

## Part B

### Differentiate

#### 2.1 Feature search VS Feature Conjunction search

Feature Search	Feature Conjunction Search
Searching for a target defined by a single distinctive feature (e.g., color or orientation)	Searching for a target defined by a combination of features (e.g., color and shape)
Typically efficient, with search times relatively unaffected by the number of distractors	Less efficient, with search times increasing linearly with the number of distractors
Automatic and parallel guidance to the target, making it easier to locate	Less automatic guidance often requires serial processing, leading to slower search times
Targets are highly salient due to distinct features, making them easily detectable	Targets may not stand out as much among distractors, requiring more effort to locate
Finding a red circle among green circles	Locating a red circle among green squares and blue circles
Primarily involves early visual areas where feature-based attention enhances processing	Involves higher-level cortical areas where attention must be deployed to multiple features simultaneously

#### 2.2 Dichotic listening task VS Split span task

Dichotic Listening Task	Split Span Task
Intensity differs	Same intensity
different stimuli in each ear	Same stimuli in each ear
Selective attention	Divided attention

Assessing auditory attention and processing	Assessing visual working memory capacity
Simultaneous presentation of stimuli	Sequential presentation of stimuli
Typically involves non-verbal stimuli (e.g., tones, noises)	Usually involves verbal stimuli (e.g., numbers, words)

### 2.3 Ventriloquist effect vs McGurk effect

<b>Ventriloquist Effect</b>	<b>McGurk Effect</b>
Perception of sound location altered by visual cues	Illusion where auditory perception is influenced by visual perception of mouth movements
Usually involves auditory stimuli (sounds or speech)	Involves both auditory stimuli (speech) and visual stimuli (mouth movements)
Integration of auditory and visual cues in spatial perception	Integration of auditory and visual cues in speech perception
Visual dominance on source of the sound	Visual dominance on auditory perception
Perceiving a sound as coming from a ventriloquist's dummy rather than the ventriloquist's actual location	Perceiving a combination of "ba" auditory input and "ga" visual input as "da" or "tha"

### 2.4 Explicit memory vs Implicit memory

<b>Explicit Memory</b>	<b>Implicit Memory</b>
intentional memory of specific information or events that can be consciously recalled and declared	unintentional memory of information or experiences that influence behavior or thought without conscious awareness

Involves conscious awareness and deliberate effort to recall information	Operates without conscious awareness
Stores facts, events, and experiences that can be articulated verbally	Stores procedural skills, habits, conditioning, and priming effects
Involves explicit, effortful retrieval processes, such as recall or recognition	Often activated automatically without conscious effort, triggered by cues or environmental stimuli
Remembering the name of a childhood friend or recalling a specific event from the past	Riding a bicycle, typing on a keyboard, or feeling anxious in a certain situation without recalling why

## **Describe**

### **3.1 Feature Integration theory**

Feature Integration Theory, proposed by Anne Treisman, proposes that visual perception involves the automatic processing of individual features followed by attentional binding to integrate these features into coherent objects.

- Preattentive stage: Basic features are automatically processed.
- Parallel processing: Multiple features are processed simultaneously.
- Attentional binding: Attention is needed to integrate features into objects.
- Serial attentional processing: Features are bound sequentially.
- Illusory conjunctions: Features may be incorrectly combined without full attention.
- Attentional limitations: Attention acts as a bottleneck in complex scenes.

### **3.2 Partial report superiority effect**

The Partial Report Superiority Effect is a phenomenon in which participants demonstrate better recall of specific elements within a visual or auditory stimulus when asked to report only a subset of those elements compared to when asked to report all elements. This effect was first demonstrated by George Sperling in his experiments on iconic memory.

- Iconic Memory: It occurs within the sensory memory system known as iconic memory, which retains visual information for a brief duration.
- Stimulus Presentation: Participants are briefly exposed to a matrix of letters or symbols, typically arranged in a grid pattern.
- Conditions: In the partial report condition, participants are prompted to report only a specific row or column of the matrix after its disappearance. In the whole report condition, participants are asked to report all items from the matrix.
- Results: Participants typically perform better in the partial report condition, recalling a higher proportion of items from the cued row or column compared to the whole report condition.
- Duration: The Partial Report Superiority Effect suggests that iconic memory has a greater capacity than initially assumed, with the ability to retain more information than can be recalled in its entirety.
- Mechanisms: The effect is thought to occur because the partial report task reduces the demand on attentional resources, allowing participants to focus their attention more effectively on the cued subset of items.

### **3.3 Memory consolidation**

Memory consolidation is the process by which newly acquired information is stabilized, strengthened, and integrated into existing memory networks within the brain. Here's a concise overview:

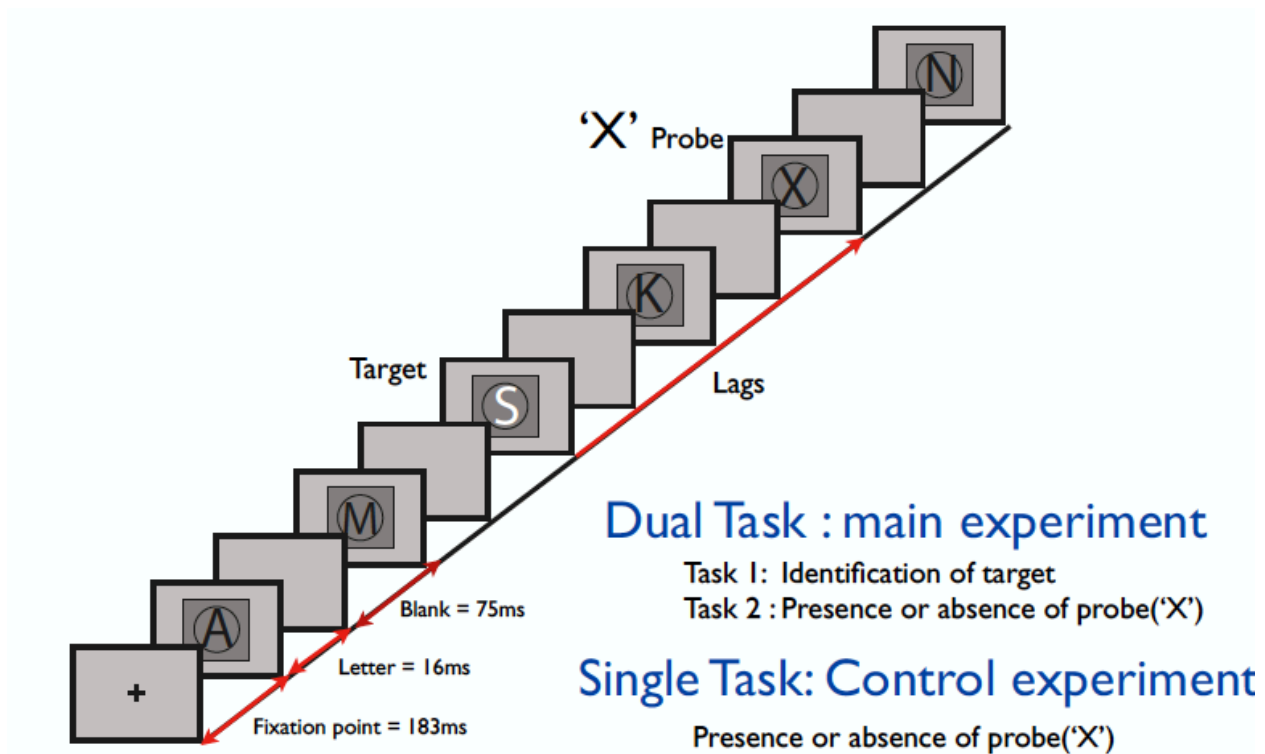
- Definition: Memory consolidation is the process of stabilizing newly acquired information into long-term memory.
- Stages: It involves synaptic consolidation (rapid changes at synapses) and systems consolidation (gradual reorganization of neural circuits).
- Neural Mechanisms: Consolidation involves synaptic strengthening, gene expression, and forming new neural connections.

- Sleep: Sleep aids in memory consolidation, especially for declarative memories.
- Brain Regions: Different brain regions are involved, with the hippocampus crucial for initial encoding and cortical regions for mature memories.
- Factors: Emotional arousal, stress, repetition, and importance of information influence consolidation.

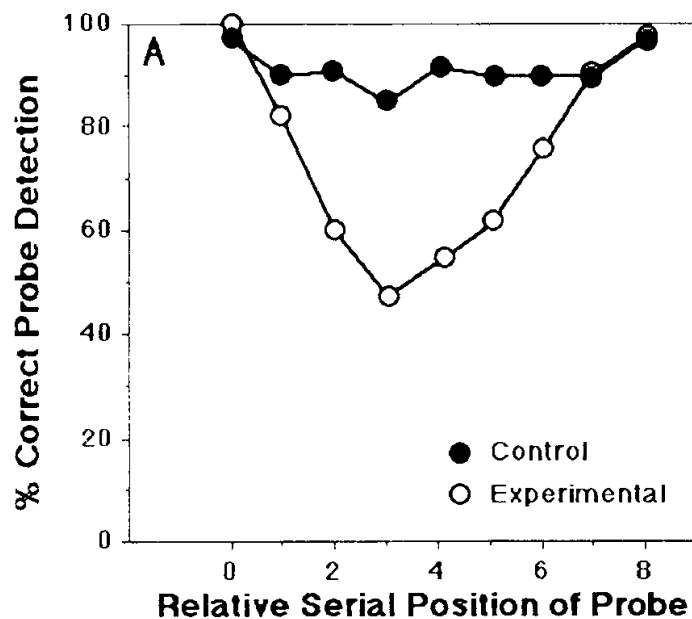
## Section – C

**Q1.** In an experiment conducted by Jane Raymond and her team in 1992, they presented a RSVP of letters. The timeline is shown in **figure 1**. The letters were black in color (any one of the 26 English alphabets) and each letter was presented for about 15 ms followed by a blank period of 75ms. Among the **RSVP** of black letters a single white letter was presented. The **white letter** could be any one of the 26 English alphabets and was represented as a **Target**. In **50%** of trials a black “X” (represented as a **probe**) was presented at **8** different **lags** with respect to white letter (Target). In other words, the probe could only appear in one of the 8 serial positions (in 50% trials) after the target. In another 50% trials no probe was present.

Participants were supposed to do two experiments, one **dual task** and another was a **single task** experiment. In a dual task experiment, participants were supposed to identify and report the white color letter and then report the presence/absence of letter “X” (probe). While in the single task experiment participants were supposed to ignore the white color letter but only report the presence of letter “X” (probe). **Figure 2** shows the results of the experiment. The plot shows the correct detection of the probe in dual task (Open circle) versus single task (filled circle) experiment.



**Figure 1:** Timeline of the experiment



**Figure 2:** Results from the experiment control & experimental in the figure represents single and dual task experiments respectively.

Answer the following questions:

**1.1** What is the full form of RSVP and what are its characteristics and significance?

**2 marks**

Full form of RSVP is Rapid Serial Visual Presentation (1 mark). This is an experimental design where the stimuli are presented at a constant spatial location (0.5 marks) rapidly. The spatial attention is held constant and attention is manipulated over time. This paradigm is used to study temporal attention (0.5 marks).

**1.2** Highlight the results from the experiment?

**2 marks**

1. The performance of probe detection in single task is above 90% at all relative serial positions.
2. The performance of probe detection in the dual task is low from serial position 2 to 6 after which the performance reverts back similar to single task.

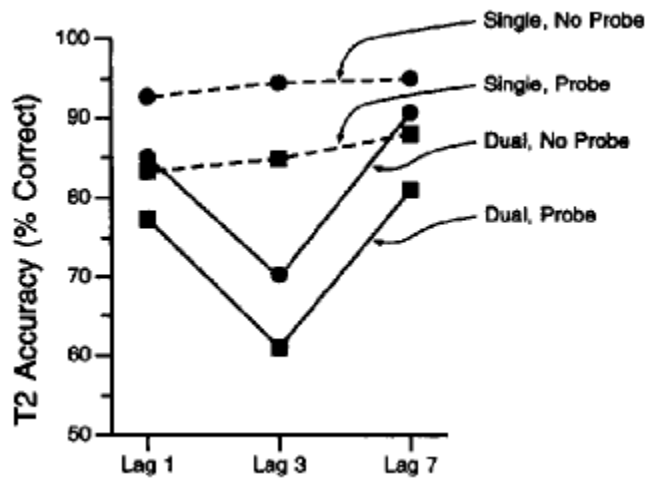
**1.3.** What was the significance of this experiment?

**1 mark**

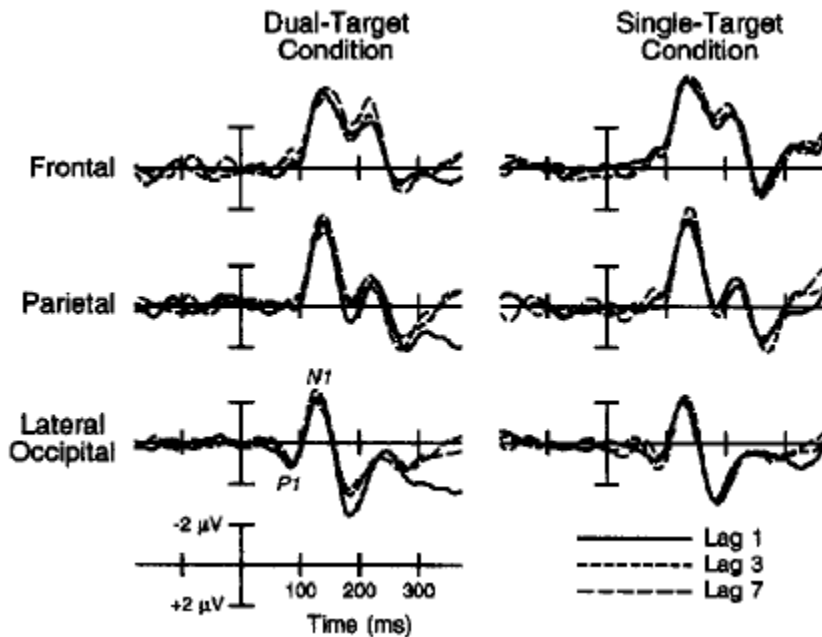
This experiment for the first time highlighted that the performance of second target detection is compromised when presented within 200-500ms after the first target represented as attentional blink.

**Q2.** In the follow up from the previous experiment (described in question 1) when EEG was conducted by Vogel, Luck and Shapiro in 1998. The timeline of the experiment was the same as described in figure 1 in 19923, Vogel and his team tested only 3 serial positions (represented as “Lag” in figure 3 A). The results from the experiment are shown in figure 3. Figure 3 A shows results from behavioral analysis and figure 3B shows results from ERP analysis. **\*\*Please ignore conditions Single, No probe and Dual No probe conditions for answering this question.**

A



B



**Figure 3:** A represents behavioral performance of the task. B represents the EEG data collected from Frontal, Parietal and Occipital areas for dual and single task experiments.



**2.1** What are the results of the experiment? Which specific time event of the experiment is the EEG (ERP) data plotted in above figure? **2 Marks**

1. In both dual as well as single task P1 and N1 peaks were.
2. P1 peak is prominent in the occipital region while N1 peak is prominent in occipital, parietal and frontal region.
3. The P1 and N1 peaks are observed for all three lags .

The data is plotted from the onset of probe “X” in the RSVP.

**2.2** What hypothesis was confirmed by this experiment? **1 Mark**

This experiment showed that attention is directed to the probe during the blink period (200-500ms)

**2.3** What were the results that supported the proposed hypothesis? **1 Mark**

The presence of P1 & N1 components even at lag3 in dual task supported the hypothesis.

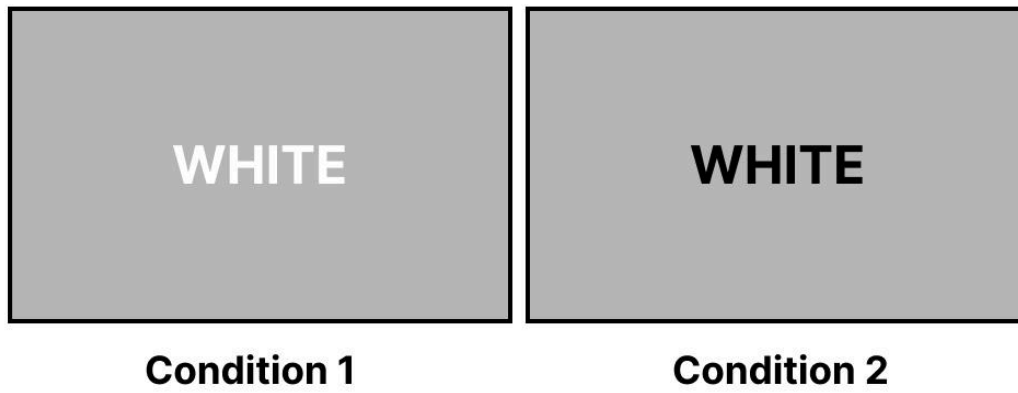
**2.4** What were the two stages of working memory that were hypothesized and tested in this study?

**1 Mark**

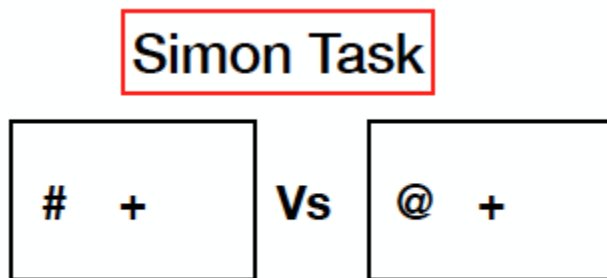
It was hypothesized that working memory has two stages one is the identification stage which is the fast stage and another is the slow consolidation stage. Identification stage involves semantic processing of the stimuli and the consolidation stage corresponds to developing a stable memory representation of the identified stimuli to be recalled or reported later.

**Q3** Representative structure for the Stroop (Figure 4A) and Simon (Figure 4B) tasks are shown in figure 4 below.

## A Stroop Task



## B Simon Task



**Figure 4: Stroop and Simon task**

**3.1** Explain Stroop and Simon tasks with respect to the figure above.

3 marks

Definition of stroop and Simon task.

**3.2** What aspect of attention does these tasks signify? 2 marks

Stroop and Simon tasks highlight that attention is always accompanied by inhibition. Stroop task highlights inhibition in the feature domain while Simon in the spatial domain.