Write your name here

Surname
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Other names

Pearson Edexcel
International
Advanced Level

Centre Number

Candidate Number

Psychology

International Advanced Subsidiary
Paper 2: Biological Psychology, Learning Theories and Development

Monday 23 May 2016 – Afternoon
Time: 2 hours

Paper Reference
WPS02/01

You do not need any other materials.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 96.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- The list of formulae and critical value tables are printed at the start of this paper.
- Candidates may use a calculator.

Advice

- Read each question carefully before you start to answer it.
- Check your answers if you have time at the end.

Turn over ▶

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FORMULAE AND STATISTICAL TABLES

Standard deviation (sample estimate)

$$\sqrt{\left(\frac{\sum(x-\bar{x})^2}{n-1}\right)}$$

Spearman's rank correlation coefficient

$$1-\frac{6\sum d^2}{n(n^2-1)}$$

Critical values for Spearman's rank

	Level of significance for a one-tailed test				
	0.05	**0.025**	**0.01**	**0.005**	**0.0025**
	Level of significance for a two-tailed test				
N	**0.10**	**0.05**	**0.025**	**0.01**	**0.005**
4	1.000	1.000	1.000	1.000	1.000
5	0.700	0.900	0.900	1.000	1.000
6	0.657	0.771	0.829	0.943	0.943
7	0.571	0.679	0.786	0.857	0.893
8	0.548	0.643	0.738	0.810	0.857
9	0.483	0.600	0.683	0.767	0.817
10	0.442	0.564	0.649	0.733	0.782
11	0.418	0.527	0.609	0.700	0.755
12	0.399	0.504	0.587	0.671	0.727
13	0.379	0.478	0.560	0.648	0.698
14	0.367	0.459	0.539	0.622	0.675
15	0.350	0.443	0.518	0.600	0.654
16	0.338	0.427	0.503	0.582	0.632
17	0.327	0.412	0.482	0.558	0.606
18	0.317	0.400	0.468	0.543	0.590
19	0.308	0.389	0.456	0.529	0.575
20	0.299	0.378	0.444	0.516	0.561
21	0.291	0.369	0.433	0.503	0.549
22	0.284	0.360	0.423	0.492	0.537
23	0.277	0.352	0.413	0.482	0.526
24	0.271	0.344	0.404	0.472	0.515
25	0.265	0.337	0.396	0.462	0.505
26	0.260	0.330	0.388	0.453	0.496
27	0.255	0.323	0.381	0.445	0.487
28	0.250	0.317	0.374	0.437	0.479
29	0.245	0.312	0.367	0.430	0.471
30	0.241	0.306	0.361	0.423	0.463

The calculated value must be equal to or exceed the critical value in this table for significance to be shown.

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Chi-squared distribution formula

$$X^2 = \sum \frac{(O-E)^2}{E} \qquad df = (r-1)(c-1)$$

Critical values for chi-squared distribution

	Level of significance for a one-tailed test					
	0.10	**0.05**	**0.025**	**0.01**	**0.005**	**0.0005**
	Level of significance for a two-tailed test					
df	**0.20**	**0.10**	**0.05**	**0.025**	**0.01**	**0.001**
1	1.64	2.71	3.84	5.02	6.64	10.83
2	3.22	4.61	5.99	7.38	9.21	13.82
3	4.64	6.25	7.82	9.35	11.35	16.27
4	5.99	7.78	9.49	11.14	13.28	18.47
5	7.29	9.24	11.07	12.83	15.09	20.52
6	8.56	10.65	12.59	14.45	16.81	22.46
7	9.80	12.02	14.07	16.01	18.48	24.32
8	11.03	13.36	15.51	17.54	20.09	26.12
9	12.24	14.68	16.92	19.02	21.67	27.88
10	13.44	15.99	18.31	20.48	23.21	29.59
11	14.63	17.28	19.68	21.92	24.73	31.26
12	15.81	18.55	21.03	23.34	26.22	32.91
13	16.99	19.81	22.36	24.74	27.69	34.53
14	18.15	21.06	23.69	26.12	29.14	36.12
15	19.31	22.31	25.00	27.49	30.58	37.70
16	20.47	23.54	26.30	28.85	32.00	39.25
17	21.62	24.77	27.59	30.19	33.41	40.79
18	22.76	25.99	28.87	31.53	34.81	42.31
19	23.90	27.20	30.14	32.85	36.19	43.82
20	25.04	28.41	31.41	34.17	37.57	45.32
21	26.17	29.62	32.67	35.48	38.93	46.80
22	27.30	30.81	33.92	36.78	40.29	48.27
23	28.43	32.01	35.17	38.08	41.64	49.73
24	29.55	33.20	36.42	39.36	42.98	51.18
25	30.68	34.38	37.65	40.65	44.31	52.62
26	31.80	35.56	38.89	41.92	45.64	54.05
27	32.91	36.74	40.11	43.20	46.96	55.48
28	34.03	37.92	41.34	44.46	48.28	56.89
29	35.14	39.09	42.56	45.72	49.59	58.30
30	36.25	40.26	43.77	46.98	50.89	59.70
40	47.27	51.81	55.76	59.34	63.69	73.40
50	58.16	63.17	67.51	71.42	76.15	86.66
60	68.97	74.40	79.08	83.30	88.38	99.61
70	79.72	85.53	90.53	95.02	100.43	112.32

The calculated value must be equal to or exceed the critical value in this table for significance to be shown.

Wilcoxon Signed Ranks test process

- Calculate the difference between two scores by taking one from the other
- Rank the differences giving the smallest difference Rank 1

  Note: do not rank any differences of 0 and when adding the number of scores, do not count those with a difference of 0, and ignore the signs when calculating the difference
- Add up the ranks for positive differences
- Add up the ranks for negative differences
- T is the figure that is the smallest when the ranks are totalled (may be positive or negative)
- N is the number of scores left, ignore those with 0 difference

Critical values for the Wilcoxon Signed Ranks test

	Level of significance for a one-tailed test		
	0.05	0.025	0.01
	Level of significance for a two-tailed test		
n	0.1	0.05	0.02
N=5	0	-	-
6	2	0	-
7	3	2	0
8	5	3	1
9	8	5	3
10	11	8	5
11	13	10	7
12	17	13	9

The calculated value must be equal to or less than the critical value in this table for significance to be shown.

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SECTION A

Answer ALL questions in this section. Write your answers in the spaces provided.

1 As part of his psychology course, Jacob investigated the relationship between aggression and antisocial behaviour. He decided to use a twin study. His sample consisted of monozygotic (MZ) and dizygotic (DZ) twins.

Jacob's results are displayed in **Table 1**.

Sample	Concordance rate between aggression and antisocial behaviour
Monozygotic twins	87%
Dizygotic twins	67%

Table 1

(a) Identify which sample of twins has a higher genetic relatedness between aggression and antisocial behaviour.

(1)

Monozygotic (MZ) twins, as they have the higher concordance rate of 87% compared with 67% for dizygotic twins.

(b) Jacob used a twin study for this investigation.

Explain **one** strength and **one** weakness of the twin study method.

(4)

Strength

Twin studies use naturally occurring variables, such as the aggression and antisocial behaviour Jacob measured, so nothing is manipulated artificially. As MZ twins share 100% of their genes and DZ twins about 50%, comparing concordance rates lets Jacob estimate the genetic influence using valid, real-life data.

Weakness

Twins are not common in the population, so Jacob may only find a small sample who may not represent everyone, reducing generalisability. Also MZ twins are often treated more alike than DZ twins, so the higher 87% concordance could be due to a shared environment rather than genes.

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(c) Explain **one** conclusion that Jacob might draw from his results.

(2)

MZ twins have a higher concordance rate (87%) than DZ twins (67%) for aggression and antisocial behaviour, so Jacob can conclude the relationship is partly genetic, but as MZ is not 100%, the environment also plays a role.

(Total for Question 1 = 7 marks)

2 Describe the role of infradian rhythms in explaining human behaviour.

Infradian rhythms are biological rhythms that last longer than 24 hours, for example weeks or months. In humans the main example is the menstrual cycle, which lasts about 28 days and is controlled by hormones such as oestrogen and progesterone. In the few days before the onset of bleeding, when the lining of the uterus wall is shed, many women experience premenstrual syndrome. This explains regular changes in behaviour such as low mood, stress, irritability, poor concentration and loss of appetite. Another example is seasonal affective disorder, a yearly rhythm in which shorter winter days lead to more melatonin being released, causing low mood, lethargy and oversleeping. This shows that behaviour can change in a regular pattern over long periods because of biological rhythms.

(Total for Question 2 = 4 marks)

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3 Siffre (1972) conducted research to test the 24-hour sleep-wake cycle. He lived underground for 205 days where there were no zeitgebers such as natural light. Siffre did not know what time it was, although he did have contact with the outside world via a telephone. His behaviour was monitored, including when he went to sleep, when he woke, and when he ate meals. The results found that he experienced a change in his daily sleep-wake cycle up to approximately 48 hours.

(a) Identify the type of bodily rhythm that Siffre (1972) was researching.

(1)

A circadian rhythm (the 24-hour sleep-wake cycle).

(b) Explain, using research, why the regulation of an internal body clock could change.

(4)

The sleep-wake cycle is controlled by an internal body clock (an endogenous pacemaker), the suprachiasmatic nucleus in the hypothalamus, which is normally reset each day by external cues called zeitgebers, especially light. Siffre's research shows that the cycle has an internal control, as without natural light or clocks his body still kept a regular pattern of sleeping and waking. However, in the absence of zeitgebers the clock could not be kept at 24 hours, so it free-ran and his sleep-wake cycle changed to approximately 48 hours. This shows that the regulation of the body clock can change when external cues such as light and temperature are removed, as there is nothing to reset it. The same happens in jet lag and shift work, when zeitgebers suddenly change and the body clock takes time to readjust.

(c) Explain **one** weakness of research conducted into the sleep-wake cycle.

(2)

Much of the research, such as Siffre's, is a case study of one person, an adult man. This means the findings are not representative of the whole population, for example women or people of other ages may have different sleep-wake cycles, so the results cannot be generalised. Siffre also had artificial light in the cave, which may itself have affected his body clock, reducing the validity of the findings.

(Total for Question 3 = 7 marks)

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4 A researcher studied the influence of light therapy on individuals with Seasonal Affective Disorder (SAD). He selected participants with a diagnosis of SAD symptoms for two or more years. They completed a self-assessment questionnaire about their mood before the light therapy treatment. They were treated with two hours of light therapy for eight weeks. Following this, the researcher reassessed their mood levels using the same questionnaire.

(a) State a one-tailed (directional) hypothesis for this study.

(3)

Participants with SAD will have a significantly higher mood self-assessment score (out of 100) after eight weeks of two hours of light therapy than before the light therapy.

(b) The results of the study are given in **Table 2** below.

Participant	Mood self-assessment score before light therapy (out of 100)	Mood self-assessment score after light therapy (out of 100)
1	38	58
2	66	71
3	34	54
4	40	51
5	36	63
6	30	55
7	42	66
8	41	68
9	27	58
10	46	56

Table 2

(i) Calculate the mean scores for before and after light therapy using the data in **Table 2**.

(2)

Before: 38 + 66 + 34 + 40 + 36 + 30 + 42 + 41 + 27 + 46 = 400

400 ÷ 10 = 40

After: 58 + 71 + 54 + 51 + 63 + 55 + 66 + 68 + 58 + 56 = 600

600 ÷ 10 = 60

Mean mood self-assessment score before light therapy *40*

Mean mood self-assessment score after light therapy *60*

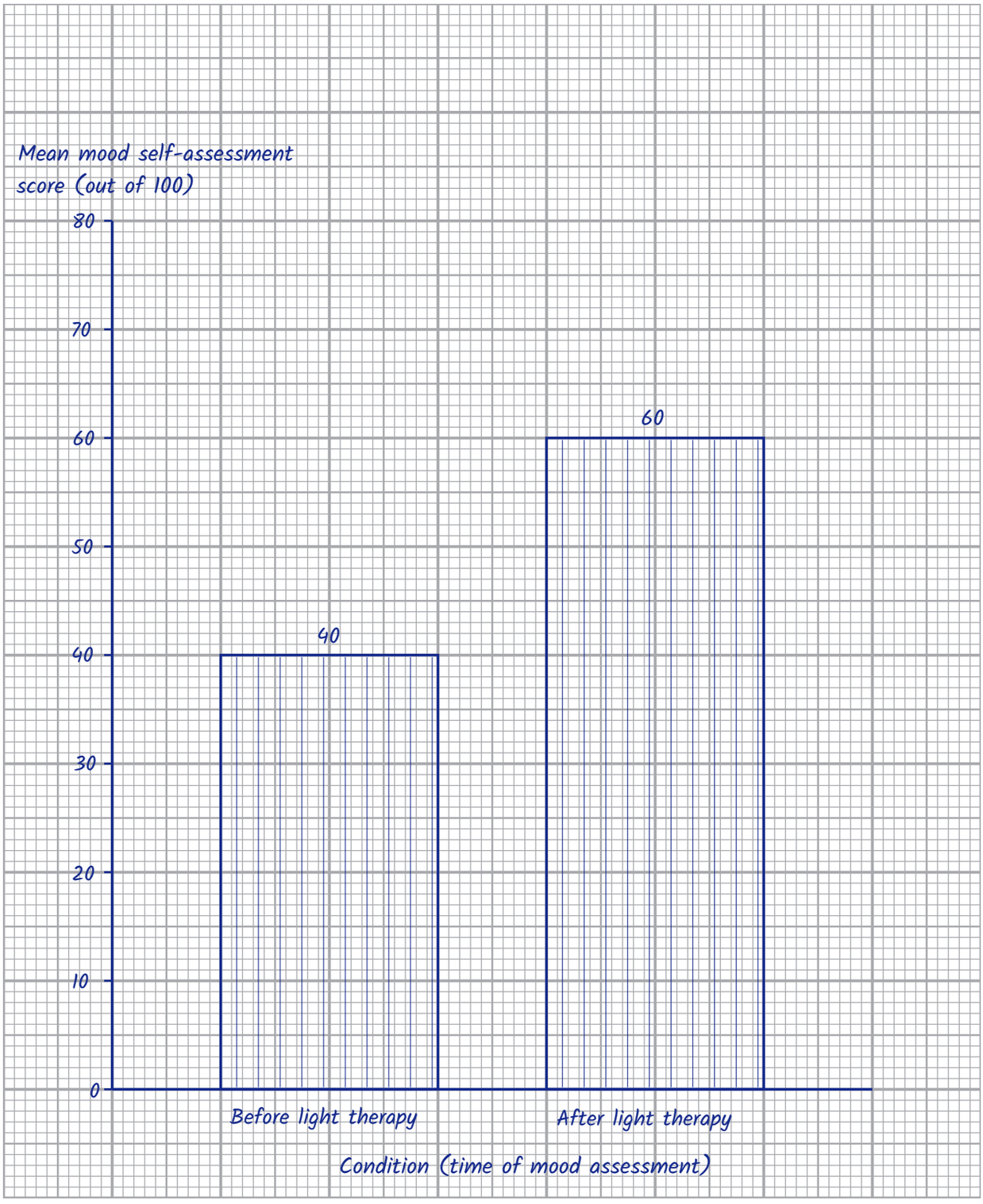
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(ii) Draw and title a suitable graph to represent the mean scores for this study.

(3)

Title: *Bar chart to show the mean mood self-assessment scores (out of 100) before and after light therapy for participants with SAD*



(Total for Question 4 = 8 marks)

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5 Evaluate Raine et al's (1997) study into brain abnormality in murderers.

Raine et al (1997) used PET scans to compare the brains of 41 people (39 men and 2 women) charged with murder or manslaughter who pleaded not guilty by reason of insanity with 41 controls matched on age and sex. All completed a continuous performance task before the scan. The murderers showed lower glucose metabolism in the prefrontal cortex and corpus callosum, and abnormal asymmetries in the amygdala, hippocampus and thalamus.

A strength is the matched pairs design: matching on age and sex controls participant variables, so differences in brain activity are more likely to be linked to the murderers' violence. PET scanning is an objective, scientific measure, so the data are not open to interpretation and the study can be replicated to test reliability, and brains can be studied while people are alive rather than after death.

However, the sample was only 41 murderers who all pleaded not guilty by reason of insanity, so they are not representative of all murderers, reducing generalisability. The pre-scan task had nothing to do with violent behaviour, so task validity is low. The study is also correlational, so it cannot show that brain abnormality causes violence, and Raine et al stressed that social factors also matter.

Overall, the study gives strong scientific evidence of a link between brain dysfunction and violence, but due to the unrepresentative sample and lack of causation it only shows a predisposition, not a full explanation.

(Total for Question 5 = 8 marks)

TOTAL FOR SECTION A = 34 MARKS

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SECTION B

Answer ALL questions. Write your answers in the spaces provided.

6 Shamilla wanted to investigate the speed of cars being driven both with and without passengers. Using a hand held speed recorder, she measured the speed of cars and noted their occupancy.

Table 3 shows the results Shamilla recorded.

Speed of cars being driven without passengers Km/h	Speed of cars being driven with passengers Km/h
56	58
60	50
66	53
53	58
55	53
61	42
47	52
71	44
60	61
55	40

Table 3

(a) Calculate the median speed for cars without passengers and the median speed for cars with passengers.

(2)

Without: 47, 53, 55, 55, 56, 60, 60, 61, 66, 71 ⇒ (56 + 60) ÷ 2 = 58

With: 40, 42, 44, 50, 52, 53, 53, 58, 58, 61 ⇒ (52 + 53) ÷ 2 = 52.5

Median speed for cars without passengers ..... 58 km/h

Median speed for cars with passengers ..... 52.5 km/h

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(b) Calculate the range of speed for cars without passengers and the range of speed for cars with passengers.

(2)

Without: 71 – 47 = 24

With: 61 – 40 = 21

Range of speed for cars without passengers ..... *24 km/h*

Range of speed for cars with passengers ..... *21 km/h*

(c) Shamilla may have wanted to consider using standard deviation instead of the range as her measure of dispersion.

Explain why standard deviation may have been more appropriate.

(2)

Standard deviation takes into account every score in the data set, as it measures how far each speed is spread around the mean, whereas the range only uses the highest and lowest speeds. So the range is distorted by one extreme speed such as 71 km/h, while the standard deviation gives a more accurate measure of dispersion.

(d) Explain **two** reasons why Shamilla chose to use a non-participant observation method for her research.

(4)

1 *If Shamilla had been a participant, for example a passenger in one of the cars, she could not have observed all the passing cars. As a non-participant she could focus fully on accurately recording each car's speed with the speed recorder and its occupancy.*

2 *Shamilla wanted to observe drivers in their natural environment on real roads. By staying separate from the drivers, they would drive as they normally do and not change their speed because of her, giving the study high ecological validity.*

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(e) There are many variables that could have affected the results Shamilla recorded on the day of her observations.

Explain **two** extraneous variables that could have affected the results.

(4)

1 *The weather: if it was raining or foggy, drivers may slow down whatever their occupancy, and Shamilla may not have seen clearly whether there were passengers in the car, so the speeds recorded may not reflect the effect of passengers, reducing the reliability of her results.*

2 *The time of day: in rush hour, heavy traffic would force all cars to drive slowly, and in poor light she may not have been able to see the passengers, so differences in speed may be caused by traffic or visibility rather than whether passengers were present.*

(Total for Question 6 = 14 marks)

7 During your course you will have learned about Watson and Rayner's (1920) classic study 'Little Albert: Conditioned emotional reactions'.

(a) Describe the procedure of the Watson and Rayner (1920) classic study.

(4)

Little Albert was a healthy 9-month-old boy. To test his emotional reactions he was shown a white rat, a rabbit, a dog, a monkey, masks, cotton wool and burning newspaper, and showed no fear of them. The only thing that frightened him was a loud noise made by striking a steel bar with a hammer behind his head, which made him startle and cry. At 11 months the conditioning began: as Albert reached to touch the white rat, the bar was struck behind him. This pairing was repeated (seven pairings over two sessions a week apart) until the rat alone made him cry and crawl away. He was later shown other objects, such as a rabbit, a dog, a fur coat and a Santa Claus mask, to test whether the fear had generalised, and was retested a month later.

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(b) Explain **one** strength and **one** weakness of the Watson and Rayner (1920) classic study.

(4)

Strength

The procedure was standardised and controlled, for example the steel bar was struck at the moment Albert touched the rat and the sessions were filmed, so the study can be replicated to test reliability. It gives clear evidence that fear can be learned through classical conditioning.

Weakness

Watson and Rayner only studied one child, Albert, who was 9 to 11 months old, so the findings are not representative of everyone and cannot be generalised, as other children may react differently to the same conditioning.

(c) Suggest **two** ethical improvements you could make to the Watson and Rayner (1920) classic study.

(4)

1 *Albert should have stayed in the study until his fear had been removed by deconditioning him, and his mother should have been fully informed, so that he did not leave with a lasting phobia. This would protect him from long-term psychological harm.*

2 *Very frightening items, such as the mask held close to his face, should be replaced with less frightening objects, and sessions should be stopped as soon as Albert became very distressed, so that he was protected from unnecessary distress during the study.*

(Total for Question 7 = 12 marks)

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8 Harry and Lucy are twins who need to learn to put their toys away after playing with them.

Discuss how Learning Theories could help teach the twins to put their toys away after playing with them.

Social learning theory (Bandura) states that behaviour is learned by observing role models and imitating them. The twins' parents could act as positive role models by putting the toys away tidily in front of them. Models who are similar or of high status are more likely to be copied, so Harry may copy his father and Lucy her mother. The four stages of modelling apply: attention (the twins watch the parent tidying), retention (they remember where the toys go), reproduction (they must be able to do it, so toy boxes should be within reach) and motivation. Motivation comes from vicarious reinforcement, so if the twins see a parent or older sibling praised for tidying up, they are more likely to imitate it.

Operant conditioning (Skinner) states that behaviour is learned through its consequences. With positive reinforcement, each time Harry and Lucy put their toys away their parents could praise them or give them a sticker or a sweet, so they are more likely to repeat it. Shaping could be used, rewarding the twins first for putting one toy in the box, then half of the toys, until they are only rewarded for tidying everything away. Negative reinforcement, such as the parents stopping nagging once the toys are away, or punishment, such as losing a toy left out, would also make tidying more likely. Combining modelling with consistent reinforcement should make putting the toys away a habit.

(Total for Question 8 = 8 marks)

TOTAL FOR SECTION B = 34 MARKS

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SECTION C

Answer ALL questions. Write your answers in the spaces provided.

9 Maria has a phobia of cats, which means that she can no longer visit her friend, Alice, who has just bought a cat.

Evaluate systematic desensitisation as a treatment/therapy for Maria's phobia.

You must make reference to the context in your answer.

(12)

Systematic desensitisation (SD) was developed by Wolpe (1958) and is based on classical conditioning. It assumes Maria's phobia of cats was learned by associating cats with fear, so it can be unlearned through counterconditioning: the fear response is replaced with relaxation, as two opposite emotions cannot be felt at the same time (reciprocal inhibition).

First Maria would be taught relaxation techniques such as deep breathing and muscle relaxation. She would then build a fear hierarchy with the therapist, from the least feared situation, such as hearing the word "cat" or looking at a cartoon of a cat, through photographs and videos of cats, then being in a room with a cat in a cage, up to the most feared, such as stroking Alice's cat. Maria would work through the hierarchy step by step, only moving on when she feels calm at the current step. If she becomes anxious she would use her relaxation technique until the anxiety passes. The final goal is that Maria can visit Alice and stay calm around her cat.

A strength is that there is evidence that SD works. McGrath et al (1990) successfully treated a 9-year-old girl with a phobia of noises using systematic desensitisation, suggesting Maria's phobia could also be reduced. As it is based on learning principles tested in controlled conditions, it is also seen as scientific. SD is considered more ethical than flooding, as Maria has control over the pace and can stop at any time, so she experiences less distress. It is also quick and cheap compared with psychodynamic therapy, as Maria could be treated in a few sessions.

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However, SD relies on Maria being able to learn relaxation and to imagine the feared situations vividly; if she cannot, it may not work. It treats the symptoms rather than any underlying cause, so psychodynamic therapists would argue the fear may return or be replaced by another symptom, and they point out that many people with phobias cannot recall any experience with the feared object. SD is also often used together with other treatments such as cognitive behavioural therapy or drugs (Burke et al, 1997), so it is hard to know how much improvement is due to SD alone.

Overall, SD seems a suitable treatment for Maria, as her phobia is of a specific object which she can face gradually in real life at Alice's home, and it is ethical and supported by evidence. However, its success depends on her motivation and on whether her phobia is purely learned.

(Total for Question 9 = 12 marks)

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10 Liam is a 14-year-old boy who has been getting into trouble at school for fighting with other boys.

To what extent does biological psychology and learning theories and development explain Liam's aggressive behaviour?

You must make reference to the context in your answer.

(16)

Biological psychology explains aggression through hormones, genes, the brain and evolution. Testosterone, the male sex hormone, is linked to aggression and may explain why males are more aggressive than females. Liam is 14, so he is going through puberty, when testosterone levels rise sharply and are unbalanced, which could explain why he has started fighting other boys. Kalat (1998) reported that among 15 to 25-year-old men, those with the highest levels of testosterone also showed the highest levels of aggression in crime statistics. Cortisol may also be involved, as low levels of this stress hormone are linked to higher aggression.

The MAOA gene controls the enzyme monoamine oxidase A, which regulates serotonin. Liam may have a low-activity version, so his serotonin is less well regulated, making him more impulsive and aggressive. Brunner et al (1993) found a defective MAOA gene in a Dutch family with a history of male violence. Raine et al (1997) found lower activity in the prefrontal cortex of murderers; as this area controls impulses and is still developing at 14, Liam may find it harder to stop himself fighting. Evolutionary theory (Darwin) suggests aggression is an adaptive trait that helps males compete for status and protect their partners and genes. Buss and Shackelford (1997) showed males threaten other males to protect their partner, which could explain why Liam fights other boys.

However, biological explanations are reductionist, reducing Liam's behaviour to hormones or genes, and they do not explain individual differences, as not all 14-year-old boys fight. Much of the evidence is correlational, so fighting may raise testosterone rather than the other way round, and the approach ignores Liam's situation at school.

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Learning theories explain aggression as learned from the environment. Social learning theory (Bandura) states that aggression is learned by observing role models and imitating them. Liam may have watched older boys at school, a brother, his father or characters on television fighting, especially same-sex models he identifies with. If he saw them gain respect or status for fighting, this vicarious reinforcement would motivate him to imitate them. Bandura, Ross and Ross (1961) found that children who watched an adult act aggressively towards a Bobo doll imitated the aggression, and boys were especially likely to copy an aggressive male model, which fits Liam fighting other boys. Operant conditioning also applies: if Liam is positively reinforced for fighting, for example with admiration from friends or by getting what he wants, he will repeat it, and if fighting stops him being teased it is negatively reinforced.

Learning theories have strong experimental support and are less deterministic, suggesting Liam's behaviour can be changed by removing rewards for fighting. However, Bandura's study was a laboratory experiment with a doll that cannot be hurt, so it may lack validity for real fights between teenagers. Learning theories also cannot explain why males are more aggressive than females across cultures, or why some boys who see aggression do not copy it. Freud's idea of catharsis suggests Liam's fighting may release built-up unconscious frustration, although this is hard to test scientifically.

In conclusion, neither approach fully explains Liam's aggression alone. His age suggests that rising testosterone and an immature prefrontal cortex may give him a biological predisposition, but whether this becomes fighting probably depends on what he has learned from role models and the reinforcement he gets at school. An interactionist explanation, combining biology and learning, best explains Liam's behaviour.

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(Total for Question 10 = 16 marks)

TOTAL FOR SECTION C = 28 MARKS
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