

STUDENT NUMBER

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# PSYCHOLOGY

## Written examination

Monday 30 October 2023

Reading time: 9.00 am to 9.15 am (15 minutes)

Writing time: 9.15 am to 11.45 am (2 hours 30 minutes)

### QUESTION AND ANSWER BOOK

#### Structure of book

<i>Section</i>	<i>Number of questions</i>	<i>Number of questions to be answered</i>	<i>Number of marks</i>
A	40	40	40
B	9	9	80
			Total 120

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners and rulers.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or correction fluid/tape.
- No calculator is allowed in this examination.

#### Materials supplied

- Question and answer book of 40 pages
- Answer sheet for multiple-choice questions
- Additional space is available at the end of the book if you need extra space to complete an answer.

#### Instructions

- Write your **student number** in the space provided above on this page.
- Check that your **name** and **student number** as printed on your answer sheet for multiple-choice questions are correct, **and** sign your name in the space provided to verify this.
- All written responses must be in English.

#### At the end of the examination

- Place the answer sheet for multiple-choice questions inside the front cover of this book.

**Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.**

**SECTION A – Multiple-choice questions****Instructions for Section A**

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.

Choose the response that is **correct** or that **best answers** the question.

A correct answer scores 1; an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

**Question 1**

Which of the following branches of the nervous system are dominant in a conscious response, an unconscious response and a spinal reflex?

	Conscious response	Unconscious response	Spinal reflex
A.	spinal cord	brain	brain and spinal cord
B.	brain and spinal cord	spinal cord	spinal cord
C.	brain	spinal cord and brain	spinal cord
D.	brain and spinal cord	brain and spinal cord	brain

**Question 2**

Which of the following is correct for dopamine and glutamate?

	Dopamine		Glutamate	
	Action	Function	Action	Function
A.	excitatory	induces sleepiness	inhibitory	increases learning
B.	excitatory	increases learning	inhibitory	reduces stress response
C.	inhibitory and excitatory	increases feelings of pleasure	excitatory	increases learning
D.	inhibitory and excitatory	reduces addictive behaviours	excitatory	reduces sleepiness

**Question 3**

According to Hans Selye's General Adaptation Syndrome, a person is most likely to enter the stage of exhaustion when they

- A. appraise the situation as being beyond their coping abilities.
- B. have experienced chronic stress and then encounter an acute stressor.
- C. perceive themselves as not having the resources to cope with chronic stress.
- D. experience shock and their parasympathetic nervous system is unable to function.

**Question 4**

Which of the following is correct for long-term potentiation and long-term depression?

	Long-term potentiation	Long-term depression
A.	involves sprouting and rerouting	involves pruning and rerouting and increased glutamate transmission
B.	reduces the efficacy of neuronal synapses through pruning	strengthens the efficacy of neuronal synapses through sprouting
C.	strengthens the efficacy of neuronal synapses through increased secretion of glutamate	reduces the efficacy of neuronal synapses through pruning of redundant pathways
D.	is characterised by a decrease in post-synaptic strength caused by pruning of synapses	is characterised by an increase in post-synaptic glutamate transmission

**Question 5**

While crossing a busy road Alex was nearly hit by a car. The car came towards them and they remained still on the spot, briefly unable to move. After reaching the other side safely, Alex realised their hands were shaking and their breathing was increased; they felt angry and wanted to yell at the driver for being careless.

Which of the following correctly identifies Alex's experience with nearly being hit by the car?

	When the car came towards them		When their hands were shaking and breathing was increased	
	Dominant nervous system	Response	Dominant nervous system	Response
A.	sympathetic	freeze	sympathetic	flight
B.	sympathetic	flight	parasympathetic	freeze
C.	parasympathetic	fight	parasympathetic	freeze
D.	parasympathetic	freeze	sympathetic	fight

Use the following information to answer Questions 6 and 7.

Peta received news that their job interview was unsuccessful despite them preparing thoroughly and feeling confident. After initially feeling disappointed and thinking that they would never get a job again, they decide to call and ask for feedback about the interview.

**Question 6**

Referring to Lazarus and Folkman's Transactional Model of Stress and Coping, correctly identify Peta's primary and secondary appraisals of this event.

	Primary appraisal	Secondary appraisal
A.	It did not matter and was irrelevant.	They did not have the resources to cope.
B.	It could potentially harm their future employment prospects.	They had the resources to cope with this setback.
C.	They had resources to improve their chances of getting a job.	They felt stressed and unable to apply for future jobs.
D.	They did not have the ability to cope with this setback.	They demonstrated coping flexibility.

**Question 7**

Peta uses this experience and feedback to imagine their next job interview.

Their ability to create a possible imagined future relies on

- A. the ability to construct mental imagery while they are in their next interview.
- B. semantic autobiographical memory of the answers that they provided last time.
- C. episodic autobiographical memory of the room the interview will take place in.
- D. the encoding of implicit and explicit memories of the company they are applying to.

Use the following information to answer Questions 8–10.

A large-scale study on mental health and wellbeing asked participants to select one self-management strategy they had implemented to manage their mental health in the last six months.

Self-management mental-health strategies						
	Practised thinking positively	Sought support from family or friends	Practised mindfulness meditation	Changed diet	Took oral supplements (e.g. vitamins)	Cut out alcohol or drugs
Percentage of sample (%)	25.8	21.0	20.6	17.3	12.6	2.7

Source: adapted from Australian Bureau of Statistics, 'National Study of Mental Health and Wellbeing', 2022, <abs.gov.au>

### Question 8

According to the information in the table above, which one of the following statements is true?

- A. The most commonly used avoidance strategies were biological.
- B. Biological strategies were utilised less than mindfulness meditation.
- C. Psychological strategies were utilised more than biological strategies.
- D. More people used social support strategies than psychological support strategies.

### Question 9

Researchers wanted to evaluate the impact of public health campaigns promoting strategies for mental wellbeing on the number of individuals using these strategies over time.

What would be the most appropriate way for researchers to determine the impact of the campaigns?

- A. Calculate the percentage change in people using each strategy 12 months later.
- B. Calculate the mode of the number of individuals using a strategy at six-month intervals.
- C. Identify outliers of scores of the number of individuals using a strategy on a weekly basis.
- D. Assess the standard deviation of scores of the number of individuals using a strategy monthly.

### Question 10

Researchers found that people were likely to change strategies if they did not see a change in their mental wellbeing.

Changing strategies demonstrates

- A. avoidance of the underlying stressor.
- B. a primary appraisal, as they determined the stressor to be benign.
- C. coping flexibility, as they were able to change strategies for a better outcome.
- D. a primary appraisal, as they determined they did not have the resources to cope.

**Question 11**

Aboriginal and Torres Strait Islander approaches to learning and knowledge are fundamentally different from Western approaches.

One unique aspect of Aboriginal and Torres Strait Islander ways of learning is that

- A. the learner is involved in collaborative activities.
- B. knowledge is held by the teacher and received by the student.
- C. learning is interwoven and relational to kinship through Country.
- D. the multimodal system is a collection of artefacts that are brought together to create a successful learning environment.

*Use the following information to answer Questions 12–14.*

Physical education teachers often demonstrate a desired motor skill and then ask their students to perform the same skill in the next lesson. The teacher then provides them with encouraging and focused feedback while they practise the motor skill.

**Question 12**

According to the Atkinson-Shiffrin multi-store model of memory, the retention stage of observational learning is most effective when

- A. the visual information of the motor skill is first received in the sensory register.
- B. rehearsal of the visual image of the motor skill maintains it in the short-term memory store.
- C. the memory of the motor skill is retrieved from the short-term memory store to the sensory memory store.
- D. the mental representation of the motor skill is encoded from the short-term memory store to the long-term memory store.

**Question 13**

In the first lesson, what are the two most important observational learning processes that will influence how the student begins to learn the target motor skill?

- A. attention and retention
- B. retention and reinforcement
- C. reproduction and motivation
- D. reinforcement and motivation

**Question 14**

As students master the desired action, the memory of the motor skill involves the

- A. neocortex and hippocampus, as it is an explicit memory.
- B. basal ganglia and cerebellum, as it is an implicit memory.
- C. hippocampus and cerebellum, as it is an implicit memory.
- D. hippocampus, neocortex and amygdala, as it is an explicit memory.

Use the following information to answer Questions 15–18.

Dawes et al. (2022) conducted an investigation with 30 people who experience aphantasia (aphantasic participants), who were compared to 30 control participants who did not experience aphantasia.

Participants completed a questionnaire on visual mental imagery and an online interview, where they were asked to remember and describe the details of past personal life events and hypothetical imagined future events based on prompts.

Source: A Dawes, R Keogh, S Robuck and J Pearson, 'Memories with a blind mind: Remembering the past and imagining the future with aphantasia', *Cognition*, vol. 277, 2022, <doi.org/10.1016/j.cognition.2022.105192>

**Question 15**

Which of the following results would most likely be found?

- A. Control participants are less likely to link implicit memories with mental imagery.
- B. Aphantasic participants reporting enhanced episodic detail compared to control participants.
- C. Aphantasic participants reporting lower mental imagery vividness compared to control participants.
- D. Control participants generating more semantic detail than aphantasic participants when imagining future events.

**Question 16**

Research with people experiencing aphantasia suggests that

- A. mental imagery is important for the encoding of semantic information.
- B. episodic memories are stored in areas of the hippocampus and neocortex.
- C. autobiographical memory retrieval is dependent on vividness of mental imagery.
- D. there would be no difference in autobiographical memory between aphantasic and non-aphantasic research participants.

**Question 17**

If Dawes et al. had conducted a similar experiment using an additional group of people diagnosed with early stages of Alzheimer's disease, they would likely find which similarity between this group and the aphantasic group?

- A. short-term memory impairment
- B. difficulty retrieving childhood memories
- C. reduced semantic detail of autobiographical events
- D. impairments when asked to construct possible imagined futures

**Question 18**

If Dawes et al. wanted to test the repeatability of their results, they could conduct the investigation again using

- A. the same group of participants.
- B. a different visual imagery questionnaire.
- C. the same methodologies but with different participants.
- D. an additional group of people diagnosed with Alzheimer's disease.

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**Question 19**

Which of the following describes an advantage and a limitation of using acronyms?

	<b>Advantage</b>	<b>Limitation</b>
A.	retrieval of information is enhanced by cues	primarily limited to recalling semantic information
B.	encoding is enhanced by creating meaningful links between the information and landscapes	does not help recall larger pieces of information
C.	there is deep encoding of information through the activation of the basal ganglia	requires effort and does not guarantee understanding of the information
D.	multiple pieces of information are integrated together to enhance memory	usually requires extensive training

**Question 20**

Which of the following are accurate examples of what can be determined about sleep by video monitoring and sleep diaries?

	<b>Video monitoring</b>	<b>Sleep diary</b>
A.	timing of melatonin release	mood upon waking up each morning
B.	confirmation of leg movement shown on an electromyograph (EMG)	number of awakenings recalled
C.	duration of NREM cycles that occurred	number of REM cycles that occurred
D.	vividness of dreams that occurred	number of muscle twitches that occurred

**Question 21**

Which of the following statements about the sleep-wake cycle is most accurate?

- A. The timing of meals is not related to the regulation of the sleep-wake cycle.
- B. Internal factors have a stronger influence on the sleep-wake cycle than external factors.
- C. Temperature changes are found to have a greater impact on ultradian rhythm patterns than light.
- D. The timing of the sleep-wake cycle can be improved by internal factors but only ever impaired by external factors.



**Question 22**

For those experiencing a Delayed Sleep Phase Syndrome (DSPS), short naps throughout the day can lead to partial sleep deprivation symptoms.

Which of the following accurately represents the symptom and its cause?

	Symptom	Cause
A.	increased hyperactive behaviour	more time spent in NREM Stage 2 throughout sleep-wake cycle enhances energy levels
B.	shortened attention span	reduced amount of REM sleep due to short daytime naps
C.	decreased alertness	lack of NREM Stage 3 throughout the short daytime nap inhibits emotional resilience
D.	decreased irritability	overall increase in duration of sleep across the circadian rhythm

**Question 23**

Which of the following is a characteristic shared by both Delayed Sleep Phase Syndrome (DSPS) and Advanced Sleep Phase Disorder (ASPD)?

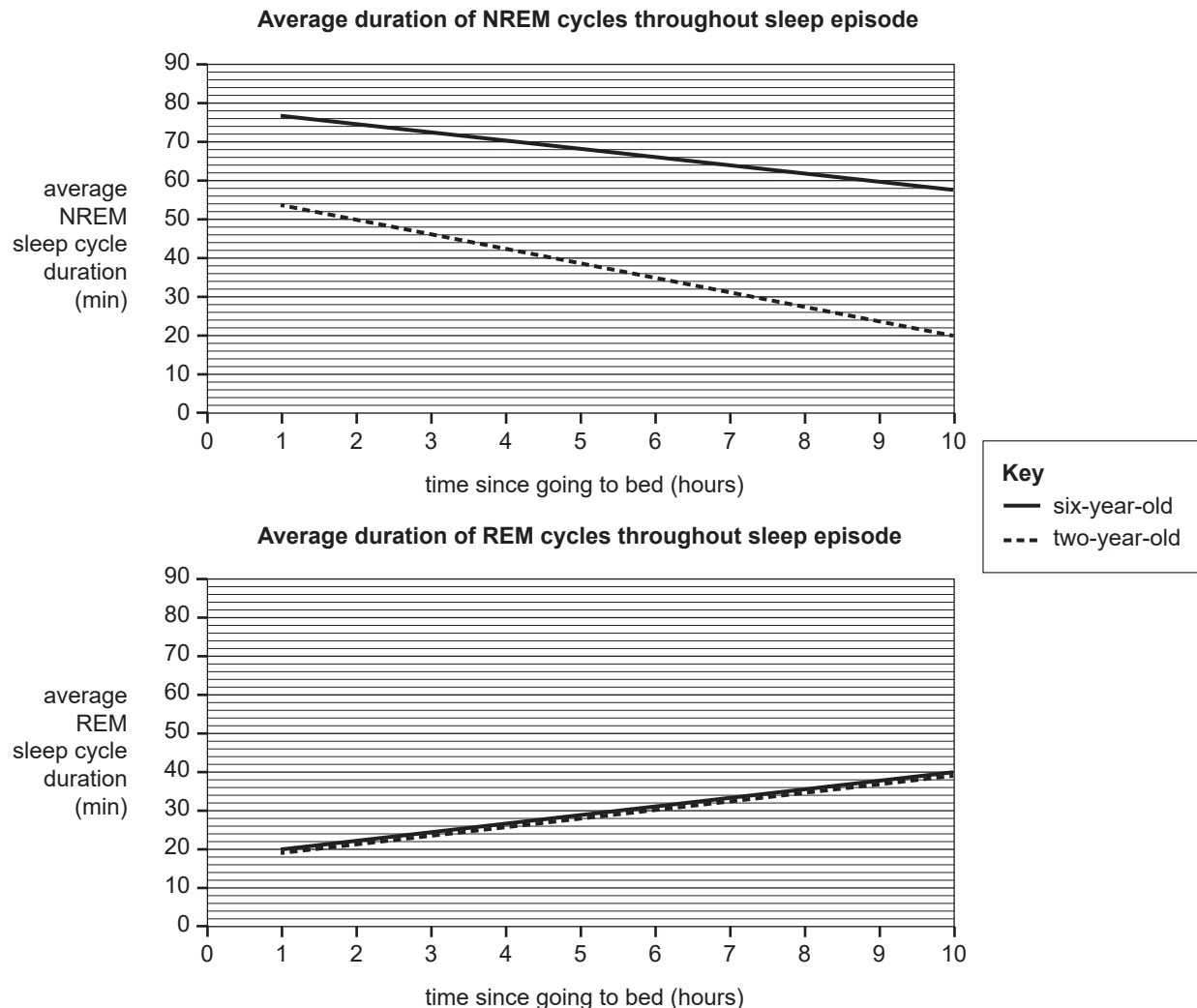
- A. Both are equally common with the elderly.
- B. Both result from not receiving enough light early in the morning.
- C. Both feature the presence of long periods of REM sleep early in the sleep episode.
- D. Neither result in any sleep deprivation if the person can sleep at times dictated by their body clock.

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Use the following information to answer Questions 24–27.

Jessica is a post-graduate university student who is conducting research into the sleep episodes of children. The first research phase included an analysis of 10 healthy two-year-old and six-year-old children's sleep episodes (total amount of sleep) across five nights following 14 hours of wakefulness. The children slept in their normal home environments and opportunities for napping (short-duration day sleeping) were provided for the two-year-old children.

The data collected is shown in the graphs below.



Source: adapted from Lopp et al. 'Developmental Changes in Ultradian Sleep Cycles across Early Childhood: Preliminary Insights', *Journal Biological Rhythms*, 32(1), 2017, pp. 64–67

#### Question 24

Each child, regardless of age, had a sleep episode with a mean duration of 10 hours overnight.

With reference to the graphs, an appropriate conclusion that Jessica could draw would be that

- A. there was an increase in the number of NREM sleep cycles from ages two to six.
- B. there were significant differences in the amount of REM sleep across ages two to six.
- C. as children age, the length of their ultradian rhythm increases and the number of ultradian rhythms per sleep episode decreases.
- D. the differences in REM sleep duration can be attributed to the earlier sleep time for two-year-old children compared to six-year-old children.

**Question 25**

A limitation of Jessica's research is that

- A. it is not possible to gain informed consent for participants under the age of 18.
- B. variables such as susceptibility to bedwetting decrease the uncertainty of the study.
- C. the six-year-old children could have different sleep patterns from the two-year-old children.
- D. the sample should include more diversity in the participant characteristics and not just healthy children.

**Question 26**

Jessica's second research phase involved participants aged 14 and 17. This phase was conducted on five school nights during the term.

Compared to the younger participants in the original study, the adolescent results would likely show

- A. longer sleep episodes.
- B. a greater amount of time spent in NREM sleep.
- C. a greater proportion of the sleep episode spent in NREM sleep.
- D. a greater amount of REM sleep at the beginning of their sleep episode.

**Question 27**

Sleep is a 'psychological construct', and this means it is important for Jessica to remember that

- A. REM sleep is easier to identify than NREM sleep.
- B. sleep quantity is difficult to measure as it cannot be directly observed.
- C. sleep can easily be mistaken for different states of normal waking consciousness.
- D. valid and reproducible sleep studies require both subjective and objective measurements.

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Use the following information to answer Questions 28–30.

Researchers conducted an experiment to investigate the influence of the chemical theophylline on the circadian rhythm of rats in dark conditions. Theophylline is found naturally in brewed tea and acts to stimulate central nervous system activity. The study was conducted on 10 rats, which were administered a single theophylline dose (0.5 mg/kg) one hour before they fell asleep, and were then monitored for two days using an electroencephalograph (EEG) with no access to natural or artificial light. Three major states of consciousness were analysed during the 48 hours of observation: waking, NREM sleep and REM sleep.

**Question 28**

The use of a control group in this study would require a group of rats that

- A. receives 0.5 mg/kg of a salt solution.
- B. is exposed to full light conditions for one of the two days.
- C. is sleep-deprived for the two days following administration of theophylline.
- D. is a different species of rats, genetically modified to not digest theophylline.

**Question 29**

The study monitored the rats for two days using an EEG.

Which of the following is a likely observation from the study?

- A. Presence of theophylline results in a reduction of awakenings.
- B. Presence of theophylline results in REM sleep brain waves that closely match waking brain waves.
- C. Neural activity during REM sleep would include high-amplitude, low-frequency waves given the inhibition of melatonin release.
- D. In the absence of light, the influence of theophylline will decrease the total time spent with high-amplitude, low-frequency waves.

**Question 30**

Which of the following is a suitable improvement to this research design that would directly improve its validity?

- A. Use rats of the same age, to minimise the influence of systematic errors on REM sleep brain-wave patterns.
- B. Introduce a 'light condition' group, to better understand the influence of theophylline on the sleep-wake cycle.
- C. Increase the sample size to 50, to improve the chances of generating similar results if the research was conducted again.
- D. Use a mixed design, to include a control group and have the rats monitored with an EEG 24 hours before the theophylline injection.

Use the following information to answer Questions 31 and 32.

A study was conducted on 24 healthy Year 10 students at a local high school. Half of the participants were administered 30 minutes of bright light therapy (BLT) each morning for four weeks. The other half of the participants did not use any BLT throughout the four weeks. After four weeks, participants were then tested on their amount of high-frequency, low-amplitude (beta) brain-wave presence while awake in the early morning using an EEG and a mathematics test performance.

The results are shown below.

	Mean percentage of high-frequency, low-amplitude (beta) brain waves	Mean mathematics test performance (out of 30)
BLT group	86.2 %	22.4
No BLT group	78.5 %	18.5

**Question 31**

Which explanation best accounts for the results from this study?

- A. BLT can delay sleep onset and increase total sleep time.
- B. BLT reduces melatonin release, thus enhancing neurotransmission throughout the brain.
- C. Melatonin can activate parts of the amygdala that are used in higher-order mathematics problems.
- D. There is a positive relationship between low-frequency brain-wave patterns and higher levels of awareness.

**Question 32**

The investigation methodology would be considered a

- A. correlational study.
- B. controlled experiment using mixed design.
- C. controlled experiment using within-subjects design.
- D. controlled experiment using between-subjects design.

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Use the following information to answer Questions 33–35.

Chen was a cheerful and easy-going person. He had been teaching for more than 10 years and decided it was time for a change, so he enrolled in an undergraduate computing degree. This shift in career and return to study resulted in high study expenses and a reduction in wages. Most of the students enrolled in his course were young and directly from high school, and they often made jokes about him being much older. This made Chen feel like he did not belong, often resulting in feelings of worry and being quick to display anger. He wanted to discontinue the degree after two months.

**Question 33**

Which of the following types of factors and reasons could be best attributed to Chen wanting to discontinue the degree?

	Type of factor	Reason
A.	internal	his perception of being too old
B.	external	not being able to regulate his emotions
C.	internal	being too old to socialise with the younger students
D.	external	not having the level of education required to complete the course

**Question 34**

Chen decided to quit his computing course.

This demonstrates

- A. poor mental wellbeing with signs of anxiety.
- B. poor mental wellbeing with signs of resilience.
- C. optimal mental wellbeing with high levels of stress.
- D. optimal mental wellbeing with the development of a phobia.

**Question 35**

Chen wants to increase his resilience.

Which social protective factor would best achieve this?

- A. connecting with other mature-age university students
- B. enrolling in the course online to alter the environment he is in
- C. accepting that he cannot change other people's perceptions of him
- D. realising that it is too late to change his career and return to teaching

Use the following information to answer Questions 36 and 37.

Henry suffers from petrophobia, a fear of rocks. It is a phobia that stems from a negative experience in childhood when he had rocks thrown down at him from a bridge. Henry's family do not understand his fear and choose to ignore his phobic reactions to rocks.

**Question 36**

According to the biopsychosocial approach, which of the following factors accurately explains Henry's phobia?

	<b>Biological</b>	<b>Psychological</b>	<b>Social</b>
<b>A.</b>	inhibitory GABA is released	classical conditioning perpetuates his rock phobia	unsupportive family
<b>B.</b>	excitatory GABA is released	cognitive bias leads him to make inaccurate conclusions	the environmental trigger of rocks
<b>C.</b>	enhanced synaptic transmission between the neural pathways of rocks and fear	classical conditioning precipitates his rock phobia	the stigma of seeking treatment
<b>D.</b>	enhanced synaptic transmission due to his emotional response	catastrophic thoughts that all bridges will have people throwing rocks at him	the environmental trigger of a bridge

**Question 37**

Which one of the following intervention types and examples could be used to reduce Henry's phobia of rocks?

	<b>Intervention type</b>	<b>Example</b>
<b>A.</b>	psychoeducation	Henry's family send him to a psychologist.
<b>B.</b>	systematic desensitisation	Using a fear hierarchy, Henry is taught to relax near a bridge and move closer when he relaxes, until he can walk under it.
<b>C.</b>	cognitive behavioural therapy (CBT)	Henry is taught to correct faulty patterns of thinking about rocks to be able to hold one without fear.
<b>D.</b>	breathing retraining	Henry is taught a series of steps to remain calm while discussing rocks, having a rock in the room and finally holding a rock.

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*Use the following information to answer Questions 38–40.*

The origins of the National Aboriginal and Islanders Day Observance Committee (NAIDOC) can be ‘traced to the emergence of Aboriginal groups in the 1920’s which sought to increase awareness in the wider community of the status and treatment of Aboriginal and Torres Strait Islander Australians.’

National NAIDOC Week is held annually in the first week of July with the aim to ‘celebrate and recognise the history, culture and achievements of Aboriginal and Torres Strait Islander peoples. NAIDOC Week is an opportunity for all Australians to learn about First Nations<sup>1</sup> cultures and histories and participate in celebrations of the oldest, continuous living cultures on earth.’

Source: adapted from <naidoc.org.au>

<sup>1</sup>**First Nations** – a term that is inclusive of Aboriginal and Torres Strait Islander peoples of Australia.

**Question 38**

In the above information, self-determination is best demonstrated by

- A. the participation of all Australians in celebrations.
- B. the origins of NAIDOC week being traced back to the 1920s.
- C. Aboriginal groups being the driving force for the creation of NAIDOC.
- D. an opportunity for all Australians to learn about the First Nations cultures and histories.

**Question 39**

The 2021 NAIDOC week theme was ‘Heal Country’.

According to the social and emotional wellbeing (SEWB) framework, the 2021 NAIDOC theme acknowledges the principle of

- A. physical health as a biological marker of health.
- B. connecting to Country as a way of healing body, mind and spirit.
- C. complex interactions between biological, psychological and social factors.
- D. spending time with Elders and developing healthy relationships with others.

**Question 40**

NAIDOC is an example of connection to

- A. a multimodal system of knowledge for all Aboriginal and Torres Strait Islander peoples.
- B. sung narrative and other cultural expressions for Aboriginal and Torres Strait Islander peoples.
- C. Country as fundamental to embracing sacred lands for Aboriginal and Torres Strait Islander peoples.
- D. community as fundamental to identity and concepts of self within Aboriginal and Torres Strait Islander peoples.



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**SECTION B****Instructions for Section B**

Answer **all** questions in the spaces provided.

**Question 1** (8 marks)

Lana is feeling stressed about her upcoming drama performance and nervous about forgetting lines on stage in front of an audience, despite practising at home in front of her family. Lana decides to go out with friends the night before the first performance to take her mind off the performance. She stays up late and does not get adequate sleep.

- a. Identify **one** physiological response that Lana may experience when she steps out on stage for the first time. 1 mark

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- b. With reference to context-specific effectiveness, evaluate Lana's decision to stay out with friends on the night before her first performance. 3 marks

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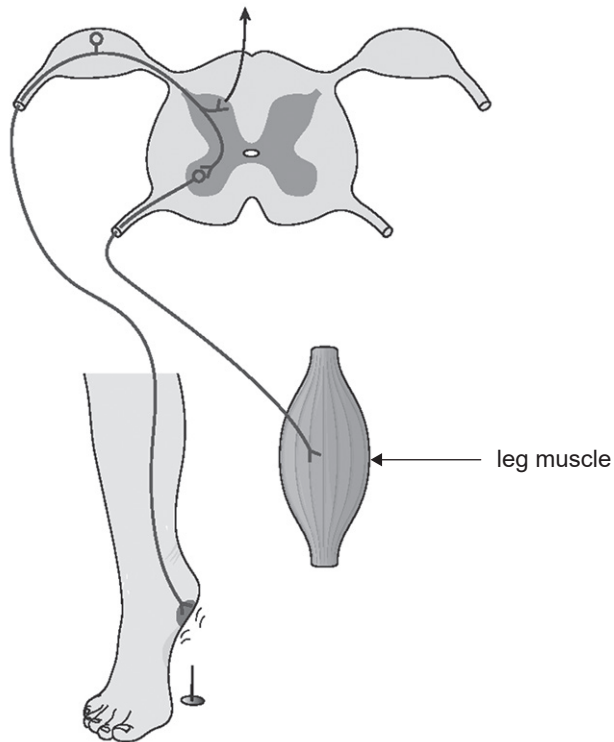
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When Lana is on stage and barefoot during her performance, she steps on a pin that has been left on the stage and automatically flinches her leg.

c. Annotate the diagram below to explain what happens when Lana steps on the pin.

4 marks



Source: Blamb/Shutterstock.com

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**Question 2** (8 marks)

Fifty participants completed nine months of mindfulness meditation training. They did the training for 30 minutes per day, six days a week.

The amount of cortisol in hair is considered a suitable measure of exposure to prolonged stress. The longer that stress lasts, the more cortisol accumulates in hair. Researchers analysed the amount of cortisol in the hair of participants every three months.

Cortisol levels in hair compared to pre-training levels		
After 3 months of training	After 6 months of training	After 9 months of training
reduced by 5%	reduced by 25%	reduced by 25%

Source: LMC Puhmann, P Vrtička, R Linz, T Stalder, C Kirschbaum, V Engert and T Singer, 'Contemplative Mental Training Reduces Hair Glucocorticoid Levels in a Randomized Clinical Trial', *Psychosomatic Medicine*, vol. 83, no. 8, 2021, p. 894

- a. Identify **one** role of cortisol in chronic stress. 1 mark

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- b. Using your knowledge of mindfulness meditation, explain the results collected in this study. 3 marks

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- c. Why is mindfulness meditation a more appropriate independent variable than adequate nutritional intake for this study? 2 marks

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- d. Previous attempts at measuring the effects of mindfulness meditation on stress levels used questionnaires.

Identify **one** limitation of using questionnaires and explain how testing hair potentially overcomes this limitation.

2 marks

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**Question 4 (7 marks)****Toilet-trained cows fighting against climate change**

In a recent experiment, researchers have conditioned cows to teach them to urinate in a toilet pen to reduce gas emissions and excess nitrates<sup>1</sup> from cow waste. If the cow waste can be collected in one place, it could be treated to reduce emissions.

Using two groups of cows, a test group and a control group, researchers trained cows to urinate in a pen in two stages. In the first stage, all cows were confined to separate pens. Test cows were given a sugar treat after they urinated in the pen. In the second stage, test cows were put in an area outside the pen and given a sugar treat after they went into the pen and urinated.

In both stages, the control cows were given a sugar treat at random times, which was not related to what they were doing. Overall, the control cows received the same number of sugar treats as the test cows.

Most of the test cows learnt to urinate in the pen in 15 days. The control cows did not learn to urinate in the pen.

<sup>1</sup>**nitrates** – a group of chemical compounds

Source: adapted from: N Dirksen, J Langbein, L Schrader, B Puppe, D Elliffe, K Siebert, V Röttgen, L Matthews, 'How Can Cattle Be Toilet Trained? Incorporating Reflexive Behaviours into a Behavioural Chain', *Animals*, 2020, <doi.org/10.3390/ani10101889>

- a. Identify the independent and dependent variables in the first stage of the research in this article. 2 marks

Independent variable \_\_\_\_\_

Dependent variable \_\_\_\_\_

- b. Why were control cows used in this research? 1 mark

\_\_\_\_\_

\_\_\_\_\_



- c. Using the language of the appropriate behaviourist approach to learning, explain how the cows learnt to urinate in the pen in the second stage of learning described in the article.

4 marks

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**Question 6** (12 marks)

For his Psychology practical investigation, Hugo decided to examine whether the use of a ‘night mode’ on smartphones could affect the quality and quantity of sleep for adolescents. ‘Night mode’ is a setting that changes the colour on a phone screen away from blue light towards the warmer end of the colour spectrum.

Hugo’s participants were 18 students in a Year 11 English class. Hugo randomly allocated the students into three groups of six. Group A was asked to use ‘night mode’ while using their smartphones for one hour before their normal bedtime for seven days. Group B was asked to not use ‘night mode’ while using their smartphones for one hour before their normal bedtime for seven days. Group C was asked to refrain from using their smartphones in the hour before their normal bedtime.

Hugo ensured all participants installed two applications (apps) on their smartphones. One would track their phone use throughout the day, including in the hour before their normal bedtime. The other app would track their sleep throughout the night. At the end of the week, Hugo collected the results from his participants and produced the following summary.

	Mean duration of phone use throughout the day (hours)	Mean duration of phone use one hour before bedtime (minutes)	Mean duration of sleep episode (hours)	Percentage of sleep episode spent in deep sleep
<b>Group A</b>	4.6	56	7.5	18%
<b>Group B</b>	4.7	58	6.5	13%
<b>Group C</b>	4.7	2	7.9	22%

- a. Outline **two** expected characteristics of a typical sleep-wake pattern specific to Hugo’s participants before the experiment started.

2 marks

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- d. Identify and explain the typical effect on sleep of the specific zeitgeber studied in this investigation. 3 marks

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- e. Why did Hugo include the 'Mean duration of phone use throughout the day (hours)' data in his results table? 1 mark

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**SECTION B – continued**  
**TURN OVER**

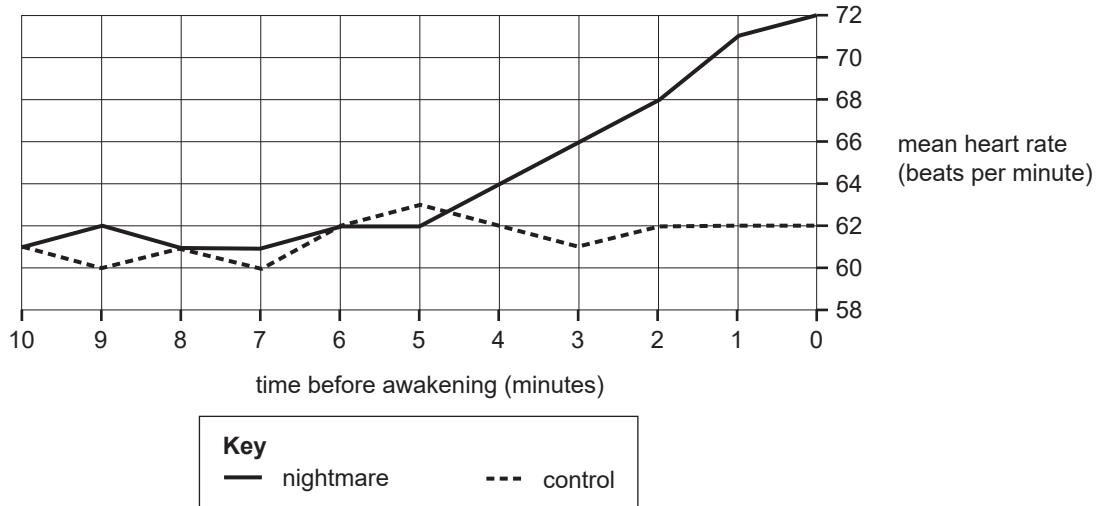
**Question 7** (14 marks)

A nightmare can be described as a frightening or unpleasant dream. Nightmares are most likely to occur during REM sleep. An estimated 50% to 85% of adults report having the occasional nightmare. An investigation was conducted by a research group to understand the physiology of nightmares.

**Investigation: Nightmares and heart rate**

The graph below shows the change in mean heart rate 10 minutes prior to awakening during a REM sleep stage nightmare, compared to participants who are not experiencing a nightmare.

**Heart rate measurements during sleep**



- a. Which subdivision of the peripheral nervous system is involved in the increased heart rate shown in the investigation? Justify your response.

2 marks

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- b. Evaluate the explanatory power of Lazarus and Folkman's Transactional Model of Stress and Coping to account for the increase in heart rate during nightmares.

2 marks

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- c. One of the roles of serotonin, a neuromodulator, is to regulate the sleep-wake cycle. It has been found to influence the vividness of dreams and nightmares (Pace-Schott, 2008).

Source: E Pace-Schott, 'Serotonin and dreaming' in JM Monti, SR Pandi-Perumal, BL Jacobs & DJ Nutt (Eds), *Serotonin and Sleep: Molecular, Functional and Clinical Aspects*, pp. 307–324, Birkhäuser, Basel (Switzerland), 2008, <doi.org/10.1007/978-3-7643-8561-3>

Identify **two** characteristics that classify serotonin as a neuromodulator.

2 marks

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- e. i. What is **one** cognitive effect of sleep deprivation that is likely to be experienced by those with a nightmare disorder? 1 mark

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- ii. Using a relevant example of catastrophic thinking, outline how the cognitive effects of sleep deprivation can impact this type of thinking. 2 marks

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**SECTION B – continued**  
**TURN OVER**

**Question 8** (12 marks)

A research team investigated the impact of an unfamiliar environment on the mental wellbeing of travellers. The 100 participants were firstly assigned a score to determine if they were a 'regular traveller' or an 'irregular traveller'. A 'regular traveller' was defined as someone who travels and stays outside of their normal home environment for more than 30 days per year; an 'irregular traveller' was defined as someone who travels and stays outside of their normal home environment for less than 30 days per year.

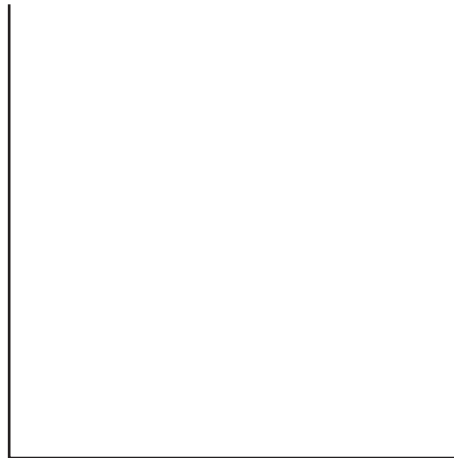
After the participants stayed overnight in a hotel, they completed a questionnaire evaluating mental wellbeing using a 4-point scale, where 1 indicated low mental wellbeing and 4 indicated high mental wellbeing.

Average results are shown in the table below.

	Regular traveller	Irregular traveller
Mental wellbeing score (out of 4)	1	4

- a. Use graphing conventions to represent the data in the table above on the axes below.

3 marks



- b. Referring to the results of this study, compare the impact of an unfamiliar environment on mental wellbeing between regular travellers and irregular travellers. 3 marks

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- c. Classify the type of data collected in this study and outline **one** strength of this data type. 2 marks

Data type \_\_\_\_\_

Strength \_\_\_\_\_

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- d. Participants who completed the questionnaire in less than one minute were excluded from the study.

- i. What variable type would the researchers be controlling for? 1 mark

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- ii. If the researchers did not control for this variable, how would it impact the results? 1 mark

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- e. Outline how the ethical concept of integrity may have been considered when administering the questionnaire and reporting the results. 2 marks

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**Question 9** (10 marks)

A research study approved by the Clinical Research Ethics Committee at a hospital compared the effects of a psychobiotic diet with a regular diet on perceived levels of stress. A psychobiotic diet is high in fermented and prebiotic foods, which are shown to improve gut health.

Forty-five adults aged between 18 and 59 from England were randomly allocated to either Condition A or Condition B.

**Condition A** Twenty-four adults were given a psychobiotic diet to follow and were discouraged from consuming ‘occasional’ foods such as sweets and fast foods. They initially received a 30-minute education session and, after two weeks, a 15-minute refresher session where their dietary intake was reviewed through a food record.

**Condition B** Twenty-one adults were only given minimal instructions such as general information about healthy eating. At the two-week follow up, their dietary intake was reviewed through a food record.

Both the Condition A and B intervention periods were four weeks, with a check-in at two weeks. All participants were debriefed after the study, and participants in Condition B were provided with information about the psychobiotic diet.

Results:

	Perceived stress level reduction
<b>Condition A</b>	32%
<b>Condition B</b>	17%

Adapted from: K Berding, TFS Bastiaanssen, GM Moloney, *et al*, ‘Feed your microbes to deal with stress: a psychobiotic diet impacts microbial stability and perceived stress in a healthy adult population’, *Molecular Psychiatry*, vol. 28, 2023, pp. 601–610

Analyse the results of this research study. As part of your answer, consider the role and the impact of gut microbiota on the gut-brain axis and future opportunities for research in this field. Evaluation of the study’s methodology and method is not required.

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