Objective: Upon completing this lesson, you will be able to define the three stages of memory and how memories go from one stage to another, as well as, what can be done to enhance the process.

The stages of memory are the following: sensory (or immediate), working (or short-term), and long-term. Immediate and working memories are temporary memories.

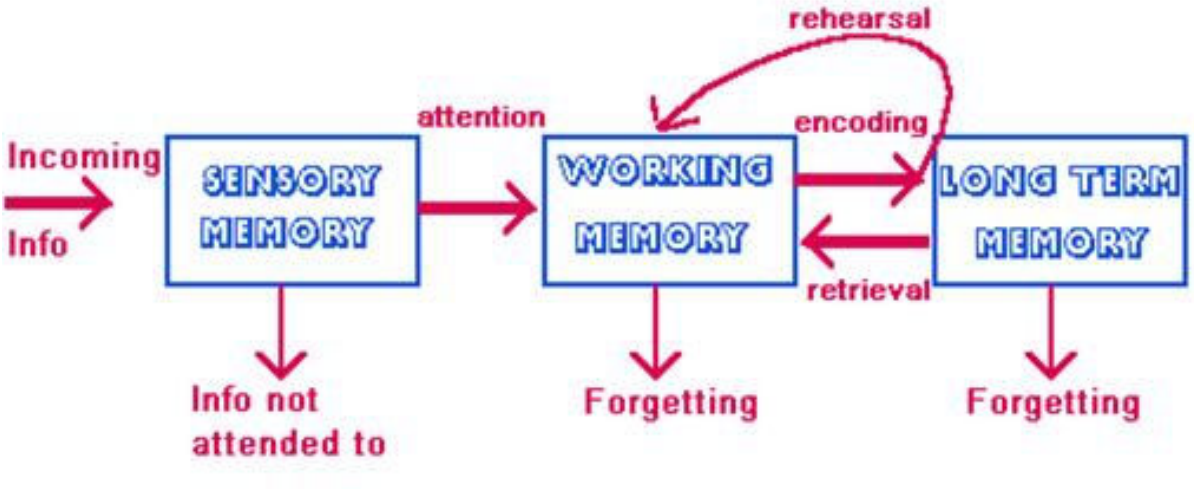

Figure 1: Stages of Memory
Image: http://healthpsych.psy.vanderbilt.edu/alcoholMemory_files/image007.jpg

Sensory memory operates subconsciously or consciously and holds data for up to 30 seconds. The individual's experiences determine its importance. You cannot recall information that your brain does not retain. (Sousa, 2011)

Working memory, or short-term memory, is the place where conscious, rather than subconscious, processing occurs. When something is in working memory, it generally captures our focus and demands our attention. It involves the ability to hold and manipulate information for use in the immediate future. After repeated practice, working memories are set down as permanent neuronal circuits of axons and dendrites ready to be activated when information is needed. "*Cells that fire together, wire together.*" Practice results in repeated stimulation of the memory circuit. Like hikers along a trail who eventually carve a depression in the road, repeated practice stimulates cells in the memory circuit so that the circuit is reinforced and becomes stronger. Working memory is embedded by repetition into ***long-term memory***, but it still needs periodic repetition for it to remain in your active memory bank and not gradually fade from disuse. (Willis, 2006)

Memories are not stored intact. Instead, they are stored in pieces and distributed in sites throughout the cerebrum (the largest part of the brain that coordinates mental actions). Which storage sites to select could be determined by the number of associations that the brain makes between new and past

learning. The more connections made, the more understanding and meaning the learner can attach to the new learning, and the more likely it is that it will be stored in different networks.

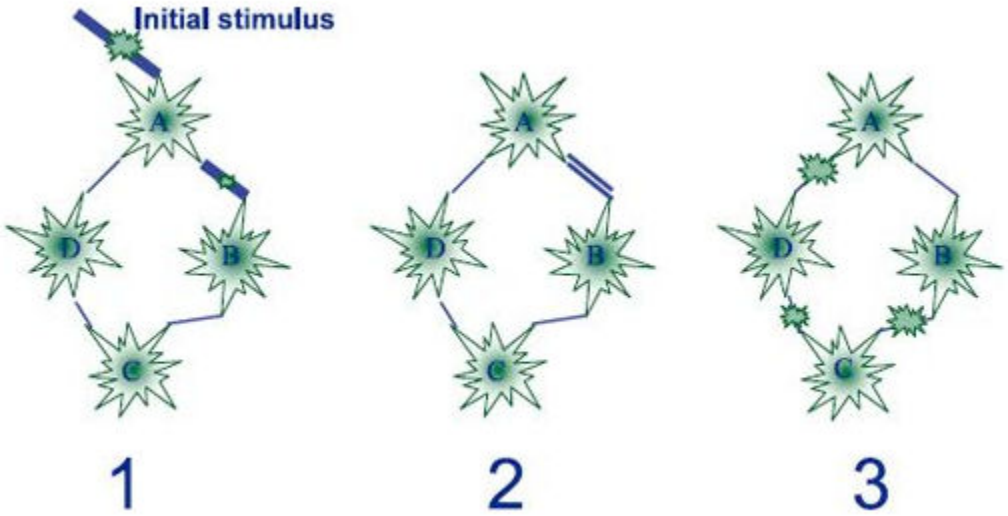

Figure 2: Creating a memory: (1) Neuron A receives a stimulus, which causes it to set off neuron B. (2) If neuron A fires again soon, a link is established. Later, neuron A can just fire weakly to set off neuron B. (3) The firing of neurons A and B may set off neighboring neurons C and D. If this happens repeatedly, the four cells become a network and will fire together in the future – forming a memory.

Just because you may feel you have learned the new information or skill doesn't mean it will be transferred to long-term storage. Extensive research on retention indicates that 70 – 90 percent of new learning is forgotten within 18 to 24 hours after the lesson. Processing and transfer between working memory and long-term storage needs adequate time for encoding and consolidation of the new information into the storage networks. (Sousa, 2011)

Once the information is successfully retrieved, it still needs to be reviewed between four and seven times to ensure retention. (Willis, 2006)

Our goal is to efficiently get information into the long term memory so we can recall it and make connections when needed.

Sousa, D. (2011). *How the Brain Learns.* Thousand Oaks: Corwin, A SAGE Company.

Willis, J. (2006). *Research-Based Strategies to Ignite Student Learning: Insights from a Neurologis and Classroom Teacher.* Alexandria: Association for Supervision and Cirriculum Development (ASCD).

How The Brain Learns, Lesson 2: Memory **Name _____**

1. Sketch the study cycle introduced in ***Lesson 1***.

2. List and describe the three stages of memory.

3. What can help 'move' a memory from short-term to long-term storage?

4. How much memory can be lost in 18 – 24 hours if it's not practiced?

5. How many times does information need to be reviewed to ensure that it's retained?

6. Explain how you think the study cycle enhances the process of getting memories in long-term storage.