

# PSYCHOLOGY

## Units 3 & 4 – Written examination



## 2023 Trial Examination

### SOLUTIONS

#### SECTION A: Multiple-choice questions (1 mark each)

##### Question 1

*Answer:* B

*Explanation:*

The Sympathetic Nervous System as part of the Autonomic Nervous System is triggered to set into motion the Fight-Flight- Freeze Response. In this case, it is the Fight and Flight response as Juniper flees on her bike to escape the path of the snake. In order to complete the motor actions of riding her bike and using the other parts of the body to complete such a sequence of actions, the Somatic Nervous System is triggered and the efferent neural pathways carry the neural messages to the muscles and other parts of the body. The Somatic Nervous System is part of the Peripheral Nervous System and so is the Autonomic Nervous System.

##### Question 2

*Answer:* B

*Explanation:*

The Somatic Nervous System is part of the Peripheral Nervous System which is responsible for motor movements. Messages are carried down the efferent pathway to the muscles and parts of the body which are involved in the actions.

**Question 3**

*Answer: D*

*Explanation:*

When Juniper encounters the snake, she goes into the Alarm Stage of the GAS model and she goes into shock and at a loss as to what to do. Then Juniper goes into the Countershock stage of the Alarm Stage and consequently, she begins to deal with the stress and the Sympathetic Nervous System is triggered so she goes into Fight-Flight mode, experiencing heightened arousal. This enables her to deal with the stress with the surge of adrenaline, noradrenaline, and cortisol.

**Question 4**

*Answer: C*

An external stressor that appears within the environment, the snake, causes an intense fight-flight response which is immediately dealt with as Juniper escapes the snake by riding the bike, and her mum picking her up by car. Therefore, this immediate stress response that quickly dissipates once the source of the stress has been removed is acute stress as opposed to chronic stress which continues for an extended period of time. The parasympathetic system would have then caused Juniper to calm down.

**Question 5**

*Answer: C*

*Explanation:*

The Autonomic Nervous System triggers the Sympathetic Nervous System to set in place a Fight-Flight response. Consequently, the pupils dilate so that one can see more clearly and with more clarity and detail. This reaction enables the person to deal with a stressor or a stressful situation. The individual's heart rate and blood pressure are increased so more energy is created for quicker action as the blood circulation increases to distribute more oxygen around the body and blood vessels dilate, consequently. Perspiration increases so the body cools down quickly and it does not overheat as rapid actions occur to deal with the stressor.

**Question 6**

*Answer: A*

*Explanation:*

Gamma-Amino-Butyric Acid (GABA) is an inhibitory neurotransmitter which is not a neurohormone. It has the opposite effect to the neurotransmitter of glutamate to block messages in the nervous system. The other 3 are neurohormones in the question are involved in the Fight-Flight-Freeze Response as part of the role of the HPA Axis's response to stressors.

**Question 7**

*Answer:* D

*Explanation:*

The neural messages related to Juniper's actions of her dialling her mother to come and get her by car, would have been passed on via The Efferent Pathway of Juniper's Somatic Nervous System, which is part of the Peripheral Nervous System. This efferent pathway which is connected to the spinal cord is made up of motor neurons.

**Question 8**

*Answer:* A

*Explanation:*

The role of the Somatic nervous system in the action of typing the digits on the phone would be to carry motor commands from the CNS about which keys to press with which finger and communicating this to the muscles in the hand and deciding which number to type next on screen of the phone. It is not taking sensations to the spinal cord and to the brain via the afferent pathway up not it is making the decisions of what numbers to type given that the brain determines this function.

**Question 9**

*Answer:* B

*Explanation:*

Juniper's fear of snakes was caused or precipitated by a strong intense association between the snake which was initially a neutral stimulus which has become a conditioned stimulus and causing an extreme fear response that has persisted. This process can be described as Classical Conditioning and the phobia has been precipitated by Juniper's snake experience by the side of the road. Although there has not been a repeated association of the conditioned and unconditioned stimulus over several trials, in this case, the amygdala would have stimulated the hippocampus to consolidate this fear in an intense manner.

**Question 10**

*Answer:* D

*Explanation:*

The perpetuation of Juniper's fear is caused by the **Operant Conditioning** model of learning, and she could try to deal with this phobia by being involved in **Cognitive Behavioral Therapy**

and **Systematic Desensitisation**. Juniper's consistent avoidance of the phobic stimulus, snakes, in any shape, form or medium has been negatively reinforced so that it is more likely that she would repeat this behavior even more often. Juniper could participate in Cognitive Behavioral Therapy focused on changing her maladaptive thoughts about snakes and be subjected to more rational and objective thinking suggested by a clinical psychologist to change her mindset and stop catastrophizing which reinforces the phobic feelings she has about snakes.

Also, Juniper could change her avoidance behavior by adopting more approach behaviors regarding the phobic stimulus. This could occur with the process of Systematic Desensitisation, whereby Juniper could in a systematic manner or in stages change her negative thoughts and anxious feelings by being exposed to snakes based on a hierarchy of least fearful (e.g. seeing a photo) to eventually most fearful (being present with a snake or touching it) and replacing intense emotions of fear to calm feelings and thoughts these times to overcome her intense fear and break the association of this fear with snakes.

### Question 11

*Answer: B*

*Explanation:*

The Hippocampus and the Amygdala are both involved in consolidating Juniper's intense fear of snakes. As mentioned earlier, although there has not been a repeated association of the conditioned and unconditioned stimulus over several trials, in this case, the amygdala would have stimulated the hippocampus to consolidate this fear in an intense manner in a one trial learning experience. The Amygdala helps individuals to learn intense fears as it works with the hippocampus to strengthen this memory based on fear as a mechanism for survival.

### Question 12

*Answer: A*

*Explanation:*

This is an example of a Spinal Reflex whereby the interneurons in the spine are responsible for the withdrawal reflex to facilitate survival as opposed to the brain being directly responsible for the withdrawal action. Interneurons would then send messages to the brain, so it makes sense of the action and interprets the response to the threat or danger. This is an unconscious response.

Therefore, the accurate process and pathway would be-

*Sensory receptors in the back of the hand – afferent neural pathway – interneurons in the Spinal cord – efferent neural pathway - muscles in the hand, arm, and shoulder-withdrawal of hand and arm from the oven.*

Glutamate is the major excitatory neurotransmitter which is involved in the process of Long-Term Potentiation which helps to form new neural pathways via repeated stimulation. This occurs via the process of sprouting, involving the growth of axons in terms of filigree appendages on the axon terminal of the pre-synaptic neuron or dendritic spines on the post-synaptic neuron, resulting in the dendrites appearing bushier. The formation of additional synapses where these dendritic spines and filigree appendages meet are referred to as synaptogenesis.

**Question 13**

*Answer: A*

*Explanation:*

In this case, Leila's brain makes the decision for her to relieve the pain by putting her hand under running water. This involves the Central Nervous System- the brain and the spinal cord which relay the messages from the brain to the Peripheral Nervous System. This is a voluntary action that is then carried out by motor neurons which form part of the Somatic Nervous System, a section of the Peripheral Nervous System.

**Question 14**

*Answer: D*

*Explanation:*

The withdrawal of the back of the hand from the burn in the oven is an example of a Spinal Reflex whereby the interneurons in the spine are responsible for the withdrawal reflex to facilitate survival as opposed to the brain being directly responsible for the withdrawal action *which occurs* when Leila runs her burnt hand under the water to find relief. This latter response is a voluntary and conscious action directed by the brain and facilitated by the Peripheral Nervous System.

**Question 15**

*Answer: B*

*Explanation:*

The Gut-Brain Axis is a Bi-directional communication network between the Central Nervous System and the Enteric Nervous System which is part of the Autonomic Nervous System. There is a two-way reciprocal communication between these two systems as it is believed that the brain could have an effect on the Gut Microbiota such as when the individual is susceptible to stress, and also the Gut Microbiome could affect the brain such as Cognitive Processing and Emotional Stability when Dysbiosis occurs. (*Imbalance of the Gut Microbiota*)

**Question 16**

*Answer: D*

*Explanation:*

This statement is incorrect- “While Orlando practises skiing, Long Term Depression causes Post-Synaptic Neurons to appear bushier because of filigree appendages growing longer.” This description of what might be happening to the beginning of synapses is true of Long -Term Potentiation, and not LTD. It describes what happens when LTP occurs as the repeated firing of neurons helps to form more neural pathways which helps to consolidate learning and memory.

**Question 17**

*Answer: B*

*Explanation:*

The correct answer is: “The process of Pruning via LTD which is responsible for removing and weakening excess neural pathways, that fire less frequently due to limited practise of skills over time.” This explains why Orlando after many years of not practising their skiing skills finds that as an adult, he no longer can ski in a competent manner and he has forgotten to do many things that he had learnt as a child to do. The neural pathway was limited in its firing over time so pruning via the process of LTD occurred. The brain is fine-tuning its neural pathways.

**Question 18**

*Answer: A*

*Explanation:*

*The incorrect statement is the following:* “Neuromodulators cause a quicker effect which lasts for longer periods as opposed to neurotransmitters which slowly alter the effectiveness of neural transmission in specific brain areas.” It is in fact just the opposite when highlighting the difference between Neurotransmitters and Neuromodulators as in the statement for D- “Neuromodulators act more slowly and last for longer periods, whereas Neurotransmitters act faster in their effect from one synapse to the other.”

Neuromodulators have a more diffused longer lasting effects as opposed to neurotransmitters who have a more localised effect in the synapses. Neuromodulators can change the effect of neurotransmitters at the synapse by making them more excitatory or more inhibitory.

**Question 19**

Answer: D

Explanation:

The incorrect answer is- *“Hunger occurs due to an increase in the baseline levels of the dopamine in the reward pathway of the brain. This results in the sensation of hunger and an increase in food seeking/eating behaviour.”*

This is the case as hunger occurs due to the *decrease* in baseline levels of dopamine not an increase and once the person chews their food while eating one gets a surge of dopamine.

**Question 20**

Answer: D

Explanation:

All of the Above is true with regards to the Gut Microbiota.

**Question 21**

Answer: B

Explanation:

The Lazarus and Folkman Transactional Model of Stress and Coping is a psychological model, and it explains different psychological approaches to stressors. On the other hand, it does not explain passive physiological responses to stress that influence the person’s behaviour who is experiencing the stress. The statement in B is based on the GAS model which is a physiological model and not a psychological model.

*It caters for an understanding that people experience the same physiological responses to stressors, and it explains the same pattern of actions triggered by the Sympathetic Nervous System and modified by the Parasympathetic System*

**Question 22**

Answer: D

Explanation:

*All of the Above* is true for this question given that Jaylen is using avoidance behaviour for each action to prevent her dealing with the girls bullying her at school.

**Question 23**

*Answer: C*

*Explanation:*

The following statement is incorrect-*Mainly written sacred texts which include Indigenous Art and Narrative Stories and Song-Lines passed on by Elders. This is the case because the word “written” should be “oral”* instead as Aboriginal and Torres Strait Islander Ways of Knowing is transmitted by word of mouth, through movement and imagery. The Elders play a significant role in passing on knowledge via different modes.

**Question 24**

*Answer: D*

*Explanation:*

*All Of the Above* is true for this question as the Framework of Learning for Indigenous Cultures is multi-modal and it encompasses all the approaches mentioned in the question.

**Questions 25**

*Answer: C*

*Explanation:*

*Explicit Episodic Autobiographical Memory is the correct answer given that the ladies in the scenario draw upon the Long-Term Memory in which knowledge of past events is stored as part of Declarative Memory. Declarative Memory stores both Semantic and Episodic memories.*

**Questions 26**

*Answer: B*

*Explanation:*

Jenny has a *highly superior autobiographical memory* and studies have shown that people with superior memories of past events who can vividly create mental pictures of these events in their mind’s eye have greater links between the Parietal and Occipital cortexes.



**Questions 27**

*Answer: C*

*Explanation:*

*Episodic Future-Thinking is a reconstruction* using mental imagery which draws upon stored explicit Long-Term Memories of two types. When one pictures future events, Episodic-Autobiographic Memories (one's memories of past events) are recalled as well as Explicit Semantic Memories which are based on General Knowledge and details of possible scenarios. Therefore, such a process involves the two types of Explicit Declarative Memories.

**Questions 28**

*Answer: A*

*Explanation:*

The answer is Aphantasia. If someone has Aphantasia they find it difficult to create mental pictures or images in their brain. This condition impairs someone from picturing past events and incidences from Episodic-Autobiographical Memories as well as picturing scenarios and details which are also drawn from Explicit Semantic Memory. Such individuals like Susan, lack the ability to picture themselves in future scenarios as they must rely on these two types of memory capacities to picture future gathering with her old friends successfully. (Episodic Future Thinking).

**Questions 29**

*Answer: D*

*Explanation:*

The answer is *All of the Above*. As Alzheimer's Disease progresses, individuals with this disorder show difficulty conjuring up mental pictures in their minds and consequently, they may have difficulty with Episodic Future Thinking as they struggle with recalling or picturing autobiographical events and past factual information. As mentioned above, both of these types of memories are needed for an individual to reconstruct this mental imagery of a possible future. Such individuals may also have trouble recognizing the faces of people she knows given that their Explicit Declarative Memories are compromised, and the mental images of certain faces linked with particular names cannot be recalled.

### Questions 30

*Answer: C*

*Explanation:*

The symptoms of individuals who suffer from Alzheimer's Disease do not equate to someone who has Synaesthesia,- individuals with a neurodiverse brain in which sensory experiences cross over together and someone who hears music may experience sensations of colour or words at the same time, for example. Features such as the following are true for people who suffer from Alzheimer's Disease- Brain Shrinkage such as Brain Atrophy, the presence of Amyloid plaques due to the build-up of Beta-Amyloid Proteins, Anterograde Amnesia and eventually, Retrograde Amnesia.

### Questions 31

*Answer: D*

*Explanation:*

The Basal Ganglia encodes implicit memories related to sequences of movement and habits which we store without being conscious of this, so they are **implicit** memories not **explicit** memories. The Amygdala plays an important role in the rapid and unconscious processing of emotions (implicit Memory) and conveys this information to the hippocampus so that emotional information can be integrated into explicit memories. E.g., implicit conditioned fear responses.

### Questions 32

*Answer: B*

*Explanation:*

Operant Conditioning occurs as the owner Marcus positively reinforces the behaviour of his dog, Raffy, by rewarding his bored dog's barking with the attention he craves.

**Questions 33**

*Answer: C*

*Explanation:*

Raffy, the Pomeranian dog, is exposed to positive reinforcement in the form of attention from his owner, Marcus who yells and chases him to stop him from barking. It makes the barking behaviour more likely to occur as he rewards Raffy with the attention he desires.

**Questions 34**

*Answer: D*

*Explanation:*

Marcus initially uses *positive reinforcement* to try and change Raffy's behaviour by rewarding Raffy's quiet behaviour with praise but then he loses his patience, and he takes away Raffy's favourite toy, his ball. He consequently, uses *negative punishment* to change the dog's behavior once and for all. Positive reinforcement is supposed to increase desirable behavior, the quietness of the dog whereas negative punishment aims to reduce undesirable behaviour, the dog barking incessantly when the zoom button goes on, by taking away a desirable object or behavior, the dog's toy in this scenario.

**Questions 35**

*Answer: A*

*Explanation:*

The aim of Positive and Negative Reinforcement is *to increase* desirable behaviour whereas Positive and Negative Punishment is *to decrease* undesirable behaviour.

**Questions 36**

*Answer: A*

*Explanation:*

Participating in more risk-taking behaviour is a behavioral response not a cognitive process linked to partial sleep deprivation. All the other statements are based on cognitive impairments.

**Questions 37**

*Answer: B*

*Explanation:*

24 hours of sustained wakefulness (Sleep Deprivation) is equivalent to the effects of BAC levels of 0.10% linked to cognitive functioning. On the other hand, 17 hours of sustained wakefulness (Sleep Deprivation) is equivalent to the effects of BAC levels of 0.05% not 0.50% in terms of cognitive functioning.

**Questions 38**

*Answer: C*

*Explanation:*

Circadian Rhythm Sleep Disorders include the following types of problems such as Delayed Sleep Phase Syndrome, Advanced Sleep Phase, Shift Work Disorder, but Sleep-Walking is not considered to be a disorder, let alone a Circadian Rhythm Sleep Disorder.

**Questions 39**

*Answer: D*

*Explanation:*

The Aboriginal and Torres Strait Islander People's Social and Emotional Wellbeing framework includes all the following aspects which are intertwined and place the individual at the center of these connections and relationships to Country, Culture, Spirit, Spirituality, Ancestors; Body, Mind & Emotions, Family, Kinship and Community. Therefore, all the above points are relevant to this framework and correct.

**Questions 40**

*Answer: B*

*Explanation:*

Low levels of the neurotransmitter, Gamma-Aminobutyric Acid (GABA), have been found to be associated with the disorder of Specific Phobias.

## **SECTION B: Short-Answer Questions**

**Question 1a. Select one from each category- (3 marks)**

### **Cognitive Functioning-Disruptions of Thinking Processes**

- Spatial Orientation is impaired.
- Thinking irrationally and illogically
- Executive Functioning is compromised such as Disruption of abilities to plan, co-ordinate, implement and evaluate deliberate actions or plans.
- Less focus and attention for an extended time
- Problem-solving and Decision-making is impaired.
- Making errors in judgement and unable to re-appraise information and assess risk factors
- Impaired memory formation and learning- Unable to concentrate on information long-enough to consolidate it into Long-Term Memory from Short-Term Memory or neural pathways prevented from being strengthened during REM sleep in order to consolidate prior learning during the day which are re-activated at this late stage normally.
- Reaction time and vigilance are lowered during monotonous tasks making them more difficult to perform due to this impediment with regards to thinking processes.
- Difficulty to simultaneously focus on several different related tasks at the same time.
- Distorted Perceptions

### **Affective Functioning- Exaggerated Emotional Responses**

- Impairments in the ability to regulate emotions.
- A change in emotional control and responses
- Less able to process and interpret emotional responses and respond accordingly.
- Greater experience of negative emotions and more susceptible to developing mood disorders such as depression and anxiety
- Possible feelings of anxiety, irritability, anger, aggressiveness, and unmotivated
- Impaired ability to recognise and categorise other people's emotions, especially based on facial expressions.
- Less empathetic to others and less emotional intelligence displayed.
- Less able to cope with stress.

### **Behavioural Actions- Impaired Actions and Reactions**

- The ability to perform fine motor functions is impaired-hand-eye co-ordination is compromised causing an increase in clumsiness, accidents, or injuries. (e.g. handwriting, computer skills or operating machinery)
- Slower reaction times during motor tasks
- Difficulty completing routine tasks.
- Increase in risk-taking behaviour.

- Slower Reflexes
- Lack of energy (feelings of lethargy)
- Trembling of hands
- Microsleeps may occur during wakefulness and disrupt attention-span, consequently, leading to accidents. They happen more often when completing monotonous or unstimulating tasks.

**Question 1b.** (4 marks)

Patrick's BAC levels (blood alcohol levels) is likely to be at approximately 0.10% after 10 drinks which will be the equivalent of 24 hours of sleep deprivation and its effects on the nervous system. On the other hand, Zoran who has had 5 drinks is more likely to have a BAC level of approximately 0.05% equal to 17 hours of sleep deprivation which would affect Cognitive, Affective and Behavioural functioning as if he had not slept for 17 hours according to the latest research.

**Question 2a.** (4 marks)

Jacinta who is going through menopause is dealing with Delayed Sleep Phase Syndrome (DSPS) that occurs when a person's circadian rhythm is delayed and the individual tends to go to bed later and wake up later. This sleep-wake cycle is in conflict with her work schedule given that she needs to get up earlier in the morning. Sasha, who is a seventeen-year-old, also is susceptible to Delayed Sleep Phase Syndrome. As children move into the adolescent stage of their life they experience a sleep-wake cycle shift resulting in a sleep phase delay (DSP). Like Jacinta, Sasha experiences a sleep onset delay, and she falls asleep later in the evening and wants to sleep later in the morning which would interfere with the scheduled times of waking up to get to school on time.

Given that Jacinta and Sasha are both not receiving the hours of sleep they require for their age, they are not getting the benefits of the restorative aspects that adequate sleep provides. This perpetuates feelings of tiredness, and it has repercussions on their cognitive, affective, behavioural functioning. Both Sasha and Jacinta are susceptible to the influence of hormonal changes which have affected their sleep-wake cycle causing a sleep-onset delay as the sleep pressure is stronger later on in the evening causing sleep-onset delay. This phenomena of sleeping later, impedes the amount of sleep Sasha and Jacinta receive given that they must awake earlier for school or work but their body needs to sleep later into the morning if they are to get adequate hours of sleep. Consequently, both of these individuals are experiencing the effects of Partial Sleep Deprivation.

**Question 2b.** (2 marks)

Frederick, Jacinta's 80-year-old father, appears to be suffering from Advanced Sleep Phase Disorder (ASPD) where the sleep pressure intensifies too early in the evening and sleep-onset occurs too early in the evening (e.g. 8 pm). Consequently, Frederick becomes alert and awakes in the early hours of the morning such as 3 or 4 am. This Sleep-Wake Cycle pattern becomes

persistent and as a result, Frederick is suffering from Partial Sleep Deprivation. This phenomenon is more common in the elderly, and it can become isolating and frustrating for such individuals who are awake when it is still dark while most of the population is still sleeping. An individual suffering from Advanced Sleep Phase Disorder (ASPD) is not receiving adequate hours of sleep for their age and so their Cognitive, Affective and Behavioural functioning can be impaired as they undergo the effects of partial sleep deprivation being subjected to an advance sleep-onset compared to other people.

**Question 2c.** (3 marks)

**Sleep Hygiene** is a term used to describe healthy sleep habits or behaviours to optimise getting to sleep when desired and achieving the quantity and quality of sleep required for good mental health and well-being. Sleep hygiene involves changing lifestyle habits and the environment that optimises sleep. Jacinta, Sasha and Frederick can attempt to achieve good sleep hygiene to enhance their sleep-wake cycle. For example, they can manipulate certain zeitgebers, cues in the environment that provide signals to our brains to do certain things at certain times to deal with the shifts in their sleep-wake cycles causing the effects of Sleep Deprivation.

For example,

- Jacinta and Sasha need to limit the amount of light (e.g., emitted from mobile phones or computers) that they are exposed to later in the evening. This is the case because artificial light emitted by tablets, phones, televisions, and computers (blue light) stimulates the brain and slows the release of melatonin which is needed to increase sleep pressure into the evening usually causing a normal sleep-onset. Hence, if the brain is stimulated by such devices emitting blue light it would make Jacinta and Sasha have difficulty falling asleep at a reasonable time.
- Frederick needs to make sure that he is exposed more to artificial light in the early evening so that he will be kept awake in the early part of the evening preventing the higher release of melatonin levels too early in the evening intensifying sleep pressure and sleep-onset delay too early. He should also keep his room dark in the early hours of the morning if he wakes up too early in order to prevent the early release of cortisol which helps us to wake up in the morning. The zeitgeber marker, natural light, triggers the release of cortisol in our body which carries out the function of waking us up as melatonin release is decreased as darkness dissipates.
- Jacinta and Sasha should make sure that they do not do things to increase their body temperature too high as it should dip before one goes to sleep. Things like exercise and warming the bedroom too much would counteract sleep onset early in the evening and help to keep them awake for longer. The onset of sleep is associated with a decrease of body temperature and an increase of melatonin which makes us drowsy, and these aspects are synched. Frederick should not cause a dip in his body temperature early in the evening as this would also make him more conducive to falling asleep earlier.
- Jacinta, Sasha and Frederik should also regulate their eating and drinking patterns to influence their sleep-wake patterns. Eating bigger meals earlier in the day and staying away from larger meals close to bedtime will help them to fall asleep easier. Insulin sensitivity (needed to regulate blood sugar levels) is greater in the morning. Hence, larger meals are processed better when eaten in the first half of the day. Since melatonin (released in the evening and night) reduces insulin release, the body is not able to process

sugars (glucose) properly when one eats late at night or very early in the morning when melatonin is high. Hence, eating at these times could cause sleep delay. Therefore, Frederick could disrupt his sleep if he eats when he wakes up at 3 am or 4 am in the morning or Jacinta and Sasha may experience sleep onset delay if they eat food when they are supposed to be falling asleep.

- Avoiding foods and drinks that contain large amounts of sugar, caffeine, and alcohol before bedtime may delay sleep onset or disrupt sleep patterns as alcohol does.
- Creating a relaxing bedroom environment -mattress, linen and pillows that are comfortable and not too hot; Curtains that block out light; a quiet space; use of scents promoting calmness such as lavender and chamomile.
- Setting a consistent sleep schedule and a regular routine for bed.
- If Jacinta and Sasha (in the late evening) and Frederick (early in the morning hours) don't fall asleep within 30 minutes instead of lying awake frustrated, they can do relaxing activities such as meditation, stretching, reading a book, in low light and not switching on any devices that emit light.
- All three individuals need to limit day-time naps so their sleep-wake cycle can become regular and over an extended period over night and not relying on extra naps to help reduce sleep debt which reinforces their maladaptive sleep-wake cycles based on Delayed or Advanced Sleep-Onset.

**Question 2d.** (2 marks)

Bright- light therapy exposes people to intense but safe amounts of artificial light for a specific and regular length of time to help synchronise their sleep-wake cycle especially when it is out of synch. Several hours of daily exposure to this artificial light can shift circadian rhythms as much as 2-3 hours per day (Shanahan et al., 1999) For Jacinta and Sasha who suffer from Delayed Sleep Phase Disorder, bright light therapy early in the morning can help to advance or time circadian rhythms earlier, so they should find it easier to sleep at an earlier time and not late in the evening as they have been experiencing. Timing the light exposure for early in the morning essentially extends the time the individuals will be awake. This will hopefully result in Jacinta and Sasha feeling “sleepy” earlier in the evening, as they have been awake for longer. Jacinta and Sasha should avoid bright light at night before they go to bed and expose themselves to light early in the morning. If they find themselves becoming sleepy during the day seeking exposure to bright light can help them increase their alertness. This may be combined with gradually adjusting the time the individual goes to bed, so Jacinta and Sasha's bedtime is slightly earlier each night. The adjustments would continue gradually until a desirable bedtime is achieved. It is important for them to maintain this routine every night, otherwise the circadian rhythm (sleep-wake cycle) may revert to the misaligned cycle again.

To treat Frederick's Advanced Sleep Phase Disorder, the bright light exposure should be carried out in the early evening when Frederick would want to go to sleep, earlier than normal for most people. This timing would help to prevent the release of melatonin and send signals to the suprachiasmatic nucleus (SCN) that it is not time to sleep so the release of melatonin is slowed down. The bright light can be removed just before Frederick desires to go to sleep. This therapy may take a week to several weeks to achieve a later bedtime and it would be a gradual process of slowly shifting the time to later sleep onset. To experience the amount of sleep Frederick requires



for optimal functioning, the bright light exposure will hopefully push his bedtime to a later time and therefore, Frederick's wake time to a later time in the morning and not as early at 3am or 4am.

**Question 3 (2 Marks)**

Vera has initially completed an unconscious spinal reflex response when she quickly withdraws her arm after scalding it in the bath, trying to check the temperature of the bath water which was obviously, too hot. The Sensory Receptors on the skin at the back of the arm send messages of feelings of the pain of the burning skin via the Sensory neurons (the afferent neural pathway) to the spinal cord where the Interneurons are located. The Interneurons then send a neural message down the Motor Neurons (Efferent Pathway) to parts of the arm, so it causes a withdrawal reflex movement. Consequently, the arm moves away from the overheated water. At the same time, the interneurons send messages up the spinal cord to the brain so that the brain is aware of what just happened, and it makes sense of the pain felt at the arm and the withdrawal movement. The Sensory and Motor Neural Pathways are part of the Somatic Nervous System which comprises the Peripheral Nervous System. The Brain and the Spinal Cord (the Interneurons) are part of the Central Nervous System. This Spinal Withdrawal Reflex is unconscious and is a survival mechanism.

The further actions of Vera running to put her arm under the cold water and her grabbing ice from the fridge to put at the back of her arm is a voluntary action directed by her brain who send motor messages to parts of the body which would help to carry out these actions. These actions are carried out by Vera's motor neurons (Efferent Neural Pathway), part of the Somatic Nervous System which is also part of the Peripheral Nervous System. The Brain and the Spinal Cord who later direct the sequence of actions make up the Central Nervous System. These later actions are Conscious Voluntary Movements.

**Question 4a. (4 marks)**

\*Raji initially goes into almost a freeze response where the parasympathetic almost dominates when he goes into Shock as he wakes up to hear the screeching sound and while half asleep, he realizes that there are two fruit-bats flying around and he tries to collect his thoughts and work out what he could do. Instead, he hides under the covers and calls out to his family to do the same by not dealing with the stressors. He is in the Alarm Stage of the GAS model at this point.

\*Raji then goes into Countershock while still in the Alarm Stage. At this point he begins to deal with the scenario of the bats flying around cabin by opening the doors and moving the duster around to eventually coax the bats out and to shake the curtains where one hid. He then checked on his wife and children. At this point the Parasympathetic System is triggered and Raji goes into Countershock in the Alarm Stage. The Fight-Flight Response that is set off enables Raji to get up and deal with the stressor although he is fearful. The HPA axis enables the release of Adrenaline and Noradrenaline to be released by the Adrenal Glands as well as the neurohormone of cortisol which energises Raji and allows part of his body to act quickly to deal with the drama. The effects of the Sympathetic System being triggered is shown by the fact that Raji is sweating profusely; his pupils dilute as he looks around quickly; he is flushed in the face and shaking, and

his heart is pounding against his chest which are all signs of heightened arousal so he can deal with the stressor. His breathing has increased, and his blood is circulating much faster to create more energy. As Raji continues to deal with the stress in terms of the GAS model he would be at the Resistance Stage. Once the fruit-bats fly out of the door of the cabin, Raji begins to calm down as he goes to check on his family and consequently, the Parasympathetic is triggered to reverse the effects of the Sympathetic System. The heart pumps slower, sweating is curbed somewhat; the pupils begin constricting and the blood flow around the body also slows down and Raji's muscles relax.

**Question 4b.** (2 marks)

Raji's response to the stressor of the flying fruit-bats in the cabin at the caravan park would be acute stress as it is an intense, short-lived stress, progressing quickly from the Alarm Stage and to the Resistance Stage with the stressful situation quickly dissipating once Raji deals with the stressors. He then calms down as the Parasympathetic System restores his nervous system back to equilibrium. Raji's scenario is not Chronic Stress which is persistent and a more debilitating stress that can even lead to exhaustion which may take a long time to deal with. With this type of stress, the individual is repeatedly in a state of heightened arousal given that cortisol, adrenaline, and noradrenaline consistently are being released often impairing the individual's immune system and making them more susceptible to health problems.

**Question 5** (4 marks)

Several coping strategies that can help relieve the effects of chronic stress include:

- **Exercise:** Regular physical activity has been shown to reduce stress hormones such as cortisol and increase endorphins, the body's natural mood boosters. Exercise also promotes better sleep, which can help reduce stress levels.
- **Mindfulness meditation:** Mindfulness meditation involves focusing on the present moment without judgment. This can help reduce stress by promoting relaxation and reducing negative thoughts and emotions.
- **Social support:** Having a supportive network of friends and family can help reduce stress levels. Talking to someone about your problems and receiving emotional support can help you feel less overwhelmed and more capable of managing stress.
- **Time management:** Feeling overwhelmed and overburdened by responsibilities can contribute to chronic stress. Effective time management can help you prioritize tasks, manage your workload, and reduce the feeling of being overwhelmed.
- **Relaxation techniques:** Activities such as yoga, deep breathing exercises, and progressive muscle relaxation can help reduce stress by promoting physical relaxation and reducing tension in the body.

These coping strategies can be effective because they help reduce the physical and psychological effects of chronic stress by promoting relaxation, reducing negative emotions and thoughts, and improving overall well-being. By incorporating these strategies into daily life, individuals can better manage their stress levels and improve their quality of life.

### **Question 6a**

Neuroplasticity, the brain's ability to change and adapt in response to experience, plays a critical role in the formation of different types of memories. The neural processes of LTP and LTD are crucial for the formation of explicit and implicit memories related to semantic memory and skills, respectively.

For example, let's consider the formation of an explicit memory related to semantic memory, such as remembering the name of a new colleague. LTP is the process by which the strength of synaptic connections between neurons is increased, leading to the long-term storage of information in the brain. In this case, when we first meet our new colleague, information about their name is transmitted through our senses and processed in the brain. If the information is deemed important, it is then sent to the hippocampus, a brain region crucial for explicit memory formation.

In the hippocampus, the synapses between neurons undergo LTP, resulting in a stronger connection between them every time the colleague's name is remembered. This process enhances the transmission of information between the neurons, leading to the consolidation of the memory. With repeated exposure to the new colleague's name, the strength of the synaptic connections becomes even stronger, and the memory becomes more consolidated each time this neural pathway is activated and easier to recall.

On the other hand, LTD is the process by which the strength of synaptic connections between neurons is decreased, leading to the weakening or elimination of connections. LTD is crucial for the formation of implicit memories related to skills. For example, let's consider learning to play a new musical instrument such as the guitar. When we first start learning, the synapses between the neurons involved in the motor skill are relatively weak. With practice, these synapses undergo LTD, resulting in a weaker connection between the neurons linked to incorrect attempts to play the guitar. This weakening of the synapses allows for more precise control of the movements required for playing the instrument, leading to the formation of a skilled memory that becomes increasingly automatic with practice and the incorrect movements are pruned away as they are less often repeated and the correct movements are consolidated given that neural pathway is repeated and firing more often.

In summary, LTP and LTD are essential neural processes that enable the brain to change and adapt in response to experience, leading to the formation of different types of memories, including explicit memories related to semantic memory and implicit memories related to skills.

**Question 6.** (2 marks)

**i. Explicit Memories:**

The brain structures involved in the encoding, consolidation, and storage of explicit memories include the hippocampus and the medial temporal lobe. The hippocampus plays a crucial role in the formation of new memories and the consolidation of recently acquired information. It helps to transform short-term memories into long-term memories by strengthening the neural connections between different brain regions. The medial temporal lobe, which includes the hippocampus, is also involved in the encoding and retrieval of explicit memories. Damage to these regions can result in the inability to form new explicit memories or recall previously acquired information.

Just in front of the hippocampus sits the amygdala which plays an important role in the rapid and unconscious processing of emotions (implicit memory), and it feeds this information to the hippocampus so that emotional information can be integrated into explicit memories. People with damage to both their amygdalae are unable to experience the emotions associated with episodic memories, and do not acquire implicit conditioned fear responses.

The neocortex, which includes 80% of the grey matter of the four cerebral lobes, stores long-term explicit memories in the form of networks of neurons, in the very same regions that represent our experiences during perception, action and thought. These experiences are sent to the hippocampus via neural pathways and then the hippocampus directs this process by binding the separate sources of information about the episode for episodic memory into an integrated memory trace which then is stored back in parts of the neocortex. Retrieval of episodic memories occurs when connections between the neocortex and the hippocampus are reconstructed in response to a cue. For e.g., when you hear an old song, it propels you back to an experience associated with it causing you to relive it. Lastly, the prefrontal cortex acts as the director of STM encoding and retrieval processes that build LTM.

**Question 6b.**

**ii. Implicit Memories** (2 marks)

The basal ganglia, cerebellum, and amygdala are the brain structures involved in the encoding, consolidation, and storage of implicit memories. The basal ganglia, cerebellum, and amygdala are all brain structures which are involved in memories that are formed unconsciously and are often related to motor skills or habits.

The basal ganglia is a group of interconnected structures located deep in the brain, and it plays a crucial role in controlling movement and procedural learning. The basal ganglia receive input from various parts of the brain, including the cortex and thalamus, and send output to the motor areas of the cortex, allowing for the execution of learned motor skills. Studies have shown that the basal ganglia are also involved in the consolidation of motor learning, which is the process of converting short-term memories into long-term memories.

The cerebellum is a large structure located at the base of the brain, and it is involved in the control of movement, balance, and coordination. The cerebellum receives input from the sensory systems and sends output to the motor areas of the cortex, allowing for the execution of learned motor skills. Studies have shown that the cerebellum is also involved in the encoding and consolidation of motor memories, as well as the acquisition of new motor skills.

The amygdala is a small almond-shaped structure located in the temporal lobe, and it is involved in the processing of emotions and the formation of emotional memories. The amygdala receives input from various parts of the brain, including the sensory systems and hippocampus, and sends output to the hypothalamus and brainstem, allowing for the expression of emotional responses. Studies have shown that the amygdala is also involved in the encoding and consolidation of emotional memories, which are a type of implicit memory.

Overall, the basal ganglia, cerebellum, and amygdala are all involved in the encoding, consolidation, and storage of implicit memories, which are memories that are formed unconsciously and are often related to motor skills or habits. These brain structures work together to allow us to learn and perform complex motor skills and emotional responses without conscious awareness or effort.

**Question 7** (6 marks)

The Method of Loci is a mnemonic device that involves mentally placing information to be remembered into a sequence of specific locations. To use this method to learn the structure and main points of a pre-prepared essay for a SAC task, Jesse needs to follow these steps:

- Choose a familiar physical location, such as her bedroom or a familiar walking route.
- Identify a sequence of specific locations within that location. For example, she could mentally walk through her bedroom, identifying specific locations such as the bed, dresser, window, and door.
- Associate each location with a main point of the essay. For example, Jesse could associate the bed with the introduction, the dresser with the first main point, the window with the second main point, and the door with the conclusion.
- Mentally place each point of the essay into the corresponding location. For example, she could imagine herself standing by the bed and reading the introduction, then walking to the dresser and reading the first main point.

Regarding the use of acronyms or acrostics to learn the points of the essay as an alternative, this could be a viable option. Jesse could create an acronym or acrostic using the first letter of each main point to help her remember the order. However, the effectiveness of this method would depend on her ability to remember the specific letters and associate them with the corresponding points.

Overall, the Method of Loci may be more effective for learning the structure and main points of a pre-prepared essay as it engages spatial and visual memory, which can help to better anchor the information in Jesse's memory. However, the effectiveness of either method would depend on Jesse's individual learning style and personal preferences.

**Question 8** (4 marks)

Songlines such as 'The Seven Sisters' are an indigenous Aboriginal or Torres Strait Islander cultural practice that involves creating and memorising song narratives that describe landmarks and geographical features in the environment. These songs, known as "songlines," serve as a means of navigation across vast and often featureless landscapes. The Method of Loci, on the other hand, is a mnemonic technique used in Western cultures to aid memory by associating items to be remembered with specific locations or "memory palaces."

Both Songlines and the Method of Loci involve the use of spatial memory and association, and both are used to aid in memory and navigation. In the Method of Loci, the individual might imagine a familiar location, such as their home, and mentally place items they need to remember in various rooms or locations within that space. Similarly, in Songlines, the singer might use landmarks and other features in the environment to create a mental map that they can use to navigate through the landscape.

However, there are also some key differences between Songlines and the Method of Loci. One of the main differences is that Songlines are rooted in a deeply spiritual and cultural practice that is tied to the land and the environment. In contrast, the Method of Loci is a technique that is primarily used to aid in memory and learning and is not necessarily tied to a specific cultural or spiritual tradition.

The use of Songlines by Aboriginal and Torres Strait Islander cultural groups involve an oral narrative linked to the geographical features which in its recounting encompasses multimodal expressions of the story and the linked knowledge it imparts down the generations. These intertwined aspects include linked narrative songs, dance, art, music, and kinship relationships which work as memory cues facilitating the passing on and consolidation of knowledge. This multi-modal approach fosters an understanding of phenomena about the plants, animals, mankind, the heavens, and all entities including mankind given that information is encoded in different parts of the brain.

On the other hand, the method of loci used by western cultures employs the use of mental imagery linked to familiar spatial places like one's home, school or workplace or a familiar journey using key landmarks. Each familiar location is used to encode and store a list of sequential words or information and it facilitates the retrieval of this information when one takes a mental journey to the specific location in a specific order. These locations act as visual cues with mental visual imagery facilitating the process. This method was used by the ancient poets and philosophers to recall passages that they would recite to audiences. With regards to Songlines, a range of mnemonic devices are used at the same time such as kinaesthetic movement, sound via the dances, imagery, and colour through the use of created art works and even spatial cues by the fundamental use of geographical locations related to the land.

Overall, while Songlines and the Method of Loci share some similarities in their use of spatial memory and association, Songlines are much more sophisticated in the use of multi-modal cues to consolidate information and to retrieve it to impart cultural knowledge and one's place in a system based on kinship.

**Question 9** (4 marks)

The different “Ways of Knowing” and imparting cultural knowledge to their younger generations employed by Aboriginal and Torres Strait Islander groups is outlined in detail in the answer to question 8. This mode of imparting and preserving knowledge for future generations is based on a multi-modal approach which cleverly scaffolds the knowledge and uses a range of memory cues to encode and retrieve information. It focuses very much on an oral tradition based on different forms embedded on Country which is all-encompassing, and it is situated in an intricate system of relationships known as “kinship” based on different expectations and obligations placed on individuals within this network for those who receive and impart knowledge. Western Cultural groups do have multi-modal ways of knowing but there is a greater focus on the written texts and communication as well as some oral components such as storytelling. Nevertheless, Indigenous cultures place a greater emphasis on the oral component, and it is fundamental to how they preserve and pass on cultural knowledge and all they understand about life and the world.

**Question 10 a.** (3 marks)

Working consistently on the night shift in an emergency department can have various impacts on Mohammed's cognitive, behavioural, affective, and physical well-being.

**Cognitive Impacts:**

- Sleep deprivation due to working irregular hours can affect Mohammed's cognitive functioning. Lack of sleep can impair memory, concentration, decision-making, and problem-solving skills.
- The unpredictable nature of his job can make it difficult for Mohammed to plan and manage his workload effectively. This can lead to a state of constant stress and overwhelm, which can further affect his cognitive abilities.

**Behavioural Impacts:**

- Irregular work hours can affect Mohammed's eating habits, leading to unhealthy food choices and a lack of proper nutrition.
- Working in an emergency department can be physically demanding, and Mohammed may find it challenging to maintain a healthy work-life balance, resulting in a lack of exercise, social interaction, and leisure time.

**Affective Impacts:**

- Constant exposure to patients with severe illnesses, injuries, and trauma can have an emotional toll on Mohammed, leading to compassion fatigue, burnout, and depression.

- Working during the night shift can also lead to social isolation, which can further impact Mohammed's emotional well-being which could lead to depression.

**Physical Impacts:**

- The irregular sleep pattern associated with working night shifts can disrupt Mohammed's circadian rhythm, leading to fatigue, decreased immunity, and an increased risk of chronic health problems.
- The high-stress environment of the emergency department can cause Mohammed's body to release stress hormones such as adrenaline, noradrenaline, and cortisol, which can have negative effects on his physical health in the long run depressing his immune system.

**Question 10b.** (3 marks)

There are several biological, social, and psychological protective factors that can help Mohammed, the doctor, from not becoming mentally ill due to the stressful demands of his work in the emergency department and working night shifts for several years. Here are some examples:

**Biological factors:**

- Regular exercise: Engaging in physical activity can improve mood, reduce stress and the depletion of stress hormones, and boost overall mental health.
- Adequate sleep and good sleep hygiene: Ensuring that he gets enough sleep, even during the day, can help Mohammed regulate his mood, manage stress, and maintain overall mental well-being.
- Balanced diet: Eating a healthy, balanced diet that includes nutrient-dense foods like fruits, vegetables, whole grains, and lean protein can provide the energy and nutrients needed to cope with stress and maintain mental health.

**Social factors:**

- Social support: Having a network of supportive friends and family members who can offer emotional support, practical assistance, and a listening ear can help Mohammed cope with stress and feeling less isolated.



- **Positive work environment:** A supportive and positive work environment can help alleviate work-related stress and boost job satisfaction. Mohammed can seek out opportunities for teamwork, mentorship, and camaraderie with his colleagues.
- **Hobbies and leisure activities:** Engaging in hobbies and leisure activities outside of work can provide a sense of balance and enjoyment, as well as promote stress relief and overall mental health.

**Psychological factors:**

- **Mindfulness and meditation:** Practicing mindfulness, meditation and yoga can help Mohammed manage stress, regulate his emotions, and maintain mental clarity and focus.
- **Cognitive-behavioural techniques:** Learning and practicing cognitive-behavioural techniques can help Mohammed identify and challenge negative thought patterns, manage stress, and promote overall mental well-being.
- **Resilience training:** Participating in resilience training programs can help Mohammed build resilience and cope with the demands of his work more effectively.

Overall, a combination of these biological, social, and psychological protective factors can help Mohammed maintain his mental health and well-being despite the stressful demands of his work in the emergency department and working night shifts for several years.

**Question 11** (4 marks)

Cultural Determinants, Cultural Continuity, and Self-Determination are all crucial components of the social and emotional wellbeing of Aboriginal and Torres Strait Islander Peoples. These factors are linked in complex ways and together can serve as protective factors for the mental health and well-being of Indigenous Australians.

Cultural determinants refer to the cultural values, beliefs, practices, and traditions that shape the way Indigenous Australians think, feel, and behave. These determinants are central to Aboriginal and Torres Strait Islander identity and help individuals maintain a sense of connection to their cultural heritage. The preservation and promotion of cultural determinants can, therefore, be viewed as a protective factor for Indigenous Australians' social and emotional well-being.

Cultural continuity is another important factor that contributes to the well-being of Indigenous Australians. This term refers to the intergenerational transmission of cultural knowledge, language, and practices. When Indigenous Australians can maintain their connection to their cultural heritage through cultural continuity, they are more likely to experience positive mental health outcomes.

Self-determination is also a critical component of the social and emotional well-being of Indigenous Australians. This concept refers to the ability of Indigenous peoples to govern themselves and make decisions about their own lives. When Indigenous Australians can exercise

self-determination, they are more likely to experience a sense of control over their lives and a sense of empowerment.

Together, cultural determinants, cultural continuity, and self-determination can be viewed as protective factors for the social and emotional well-being of Indigenous Australians. When Indigenous Australians can maintain a strong connection to their cultural heritage and exercise self-determination, they are more likely to experience positive mental health outcomes and a sense of well-being. These protective factors are essential for promoting the resilience and strength of Indigenous Australian communities.

**Question 12a** (2 marks)

Sleep pressure is the build-up of the body's need for sleep over time and it can be called homeostatic pressure to sleep. It is caused by a variety of factors, including the length of time an individual has been awake, the level of activity they have engaged in, and the body's natural circadian rhythm. This physiological drive ensures that we get enough restorative sleep each night.

The primary brain structure involved in creating sleep pressure is the suprachiasmatic nucleus (SCN), located in the hypothalamus. The SCN acts as the body's internal clock, regulating the timing of sleep and wakefulness based on environmental cues such as light and darkness. Our sleep demand will be higher after completing tasks that are more cognitively challenging or physically demanding, as well as when our immune system is fighting infection, which increases our demand for sleep. As a result, our sleep may be longer and deeper for those experiences.

Our internal biological clock (or circadian clock) is found in the hypothalamus and is called **the suprachiasmatic nucleus (SCN)**. The SCN is a cluster of 20,000 neurons deep within the brain located just above the optic chiasm, which is where the optic nerves from the two eyes cross over. The SCN receives information from the optic nerve about levels of light, which assists its function. At night, the lack of light stimulation activates the SCN to trigger the pineal gland, to release a hormone, melatonin, which causes one to get drowsy and causes sleep pressure and sleep-onset. The Pineal Gland is in the centre of the brain, between the two hemispheres, and helps to regulate the body rhythms and the sleep-cycle. Melatonin is increased in the bloodstream as it begins to get dark at dusk and peaks around midnight. Melatonin levels fall as the morning approaches, making it easier for the individual to wake up. As the sun rises the SCN will signal the release of cortisol in the Adrenal Glands and consequently, inhibit the release of melatonin so the demand for sleep will be significantly reduced. Cortisol will prepare your body to wake up by increasing arousal levels and will be reduced as it becomes dark. As the amount of time spent awake increases throughout the day, the pressure to sleep increases.

Moreover, Adenosine is a by-product of cellular metabolism that accumulates in the brain over the course of wakefulness. As adenosine levels increase, they bind to receptors in the brain that promote sleep. The accumulation of adenosine creates a feeling of sleepiness and the desire to sleep.

Other regions beside the SCN in the brain can influence the demand for sleep too such as the brainstem (in the base of the brain and the top of the spinal cord) relays information about the

state of the body such as 'having a full stomach' are influential in enabling us to fall asleep. (Colten & Altevogt, 2006)

**Question 12b.** (4 marks)

The phenomenon of sleep involves both Circadian Rhythms and Ultradian Rhythms. Circadian Rhythms are endogenous, biological processes that regulate physiological and behavioural functions over a 24-hour period. The term 'Circadian' in Latin means 'about a day.' The sleep-wake cycle is one of the most well-known Circadian Rhythms, and it is controlled by the suprachiasmatic nucleus (SCN) in the hypothalamus. The SCN receives input from light-sensitive cells in the retina, which allows it to synchronize the sleep-wake cycle with the 24-hour day.

Ultradian Rhythms, on the other hand, are biological rhythms that occur more frequently than once a day. During sleep, Ultradian Rhythms are responsible for the cycles of non-rapid eye movement (NREM) and rapid eye movement (REM) sleep that occur throughout the night.

While Circadian Rhythms roughly follow a 24-hour cycle, ultradian Rhythms are biological rhythms that follow a cycle of less than 24 hours. In terms of sleep, the Ultradian Rhythm refers to the alternation of two distinct types of sleep, NREM and REM sleep, throughout the sleep period. Each cycle lasts approximately 90 minutes per cycle. This 90-minute cycle typically occurs 4-5 times throughout the night, with the stages going forwards and backwards and different stages slightly altering in length as the night of sleep goes on into the early morning. When one sleeps several physiological changes occur at different stages of the sleep cycle. For example, one's eye movements, muscle tension and brainwaves all change cyclically throughout a typical night's sleep.

NREM sleep is divided into three stages, each of which is characterised by a different pattern of brain activity. Stage 1 NREM sleep is a transition phase between wakefulness and sleep, and it is characterised by slow, rolling eye movements and a reduction in muscle tone. Stage 2 NREM sleep is a deeper stage of sleep, during which brain activity slows even further, and there are no eye movements. Stage 3 NREM sleep is the deepest stage of sleep, also known as slow-wave sleep, during which brain activity is at its lowest, and it is difficult to awaken the sleeper. This stage is when sleepwalking, sleep-talking and night terrors is more likely to occur.

REM sleep is a distinct stage of sleep that involves rapid eye movements, hence its name. During REM sleep, brain activity increases to levels that are like those seen during wakefulness (Beta-waves), and the body becomes paralysed to prevent the sleeper from acting out their dreams. REM sleep is important for memory consolidation and emotional processing, and it is thought to play a role in learning and creativity. NREM sleep is believed to help with growth and muscle restoration from the day's wear and tear. It is believed to replenish the body.

**Question 12c.** (4 marks)

Sleep is considered a psychological construct because it is an internal, subjective experience that is difficult to observe and measure directly. Sleep is a complex process that involves changes in brain activity, body physiology, and behaviour. The subjective experience of sleep includes factors such as feelings of restfulness, awareness of external stimuli, and dreaming.

To study sleep as a phenomenon, various measurements of sleep are used to provide an understanding of its different aspects. One common measurement of sleep is electroencephalography (EEG), which records brain activity during sleep. EEG measurements can provide information about the different stages of sleep, including the amount of time spent in each stage, the frequency of brain waves, and the presence of specific patterns of activity, such as sleep spindles and slow waves. The electro-oculograph (EOG) is a device that detects, amplifies and records the activity of the electrical muscles surrounding the eyes that move or rotate them in their sockets. Electro-oculography readings are useful in determining whether someone is awake in NREM sleep, or in REM Sleep. An electromyograph (EMG) is a device that detects, amplifies and records the electrical activity created by active skeletal muscles. EMG measurements show a gradual decrease in muscle tension as we enter the sleep cycle beginning stage 1 NREM and decreasing in the deeper stage of NREM Sleep until atonia (muscle paralysis) is present during REM Sleep.

Another measurement used to study sleep is polysomnography (PSG), which includes a collection of measures of brain activity, eye movements, muscle activity, heart rate (ECG), and breathing. PSG can provide a detailed picture of sleep architecture, including the different stages of sleep, the number of awakenings during the night, and the duration of each stage.

Subjective measures of sleep, such as sleep diaries and questionnaires, are also used to study sleep as a psychological construct. These measures assess factors such as the time it takes to fall asleep, the quality of sleep, and the presence of sleep disturbances. Subjective measures of sleep are useful for assessing the impact of sleep on daily functioning and quality of life.

Overall, the various measurements of sleep provide a comprehensive understanding of sleep as a phenomenon. By combining objective measures, such as EEG and PSG, with subjective measures, such as sleep diaries and questionnaires, researchers can gain insight into both the physiological and psychological aspects of sleep. These devices all provided insight into the subjective experience of Sleep and provided greater knowledge of this psychological construct.

**Question 13** (10 marks)

**Teacher's Notes-**

**Research Hypothesis:**

- It is hypothesised if students were exposed to an intervention that relieves anxiety before highly pressurised exams, their performance would improve.
- It is predicted that students who write about one's worries and fears before taking a high-stakes and pressurized exam would lead to improved performance on the exam.

### **Independent vs Dependent Variables**

- The independent variable in this study was the intervention given to the students, where Group A did not receive any intervention (sitting quietly and Group B had to write about their fears and worries regarding the upcoming exam (intervention).
- The dependent variable was the performance of the students in the maths exam (taken in a high-stakes and pressurized environment).

### **Design**

- The study was a laboratory experiment with two conditions - pre-test (trial 1) and post-test (trial 2).
- The experimental design used was *the Between Subjects Design*. It involved an experimental and control group. (Trial 2) The experimental group was the one that did the writing exercise before the pressurised high-stakes test (the intervention group) and the control group sat quietly before the highly-pressurised high-stakes test. The group receiving the intervention was Group B and the control group was Group A. Both groups took a math pre-test (Trial 1) followed by a high-stakes and pressurized math exam (Trial 2), with the intervention group spending 10 minutes writing about their worries and fears before trial 2.

### **Sampling.**

- The study included 20 college students who were randomly assigned to either the intervention or control group. The college students were selected through a convenience sampling method.

### **The Results and their Implications**

- The results of the study showed that the group that received the intervention (Group B) performed significantly better than the group that did not receive any intervention (Group A). Group B showed a 5% improvement in their performance from the pre-test to the post-test, while Group A showed a 12% decrease in their performance. This suggests that interventions that reduce anxiety can help improve exam performance. These findings possibly highlight that writing about one's worries and fears can help alleviate anxiety and improve performance on high-stakes and pressurized exams.

### **Possible Extraneous Variables**

- Possible extraneous variables that could have influenced the results include individual differences in anxiety levels not pre-tested for, previous experience with high-stakes exams, and motivation levels of the students to succeed may have varied within the groups.

- The participants were not screened for substances before they took the pre-test and post-test. Some of them might have had caffeinated drinks before the trial or other substances that could interfere with cognitive processing and anxiety levels.
- The participants were not screened for mindfulness activities or routines that they may use before the pre-test and the post-test or the control group was not even asked if they used mindfulness practices while sitting quietly and waiting for the highly pressurised test.
- Participant differences based on different memory abilities and different IQ levels of the participants as this was not controlled for by pre-testing and using stratified sampling.

### **The Possibility of Generalisations**

- It is important to note that this study was conducted with a small sample of college students and in a laboratory setting. The findings may not generalize to other populations or real-world settings. The size of the sample was limited to 20 students and not a representative sample of the population of interest and the study was conducted in a laboratory simulating a highly pressurised scenario for the maths test. Is this really the same as a real-life scenario of high-stress testing conditions? There is not enough information about the university students or known participant differences to ascertain whether it is a representative sample for a range of characteristics, ages, and genders. Moreover, the sample is too small as well. One could raise questions about the validity and reliability of the study.

### **Suggestions for Improvements related to the study**

- The experimental design used was *the Between Subjects Design*. It involved an experimental and control group. The experimental group was the one that did the expressive test before the pressurised test and the control group was the one that sat quietly before the highly pressurised test. An alternative approach could have been the *Within Subjects Design* or the *Repeated Measures Design*. The same group would experience the two different conditions (the expressive test and the sitting quietly before the test) at different times and then the effect of the drink maths performance would be tested. An advantage of the *Between Subjects Design* is that it does not have *order effects* but one of its limitations is the possibility of participant differences as a variable that can become a confounding variable. On the other hand, the advantage of the *Within Subjects Design* is that individual differences between participants do not influence the results given the same group is compared for the different conditions (one being the IV). A limitation of the *Within-Subjects Design* is that the Order-Effect (or the Practice Effect) could influence the results as each subject has to be tested twice and may benefit from practising or react differently during the second trial/attempt.
- The sampling procedure could have included stratified sampling based on controlling a range of participant differences which is a limitation of the *Between Subjects Design*. A *Mixed Design* would have been even more optimal in this case, as it uses *Within and*

*Between Participant Designs.* A *matched-Groups Participant Design* would also control the issue of participant differences. In this case, individuals from each the two groups are matched on several variables based on participant differences. With regards to the methodology, a pre-test or screening on a range of factors could have also given more information about the Uni students who participated and who volunteered to do this study. A pre-survey or interview would have been beneficial for the researchers to collect more information about the participants.

- More realistic and real-life scenarios were needed and not just a simulated laboratory test and this could be a consideration of real-life examples being used in future studies and considerations for improvements to be made linked to this study analysed.

**Ethical Principles and Other Considerations:**

- The study followed ethical principles by obtaining informed consent from participants, voluntary participation, debriefing them after the study, and ensuring that participants were not harmed or put in any significant discomfort during the study (Beneficence and non-Maleficence were considered). There was no mention of the participants understanding that they had withdrawal rights if they wanted to leave due to distress during the study. There was also no mention related to the principle of confidentiality being upheld either. Experimenter bias being controlled for was not mentioned either given that the single-blind procedure or the double-blind procedures were not incorporated into the design of the study in question.