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Surname: StemUp Model Solution | Other names:

**Pearson Edexcel**
**International Advanced Level**

Centre Number | Candidate Number

# Psychology

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

Tuesday 16 January 2018 – 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 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.
- 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** Describe the role of the neuron in human behaviour.

*Neurons are nerve cells that carry messages around the nervous system, so they control behaviour. Dendrites on the cell body pick up messages from surrounding neurons. This message becomes an electrical impulse (action potential) that travels down the axon, which is insulated by the myelin sheath to speed it up. When the impulse reaches the terminal buttons, neurotransmitters are released into the synaptic gap and bind to receptors on the next neuron, passing the message on. Sensory neurons carry information from the senses to the brain, relay neurons pass it on within the brain and spinal cord, and motor neurons send messages to muscles, producing behaviour.*

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

**2** Samadhi lives in Norway and she finds her sleep-wake cycle changes according to the season. During the winter months Samadhi goes to bed earlier and wakes up later compared to during the summer months.

(a) Describe the role of internal pacemakers on Samadhi's sleep-wake cycle.

**(3)**

*In the Norwegian winter it is dark for longer, so less light enters Samadhi's eyes and the retina sends fewer signals to her suprachiasmatic nucleus (SCN), her main internal pacemaker in the hypothalamus. The SCN then signals the pineal gland to release more melatonin, and to start releasing it earlier in the evening. The extra melatonin makes Samadhi feel sleepy, which is why she goes to bed earlier in winter, and because the mornings stay dark, melatonin stays high for longer, so she wakes up later than in the light summer months.*

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(b) Explain **one** strength and **one** weakness of the role of internal pacemakers on the sleep-wake cycle.

**(4)**

Strength

*Ralph et al. (1990) transplanted the SCN from mutant hamsters with a 20 hour cycle into normal hamsters, and the recipients' sleep-wake cycle changed to match the donor's 20 hour cycle. This gives scientific, controlled evidence that the SCN as an internal pacemaker causes the timing of the sleep-wake cycle.*

Weakness

*Much human research into internal pacemakers uses small samples or case studies, such as single participants isolated from daylight. Because the sample is so small, the findings may be unique to those individuals, which limits how far they can be generalised to everyone's internal pacemakers.*

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

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**3** Ulrick conducted an experiment to see whether aggression increased during puberty. He gathered a sample of 10-year-olds from a local school and a sample of 15-year-olds from a school in the neighbouring town.

Ulrick recorded the number of aggressive acts carried out by 10-year-olds and the number of aggressive acts carried out by 15-year-olds using a tally chart.

(a) Identify the experimental design used by Ulrick.

**(1)**

*Independent groups design (different children in each age group: 10-year-olds and 15-year-olds).*

(b) Define what is meant by the term 'nominal data' in relation to the data gathered by Ulrick.

**(2)**

*Nominal data is data collected in named categories, with no order. Ulrick puts each aggressive act into the category "10-year-olds" or "15-year-olds" using his tally chart, so he only has a frequency (total count) of aggressive acts for each of the two age groups.*

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

| Age in years | Average number of aggressive acts |
|---|---|
| 10 | 3 |
| 15 | 4 |

**Table 1**

(c) Calculate the average number of aggressive acts carried out by 10-year-olds as a percentage of the total number of aggressive acts.

You **must** give your answer to **two** decimal places.

**(1)**

**Space for calculations**

*Total aggressive acts = 3 + 4 = 7*

*(3 ÷ 7) × 100 = 42.857... %*

*= 42.86% (2 d.p.)*

Percentage *42.86*

(d) Explain **one** conclusion about aggression that could be made from the data in **Table 1**.

**(2)**

*Ulrick could conclude that age, and so puberty, has little effect on aggression, because the 15-year-olds carried out on average 4 aggressive acts compared with 3 acts for the 10-year-olds, which is a difference of only one aggressive act.*

**(Total for Question 3 = 6 marks)**

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**4** Beryl's menstrual cycle lasts, on average, 30 days. She finds that towards the end of her menstrual cycle she becomes more argumentative with her friends.

Describe the menstrual cycle in relation to Beryl.

*Beryl's menstrual cycle is an infradian rhythm, as it lasts longer than 24 hours, on average 30 days. At the start of her cycle, FSH from the pituitary gland causes an egg to mature in a follicle, and the follicle releases oestrogen, which makes the lining of Beryl's womb thicken in preparation for a fertilised egg. LH then causes ovulation, about 14 days before the end of her cycle (around day 16 for Beryl). The empty follicle releases progesterone, which keeps the womb lining thick. If Beryl is not pregnant, her oestrogen and progesterone levels fall and the lining breaks down, so she menstruates and the cycle starts again. This fall in hormones towards the end of her cycle is thought to cause premenstrual syndrome (PMS), which can cause irritability, explaining why Beryl becomes more argumentative with her friends at this point.*

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

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**5** During your course you will have learned about Brendgen et al.'s (2005) contemporary study.

(a) Describe the sample used by Brendgen et al. (2005) in their study.

**(2)**

*Brendgen et al. (2005) used 234 pairs of six-year-old twins (both monozygotic and dizygotic, male and female) from the Quebec Newborn Twin Study in the Montreal area of Canada. Most of the twins were of European descent, with a small proportion (2%) of Native North American descent.*

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(b) Explain **one** strength and **one** weakness of Brendgen et al.'s (2005) study.

**(4)**

Strength

*Aggression was rated by both teachers and peers, and the two sets of ratings gave very similar results. This shows the ratings of the twins' social and physical aggression were consistent, so the study has good reliability and the findings are more trustworthy.*

Weakness

*All the participants were six years old and from one area of Canada, so the sample is not representative of other ages or cultures. The results may not generalise to older children or adults, especially as physical aggression is thought to reduce with age, so genetic and environmental effects may differ at other ages.*

**(Total for Question 5 = 6 marks)**

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**6** You will have carried out a practical investigation when studying biological psychology.

Evaluate your practical investigation from biological psychology.

**(8)**

*For my practical I carried out a correlational study to see if there was a relationship between age and the number of hours slept per night. I used a self-report questionnaire asking participants their age in years and how many hours they usually sleep per night, with a standardised set of instructions and a right to withdraw. I used an opportunity sample of 50 participants (25 males and 25 females) aged 16 to 70. I analysed the data using Spearman's rank correlation coefficient and drew a scatter diagram, and found a significant negative correlation: as age increased, hours of sleep per night decreased.*

*One strength is the sample of 50 with equal numbers of males and females across a wide age range. This is large enough to reduce the effect of individual differences, so the sample is fairly representative of the age range studied and the findings are more generalisable. The questionnaire was also standardised, with every participant asked the same closed questions, so the study could easily be replicated to test its reliability, and the quantitative data was easy to analyse objectively.*

*However, opportunity sampling means I mainly asked people who were available to me, such as friends and family, so the sample may be biased. Self-report data may lack validity, as participants may not remember exactly how long they sleep, or may give socially desirable answers, for example not wanting to admit their age. Also, as it was a correlation, I cannot conclude that getting older causes people to sleep less, as other variables such as work, stress or health problems may affect both.*

*Overall my practical was reliable and gave useful results, for example suggesting care homes*

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*should not put older residents to bed too early. However, because of the self-report data and correlational design, its validity is limited, and a sleep diary or sleep monitor would give more accurate data.*

**(Total for Question 6 = 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.**

**7** Andrija wants to train his cat to come into the house when he calls its name. Andrija decides to use operant conditioning to train his cat.

(a) Describe how Andrija could use operant conditioning to train his cat to come into the house when he calls its name.

**(4)**

*Andrija could use shaping. First, he calls the cat's name and gives it a cat treat as soon as it looks up at him, so the response is positively reinforced. He then gradually increases what the cat has to do, only rewarding it when it moves towards him, then when it comes to the door, until it only gets a treat when it comes all the way into the house when he calls its name. Food is a primary reinforcer, and Andrija could also stroke the cat as a reward. He could use negative reinforcement by stopping a repeated loud call as soon as the cat comes in, which removes an unpleasant stimulus. If the cat does not come when called, Andrija could punish it by not petting it or giving it a treat when it does eventually return, so ignoring his call is less likely to be repeated. He should reward the cat every time at first (continuous reinforcement), then switch to a variable ratio schedule so the behaviour is harder to extinguish.*

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Andrija decides to use operant conditioning to encourage his son, Alexi, to make his bed.

(b) Explain **one** weakness of Andrija using operant conditioning to encourage Alexi to make his bed.

**(2)**

*Alexi may find the reward Andrija offers, such as praise or pocket money, less desirable than the free time he gains from not making his bed. If so, the reward does not act as a reinforcer, so Alexi will not be motivated to learn to make his bed, and if the rewards stop, the behaviour may become extinct.*

**(Total for Question 7 = 6 marks)**

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**8** Karolina has carried out an investigation to see if watching television programmes where people help each other, increased the helping behaviour of young children. She recorded the number of helping behaviours each child displayed before and after they had watched the television programmes.

Karolina's results are shown in **Table 2**.

| Participant | Condition A Number of helping behaviours displayed before watching the television programmes | Condition B Number of helping behaviours displayed after watching the television programmes |
|---|---|---|
| one | 3 | 5 |
| two | 9 | 4 |
| three | 0 | 2 |
| four | 2 | 6 |
| five | 4 | 6 |
| six | 2 | 3 |
| seven | 5 | 8 |
| eight | 1 | 3 |

**Table 2**

(a) Calculate the mean score for Condition B using the results from **Table 2**.

You **must** give your answer to **two** decimal places.

**(1)**

**Space for calculations**

*Sum of Condition B = 5 + 4 + 2 + 6 + 6 + 3 + 8 + 3 = 37*

*Mean = 37 ÷ 8 = 4.625*

Mean *4.63*

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Karolina calculated the ranges for her results.

The ranges for Karolina's results are shown in **Table 3**.

| Range for number of helping behaviours displayed before watching the television programmes | Range for number of helping behaviours displayed after watching the television programmes |
|---|---|
| 9 | 6 |

**Table 3**

(b) Interpret the data shown in **Table 3**.

**(2)**

*There was a greater spread of helping behaviours before watching the television programmes than after, as the range before was 9 compared with 6 after, which is 3 less. This suggests the children's helping was more consistent after the programmes, although the range of 9 may be distorted by one extreme score.*

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Karolina collected ordinal data in her investigation.

(c) Compare ordinal data and interval data.

**(4)**

*Both ordinal and interval data are numerical, so descriptive statistics such as a median and range can be calculated on both types of data.*

*However, ordinal data can be put in rank order but there are not equal gaps between the points, such as ratings or ranks, whereas interval data is measured on a scale with equal units between each point, such as time in seconds. This makes ordinal data less precise and detailed than interval data, and more subjective, so it is analysed with ranks (for example a Wilcoxon test) rather than using the actual values.*

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

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**9** Watson and Rayner (1920) used classical conditioning in their study on Little Albert.

(a) Identify the unconditioned stimulus (UCS) in Watson and Rayner's (1920) study.

**(1)**

*The loud noise made by hitting a steel bar with a hammer behind Little Albert's head.*

(b) Explain **two** ethical weaknesses of Watson and Rayner's (1920) study.

**(4)**

1 *Albert's mother may not have given fully informed, freely given consent, as she worked as a wet nurse at the hospital where the study took place, so she may have felt she had to agree, and she could not easily withdraw Albert from the study.*

2 *The study broke the guideline of protection from harm, as Albert was caused distress: he cried and tried to crawl away whenever he saw the rat after conditioning. He was also removed from the study before his fear could be extinguished, so it may have lasted after he left.*

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(c) Explain **one** improvement that could be made to the sample used in Watson and Rayner's (1920) study.

**(2)**

*Watson and Rayner could have used a larger sample of several infants of different ages and backgrounds instead of just one child. This would be more representative, so they could more confidently conclude that fear can be classically conditioned in humans generally, rather than just in Little Albert.*

**(Total for Question 9 = 7 marks)**

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**10** Brigita is five years old. She has observed her mother applying make-up, and her father telling her mother how nice she looks.

Brigita finds her mother's make-up and puts it onto her own face.

(a) State **two** reasons why Brigita imitates her mother.

**(2)**

1 *Her mother is the same gender as Brigita, so she identifies with her mother as a role model.*

2 *Brigita is vicariously reinforced, as she sees her father praise her mother for how nice she looks.*

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

**(4)**

Strength

*Social learning theory is a more complete explanation than operant and classical conditioning, as it includes cognitive factors (attention, retention, reproduction, motivation). It can explain how new behaviour is learned by observation without anyone directly reinforcing it, such as children imitating role models.*

Weakness

*Research supporting the theory, such as Bandura, Ross and Ross (1961), was done in laboratories with Bobo dolls, which are not real people and do not hit back. The behaviour may not transfer to real life, so the research lacks ecological validity, which weakens support for the theory.*

**(Total for Question 10 = 6 marks)**

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**11** Lotte is a psychoanalyst. She has a new client, Olaf, who has come to her for psychoanalysis because he has problems working with his new manager, who is female.

Discuss how Lotte may use psychoanalysis to help Olaf with his problems working with his new manager.

You must refer to the context in your answer.

**(8)**

*Psychoanalysis aims to make unconscious thoughts and feelings conscious, so that Olaf gains insight into the causes of his problems and can resolve them. Freud believed many adult problems come from unresolved childhood conflicts, so Lotte may suspect that Olaf's difficulty with a female manager comes from his early relationship with his mother, for example an unresolved Oedipus complex in the phallic stage, or a defence mechanism such as displacement, where feelings about his mother are directed at his manager.*

*Lotte could use free association, asking Olaf to lie on the couch and say whatever comes into his mind when she says words such as "mother", "woman" or "boss", without censoring anything. Hesitations or emotional reactions may reveal repressed memories, such as feeling controlled or rejected by his mother. Lotte could also use dream analysis. Olaf may dream about his manager, but in disguised form, such as a female dog chasing him. The dream he reports is the manifest content, and Lotte will interpret the symbols to uncover the latent content, such as anger towards his mother that he now feels towards his manager.*

*Lotte will also look for transference, where Olaf transfers feelings from past relationships onto her as a female analyst. If Olaf becomes hostile or defensive towards Lotte, she can show him that these feelings really belong to his mother, so he understands how his unconscious is driving his behaviour at work. Through this insight and catharsis, Olaf should be able to work more calmly with his new manager.*

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*However, psychoanalysis is lengthy and expensive, often taking several sessions a week over months or years, which may not suit Olaf if he needs to improve quickly at work. Lotte's interpretations of his dreams and free associations are subjective, so another analyst may interpret them differently, and Olaf may reject them, which Lotte might call resistance. On the other hand, the therapy is tailored to Olaf as an individual and treats the underlying cause rather than just his symptoms, so his problem with female authority figures is less likely to return. Overall, psychoanalysis could help Olaf, but only if he is willing to commit to long-term therapy.*

**(Total for Question 11 = 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.**

**12** Evaluate research into infradian rhythms.

**(12)**

*Infradian rhythms are biological rhythms lasting longer than 24 hours, such as the menstrual cycle, which lasts about 28 days. Research has investigated what controls them. McClintock (1971) studied 135 female college students living together in dormitories and found that the menstrual cycles of friends and room-mates became more synchronised over the academic year, suggesting an exogenous zeitgeber, possibly pheromones, affects the cycle. Russell et al. (1980) tested this by collecting sweat from a donor woman's armpit and rubbing it on the upper lips of five women; four out of the five synchronised their menstrual cycle with the donor's cycle. Reinberg (1967) found that a woman who spent three months in a cave with only dim lighting had a shorter menstrual cycle, suggesting light also affects the rhythm. Research has also looked at effects on behaviour: Dalton (1964) found that premenstrual syndrome (PMS) was associated with an increase in accidents, crime and poorer exam performance in women. Seasonal affective disorder (SAD) is a yearly (circannual) rhythm linked to melatonin, and Murphy et al. (1993) found that light therapy can reduce the release of melatonin.*

*A strength of Russell et al. (1980) is that it was a single blind study, as the women did not know whether they were in the experimental group or the control group (who had alcohol only). This reduced demand characteristics, adding control and increasing reliability. Much of this research also collects objective, numerical data, such as the number of days in each cycle, so it is scientific and not open to interpretation.*

*However, Russell et al. used only five women, and Reinberg studied a single woman, so the findings may be due to something unique about those individuals and cannot be generalised to all women. The evidence for menstrual synchrony is also inconsistent: Yang and Schank (2006)*

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studied Chinese women living together in dormitories and found no synchronisation, which suggests McClintock's results may have been due to chance, and her data relied on women recalling their own cycle dates, which may be inaccurate. Dalton's (1964) research only shows an association, not cause and effect, so other factors such as stress may explain the increase in accidents and crime. Evolutionary explanations, that synchrony helped women share childcare, are hard to test scientifically because evolution takes place over a very long period.

On the other hand, research into infradian rhythms has useful applications. Research into light and melatonin has led to light boxes being used to reduce the symptoms of SAD, and understanding PMS has helped women seek treatment, which improves their quality of life.

In conclusion, research into infradian rhythms provides some well controlled, objective evidence that the menstrual cycle is influenced by exogenous zeitgebers such as pheromones and light, and has practical benefits. However, the small samples, conflicting findings and correlational data mean the conclusions should be treated with caution, and larger, more controlled studies are needed.

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**13** Brianna and Finnian work in a hospital that specialises in helping people with mental health issues. A patient has recently been referred with a sleeping disorder. Brianna and Finnian cannot decide on the best method to use in order to understand the patient's sleeping disorder.

Brianna wants to use scanning techniques on the patient as she thinks the sleeping disorder could be biological. Finnian wants to use a case study method as used by Freud, as he thinks the sleeping disorder may be unconscious.

Assess whether Brianna and Finnian should use scanning techniques or a Freudian case study method with their patient.

You must refer to the context in your answer.

**(16)**

*Scanning techniques allow the brain to be studied while the person is alive. CAT scans pass multiple x-rays through the head from different angles to build up a computer image of the brain's structure. PET scans involve injecting a radioactive glucose tracer; active brain areas use more glucose and emit gamma rays, so the scan shows the brain as it is working. fMRI scans use a strong magnetic field to detect changes in blood oxygen, showing which areas are active. In contrast, Freud used case studies to gather detailed, in-depth qualitative data about individual patients, such as Little Hans (1909), using methods such as free association and dream analysis to uncover unconscious conflicts from childhood.*

*Brianna could use a PET scan to see whether the patient has abnormally high or low activity in brain areas involved in sleep, such as the hypothalamus. Raine et al. (1997) used PET scans to show that murderers who pleaded not guilty by reason of insanity had different activity in areas such as the prefrontal cortex compared with controls, which shows that scans can identify biological differences linked to behaviour. Scans provide objective, quantitative data that can be compared with healthy brains, so they are scientific and reliable, and if a biological cause is found, the patient's sleeping disorder could be treated quickly, for example with drugs.*

*However, scanning techniques have problems. A CAT scan exposes the patient to radiation, and a PET scan involves injecting a radioactive substance, so the risks have to be weighed against the*

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benefits, especially if repeated scans are needed. fMRI is better here as it is non-invasive and uses no radiation, but the patient could not have one if they have a pacemaker or metal implants. Scanners are also confined and noisy, so the patient may find it stressful and must keep completely still, which is difficult for someone with a sleeping disorder and may mean the scan does not show their normal brain activity. Scans also only show correlation: abnormal activity could be a result of the sleeping disorder rather than its cause.

Finnian's case study approach would allow him to gather rich, detailed data about the patient's childhood and relationships over many sessions. He could ask the patient to keep a dream diary and interpret the manifest content of their dreams to uncover the latent content, which may reveal anxieties that disturb their sleep. He should sit behind the patient during free association so his non-verbal cues do not influence what the patient says. This treats the patient as an individual and could uncover an unconscious cause that a scan would never show.

However, Freud's methods rely on the analyst interpreting what the patient says, which is subjective, so different analysts may reach different conclusions and the findings have low reliability. Unconscious processes cannot be directly measured, so it is very hard to test whether the sleeping disorder really is unconscious, which makes the method unscientific. Case studies also take a long time, so the patient may continue to suffer, and Freud's own case studies, like Little Hans, were based on a small number of unusual patients, so his theories may not apply to this patient.

In conclusion, Brianna and Finnian should start with scanning, ideally an fMRI scan because it is safer than CAT or PET. Scans give objective, scientific data and could quickly rule a biological cause in or out. If the scan shows no abnormality, Finnian's case study could then explore possible unconscious or childhood causes in depth. Using both methods together would give the

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most complete understanding of the patient's sleeping disorder, as the problem may have both biological and psychological causes.

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**(Total for Question 13 = 16 marks)**

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

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