two distinct types. (p. 367)
d. As studies of amnesia victims show, memory losses following damage to the hippocampus are quite predictable.

15. **d.** is the answer. (p. 367)
a. & b. Explicit memory (also called declarative memory) is memory of facts and experiences that one can consciously know and declare.
c. There is no such thing as prime memory.

16. **d.** is the answer. (p. 373)
a. State-dependent memory is the phenomenon in which information is best retrieved when the person is in the same emotional or physiological state he or she was in when the material was learned.
b. Encoding failure occurs when a person has not processed information sufficiently for it to enter the memory system.
c. Priming is the process by which a memory is activated through retrieval of an associated memory.

17. **b.** is the answer. When the words were organized into categories, recall was two to three times better, indicating the benefits of hierarchical organization in memory. (p. 360)
d. This study did not examine the use of mnemonic devices.

18. **a.** is the answer. (p. 351)
b. Herman Ebbinghaus conducted pioneering studies of verbal learning and memory.
c. Loftus and Palmer conducted influential research studies of eyewitness memory.
d. George Sperling is known for his research studies of iconic memory.

19. **d.** is the answer. It is in both encoding and retrieval that we construct our memories, and as Loftus' studies showed, leading questions affect people's memory construction. (p. 385)
a. The memory encoding occurred at the time of the event in question, not during questioning by the hypnotist.
b. State-dependent memory refers to the influence of one's own emotional or physiological state on encoding and retrieval, and would not apply here.
c. Proactive interference is the interfering effect of prior learning on the recall of new information.

20. **b.** is the answer. (p. 369)
a. The hippocampus is a temporary processing site for *explicit memories.*
c. & d. These areas of the brain are not directly involved in the memory system.

21. **b.** is the answer. Blocking is an example of retrieval failure. Each of the others is an example of a "sin of distortion," in which memories, although inaccurate, are retrieved (p. 377)

Matching Items

1. n (p. 362)	**6.** c (p. 356)	**11.** g (p. 379)
2. o (p. 351)	**7.** e (p. 359)	**12.** j (p. 384)
3. l (p. 358)	**8.** f (p. 358)	**13.** h (p. 376)
4. a (p. 380)	**9.** i (p. 379)	**14.** k (p. 376)
5. m (p. 374)	**10.** b (p. 370)	**15.** d (p. 376)

Progress Test 2

Multiple-Choice Questions

1. **c.** is the answer. As Ebbinghaus and Bahrick both showed, most of the forgetting that is going to occur happens soon after learning. (p. 377)
2. **d.** is the answer. (pp. 379–380)
   a. & b. This study did not find evidence that memories fade (decay) with time.
   c. When one is awake, there are many *more* potential sources of memory interference than when one is asleep.
3. **a.** is the answer. A test of recall presents the fewest retrieval cues and usually produces the most limited retrieval. (p. 370)
4. **d.** is the answer. (p. 368)
5. **d.** is the answer. According to the serial position effect, items at the beginning and end of a list tend to be remembered best. (p. 356)
6. **a.** is the answer. (p. 356)
   b. In the serial position effect, the items in the middle of the list always show the *poorest* retention.
   c. & d. Delayed recall erases the memory facilitation for items at the end of the list.
7. **c.** is the answer. Processing a word in terms of its meaning (semantic encoding) produces much better retention than does visual or acoustic encoding. (p. 357)
8. **d.** is the answer. Surprisingly, Lashley found that no matter where he cut, the rats had at least a partial memory of how to solve the maze. (p. 364)
   a. & b. Lashley's studies did not investigate the significance of the interval between learning and cortical lesioning.
9. **a.** is the answer. A blow to the head wipes out recent experiences because information in STM did not have time to consolidate into LTM. (p. 366)
   b. Such injuries disrupt the formation, rather than the retrieval, of memories.
   c. Although nutrition plays an important role in neural functioning, the effects of such injuries are independent of nutrition.
10. **d.** is the answer. (p. 365)
11. **c.** is the answer. According to Freud, we repress painful memories to preserve our self-concepts. (p. 380)
    a. & b. The fact that repressed memories can sometimes be retrieved suggests that they were encoded and have not decayed with time.
12. **d.** is the answer. When misled by the phrasings of questions, subjects incorrectly recalled details of the film and even "remembered" objects that weren't there. (pp. 382–383)
13. **c.** is the answer. Speed reading, which entails little active rehearsal, yields poor retention. (pp. 391–392)
14. **b.** is the answer. (p. 351)
    a. Encoding is the process of getting information *into* memory.
    c. Rehearsal is the conscious repetition of information in order to maintain it in memory.
    d. Storage is the maintenance of encoded material over time.
15. **b.** is the answer. Amnesia patients typically have suffered damage to the hippocampus, a brain structure involved in processing explicit memories for facts. (pp. 367, 368)
    a. Amnesia patients do retain implicit memories for how to do things; these are processed in the more ancient parts of the brain.
    c. & d. Amnesia patients generally do not experience impairment in their iconic and echoic sensory memories.
16. **b.** is the answer. (p. 354)
    a. Information in short-term memory has *already* been encoded.
    c. Iconic and echoic are types of *sensory* memory.
    d. Retrieval is the process of getting material out of storage and into conscious, short-term memory. Thus, all material in short-term memory has either already been retrieved or is about to be placed in storage.
17. **c.** is the answer. By breaking concepts down into subconcepts and yet smaller divisions and showing the relationships among these, hierarchies facilitate information processing. Use of main heads and subheads is an example of the organization of textbook chapters into hierarchies. (p. 360)
    a. Mnemonic devices are the method of loci, acronyms, and other memory *techniques* that facilitate retention.
    b. Chunks are organizations of knowledge into familiar, manageable units.
    d. Recognition is a measure of retention.
18. **d.** is the answer. (pp. 387–388)
19. **c.** is the answer. Short-term recall is slightly better for information we hear rather than see, because echoic memory momentarily outlasts iconic memory. (p. 363)
    a. Meaningful stimuli, such as words, are usually remembered more easily than meaningless stimuli, such as random letters.

b. Iconic memory does not last as long as echoic memory in short-term recall.
d. Although context is a powerful retrieval cue, there is no general facilitation of memory in an unusual context.

20. **c.** is the answer. Loftus and Palmer found that eyewitness testimony could easily be altered when questions were phrased to imply misleading information. (pp. 382–383)
a. Although memories *are* constructed during encoding, the misinformation effect is a retrieval, rather than an encoding, phenomenon.
b. & **d.** In fact, just the opposite is true.

21. **d.** is the answer. (p. 376)
a. This defines absent-mindedness.
b. This is misattribution.
c. This is bias.

True–False Items

1. T (p. 355)
2. T (p. 363)
3. F (p. 385)
4. T (p. 388)
5. T (p. 377)
6. F (p. 385)
7. F (p. 380)
8. T (p. 392)
9. F (p. 381)
10. F (p. 354)

Psychology Applied

Multiple-Choice Questions

1. **d.** is the answer. (p. 370)
a. & **b.** In order to correctly answer either type of question, the knowledge must have been encoded and stored.
c. With fill-in-the-blank questions, the answer must be recalled with no retrieval cues other than the question. With multiple-choice questions, the correct answer merely has to be recognized from among several alternatives.

2. **d.** is the answer. (p. 356)
a. & **b.** A serial position effect would presumably occur whether the study and retrieval contexts were the same or different.
c. As researchers found, when recall is delayed, only the first items in a list are recalled more accurately than the others. With immediate recall, both the first and last items are recalled more accurately.

3. **d.** is the answer. That all four mistakes are based on a sound confusion suggests that the letters were encoded acoustically. (pp. 356–357)
a. Memorizing a list of letters would involve effortful, rather than automatic, processing.
b. The mistakes do not involve letters that are similar in appearance.
c. Semantic encoding would have been suggested by errors based on similarities in meaning.

4. **b.** is the answer. Retroactive interference is the disruption of something you once learned by new information. (p. 379)
a. Proactive interference occurs when old information makes it difficult to correctly remember new information.
c. & **d.** Interference produces forgetting even when the forgotten material was effectively encoded and stored. Janice's problem is at the level of retrieval.

5. **b.** is the answer. (pp. 379–380)
a., **c.**, & **d.** Involvement in other activities, even just eating or listening to music, is more disruptive than sleeping.

6. **c.** is the answer. Susan's memories are affected by her bad mood. (p. 374)
a. Priming refers to the conscious or unconscious activation of particular associations in memory.
b. Memory construction refers to changes in memory as new experiences occur.
d. Although Susan's difficulty in recalling the good could be considered retrieval failure, it is caused by the mood-congruent effect, which is therefore the best explanation.

7. **a.** is the answer. Priming is the conscious or unconscious activation of particular associations in memory. (p. 372)
b. Déjà vu is the false impression of having previously experienced a current situation.
c. That Martina is able to retrieve her former classmates' names implies that they already have been encoded.
d. Relearning is a measure of retention based on how long it takes to relearn something already mastered. Martina is recalling her former classmates' names, not relearning them.

8. **b.** is the answer. Being back in the context in which the original experiences occurred triggered memories of these experiences. (p. 373)
a. The memories were triggered by similarity of place, not mood.
c. Retroactive interference would involve difficulties in retrieving old memories.
d. Echoic memory refers to momentary memory of auditory stimuli.

9. **a.** is the answer. Time and space—and therefore sequences of events—are often automatically processed. (p. 353)
b. That she had *little difficulty* indicates that the processing was automatic, rather than effortful.
c. & **d.** State-dependent memory and priming

have nothing to do with the automatic processing of space and time.

10. **d.** is the answer. Flashbulb memories are unusually clear memories of emotionally significant moments in life. (p. 351)

11. **a.** is the answer. Proactive interference occurs when old information makes it difficult to recall new information. (p. 379)
b. If Carlos were having trouble remembering the old extension, this answer would be correct.
c. & d. Carlos has successfully encoded and stored the extension; he's just having problems retrieving it.

12. **a.** is the answer. (p. 367)
b., c., & d. Explicit memory, also called declarative memory, is the memory of facts that one can consciously "declare."

13. **b.** is the answer. (pp. 356, 357)
a. & c. Your failure to recall the answer indicates that it was never encoded semantically.
d. Spatial information, such as the location of an answer (but not the actual answer) on a textbook page, is often encoded automatically.

14. **c.** is the answer. (p. 378)
a. & b. The name of your homeroom teacher, which you probably heard at least once each day of school, was surely processed into memory (encoded) and maintained there for some time (stored).
d. State-dependent memory is the tendency to recall information best in the same emotional or physiological state as when it was learned. It is unlikely that a single state was associated with learning your homeroom teacher's name.

15. **a.** is the answer. Short-term memory capacity is approximately seven digits. (p. 362)
b. Because iconic memory lasts no more than a tenth of a second, regardless of how much material is experienced, this cannot be the explanation for Brenda's difficulty.
c. The final four digits should be no more difficult to organize into chunks than the first five digits of the address code.
d. Memory for digits is an example of explicit, rather than implicit, memory.

16. **a.** is the answer. (p. 380)
b. Although Lewis' difficulty in recalling these memories could be considered retrieval failure, it is caused by repression, which is therefore the *best* explanation.
c. This answer is incorrect because it is clear that Lewis fails to remember these experiences because they are painful memories and not because he is in a different emotional or physiological state.
d. Flashbulb memories are especially *vivid* memories for emotionally significant events. Lewis has no memory at all.

17. **d.** is the answer. (p. 382)
a. This is an example of proactive interference.
b. This is an example of the disruptive effects of depressant drugs, such as alcohol, on the formation of new memories.
c. This is mood-congruent memory.

18. **c.** is the answer. (p. 358)
a. The peg-word system involves developing associations between rhyming words in a jingle and to-be-remembered items.
b. Acronyms are words created from the first letters of to-be-remembered words.
d. Chunking is the organization of information into meaningful units, such as acronyms.

19. **c.** is the answer. Blows to the head usually disrupt the most recent experiences, such as this one, rather than long-term memories like those in choices a. and b., or new learning such as that in choice d. (p. 366)

20. **c.** is the answer. The hippocampus is involved in processing new facts for storage. (p. 368)
a., b., & d. Studies of amnesia victims with hippocampal damage show that neither classical conditioning nor skill memory are impaired, indicating that these aspects of memory are controlled by more primitive regions of the brain.

21. **d.** is the answer. In this example, the questions Frank was asked to answer created misinformation that later became part of his memory. (p. 376)
a. This answer would have been correct if Frank had been molested by the counselor but had failed to encode it in his memory.
b. This answer would have been correct if Frank had been molested but the memory trace had faded with time.
c. Misattribution might have occurred if Frank had witnessed another camper being molested and later recalled himself as the actual victim.

Essay Question

Experts agree that child abuse is a real problem that can have long-term adverse effects on individuals. They also acknowledge that forgetting of isolated events, both good and bad, is an ordinary part of life. Although experts all accept the fact that recovered memories are commonplace, they warn that memories "recovered" under hypnosis or with the use of

drugs are unreliable, as are memories of events before age 3. Finally, they agree that memories can be traumatic, whether real or false.

Key Terms

Writing Definitions

1. **Memory** is the persistence of learning over time via the storage and retrieval of information. (p. 349)
2. A **flashbulb memory** is an unusually vivid memory of an emotionally important moment in one's life. (p. 351)
3. **Encoding** is the first step in memory; information is translated into some form that enables it to enter our memory system. (p. 351)
4. **Storage** is the process by which encoded information is maintained over time. (p. 351)
5. **Retrieval** is the process of bringing to consciousness information from memory storage. (p. 351)
6. **Sensory memory** is the immediate, very brief recording of sensory information in the memory system. (p. 351)
7. **Short-term memory** is conscious memory, which can hold about seven items for a short time. (p. 351)
8. **Long-term memory** is the relatively permanent and unlimited capacity memory system into which information from short-term memory may pass. (p. 351)
9. **Working memory** is the newer way of conceptualizing short-term memory as a work site for the active processing of incoming auditory and visual-spatial information, and of information retrieved from long-term memory. (p. 352)
10. **Automatic processing** refers to our unconscious encoding of incidental information such as space, time, and frequency and of well-learned information. (p. 353)
11. **Effortful processing** is encoding that requires attention and conscious effort. (p. 354)
12. **Rehearsal** is the conscious, effortful repetition of information that you are trying either to maintain in consciousness or to encode for storage. (p. 354)
13. The **spacing effect** is the tendency for distributed study or practice to yield better long-term retention than massed study or practice. (p. 355)
14. The **serial position effect** is the tendency for items at the beginning and end of a list to be more easily retained than those in the middle. (p. 356)
15. **Visual encoding** is the use of imagery to process information into memory. (p. 356)
16. **Acoustic encoding** is the processing of information into memory according to its sound. (p. 356)
17. **Semantic encoding** is the processing of information into memory according to its meaning. (p. 356)
18. **Imagery** refers to mental pictures and can be an important aid to effortful processing. (p. 358)
19. **Mnemonics** are memory aids (the method of loci, acronyms, peg-words, etc.), which often use vivid imagery and organizational devices. (p. 358)
20. **Chunking** is the memory technique of organizing material into familiar, meaningful units. (p. 359)
21. **Iconic memory** is the visual sensory memory consisting of a perfect photographic memory, which lasts no more than a few tenths of a second. (p. 362)

    Memory aid: *Icon* means "image" or "representation." **Iconic memory** consists of brief visual images.
22. **Echoic memory** is the momentary sensory memory of auditory stimuli, lasting about 3 or 4 seconds. (p. 362)
23. **Long-term potentiation (LTP)** is an increase in a synapse's firing potential following brief, rapid stimulation. LTP is believed to be the neural basis for learning and memory. (p. 365)
24. **Amnesia** is the loss of memory. (p. 367)
25. **Implicit memories** are memories of skills, preferences, and dispositions. These memories are evidently processed, not by the hippocampus, but by a more primitive part of the brain, the cerebellum. They are also called *procedural* or *nondeclarative memories*. (p. 367)
26. **Explicit memories** are memories of facts, including names, images, and events. They are also called declarative memories. (p. 367)
27. The **hippocampus** is a neural center located in the limbic system that is important in the processing of explicit memories for storage. (p. 368)
28. **Recall** is a measure of retention in which the person must remember, with few retrieval cues, information learned earlier. (p. 370)
29. **Recognition** is a measure of retention in which one need only identify, rather than recall, previously learned information. (p. 370)
30. **Relearning** is also a measure of retention in that the less time it takes to relearn information, the more that information has been retained. (p. 370)

31. **Priming** is the activation, often unconscious, of a web of associations in memory in order to retrieve a specific memory. (p. 372)
32. **Déjà vu** is the false sense that you have already experienced a current situation. (p. 373)
33. **Mood-congruent memory** is the tendency to recall experiences that are consistent with our current mood. (p. 374)
34. **Proactive interference** is the disruptive effect of something you already have learned on your efforts to learn or recall new information. (p. 379)
35. **Retroactive interference** is the disruptive effect of something recently learned on old knowledge. (p. 379)

    Memory aid: *Retro* means "backward." ***Retro*active interference** is "backward-acting" interference.
36. **Repression** is an example of motivated forgetting in that painful and unacceptable memories are prevented from entering consciousness. In psychoanalytic theory, it is the basic defense mechanism. (p. 381)
37. The **misinformation effect** is the tendency of eyewitnesses to an event to incorporate misleading information about the event into their memories. (p. 383)
38. At the heart of many false memories, **source amnesia** refers to misattributing an event to the wrong source. (p. 384)

Cross-Check

ACROSS
1. repression
4. echoic
6. semantic
7. priming
11. imagery
14. LTP
15. iconic
19. chunking
20. flashbulb
21. amnesia
22. rehearsal

DOWN
1. recognition
2. sensory
3. misinformation effect
4. effortful
5. hippocampus
8. implicit
9. mnemonics
10. acoustic
12. automatic
13. proactive
16. long term
17. visual
18. déjà vu

FOCUS ON VOCABULARY AND LANGUAGE

The Phenomenon of Memory

Page 349: Your memory is your mind's *storehouse*, the *reservoir* of your accumulated learning. Myers is using an analogy to help you understand the general concept of memory. Both *storehouses* and *reservoirs* are used to keep materials (water, food, etc.) until we need them. Likewise, your memory system retains most of the things you experienced (*accumulated learning*), and items can be recalled or retrieved as required.

Page 349: Some studies have explored *the roots and fruits* of memory loss. Some researchers have examined the origins and causes (*roots*) of memory loss, and others have noted the benefits (*fruits*) of not having a perfect memory for everything that happens.

Page 350: . . . medal winners in a memory Olympics. . . . People with exceptional memories are being likened or compared to the top athletes in the Olympic Games. S, for example, would clearly receive the top prize (*medal winner*) in any competition in which remembering vast amounts of information was being tested (*memory Olympics*).

Page 350: Do S's memory *feats* make your own memory seem *feeble*? Myers is pointing out that although S may have demonstrated spectacular abilities in remembering all sorts of things (*memory feats*), normal memory in the average person is no less astounding in many ways (*pretty staggering*). Despite our occasional failures, our ordinary memory accomplishments, which we tend to take for granted, are quite remarkable (*they are far from being feeble*).

Pages 351–352: Instead we *shine the flashlight beam of our attention on* certain incoming stimuli—often novel or important stimuli. One model of memory suggests that we only focus on (*shine the flashlight beam of our attention on*) and process one part or aspect of the total sensory input, particularly new (*novel*) or important stimuli. We can also locate and bring back stored information from long-term memory (**LTM**) into short-term memory (**STM**).

Encoding: Getting Information In

Page 354: . . . boost . . . One way to improve and increase the power of our memory is to use **rehearsal**. Thus, actively repeating some new information (such as a stranger's name or new terminology) will help strengthen (*boost*) our ability to remem-

ber this material. As Myers notes it is important for effective retention to space out or distribute rehearsals over time (*the spacing effect*) rather than doing the repetitions all at once (massed practice or cramming).

Page 354: His [Ebbinghaus'] solution was to form a list of all possible *nonsense syllables* created by *sandwiching* a vowel between two consonants. In order to avoid using meaningful words with prior associations, Hermann Ebbinghaus invented three-letter words that made no sense and had no meaning (*nonsense syllables*). He did this by putting a vowel (*sandwiching it*) between two consonants. His nonsense (*meaningless*) syllables were consonant (C), vowel (V), consonant (C), or CVCs.

Page 356: Gordon Bower and Daniel Morrow (1990) liken our minds to theater directors who, *given a raw script,* imagine a *finished stage production.* This suggests that what we remember is not an exact replica of reality. We construct some mental representation or model (*finished stage production*) from the basic sensory information (*raw script*) available to us, and so, when we recall something, it is our own version (*mental model*) that comes to mind and not the real thing.

Page 358: Thanks to the durability of our most vivid images, we sometimes recall our experiences with *mental snapshots* of their best or worst moments. The use of imagery or mental pictures (*snapshots*) is one way to enhance recall. We have exceptionally good memory for pictures and ideas that are encoded using visual imagery. As Myers notes, "imagery is at the heart of many memory aids" (e.g., method of loci, peg-word, etc.).

Page 358 (caption) . . . "talk until you are blue in the face". . . This refers to the situation in which someone says the same thing (e.g., a request, a plea, a warning) over and over, but saying it does not appear to have any effect on the listener. You can warn people repeatedly about the dangers (*health hazards*) of sun tanning and smoking (*you can talk until you are blue in the face*) with little or no change in the target audience's behavior. Visual images of the consequences of tanning and smoking have a greater impact.

Page 359: For example, the *"peg-word"* system requires that you first memorize a *jingle.* A *jingle* is an easily remembered succession of words that ring or resound against each other due to alliteration or rhyme and are often used in radio or TV commercials. The mnemonic (memory aid) called the *"peg-word"* method is based on memorizing a short 10-item poem (*jingle*) that can be associated with a new list of 10 items through visual imagery. The new items are hung on, or pegged to, the familiar items.

Page 360: Motionless while learning the numbers, Donatelli then *sprang alive.* He *whispered numbers, rubbed his chin, tapped his feet, counted on his fingers, and ran his hands through his hair.* By **chunking** (organizing material into meaningful units) we can increase the amount of information we can remember. Donatelli was able to recall up to 106 numbers read to him only once, one digit per second, by using chunking and hierarchies (clusters of chunks, organized from small to big). He was quiet while listening to the list but became very active and agitated (*he sprang alive*) as he used his mnemonic technique.

Storage: Retaining Information

Page 362: It was harder than reading by *lightning flashes.* In his investigation of sensory storage, George Sperling showed his subjects an array of nine letters for a very brief period (for about the length of a *flash of lightning*). He demonstrated that this was sufficient time for them to briefly view (*glimpse*) all nine letters and that an image remained for less than half a second before fading away; he called this brief (*fleeting*) memory of visual stimuli **iconic memory.**

Page 363: . . . Sherlock Holmes . . . Mystery writer Sir Arthur Conan Doyle's most popular character was a very intelligent and logical private detective named Sherlock Holmes. Holmes believed, as did many others, that our memory capacity was limited, much as a small empty room or attic can hold only so much furniture before it overflows. Contemporary psychologists now believe that our ability to store long-term memories is basically without any limit.

Page 363 (caption): Among animals, one contender for *champion memorist* would be a mere *birdbrain*—the Clark's nutcracker. . . . Clark's nutcracker is a small bird with a small brain (*birdbrain*) but a phenomenal memory (it is a *champion memorist*) of where it buries its food. It can recall, after a period of more than 6 months, 6000 different locations of hidden food (*caches*).

Pages 364–365: . . . with tongue only partly in cheek. When someone makes a statement that is not meant to be taken seriously, we note that it was said *with tongue in cheek.* When researchers stated that "memories are more of a spiritual than a physical reality,"

they were not totally serious (*tongue only partially in cheek*).

Page 366: Arousal *can sear* certain events into the brain. When arousal level rises because of stress, so too do the levels of certain hormones. These in turn signal the brain that something important has happened and the events that triggered the arousal make an indelible impression on the brain much as a hot grill burns (*sears*) its shape on the surface of the meat placed on it.

Page 367: They [people with amnesia] can be classically conditioned. . . . They can learn to read *mirror-image writing* or do a *jigsaw puzzle*. . . . They can be classically conditioned. People who have lost the ability to remember new information (*amnesics*) may nevertheless be capable of learning through association (classical conditioning) and of learning to solve problems (e.g., *jigsaw puzzles*) even if they are not aware of having done so. Myers notes that these findings suggest that memory is not a single, unified system. Amnesics can learn how to *do* something (**implicit memory**) without any knowledge of this learning (**explicit**, or **declarative**, **memory**).

Page 368: London cabbie . . . Taxi-cab drivers are often called *cabbies* and those who work in London, England (*London cabbies*), face an enormous challenge trying to memorize the complicated layout (*maze*) of city streets; the longer they work there the larger the rear area of the hippocampus (which specializes in spatial memory) becomes.

Page 369: Savoring that memory of a successful performance requires a *mental symphony conductor* that retrieves *snippets* from various cortical storage sites and integrates them with the emotional associations provided by your amygdala. Reliving and relishing (*savoring*) the memory of past accomplishments needs the mind's equivalent of an orchestra's director and organizer (*a mental symphony's conductor*) to locate pieces (*snippets*) from different brain areas (*various cortical storage sites*) and integrate them with emotional associations provided by the amygdala.

Retrieval: Getting Information Out

Page 374: If put in a *buoyant mood* . . . people recall the world through *rose-colored glasses*. . . . Our memories are affected by our emotional states (*moods*). Thus, if we are in a good or happy (*buoyant*) mood, we are more likely to view the total situation in a more optimistic and hopeful way (*through rose-colored glasses*). And if we are sad and unhappy, our memories are affected, or tainted, by our negative mood (*being depressed sours memories*). Memory of events and people is influenced by the particular mood we are in, whether it is good or bad, and we tend to remember the events accordingly.

Page 374: When teenagers are *down,* their parents seem inhuman; as their mood *brightens,* their parents *morph from devils into angels.* Because our memories tend to be **mood-congruent**, we are likely to explain our present emotional state by remembering events and people as being consistent (*congruent*) with how we now feel. In one study when young adolescents were in a bad mood (*down*), they viewed their parents as cruel and uncaring (inhuman), but later when they were in a much better (*brighter*) mood their parents were described in much nicer terms. It seemed as though their parents had undergone an amazing change in character (*morphing from devils to angels*), but the change was simply in the teenagers' mood. As Myers notes, *"passions [or emotions] exaggerate."*

Forgetting

Page 375: Amid all the *applause for memory* . . . have any voices been heard in praise of forgetting? We tend to focus on the importance of remembering and recalling information (*there is much applause for memory*). However, if we could not forget, we would be like the Russian memory expert (*memory whiz*) S who was overwhelmed by the amount of useless information he had stored (*haunted by his junk heap of memories*). Thus, many people, from William James to contemporary cognitive psychologists, acknowledge the importance of forgetting.

Page 378: A name *may lie poised on the tip of the tongue,* waiting to be retrieved. The expression *"it's on the tip of my tongue"* refers to the feeling you get when you are trying to remember something (a name, place, etc.) but can't, even though you feel you know it and can *almost* say it (*it's on the tip of your tongue*). Given an appropriate retrieval cue (such as the first letter of the name or something it rhymes with, etc.) we can often remember the item.

Page 379: As you collect more and more information, your *mental attic* never fills, but it certainly gets *cluttered.* We may have an unlimited amount of space in our memory system or *mental attic* (a room at the top of a house), but with a constant flow of new information coming in, the storage can become disorganized (*cluttered*). The new information may get in the way of recalling old material (**retroactive interference**), or old material may block or disrupt recall of new information (**proactive interference**).

Page 380: We *sheepishly* accepted responsibility for 89 cookies. Still, we had not come close; there had been 160. The Myers family obviously loves chocolate chip cookies, and the story of how all 160 were devoured (*scarfed, wolfed down, ate, consumed*) within 24 hours (*not a crumb was left*) is quite funny but makes an important point. Embarrassed, guilty, and feeling a little foolish (*sheepish*), they could only account for and remember eating 89. This illustrates the self-serving nature of memory and how, unknowingly, we change and revise our own histories.

Page 381: The words *relit a blown-out candle* in the mind . . . Just as an extinguished (*blown-out*) candle can be reignited (*relit*) with a match, the presentation of a retrieval cue may help someone recall or retrieve a long forgotten memory. Although Freud proposed that we repress memories of painful experiences in the unconscious mind in order to protect our self-concepts and minimize anxiety, Myers notes that most contemporary memory researchers believe repression rarely, if ever, happens.

Memory Construction

Page 384: Because memory is *reconstruction* as well as *reproduction*, we can't be sure whether a memory is real by how real it feels. It is difficult to determine if a memory is real simply by noting how real it feels or how confident we are about its accuracy. We not only recall and retrieve real memories (*reproduction*) but we also manufacture false memories (*reconstruction*).

Page 385: Memory construction helps explain why *"hypnotically refreshed"* memories of crimes so easily incorporate errors, some of which originate with the hypnotist's leading questions. Because of the tendency to manufacture events without being consciously aware of doing so (*memory construction*), people are likely to be influenced by suggestions and biased questions while under hypnosis. Their subsequent recollections (*"hypnotically refreshed"*) may therefore be a mixture of fact and fiction.

Page 386: If memories can be *sincere*, yet so *sincerely wrong*, might children's recollections of sexual abuse be prone to err? The evidence suggests that under appropriate conditions children's memories can be reliable and accurate (*sincere*), but that they are also prone to the misinformation effect and can be misled by biased questions and suggestions; later, the children are not able to reliably separate real from false (*sincerely wrong*) memories.

Improving Memory

Page 391: Sprinkled throughout this chapter and summarized here for easy reference are *concrete* suggestions for improving memory. This chapter on memory has many good ideas for memory improvement scattered or interspersed (*sprinkled*) throughout it, and Myers has pulled them together in an easy to understand format—the **SQ3R** (**S**urvey, **Q**uestion, **R**ead, **R**ehearse, **R**eview) method. These are real and tangible (*concrete*) ways that will help you improve your memory. Use them!!!