Please check the examination details below before entering your candidate information

Candidate surname: StemUp Model Solution

Other names:

Centre Number | Candidate Number

# Pearson Edexcel International Advanced Level

**Time** 2 hours

**Paper reference** **WPS02/01**

# Psychology

## International Advanced Level
## PAPER 2: Biological Psychology, Learning Theories and Development

**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 statistical 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.
- Try to answer every question.
- 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** |
| **5** | 0.900 | 1.000 | 1.000 | 1.000 | 1.000 |
| **6** | 0.829 | 0.886 | 0.943 | 1.000 | 1.000 |
| **7** | 0.714 | 0.786 | 0.893 | 0.929 | 0.964 |
| **8** | 0.643 | 0.738 | 0.833 | 0.881 | 0.905 |
| **9** | 0.600 | 0.700 | 0.783 | 0.833 | 0.867 |
| **10** | 0.564 | 0.648 | 0.745 | 0.794 | 0.830 |
| **11** | 0.536 | 0.618 | 0.709 | 0.755 | 0.800 |
| **12** | 0.503 | 0.587 | 0.678 | 0.727 | 0.769 |
| **13** | 0.484 | 0.560 | 0.648 | 0.703 | 0.747 |
| **14** | 0.464 | 0.538 | 0.626 | 0.679 | 0.723 |
| **15** | 0.446 | 0.521 | 0.604 | 0.654 | 0.700 |
| **16** | 0.429 | 0.503 | 0.582 | 0.635 | 0.679 |
| **17** | 0.414 | 0.485 | 0.566 | 0.615 | 0.662 |
| **18** | 0.401 | 0.472 | 0.550 | 0.600 | 0.643 |
| **19** | 0.391 | 0.460 | 0.535 | 0.584 | 0.628 |
| **20** | 0.380 | 0.447 | 0.520 | 0.570 | 0.612 |
| **21** | 0.370 | 0.435 | 0.508 | 0.556 | 0.599 |
| **22** | 0.361 | 0.425 | 0.496 | 0.544 | 0.586 |
| **23** | 0.353 | 0.415 | 0.486 | 0.532 | 0.573 |
| **24** | 0.344 | 0.406 | 0.476 | 0.521 | 0.562 |
| **25** | 0.337 | 0.398 | 0.466 | 0.511 | 0.551 |
| **26** | 0.331 | 0.390 | 0.457 | 0.501 | 0.541 |
| **27** | 0.324 | 0.382 | 0.448 | 0.491 | 0.531 |
| **28** | 0.317 | 0.375 | 0.440 | 0.483 | 0.522 |
| **29** | 0.312 | 0.368 | 0.433 | 0.475 | 0.513 |
| **30** | 0.306 | 0.362 | 0.425 | 0.467 | 0.504 |

**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.**

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**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

## BIOLOGICAL PSYCHOLOGY

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

**1** (a) State the function of neurotransmitters.

**(1)**

*Neurotransmitters are chemical messengers released from the pre-synaptic neuron into the synapse, where they bind to receptors on the post-synaptic neuron, so they pass messages from one neuron to the next.*

(b) Explain **one** weakness of the function of neurotransmitters as an explanation of human behaviour.

**(2)**

*It is reductionist because it ignores external factors such as zeitgebers (for example daylight) that also affect behaviour. Siffre (1975) found that when he lived in a cave without external cues his sleep/wake cycle lengthened to beyond 24 hours, so neurotransmitters alone cannot fully explain human behaviour.*

**(Total for Question 1 = 3 marks)**

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**2** Serenity has carried out a correlation to determine whether there is a relationship between how old her participants are in years and the number of hours they slept on average per night.

(a) State the **two** fully operationalised co-variables in Serenity's correlation.

**(2)**

1 *The age of each participant measured in years.*

2 *The average number of hours each participant slept per night.*

Serenity's results are shown in **Table 1**.

| Age (years) | Average amount of sleep per night (hours) |
|---|---|
| 21 | 9 |
| 18 | 10 |
| 30 | 8 |
| 27 | 9 |
| 24 | 7 |

**Table 1**

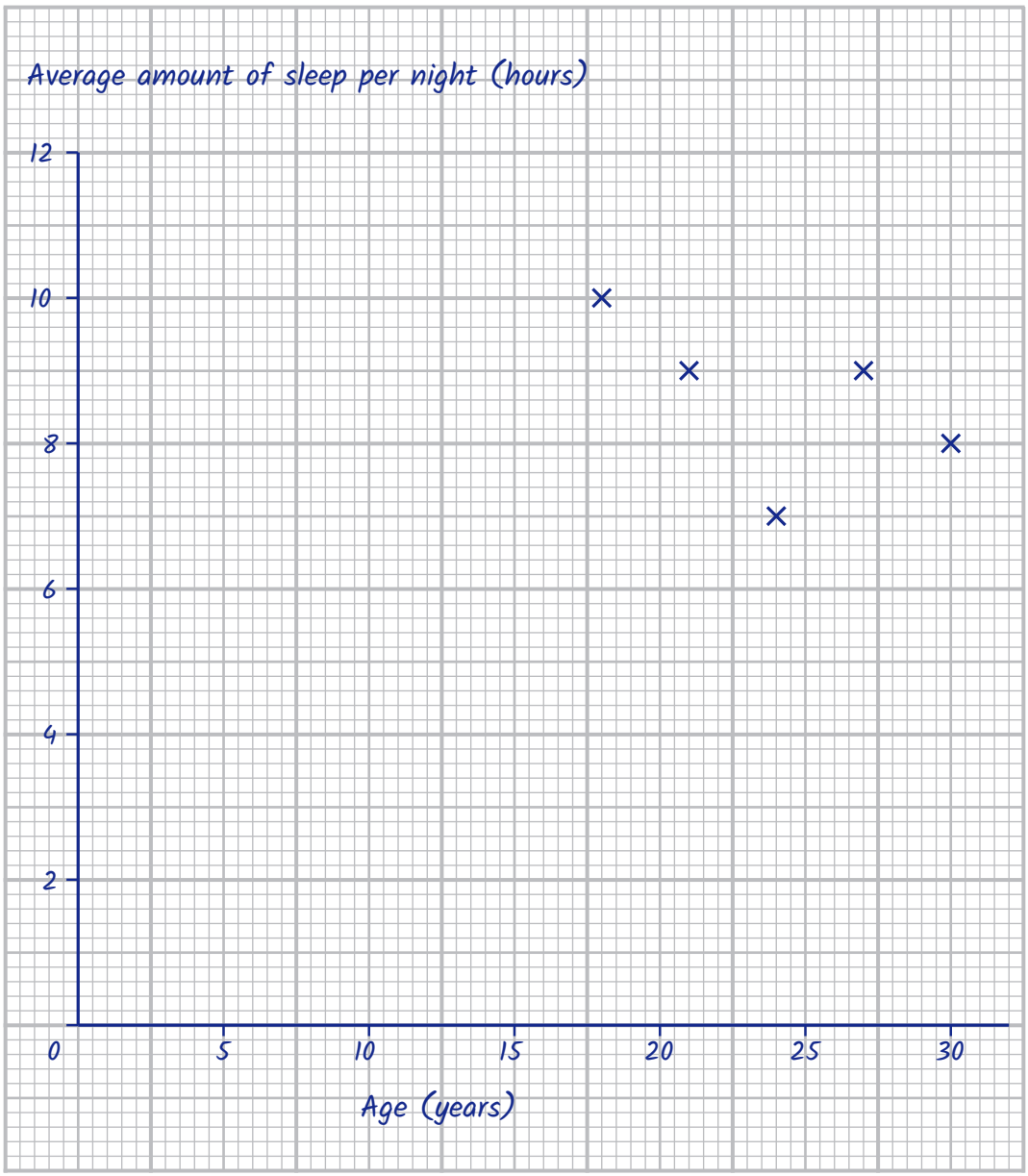
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(b) Draw a scatter diagram to represent the data shown in **Table 1**.

**(3)**

Title

*A scatter diagram to show the relationship between the age of participants in years and the average number of hours they slept per night*




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(c) Serenity used the Spearman's rank test to see if her results were significant.

Give **two** reasons why Serenity used the Spearman's rank test for her data.

**(2)**

1 *Serenity was looking for a relationship (correlation) between age in years and the average hours slept per night, and Spearman's rank is a test of correlation.*

2 *Her data are at least ordinal level, because both age in years and hours of sleep per night can be ranked in numerical order.*

**(Total for Question 2 = 7 marks)**

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**3** In your studies of biological psychology, you will have learned about the infradian rhythm of the menstrual cycle.

(a) Describe the infradian rhythm of the menstrual cycle.

**(4)**

*The menstrual cycle is an infradian rhythm because it lasts longer than 24 hours, about 28 days on average, and it is regulated by hormones. In the first half of the cycle the pituitary gland releases FSH, which causes an egg follicle to develop in the ovary, and oestrogen levels rise so the lining of the womb thickens. Oestrogen levels are at their highest about halfway through the cycle, when a surge of LH causes ovulation and the egg is released. In the second half of the cycle progesterone levels increase so the womb lining is maintained in case the egg is fertilised. If the egg does not implant, progesterone levels fall and the lining of the womb is shed (menstruation), and the cycle begins again.*

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(b) Explain **two** strengths of infradian rhythms as an explanation of human behaviour.

**(4)**

1 *Penton-Voak et al. (1999) found that the menstrual cycle affects which male faces women prefer, which supports the idea that infradian rhythms affect behaviour, as women preferred more masculine faces around ovulation, their most fertile time, so the rhythm affects who we find attractive.*

2 *Dalton (1964) found that pre-menstrual syndrome was associated with an increase in crimes, suicides and accidents, which suggests the infradian rhythm affects behaviour, as there was a negative effect on female behaviour at this stage of the cycle, giving the explanation plausibility.*

**(Total for Question 3 = 8 marks)**

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**4** During your studies of biological psychology, you will have learned about one of the following contemporary studies in detail:

- McDermott (2008)
- Hoefelmann et al. (2006).

(a) Describe your chosen contemporary study.

**(4)**

Chosen study

*McDermott (2008)*

*McDermott (2008) aimed to see whether differences in aggression, measured by giving hot sauce as a punishment, were linked to the MAOA gene. Male participants were split into two groups by genotype: those with the high activity version of the gene (MAOA-H) and those with the low activity version (MAOA-L). Participants played a game for money against an unseen opponent who took either a small (20%) or a large (80%) share of their earnings, and aggression was measured by how willing they were to pay to make the opponent eat hot sauce, and how much sauce they gave. The results showed that the MAOA-L group were more aggressive, being more likely to punish their opponent with hot sauce, especially when 80% of their earnings had been taken (high provocation).*

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(b) Explain **two** weaknesses of your chosen contemporary study in terms of validity.

**(4)**

1 *Giving hot sauce to an unseen opponent is not like real-life aggression towards a person you can see, so the MAOA-L group may not be more aggressive face to face, which reduces the ecological (external) validity of the results.*

2 *Eight of the participants said in the post-experiment interview that they did not believe they were really giving hot sauce to someone else, so their behaviour may not have been genuine aggression, which reduces the internal validity of the study.*

**(Total for Question 4 = 8 marks)**

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**5** Evaluate the use of brain-scanning techniques in biological psychology.

**(8)**

*Brain-scanning techniques let psychologists look inside the living brain. CAT scans pass X-rays through the head from many angles to build an image of the brain's structure, so they can show damage or tumours in areas linked to behaviour such as aggression. PET scans show function: a radioactive tracer attached to glucose is injected and the scanner detects where it is used most, showing active areas, as in Raine et al. (1997), who found murderers had less activity in the prefrontal cortex. fMRI uses powerful magnets to detect changes in blood oxygen, showing which areas are active during a task, and has been used to study sleep. In each case a computer turns the data into a three-dimensional image.*

*A strength is that scans are scientific and objective, as they measure brain activity directly rather than relying on self-report, so findings such as Raine et al. (1997) give credible biological evidence. Scans also have practical uses, for example identifying low activity in areas such as the prefrontal cortex or amygdala so that support can be given to people at risk of aggression.*

*However, CAT and PET scans expose people to radiation, so they are not suitable for everyone, such as pregnant women, and cannot be repeated often, which limits research. fMRI is safer as it uses no radiation, which is why it may be preferred, but it is expensive and the person must lie still in a noisy scanner, which is an artificial setting, so brain activity may not reflect real-life behaviour. Scans are also correlational: they show that an area is active, not that it causes the behaviour. Finally, the images still have to be interpreted by researchers, so there is some subjectivity.*

*Overall, brain scans are very useful because they give objective evidence about the structure and function of the living brain, but they should be combined with other methods because*

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*they show correlation rather than cause and raise practical and ethical issues.*

**(Total for Question 5 = 8 marks)**

**TOTAL FOR SECTION A = 34 MARKS**

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## SECTION B

## LEARNING THEORIES AND DEVELOPMENT

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

**6** Jasmine has learned how to clean her shoes after she paid attention to her sister cleaning shoes.

(a) Describe 'attention' as it is used in social learning theory, using Jasmine as an example.

**(2)**

*Attention is when the observer notices and focuses on the behaviour a model demonstrates, as without attention the behaviour cannot be learned. Jasmine focused on her sister, a same-sex role model she identifies with, as she demonstrated cleaning shoes, so she noticed the steps involved.*

(b) Explain **one** weakness of social learning theory.

**(2)**

*Charlton et al. (2000) found that the introduction of television on St Helena did not increase anti-social behaviour in most children, which goes against the idea that we imitate aggressive role models on TV, so other factors such as family and community must affect whether behaviour is learned.*

**(Total for Question 6 = 4 marks)**

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**7** Elijah has been asked to investigate whether today's teenagers feel more stressed compared to teenagers ten years ago and twenty years ago.

He created a questionnaire that contains open questions. Elijah asked 10 teenagers, 10 people in their mid-twenties and 10 people in their mid-thirties to answer them.

Once Elijah had all the questionnaires back, he noted down the age of the participants and carried out a thematic analysis on the data.

(a) Describe how Elijah could carry out a thematic analysis on his data.

**(4)**

*Elijah could use a deductive approach and decide in advance which themes about stress to look for, such as 'school pressure', 'social media' or 'worries about the future'. Alternatively, with an inductive approach, he would read through all 30 questionnaires several times and let the themes about stress emerge from the answers. Once he has his themes he would decide which codes belong in each theme, for example 'not sleeping' or 'feeling tired' would go in a behavioural/physical theme. Finally he would go through each questionnaire, code the answers into the themes and count how often each theme occurs for the teenagers, the people in their mid-twenties and those in their mid-thirties, so he can compare stress across the three age groups.*

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(b) Explain **two** improvements Elijah could make to his investigation.

**(4)**

1 *Elijah could ask another researcher to code the questionnaires about stress independently using his themes, so the two sets of results can be compared and, if they agree, this shows inter-rater reliability and that Elijah was not biased in his coding.*

2 *Elijah could ask someone else to randomly number the questionnaires and keep a record of which were answered by teenagers, mid-twenties and mid-thirties, so when he codes the data he does not know each participant's age, which reduces experimenter bias.*

**(Total for Question 7 = 8 marks)**

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**8** Willow has started psychoanalysis to treat her phobia of expressing her opinion. She has an important meeting in three months' time where she needs to be able to state what she thinks.

The psychoanalyst uses free association as part of the therapy. During free association Willow accidently mentioned her father when talking about her husband. In another session Willow was talking about how she did not like her boss and then mentioned how her mother had the same colour hair as her boss.

The psychoanalyst wanted to focus on these statements, but Willow felt embarrassed about her mistakes and tried to talk about something else. She felt the mistakes were not important.

(a) Describe free association as used in Willow's psychoanalysis.

**(4)**

*Free association is when Willow is asked to say whatever comes into her mind without censoring it, which allows unconscious thoughts to become conscious, such as Willow mentioning her father when talking about her husband. Because Willow is relaxed, the ego defence mechanisms become weaker, so unconscious links, such as her boss reminding her of her mother through the same hair colour, can be expressed. The psychoanalyst wanted to focus on these slips because they believe there is a deeper meaning behind them that could give Willow insight into the cause of her phobia of expressing her opinion. Willow felt embarrassed and changed the subject, which the psychoanalyst would see as resistance, as her conscious mind is trying to protect her from painful unconscious feelings about her parents.*

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(b) Explain **one** strength and **one** weakness of free association as a treatment for Willow.

**(4)**

Strength

*Free association lets the psychoanalyst uncover what is in Willow's unconscious, such as how she links her husband with her father, so it can help Willow understand the root cause of her phobia of expressing her opinion, unlike therapies such as systematic desensitisation which only treat the symptoms.*

Weakness

*Free association can take years before Willow is relaxed enough to say things she did not mean, such as linking her boss's hair colour to her mother, and she is resisting, so as she needs to overcome her phobia in three months, a faster therapy such as systematic desensitisation may suit her better.*

**(Total for Question 8 = 8 marks)**

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**9** Rose has conducted an investigation into whether males or females spend more time doing jobs around the house. She asked her participants to estimate how many hours a week they spent on average doing jobs around the house.

Rose's results for males are shown in **Table 2**.

| Participant | Average number of hours a week males spend doing jobs around the house | $(x - \bar{x})$ | $(x - \bar{x})^2$ |
|---|---|---|---|
| **A** | 4 | −1.83 | 3.35 |
| **B** | 7 | 1.17 | 1.37 |
| **C** | 10 | 4.17 | 17.39 |
| **D** | 5 | −0.83 | 0.69 |
| **E** | 7 | 1.17 | 1.37 |
| **F** | 2 | −3.83 | 14.67 |
| Mean | 5.83 | Sum of differences² = | 38.84 |
| Standard deviation = 2.79 | | | |

**Table 2**

(a) Calculate the standard deviation to two decimal places for the data gathered by Rose by completing **Table 2**.

You must show your calculations.

The formulae and statistical tables can be found at the front of this paper.

**(4)**

**Space for calculations**

$(x - \bar{x})^2$: $(-1.83)^2 = 3.35$, $1.17^2 = 1.37$, $4.17^2 = 17.39$,

$(-0.83)^2 = 0.69$, $1.17^2 = 1.37$, $(-3.83)^2 = 14.67$

Sum = 3.35 + 1.37 + 17.39 + 0.69 + 1.37 + 14.67 = 38.84

$n - 1 = 6 - 1 = 5$, $38.84 \div 5 = 7.768 = 7.77$

$s = \sqrt{7.77} = 2.787...$ so standard deviation = 2.79 (2 d.p.)

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(b) Explain **one** reason why Rose used the standard deviation for her investigation.

**(2)**

*The standard deviation uses all six males' scores for the hours they spend doing jobs around the house each week, so it shows how spread out the scores are around the mean of 5.83 hours, which tells Rose how representative the mean is of the males in her sample.*

**(Total for Question 9 = 6 marks)**

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**10** Axel has a young dog. He is taking it to puppy class to teach it how to sit and how to wait. He also wants to teach the puppy how to do tricks such as roll over and put a paw into his hand.

The puppy class instructor has told him to use treats and praise to teach the puppy. Axel's father says that if the puppy misbehaves then it should be put in a cage for a short while. Axel is concerned about giving the puppy treats all the time.

Discuss how operant conditioning can be used to train Axel's puppy.

You must make reference to the context in your answer.

**(8)**

*Operant conditioning is learning through consequences: a behaviour that is followed by a pleasant consequence is reinforced and becomes more likely to be repeated, while a behaviour followed by an unpleasant consequence is punished and becomes less likely. Positive reinforcement means giving something desirable after the behaviour. The puppy class instructor is using this when Axel gives the puppy a treat and praise as soon as it sits or waits, so the puppy associates sitting with the reward and sits more often. The reward must come immediately after the behaviour so the puppy links the two.*

*Treats are a primary reinforcer as they meet a biological need, while praise is a secondary reinforcer that only becomes rewarding by being paired with treats. This answers Axel's concern, because once praise has been paired with treats it can be used on its own. He could also move from continuous reinforcement to a schedule, such as fixed ratio, giving a treat after the puppy has sat on command five times, or a variable ratio schedule, giving treats unpredictably, which makes the behaviour more resistant to extinction.*

*Tricks such as rolling over cannot be learned in one go, so Axel should use behaviour shaping, as Skinner did with animals: reinforce successive approximations, first lying down, then rolling onto its back, then a three-quarter roll and finally a full roll, giving a treat at each step. Putting a paw in his hand can be shaped in the same way, first rewarding lifting the paw, then touching his hand.*

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*Axel's father suggests putting the puppy in a cage when it misbehaves. This is negative punishment, as the puppy's freedom and attention are removed, so misbehaviour should decrease. However, punishment only tells the puppy what not to do and may make it fearful, and the puppy may learn to associate the cage with something bad, so it would not rest in it calmly. Also, if the cage is used a while after the misbehaviour the puppy will not make the link. Reinforcing the wanted behaviour, such as rewarding the puppy for waiting calmly, is usually more effective.*

*Overall, operant conditioning is a very effective way to train Axel's puppy, mainly through positive reinforcement and shaping with treats and praise, gradually thinning out the treats, with punishment used rarely, if at all.*

**(Total for Question 10 = 8 marks)**

**TOTAL FOR SECTION B = 34 MARKS**

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## SECTION C

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

**11** To what extent can genes be used as an explanation of aggression?

**(12)**

Genes may explain aggression because they affect brain chemistry. The MAOA gene codes for the enzyme monoamine oxidase A, which breaks down neurotransmitters such as serotonin, noradrenaline and dopamine. If a person has the low activity version (MAOA-L), the monoamines are not broken down properly, which may affect impulse control and the fight or flight response, increasing aggression. Another genetic explanation is XYY syndrome, where males have an extra Y chromosome, which was thought to make them more aggressive and less empathetic.

There is evidence that genes play a role. Brunner et al. (1993) studied 28 males from a Dutch family with a history of aggressive and violent crime and found they had a defect in the MAOA gene, giving very low MAOA activity. McDermott (2008) found that MAOA-L males were more aggressive in a laboratory task, giving more hot sauce to an opponent, especially when highly provoked. Animal research such as Godar et al. (2014) found that mice bred with defective MAOA genes were more aggressive, which supports a causal role for the gene as it can be manipulated in a controlled way. Twin studies also suggest a genetic influence: Brendgen et al. (2005) found that physical aggression in 6-year-old twins was largely explained by genetic factors.

However, there are problems with this explanation. Brunner et al. studied only one family, so the findings may not generalise to the wider population. McDermott's hot sauce task lacks ecological validity, so it may not show real-world aggression. Animal research such as Godar et al. may not apply to humans, whose aggression is affected by thought and culture. The XYY explanation is weak, as later research suggests any link with crime may be due to lower

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intelligence or labelling rather than aggression itself.

Most importantly, genes do not act alone. Caspi et al. (2002) found that males with low MAOA activity were only more likely to be violent if they had also been maltreated as children, showing a gene and environment interaction. Brendgen et al. (2005) found that social aggression was only about 20% due to genes, with 60% due to non-shared environment, so genes explain some types of aggression more than others. Social learning theory also explains aggression through imitation of role models, which genes cannot account for.

In conclusion, genes can explain aggression to a moderate extent, as there is consistent evidence that genes such as MAOA increase the risk of aggression, especially physical aggression. However, genes alone are reductionist and deterministic; the best explanation is an interactionist one, where a genetic predisposition makes aggression more likely only when triggered by environmental factors such as abuse in childhood.

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**12** In your studies of biological psychology and learning theories, you will have learned about the following studies:

- Brendgen et al. (2005)
- Watson and Rayner (1920).

Evaluate the studies by Brendgen et al. (2005) and Watson and Rayner (1920).

**(16)**

*Brendgen et al. (2005) aimed to compare social aggression with physical aggression and see to what extent each was due to genes, shared environment or non-shared environment. They used 234 pairs of 6-year-old MZ and DZ twins, and teachers and classmates (peers) rated each child's aggression using questionnaires. They found that physical aggression was mainly explained by genetic factors, whereas social aggression was about 20% due to genes, 20% due to shared environment and 60% due to non-shared environment.*

*Watson and Rayner (1920) aimed to see if they could classically condition a fear response in a young child, Little Albert. At 9 months old he showed no fear of a white rat. They then repeatedly paired the white rat with a loud noise made by striking a metal bar with a hammer behind him. Little Albert became afraid of the rat even when the noise was not presented, and the fear generalised to similar objects such as a rabbit, a dog and a fur coat.*

*Brendgen et al. (2005) has strengths. The sample of 234 twin pairs is large, so anomalous results would not skew the data, making the results more representative of 6-year-old twins. Teacher and peer ratings showed a significant relationship for both physical and social aggression, so the data are reliable and not just due to how a child behaved on one day or one rater's bias. The study is also ethical, as written informed consent was gained from parents and the institutional review board approved the questions.*

*However, Brendgen et al. has weaknesses. 84% of the twins were of European descent, so the*

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results may not generalise to other cultures, such as more collectivist cultures where environmental factors may affect aggression differently. The children were all 6 years old, and physical aggression declines from about this age while social aggression increases until about 8, so the findings may not apply to older children. Ratings are also subjective, so there may be some bias in how teachers and peers judged aggression.

Watson and Rayner (1920) also has strengths. They tested Albert at 9 months and showed that he was not originally afraid of the white rat, so the fear can be said to be caused by the conditioning, giving internal validity. They also moved the study to a well-lit lecture room and Albert still showed fear, so the fear response was not just due to the laboratory setting, which increases the credibility of the results.

However, the study is unethical: they deliberately caused distress to Albert, as shown by him crying and crawling away when the rat was near, and they did not extinguish the fear before he left. Because of this the study cannot be repeated, so the findings cannot be checked for reliability. It was a case study of one child, so the results may not generalise to other children. Also, Albert was too young to talk, so the researchers had to infer fear from his behaviour, which is subjective.

Comparing the two, Brendgen et al. is more ethical and has a large sample with two sources of rating, so its results are more reliable and generalisable, while Watson and Rayner used a single child and caused harm. However, Watson and Rayner had more control, as they manipulated the conditioning and showed cause and effect, whereas Brendgen et al. relied on ratings and estimates of genetic influence. Overall, both studies make useful contributions, showing that genes and learning both affect behaviour, but Brendgen et al. is the stronger study scientifically and ethically, while Watson and Rayner's findings must be treated with

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*caution because of its single participant and serious ethical problems.*

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**(Total for Question 12 = 16 marks)**

**TOTAL FOR SECTION C = 28 MARKS**
**TOTAL FOR PAPER = 96 MARKS**

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