VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

State Government Victoria

2014 Psychology GA 3: Examination

GENERAL COMMENTS

The 2014 Psychology exam was a two-and-a-half hour examination that assessed Units 3 and 4 of the *VCE Psychology Study Design*. The exam consisted of three sections: Section A comprised 65 multiple-choice questions and was worth 65 marks. Section B comprised 15 short-answer questions and was worth 60 marks. Section C involved a research scenario and comprised two short-answer questions worth 5 marks, and an extended response question worth 10 marks.

Areas of the study design in which students demonstrated significant strength included:

- principles of research ethics
- physiological responses associated with stress/eustress
- mental health and psychological disorders
- retrieval failure theory
- chunking in memory
- controlled and automatic processes
- memory encoding processes
- consolidation of learning through sleep
- problem-focused coping
- dimensional approaches to mental health
- biopsychosocial model of mental health
- hemispheric specialisation of motor cortex
- spatial neglect
- eyewitness memory
- Lazarus and Folkman's Transactional Model of Stress and Coping.

Areas of the study design in which students demonstrated weakness included:

- knowledge of the roles of the amygdala and hippocampus in memory
- the benefit of a repeated-measures design as applied to a research scenario
- the meaning/interpretation of a *p* value
- the three-phase model of operant conditioning
- the benefits/characteristics of a variable ratio schedule of reinforcement as applied to a scenario
- the function and organisation of the somatosensory cortex
- the ability to apply knowledge of psychological theories and concepts to a scenario
- the ability to critically analyse and explain the limitations of a research scenario and suggest appropriate improvements (the extended response).

A particular area of weakness in students' responses in 2014 was a failure to apply knowledge in the context of the scenario provided in the question. Generic, rote-learned responses to questions that required specific application to the given scenario were not awarded any marks.

Students must clearly address the question and ensure any examples given are specific to the question asked. Students must also ensure that they answer each part of each question.

Students are strongly advised to respond to every multiple-choice question. Not only is it impossible to achieve a mark if no response is given, but leaving a line blank also increases the likelihood that later answers on the computer-scored sheet will be out of synchronisation and students may miss out on further marks. It is always possible to change a response by carefully erasing and re-shading. It is suggested that the use of a ruler, moved down the page as each question is answered, will help to ensure that the correct response line is completed.

As marking is completed online using scanned images of the exam paper, it is emphasised that students should write within the marked boundaries on the paper for each question and clearly indicate if a question is to be continued in the extra pages provided at the end of the question and answer book. If students continue a response in the extra space, they must number the response clearly.

Students are reminded that, although spelling errors are not penalised, the meaning of the response must be clear and unambiguous. Students should take care to spell scientific terms correctly.

2014 Examination Report

SPECIFIC INFORMATION

This report provides sample answers or an indication of what answers may have included. Unless otherwise stated, these are not intended to be exemplary or complete responses.

The statistics in this report may be subject to rounding errors resulting in a total less than 100 per cent.

Section A – Multiple-choice questions

The table below indicates the percentage of students who chose each option. The correct answer is indicated by shading.

Question	% A	% B	% C	% D	Comments
1	1	81	16	3	
2	8	69	19	3	
3	4	8	2	85	
4	20	77	2	1	
5	5	4	33	58	
6	92	2	2	4	
7	5	5	86	4	
8	0	5	94	0	
9	7	3	7	82	
10	11	56	14	19	
11	14	76	4	5	
12	14	0	3	83	
13	79	4	2	16	
14	75	20	3	2	
15	15	13	28	44	
16	7	5	70	18	
17	1	10	20	68	
18	32	11	44	13	
19	13	11	74	1	
20	47	7	42	4	Many students chose option A, frontal lobe; however, this ignored the other crucial information in the stem of the question relating to the proportion of neurons in the brain, clearly indicating a structure larger than the frontal lobes. Therefore, the correct answer was cerebral cortex (option C), of which the frontal lobes are a subset.
21	50	3	7	40	
22	86	4	3	6	
23	11	8	3	78	
24	24	66	3	7	
25	37	26	4	32	A ‘conclusive diagnosis’ of Alzheimer’s disease can only be made after death, at autopsy. The fact that John’s memory for semantic information is still good is likely due to the relatively early stage of the disease, similarly with his ability to complete his daily routines. The first sign of memory problems in Alzheimer’s is loss of short-term memory. Neither the preservation of his semantic memory, nor his ability to complete his daily routines provide conclusive evidence that John is suffering from Alzheimer’s.
26	4	9	79	8	
27	4	11	34	50	
28	82	3	4	11	
29	12	70	8	10	
30	15	15	7	64	
31	24	55	11	9	
32	92	4	4	1	
33	65	17	10	8	

2014 Examination Report

Question	% A	% B	% C	% D	Comments
34	17	21	36	27	
35	12	26	50	13	Most students selected option C, body temperature always reaches its lowest level during REM sleep. However, this is not the reason that body temperature is useful to study sleep. The correct answer was B, that body temperature follows a regular daily cycle. The regular daily cycle of changes in body temperature is closely coupled with the circadian rhythms, with a drop in core body temperature being associated with the onset of sleepiness.
36	69	1	2	28	
37	13	12	45	29	
38	3	4	84	9	
39	10	34	4	52	
40	2	2	60	36	
41	3	25	6	66	
42	21	58	4	16	
43	70	4	15	11	
44	8	80	2	10	
45	16	6	63	15	A number of students chose option D, observational learning and classical conditioning, but this reflects confusion between operant and classical conditioning. The scenario clearly described Romish being rewarded for producing desired behaviours – this is the basis of reinforcement in operant conditioning. Therefore, the correct response is option C, observational learning and operant conditioning.
46	58	7	9	26	A significant proportion of students selected option D, punishment. However, option A, negative reinforcement, was the correct answer, given that the question was phrased in terms of learning to produce a desired behaviour (reinforcement), rather than learning to stop an undesirable behaviour (punishment). Negative reinforcement and punishment can be difficult to distinguish; the difference depends on whether the scenario is focused on the behaviour that is being punished (talking with an English accent) or on the behaviour that is being reinforced (talking with an Australian accent). The scenario in the question included aspects of both, but the question focused specifically on reinforcing the production of the desired behaviour. Negative reinforcement entails the removal of a punishing consequence when the desired behaviour is produced. In the scenario, teasing is a punishing stimulus that is removed when the desired behaviour of Dan speaking with an Australian accent is produced. If the question had said 'Dan quickly learned to stop speaking with an English accent as a result of…' then the correct answer would have been D (punishment). In this case the teasing punishes the production of the English accent.

Question	% A	% B	% C	% D	Comments
47	29	57	3	12	Many students selected option A, punishment, rather than option B, response cost. This reflects a tendency to confuse the two concepts. Response cost (also sometimes referred to as 'negative punishment') occurs when a desired stimulus is removed whenever an undesirable behaviour is produced. In this case, Mr Zhang removed recess time as a means to reduce the behaviour of the boys teasing Dan. The removal of the desired stimulus is the 'cost' of the teasing behaviour. Response cost is a form of punishment, but the correct answer to the question was the more specific 'response cost'.
48	76	3	19	2	
49	1	95	1	2	
50	33	44	6	17	The scenario described aspects of observational/social learning and operant conditioning (positive reinforcement); however, the question asked specifically about 'the type of learning demonstrated by Edward when he first tried knitting ...'. The scenario implied that Edward's decision to try knitting was based on his observation of the praise his grandmother received for her knitting, and his observation of her knitting. Therefore, the correct answer for this question was option A, social learning. Many students chose option B, operant conditioning, but this relates only to the reinforcement Edward received once he began knitting, not what prompted him to produce the behaviour in the first instance.
51	4	3	90	3	
52	36	10	24	30	
53	3	14	62	20	
54	8	9	15	67	
55	2	4	8	86	
56	1	10	86	2	
57	76	5	15	3	
58	1	0	1	98	
59	17	3	70	10	
60	4	85	2	10	
61	83	1	3	13	
62	2	26	67	5	
63	3	6	3	88	
64	1	87	12	1	
65	5	2	13	80	

Section B – Short-answer questions

In this section, areas requiring improvement included:

- knowledge of the roles of the amygdala and hippocampus in memory (Question 1)
- the benefit of a repeated-measures design as applied to a research scenario (Question 6a.)
- the meaning/interpretation of a *p* value (Question 8b.)
- the three-phase model of operant conditioning (Question 12)
- the benefits/characteristics of a variable ratio schedule of reinforcement (Question 14)
- the function and contralateral organisation of the somatosensory cortex (Questions 15b. and 15c.).

Question 1

Marks	0	1	2	Average
%	42	33	25	**0.9**

This question assessed students' knowledge of the function of the amygdala and hippocampus in memory. Students could gain a total of two marks – one each for correctly identifying the role of each structure in memory.

The primary function of the amygdala is the consolidation of emotional information in memory, especially information relating to fear.

Acceptable answers required the use of an appropriate word to describe the function of the amygdala, and reference to memory for emotional information and/or fear. Acceptable words to describe the function of the amygdala in memory included: store, form, consolidate, encode, retrieve.

Some students referred to the function of the amygdala as being involved in procedural memory. Fear conditioning is an implicit memory process that should not be confused with implicit memory more generally. Procedural memory is a subset of implicit memory, but the amygdala is not involved in all implicit memory processes. Procedural memory is primarily supported by circuitry linking the motor cortical areas of the brain with subcortical loops through the striatum and the cerebellum. Consequently, no marks were awarded for procedural memory.

The primary function of the hippocampus is in the consolidation of declarative/explicit memories, including episodic and semantic memories.

Acceptable words to describe the function of the hippocampus included: consolidation, storage, retrieval, encoding, forming, processing. While the hippocampus is crucially involved in the storing/storage of declarative memories, it is not generally thought to be a place of long-term storage in itself.

Acceptable memory functions of the hippocampus included: declarative, explicit, episodic and semantic memory.

Question 2

Marks	0	1	2	3	Average
%	23	31	28	18	**1.4**

This question assessed students' knowledge of Elizabeth Loftus's work in relation to the processes involved in eyewitness memory. It required students to explain how leading questions may produce incorrect recall of a witnessed event, with explicit reference to the work of Loftus.

To obtain full marks, students' responses needed to demonstrate understanding of how a leading question may act to bias (i.e. 'lead') the memory retrieval/recall process towards the information implied by the question, and how this might then affect the knowledge that is stored in the memory trace. The response needed to include information that was broadly consistent with the following points:

- The work of Loftus demonstrates that the act of retrieving (recalling) information from memory is a reconstructive process.
- The process of memory search (recall/retrieval) can be influenced/biased by the wording of a question.
- The misinformation suggested by the question can potentially become stored as part of an updated representation of the memory trace.

Many students described Loftus and Palmer's 1974 study in which they investigated the effect of the verb used to describe the impact of two cars in a question asking participants to recall the speed at which they had witnessed the two cars to be travelling in a video of the accident (for example, 'About how fast were the cars travelling when they smashed/bumped/hit/contacted each other?). Participants who were asked questions containing the verb 'smashed' tended to make much higher speed estimates than those who heard a verb like 'contacted'. When asked one week later whether they had seen broken glass at the scene, participants who had heard the verb 'smashed' tended to respond 'yes' much more often than those who had heard a verb like 'contacted', even though the film showed no broken glass. Loftus and Palmer argued on the basis of this finding, and related findings, that the leading questions have the potential to change the memory representation of the event.

Accurate descriptions of the Loftus and Palmer study were not sufficient to gain full marks. Students had to use the study to demonstrate their understanding of the reconstructive processes involved in recall and how the use of these

different verbs in the question could act not only to bias the speed estimates that were given, but to alter the information stored in the memory trace for the event.

Question 3

Marks	0	1	2	3	4	5	Average
%	10	14	19	21	21	15	2.7

This question assessed students' understanding of classical and operant conditioning. Students were given a table that compared the features of classical and operant conditioning and were required to complete the blank cells. The table below provides the acceptable responses for each blank cell.

Feature	Classical conditioning	Operant conditioning
acquisition	*response is conditioned or learned through association of two stimuli*	The response is learned or conditioned by association with its consequences. OR A voluntary behaviour is strengthened by association with a reinforcing consequence, or weakened by association with a punishing consequence. A common error was to focus only on reinforcement, neglecting punishment.
nature of response	Involuntary/reflexive/unconscious response, involving the autonomic nervous system.	*voluntary, intentional response involving central nervous system*
timing of stimulus and response	The response (whether conditioned or unconditioned) occurs after the stimulus (whether conditioned or unconditioned). Many students referred to the timing between the CS and UCS (i.e. the two stimuli) rather than between stimulus and response.	Stimulus and response could be interpreted in terms of the three-phase model of operant conditioning (i.e. discriminant stimulus occurs before the response), or in terms of the consequences being referred to as the stimulus (i.e. response/behaviour occurs before the stimulus/consequence). Therefore, both answers were accepted as correct. Many students said that the consequences **must** follow immediately for operant conditioning to be effective. However, this is not the case in many forms of human operant conditioning, where there can be a long delay between the behaviour and the consequences.
spontaneous recovery	Spontaneous recovery may occur after a period of extinction, when the conditioned stimulus is reintroduced (after a period of rest). To gain one mark for this cell it was sufficient simply to restate the information provided in the corresponding cell for operant conditioning. Some students provided additional information that was incorrect (for example, 'when the unconditioned stimulus is reintroduced') or by stating that spontaneous recovery does not occur in classical conditioning.	*a response may occur after a period of extinction*

Question 4

Marks	0	1	2	3	4	Average
%	36	4	19	2	40	**2.1**

This question assessed students' knowledge of the delayed onset of sleep in adolescence (sleep-onset shift), which results in adolescents going to sleep later than adults and consequently tending to wake later. There is only a single shift of the sleep cycle that has two components: going to sleep later and waking later. Students were awarded full marks if they:

- identified the delayed onset of sleep and waking compared to an adult
- identified the delayed onset of sleep (but did not mention delayed waking) and also suggested another difference between the sleeping patterns of adolescents and adults (for example, increased sleep debt in adolescents, differences in the proportion of REM/NREM sleep, etc.)

No marks were awarded if the crucial sleep-onset shift was not identified as part of the response.

Question 5

Marks	0	1	2	3	Average
%	7	12	33	48	**2.2**

To gain full marks, students needed to identify that:

- seeing a spider (a fearful stimulus) activated Jonah's sympathetic nervous system
- the activation of the sympathetic nervous system produced the physiological responses characteristic of the fight-or-flight response, including increased heart rate and breathing.

Question 6a.

Marks	0	1	Average
%	84	16	**0.2**

Students did not answer this question well. Students needed to be able to apply their knowledge of repeated-measures designs to the scenario. In a repeated-measures design each participant acts as his or her own perfectly matched control, reducing the potential for confounding variables that tends to occur in between-group designs. In the context of the experiment described, the key advantage of using a repeated-measures design is that it would enable the experimenter to control for individual differences between participants in variables that may affect the data and the interpretation of the results, including differences in things such as sleep patterns, weight, age, and especially pain sensitivity (the dependent variable). No marks were awarded to students who provided a generic response without direct reference to the scenario. The question asked specifically that students refer to 'this particular study'.

Question 6b.

Marks	0	1	2	Average
%	13	41	45	**1.3**

Students needed to identify that:

- participants would experience REM rebound once allowed to sleep uninterrupted
- this would result in a return to normal levels of pain sensitivity.

Question 7a.

Marks	0	1	2	Average
%	18	30	52	**1.4**

This question required students to apply their knowledge of acrostics and acronyms to the scenario. One mark each could be achieved for providing a suitable example of an acrostic and an acronym applied to the scenario. No marks were awarded in either case for a generic definition without an example relevant to the scenario.

- Acrostic: To remember the sequence of places to stop, Laura could have made up a sentence comprising words that use the first letter of each place to visit, matching the order of the places in list. An example for this scenario would be Parrots Often Squawk Horribly or Psychology Often Seems Hard, etc.

To gain a mark for the acrostic, students had to construct a meaningful sentence, with each word beginning with a letter that could be associated with the first letter of each place to be visited, maintaining the order/sequence of places. Students could have included a sentence with five words if they wished to reference both words in post office (for example, Playful Otters Often Swim Happily).

- Acronym: Laura could have used the first letter of each word in her list of places to visit to form word, or a pronounceable string of letters. In Laura's case, the sequence of places to be visited lends itself to the acronyms POSH (if post office is treated as one word) or POOSH (if post office is treated as two words).

Question 7b.

Marks	0	1	2	3	Average
%	31	38	22	9	**1.1**

To gain full marks students needed to explain that acrostics and acronyms are mnemonic devices (memory aids) that provide cues to assist the ability to retrieve information in the required order/sequence by elaborating and organising the material in long-term memory. Students did not perform well on this question. Many confused the two mnemonics. Others did not mention that these mnemonic devices aid in the recall of the order/sequence of information or that they serve to elaborate on the information in memory.

Question 8

The scenario in this question assessed three different aspects of the study design. Question 8a. assessed knowledge of the differences between recall and recognition as measures of memory retention. Question 8b. assessed knowledge of statistical significance and Question 8c. assessed knowledge of research design relating to the study of memory.

8a.

Marks	0	1	2	3	Average
%	14	19	24	43	**2**

Students were expected to identify the Blue Group as being most likely to remember the greatest number of nonsense syllables on average because memory retention was assessed using a recognition memory test, rather than free recall. Recognition tests provide cues for the studied items, whereas free recall requires the participant to rely entirely on their own memory for the studied items. For this reason, recognition tests are considered to be a more sensitive measure of memory retention than recall.

8b.

Marks	0	1	Average
%	44	56	**0.6**

This question was not answered well. The following points provide a basic understanding of the *p* value in relation to statistical significance, assuming an analysis involving a comparison of the mean for two groups.

- A *p* value indicates the probability of obtaining the observed difference in the data under the assumption that any observed difference merely reflects random sampling error due to normal variation in the population from which the samples are drawn (i.e. assuming there is no effect of the experimental manipulation/independent variable).
- A very small *p* value (for example, $p < 0.05$) indicates that the probability/chance of obtaining the difference observed in the data is very low (for example, less than 5 per cent) if there really were no difference other than what would be expected due to random sampling error or, as commonly phrased by students, 'due to chance'.
- When the alpha level, or significance level, is set to 0.05, this defines a criterion for the *p* value below which the researcher is willing to reject the hypothesis of no difference and can conclude that a statistically significant effect of the independent variable has been observed in the data.
- In the context of the scenario provided, a *p* value below the set alpha level of 0.05 enables the researcher to conclude that the difference observed between the groups is significant or statistically significant at that alpha level. Another way of saying this is that the probability of obtaining the observed difference between the two groups due to random sampling error alone (or, as commonly expressed by students, 'due to chance alone') is less than 5 per cent.

To obtain one mark for this question it was sufficient to simply say that the *p* value of < 0.05 indicates that the difference in the means observed between the two groups was significant (or that the results were statistically significant). Many students tried to explain this further, which sometimes resulted in contradictory responses. For

example, some students went on to say that the *p* value indicated that 'less than 5 per cent of the results were due to chance'. These students were not awarded the mark.

8c.

Marks	0	1	2	Average
%	23	53	24	**1**

To obtain full marks students needed to demonstrate their understanding that using nonsense syllables rather than real words to test memory would allow the researcher to control for possible differences between participants (1 mark) in the meaningfulness of the items to be remembered.

Question 9

This question focused on a research scenario that assessed knowledge of eustress and distress, as well as research methods relating to participant variables and ethical considerations.

9a.

Marks	0	1	2	Average
%	11	12	77	**1.7**

Students needed to describe two physiological responses participants were likely to experience after receiving either of the messages. Suitable answers for either message included: increased heart rate, increased perspiration/sweating, dilated pupils, decreased salivation, or any other sympathetic nervous system response.

This question was answered well.

9b.

Marks	0	1	Average
%	31	69	**0.7**

The reason that the physiological responses would be similar in both cases is that both messages activate a form of stress response; the positive message (message 1) produces eustress and the negative message (message 2) produces distress. It was also acceptable to respond that both messages would activate a sympathetic nervous system response.

The majority of students answered this question well.

9c.

Marks	0	1	Average
%	32	68	**0.7**

Dr Spiteri may have asked for information about the nationality of the participants to control for cultural differences in the way participants might respond to the two messages.

This question was also answered well by the majority of students.

9d.

Marks	0	1	2	Average
%	23	23	54	**1.3**

The first part of the question asked which ethical principle Dr Spiteri may have breached by sending a fake text message to participants. Acceptable answers included principles relating to deception, informed consent or beneficence/harm (1 mark).

The second part of the question asked students to identify what Dr Spiteri would need to do to avoid breaching this principle. Students needed to state that full debriefing of the participants regarding the deception and true aims of the study would be required to minimise any possible harm caused by the fake messages (1 mark).

Question 10

Marks	0	1	2	3	Average
%	10	10	48	32	**2**

This scenario assessed students' knowledge of the difference between normal/universal experiences (for example, grief) and chronic psychological disorders/mental illnesses (for example, depression). The question asked students to consider the information given in the scenario and to indicate whether it could be used to determine if Drew was experiencing a mental illness.

The scenario indicated that Drew is normally a confident, funny and friendly man, but that his behaviour changed significantly after the death of his grandfather, with Drew experiencing symptoms consistent with normal grieving but also with depression. The final sentence stated that these symptoms continued for two weeks, but no mention was made of what happened after those two weeks (for example, did Drew return to his normal behaviour, or did he then seek help?). Students could have responded either 'yes' or 'no' to this question, with the number of marks awarded being based on the subsequent reasoning provided to support their answer.

The strongest responses noted that while Drew's change in behaviour is normal/universal when grieving the loss of a loved one, the symptoms described are also characteristic of depression/mental illness. Given this, a diagnosis of mental illness/depression would be warranted if the symptoms persisted beyond two weeks and continued to interfere significantly with his normal functioning. Therefore, although the information provided was certainly useful, more information would be required before a diagnosis could be made.

Question 11

This question assessed students' knowledge of the biopsychosocial framework, as well as ethical considerations relating to research in the area of mental health.

11a.

Marks	0	1	2	3	Average
%	10	19	33	38	**2**

This question required students to suggest a biological, psychological and social factor that each may have improved George's outcome. The question did not explicitly require that these factors be present in the scenario, so there was a wide range of acceptable responses for each factor.

- Biological factors included: not having a genetic predisposition to the mental illness; being able to continue taking his medication after leaving hospital.
- Psychological factors included: being able to continue his counselling sessions; learning coping strategies; learning meditation; having access to cognitive behaviour therapy, etc.
- Social factors included: having support from family or friends to provide accommodation/transport; being able to receive his social support concession to enable him to buy his medication, etc.

11b.

Marks	0	1	Average
%	27	73	**0.8**

The withdrawal of George's usual medication as part of the drug trial might be considered unethical if it put George at risk of another episode of mental illness. Acceptable responses referred in some way to the potential harm/risk involved in withdrawing George's medication. Another acceptable answer was that withdrawal of medication might compromise George's ability to provide informed consent regarding his participation and continuation in the trial.

The majority of students answered this question well.

Question 12

Marks	0	1	2	3	4	5	6	Average
%	35	11	7	7	8	10	22	**2.6**

This question assessed students' knowledge of the three-phase model of operant conditioning. One mark was awarded for each phase correctly named, and another mark was awarded for each phase that was correctly explained in relation to the scenario.

This question was answered poorly. Many students provided a description of the phases, but did not name them and/or wrote about operant conditioning generally, without showing knowledge of the three phases and how they are related. Some students misunderstood the idea of phases and gave the same answer for each phase, while others gave answers relating to classical conditioning. Responses such as these did not receive any marks.

- Phase 1 is referred to as the 'discriminative stimulus' or simply the 'stimulus'. In this phase, the learner is presented with a signal (stimulus) to associate with the production of the desired behaviour. An example related to the scenario would be Karen holding out her hand to Treasure and saying, 'shake'.
- Phase 2 is referred to as the 'response' or the 'behaviour'. In this phase, the desired behaviour is produced. In this scenario, the response/behaviour would be Treasure lifting his paw to shake Karen's hand, or Karen lifting Treasure's paw to shake to assist him to produce the behaviour.
- Phase 3 is referred to as the 'consequence'. In this phase, the learner is rewarded when the desired behaviour is produced. An example related to the scenario would be Karen giving Treasure a treat after he produced the desired behaviour, or praising Treasure.

Question 13

Marks	0	1	2	3	Average
%	26	29	27	18	**1.4**

This question assessed students' knowledge of the mechanisms involved in adaptive plasticity and their ability to apply this knowledge to the given scenario. For full marks students needed to identify adaptive plasticity as the focus of Georgina's physiotherapy (not developmental plasticity), explain how linking the movement of her arm with thinking about moving might produce re-routing of the neural connections for moving her arm and/or encourage the sprouting of new neural connections.

This question was not answered well. Students struggled to apply their knowledge of adaptive plasticity in a coherent and structured explanation.

Question 14

Marks	0	1	2	3	Average
%	40	27	25	8	**1**

This question assessed students' knowledge of reinforcement schedules, specifically the advantages of a variable ratio schedule.

To gain full marks, students needed to:

- define the variable ratio schedule as involving rewards being given after a variable/changing number of responses. In this schedule the rewards are reliable but unpredictable
- explain that the varying number of responses (car sales) required to receive a reward motivates the learner to maintain a steady and rapid rate of responding (sales) because the next response (sale) could be the one that yields a reward
- explain that a variable ratio schedule of reinforcement produces behaviour that is resistant to extinction because the learner is accustomed to variation in the number of responses required to produce a reward.

This question was not answered well. Many students were unable to provide any evidence that they understood the benefits or characteristics of a variable ratio schedule. Many students showed some knowledge of the various reinforcement schedules but were unable to apply their knowledge effectively to the given scenario.

Question 15

This question assessed students' knowledge of the contralateral organisation of the motor and somatosensory cortices. The scenario was framed in terms of a study investigating hemispheric functioning via direct electrical stimulation of the cortex.

15a.

Marks	0	1	Average
%	29	71	**0.7**

A response that Dr Higgins might have observed when she stimulated Tom's left motor cortex was movement/twitching on the right side of his body.

It was acceptable to name any body part on the right side of Tom's body that might move when the motor cortex is stimulated. This question was answered well by the majority of students.

15b.

Marks	0	1	Average
%	46	54	**0.6**

A response that Dr Higgins might have observed when she stimulated Tom's right somatosensory cortex was Tom's report of experiencing a sensation/tingling/heat/cold/pressure/pain on the left side of his body. It was acceptable to name any body part on the left side of Tom's body where he may experience a sensation. Given that the question was phrased in terms of what would be observable to Dr Higgins, it was acceptable for students to respond that Dr Higgins might observe Tom reaching for the left side of his body as if he felt something touch it, etc. The key considerations were that students made it clear that they understood that the somatosensory cortex is involved in processing the experience of sensation, not movement, and that they identified the correct side of the body on which the sensation would be experienced. This question was not answered as well as 15a., usually because students referred to movement rather than to sensation.

15c.

Marks	0	1	2	Average
%	39	41	20	**0.8**

This question required students to refer to Dr Higgins's observations and explain what they suggest about the specialisation of the hemispheres. Students needed to refer to both movement and sensation (because Dr Higgins observed both of these) and to the fact that Tom's responses suggest that these functions are organised contralaterally, with the left motor cortex controlling movement on the right side of the body (and vice versa), and the right somatosensory cortex controlling sensation on the left side of the body (and vice versa). Many students did not refer to somatosensory cortex/sensation when answering this question, instead referring only to motor cortex/movement.

Section C – Research scenario

The questions in this section assessed students' knowledge of research methods and their ability to apply this knowledge to a research scenario.

The research scenario described a study commissioned by the Green Valley Tennis Club. The study was designed to compare the effectiveness of an observational learning condition for mastering a new serving technique to a control condition.

Question 1

Marks	0	1	2	3	Average
%	16	26	37	21	**1.6**

Students were asked to write a research hypothesis for the study. A research hypothesis should state a prediction relating to the expected effect of an independent variable on a dependent variable as a means for testing a theory or for answering a specific research question. To score full marks, students needed to:

- identify the research population as the Green Valley Tennis Club (1 mark)
- identify the independent and dependent variables respectively as the comparison between the observational learning and control conditions, and mastery of the new serving technique (1 mark)
- state the predicted direction of the results if the hypothesis were true: that those in the observational learning condition would master the new serving technique more effectively (or reproduce the new serving technique more accurately) than those in the control condition (1 mark).

Examples of an acceptable response included the following. Words in parentheses indicate optional wording, not required additional information.

- If observational learning, in addition to written instructions and a weekly one-hour practice session, is a more effective method for mastering a new serving technique than a control condition consisting of written instructions and practice alone, then members of the Green Valley Tennis Club who participated in the observational learning condition should master the new serving technique more effectively (or reproduce the new serve more accurately) than those in the control condition.
- Members of the Green Valley Tennis Club who learned a new serving technique by watching a video of a professional tennis player modelling the serve in addition to written instructions and one-hour weekly practice sessions should master the new serving technique more effectively (or should reproduce the new serve more accurately) than those who learned through written instruction and practice alone.

The most common error was a tendency to leave out the population. Many students did not use the structure of a research hypothesis and simply provided a description of the aims of the study.

Question 2

Marks	0	1	2	Average
%	51	15	33	**0.8**

This question assessed students' knowledge of descriptive and inferential statistics. Students were required to identify one descriptive statistic and one inferential statistic used to summarise the results reported in the scenario.

Descriptive statistics provide a summary of the characteristics of the sample (for example, the number of males and females) and summarise the measures used in a study (for example, the mean, median and mode, and measures of variability, such as the standard deviation). Only one descriptive statistic was provided in the research scenario: the mean accuracy score out of 50 for each group (1 mark). It should be noted that a table is not a descriptive statistic, rather, it is simply a method for representing/reporting descriptive statistics.

Inferential statistics are used to draw conclusions (inferences) that extend beyond the basic data to the population from which the sample was drawn. For example, inferential statistics are used to determine the probability of obtaining the observed difference between groups due to random variation in the population from which the groups were drawn (i.e. due to chance). Examples of inferential statistics include test statistics such as *t*-values (for a *t*-test between two groups) and *p* values. In the research scenario, the only inferential statistic reported was the *p* value, or significance level, of the statistical test, reported as $p = 0.10$ (1 mark).

This question was not answered well. Many students referred to the independent and dependent variables instead of the relevant descriptive and inferential statistic.

Question 3

Marks	0	1	2	3	4	5	6	7	8	9	10	Average
%	10	13	16	17	16	12	8	5	3	1	0	**3.3**

The question required students to identify and discuss the limitations of the research study described in the scenario, and to suggest suitable improvements if the study were to be repeated. It was suggested that students could consider potential limitations in the domains of sampling and allocation methods, research design, data collection, and the interpretation of the results. The question assessed students' critical analysis skills as applied to a research scenario and their ability to express this knowledge in a structured and coherent response.

Many students provided only minimal responses and demonstrated a limited ability to analyse and evaluate the research methods used in the study.

To score well, students needed to identify a range of limitations, from the most obvious problems with sampling and allocation through to more subtle problems relating to the design of the study, the validity and reliability of the chosen research measures/methods for collecting the data and the impact of these limitations on the interpretation of the results.

The most successful students went beyond simply naming/listing problems (for example, 'a convenience sample was used') and instead provided detailed explanations of the problems as related to the scenario. The suggestions for improvements needed to provide more than a generic response (for example, 'a repeated-measures design would allow participant variables to be controlled') and the suggestions needed to be justified clearly in relation to the study. For example, while it is generally true that a repeated-measures design enables participant variables to be controlled

compared to an independent-groups design, a repeated-measures design would not be suitable in this particular scenario because it would be impossible to control for the effect of completing one of the conditions prior to the other, even using counterbalancing. A more thoughtful response would have noted that either a matched-participant design or true random allocation to groups were the best solutions for controlling participant variables in this scenario, and would have explained why.

Some of the limitations and improvements students could have included are listed below. Students did not need to provide all of these limitations/suggestions, and there may be some valid points that are not included here. However, to score well, a range of limitations from across these domains was required, demonstrating critical analysis of the scenario and application of knowledge about research methods and design.

Students tended to provide very limited responses to the research scenario. This indicates that preparation for the extended response should be a focus for teachers and students in future. Allowing sufficient time for the response should also be a consideration in preparing for the exam.

Sampling
Problem – Convenience sampling/recruitment via Facebook would produce a non-representative sample of the Green Valley Tennis Club population.
Solution – To obtain a more representative sample of the population it would have been better to use a range of participant recruitment methods, which may include things like a mail-out, phone calls, posters on club walls, etc.

Or, random sampling could have been used, whereby members' names could be drawn from a hat for contacting. Note that this method does not guarantee a representative sample, as it would still entail a self-selection bias (i.e. those drawn from the hat cannot be forced to participate, and there may be participant characteristics that differ systematically between those inclined to participate and those not so inclined). Nevertheless, it would result in a more representative sample than the Facebook recruitment method.

It would have been possible to contact all members regarding the study via a mail-out (again, people self-select to participate, but at least this is likely to result in a more representative sample than recruitment via Facebook).

Research design
Many students suggested that an independent groups design was problematic, but a comparison between groups is the best design for this study, given that it would be impossible to control for prior training effects in a repeated-measures design for a study of this nature.

Given that a comparison between groups is the best design for this scenario, it is essential then to counter any potential confounding variables between the groups. This leads naturally to a consideration of the method for allocating participants to groups.

Allocation to groups
Problem – Allocating participants to groups according to which day of the week the participants played may have resulted in systematic biases/differences between the groups (for example, if the players who play on different days have different skill levels; women's competition on one day, men's on the other, etc.). Systematic differences between groups not due to the independent variable would make the results difficult to interpret.
Solution – It would have been better to randomly allocate participants to groups (names out of a hat, random number generator, etc.), with random allocation assumed to even out any potential systematic differences between groups. Alternatively, the researchers could have adopted a matched-groups design, attempting to match participants in each group on variables such as age, gender, number of years playing, level of competition/skill, etc.

Data collection and measurement issues
Problem – Participants were not supervised and undertook the training in their own time. There was a lack of control of participant compliance with the instructions/training schedule – it was not possible to tell whether the participants in each group followed the instructions as requested. This is likely to have produced unreliable data.
Solution – Instead, participants could have been asked to fill out a compliance schedule or diary of their training sessions. Or, participants could have been required to watch the video/practice the serve in a controlled location under the supervision of a researcher.

Problem – The measurement of the dependent variable in terms of holistic judgments of accuracy of reproduction of the serve over 10 trials is open to subjective judgments that potentially vary between judges.

Solution – A more objective and reliable measure of learning might have been obtained. For example, the researchers might have used musculoskeletal tracers attached to limbs to measure accuracy of the performance of the serve biomechanically and compare to the model. Alternatively, a video recording might have been taken of the serves for later slow-motion analysis against a video of the model serving. Rather than making a holistic judgment, the serve could have been analysed into components with an aggregate score produced.

Problem – Having 10 judges drawn from the senior club officials could result in poor standardisation of scoring across judges (a problem known as inter-rater reliability). The judges were not independent of the tennis club, resulting in potentially biased scoring – judges may have had a conflict of interest in personal relationships with some of the participants, again, potentially affecting the objectivity of the ratings. The judges were also not necessarily experts in judging the new serving technique.
Solution – It would be better to have a smaller group of independent expert judges to increase the reliability and validity of the ratings.

Problem 'experimenter effects' – The senior club officials were potentially aware of which participants were allocated to which condition.
Solution – It would be better to have a single-blind experiment in which the judges did not know to which condition the participants had been allocated. This would increase the objectivity, validity and reliability of the ratings. A double-blind design would not be possible in this scenario, as the participants necessarily knew to which training condition they had been allocated.

Problems with data analysis/interpretation of the data
Problem – Many students noted the non-significant *p* value. However, this is not necessarily a problem with the study, it is simply the result. The main issue with interpreting the result is that it is very difficult to determine if the non-significant result is in any way valid or able to be generalised, given the weaknesses of the research identified above.
Solution – Students might have noted that repeating the study, with appropriate improvements in place, would be required to determine whether the observational learning intervention was effective. And, if the results were to be more widely applicable to recreational tennis players in general, participants should be recruited more broadly from the wider recreational tennis population.