



**EXAM PAPERS PRACTICE**

# **Psychology**

## **Biopsychology Mark Scheme**

## Mark schemes

**1** [AO1 = 1]

C

**2** (a) [AO1 = 1]

False

(b) [AO1 = 1]

False

**3** Marks for this question: AO1 = 6, AO3 = 10

Level	Marks	Description
4	13 – 16	Knowledge is accurate and generally well detailed. Discussion / evaluation / application is thorough and effective. The answer is clear, coherent and focused. Specialist terminology is used effectively. Minor detail and / or expansion of argument sometimes lacking.
3	9 – 12	Knowledge is evident. There are occasional inaccuracies. Discussion / evaluation / application is apparent and mostly effective. The answer is mostly clear and organised. Specialist terminology is mostly used effectively. Lacks focus in places.
2	5 – 8	Some knowledge is present. Focus is mainly on description. Any discussion / evaluation / application is only partly effective. The answer lacks clarity, accuracy and organisation in places. Specialist terminology is used inappropriately on occasions.
1	1 – 4	Knowledge is limited. Discussion / evaluation / application is limited, poorly focused or absent. The answer as a whole lacks clarity, has many inaccuracies and is poorly organised. Specialist terminology either absent or inappropriately used.
	0	No relevant content.

Please note that although the content for this mark scheme remains the same, on most mark schemes for the new AQA Specification (Sept 2015 onwards) content appears as a bulleted list.

### AO1

The term 'research' refers to both theory / explanations and studies.

Students are likely to focus on research studies into shift work and jet lag, although other examples, such as seasonal affective disorder, could also be relevant if presented in the context of the disruption of biological rhythms. Effects of disrupting biological rhythms through shift work and jet lag can be behavioural (e.g. lowered productivity), psychological (e.g. tiredness, depression, anxiety), or physiological (e.g. increased vulnerability to heart disease and cancer). For each of these and for both shift work and jet lag there are many accessible research studies.

More anecdotal answers that simply describe effects of disrupting biological rhythms without reference to research studies may earn very limited credit as the description is based on research. This includes reference to real world events such as Chernobyl and Three Mile Island.

Some candidates may begin by outlining the mechanisms behind the disruptive effects, such as the dislocation of endogenous pacemakers and external zeitgebers i.e. outlining an *explanation* for the effects of disrupting biological rhythms.

### AO3

Commentary might include the implications of findings for our understanding of the mechanisms of the effects of disruption, and application of findings to reduce the impact of disruption e.g. by changes to shift work patterns, or by adjusting behaviour when crossing time zones. For full credit such applications should be linked to mechanisms / explanations. Treatments for jet lag e.g. melatonin, would be creditable as long as there is an explicit link to biological rhythms e.g. via the role of melatonin in biological clocks.

Use of the findings of relevant research studies is an accessible source of credit, where used to support or contradict our understanding of the mechanisms.

Credit also discussion of practical applications of findings. Some convincing studies show that modifying shift work patterns can have significant beneficial effects on behaviour and health. Other relevant discussion may include reductionism and the nature / nurture debate.

4

Please note that the AOs for the new AQA Specification (Sept 2015 onwards) have changed. Under the new Specification the following system of AOs applies:

- AO1 knowledge and understanding
- AO2 application (of psychological knowledge)
- AO3 evaluation, analysis, interpretation.

**[AO1 = 2, AO2 = 2]**

**AO1**

Up to two marks for outlining the role of the CNS and the ANS in behaviour. One mark for each. This will probably be embedded in the application to Martha.

For CNS, possible points might include brain and role in life functions / psychological processes / higher mental functions and spinal cord and its role in transmitting information to and from the brain. Controls reflex behaviours.

For ANS, possible points might cover that it controls life-maintaining processes such as heart rate; transmits information to and from internal organs; sympathetic division of ANS prepares body for action; parasympathetic division conserves / stores energy.

**AO2**

Up to two marks for application of the role of the CNS and the ANS to Martha. One mark for each.

Likely answers for CNS:

Brain / cerebral cortex in higher mental functions / conscious awareness (I realised that...); decision making (...I decided to run.); auditory cortex / temporal lobe in processing auditory information (... I heard footsteps behind me...); visual cortex / occipital lobe in processing visual information (I saw a bus...).

Less likely but accept:

Cerebellum in regulating movement and sense of balance - 'walking' and '...leapt on the bus'.

Likely answers for ANS will relate to the sympathetic division of ANS and to fight / flight response: increased heart rate in emergency action (...my heart was beating so fast...); increased action of adrenal glands and energising effect (...moved with such speed / shaking); blood vessels to limbs dilate (... sweating).

**5**

**[AO1 = 2]**

Up to 2 marks for an outline of synaptic transmission.

One mark for reference to the release of neurotransmitter into the synapse.

One mark for reference to neurotransmitter binding with receptors on the dendrite or next neuron to binding another impulse.

Credit a diagram that illustrates the process above.

**6**

**[AO1 = 1]**

B

7

[AO1 = 1]

B

8

Marks for this question: AO1 = 6, AO3 = 10

Level	Marks	Description
4	13 – 16	Knowledge is accurate and generally well detailed. Discussion / evaluation / application is thorough and effective. The answer is clear, coherent and focused. Specialist terminology is used effectively. Minor detail and / or expansion of argument sometimes lacking.
3	9 – 12	Knowledge is evident. There are occasional inaccuracies. Discussion / evaluation / application is apparent and mostly effective. The answer is mostly clear and organised. Specialist terminology is mostly used effectively. Lacks focus in places.
2	5 – 8	Some knowledge is present. Focus is mainly on description. Any discussion / evaluation / application is only partly effective. The answer lacks clarity, accuracy and organisation in places. Specialist terminology is used inappropriately on occasions.
1	1 – 4	Knowledge is limited. Discussion / evaluation / application is limited, poorly focused or absent. The answer as a whole lacks clarity, has many inaccuracies and is poorly organised. Specialist terminology either absent or inappropriately used.
	0	No relevant content.

Please note that although the content for this mark scheme remains the same, on most mark schemes for the new AQA Specification (Sept 2015 onwards) content appears as a bulleted list.

**AO1**

The emphasis in this question is in the ‘role’ of endogenous pacemakers. Endogenous pacemakers (EP) and exogenous zeitgebers interact in the control and fine tuning of biological rhythms. An effective approach to marks would be to describe examples of endogenous pacemakers, such as the suprachiasmatic nucleus (SCN), pineal gland and melatonin release. There are other pacemakers in the brain, eg for body temperature, although answers focusing on the SCN and pineal may receive marks across the scale. A further route to marks would be to describe the mechanisms underlying the interaction between EPs and exogenous zeitgebers such as light.

### AO3

It is likely that research evidence will provide the major source of discussion on this question. There are many studies supporting a role for EPs in the control of biological rhythms, and how they interact with exogenous zeitgebers; these include Siffre's original isolation study and subsequent similar work, experiments on infradian rhythms, and even research on non-human animals (eg hamsters) and plants could be made directly relevant to this question.

The effects of disrupting biological rhythms can also provide evidence directly relevant to the question. Interpretation and evaluation of research evidence should distinguish the quality of answers, with better candidates able to describe accurately how findings support the role of EPs in the control of biological rhythms.

Also relevant would be methodological evaluation of research evidence, although this would only be effective if the implications for findings are clear and application of scientific ideas and evidence eg the implications of findings on the disruption of biological rhythms and possible remedies for shift work and jet lag.

Issues that could be relevant in the context of the role of endogenous pacemakers in the control of biological rhythms: biological approach, evolutionary: use of animals in research, reductionism, free will / determinism, ethics.

9

[AO3 = 3]

Up to three marks for a brief evaluation of the use of EEGs. Credit up to 3 separate evaluative points or one point fully elaborated or a combination of these.

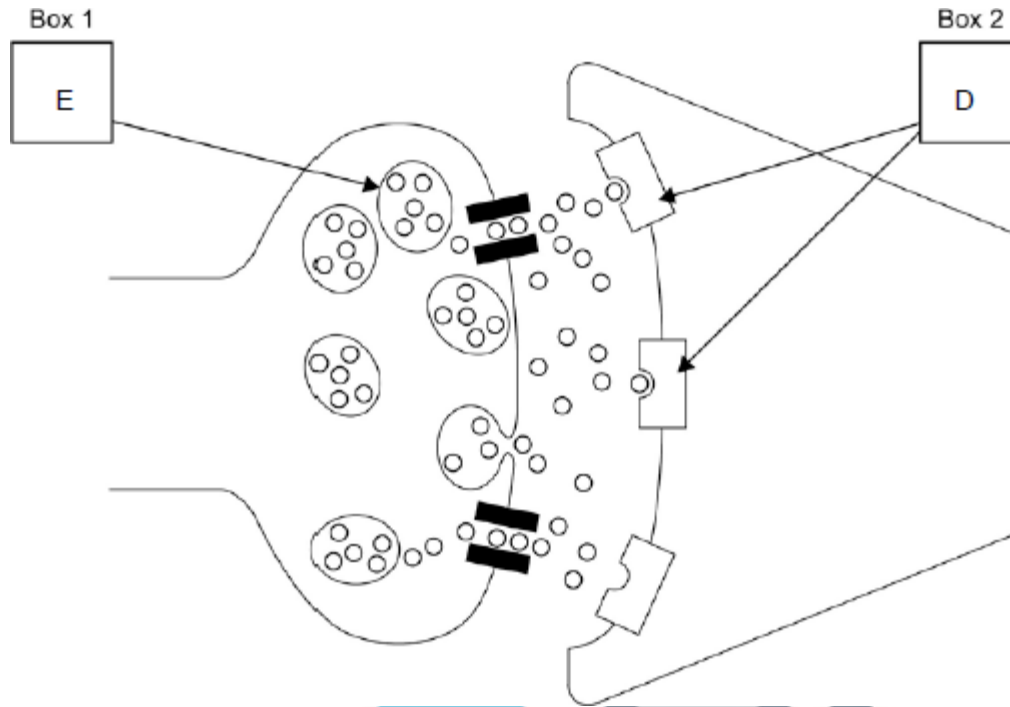
Likely points: safe way of measuring brain activity; there is no surgery or invasive process; helps to identify activity in various regions of brain; its use as a diagnostic tool eg epilepsy; lacks precision in measuring individual action potential of neurons / electrodes not sensitive enough, etc.

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10

[AO1 = 2]

1 mark each for D and E in correct boxes.



11

[AO1 = 2]

2 marks for clear outline of the key difference: EEG is a recording of general brain activity usually linked to states such as sleep and arousal, whilst ERPs are elicited by specific stimuli presented to the participant.

1 mark for a muddled / vague answer that shows some understanding of general state vs specific response.

Note - question is about differences, so no credit for simply describing the technique.

12

[AO1 = 1]

C

Level	Marks	Description
4	13 – 16	Knowledge of hemispheric lateralisation and language centres in the brain is accurate and generally well detailed. Discussion is thorough with effective reference to cases of aphasia. Answer is clear, coherent and focused. Specialist terminology is used effectively. Minor detail and/or expansion of argument sometimes lacking.
3	9 – 12	Knowledge of hemispheric lateralisation and language centres in the brain is evident. There are occasional inaccuracies. Discussion is apparent and reference to cases of aphasia is mostly effective. The answer is mostly clear and organised. Specialist terminology mostly used effectively. Lacks focus in places.
2	5 – 8	Some knowledge of hemispheric lateralisation and language centres in the brain is present. Focus is mainly on description. Any discussion and reference to cases of aphasia is only partly effective. The answer lacks clarity, accuracy and organisation in places. Specialist terminology used inappropriately on occasions.
1	1 – 4	Knowledge of biological explanations of offending behaviour is limited. Discussion is limited, poorly focused or absent. The answer as a whole lacks clarity, has many inaccuracies and is poorly organised. Specialist terminology either absent or inappropriately used.
	0	No relevant content.

### Possible content

- Systematic research from Wernicke and Broca onwards has demonstrated that in most people language centres are lateralised to the left hemisphere.
- Wernicke's area seems to be responsible for the interpretation of speech – damage leads to receptive or sensory aphasia
- Broca's area was thought to be responsible for the production of speech this is now thought to involve a wider network than just Broca's area – damage leads to production (expressive) or motor aphasia

### Possible application

- The presence of a right sided paralysis confirms that in cases such as Robert's there is lateralised damage to the left hemisphere
- Robert, can understand speech so we conclude that he does not have Wernicke's, receptive, aphasia; caused by damage to Wernicke's area in the left hemisphere.
- Robert cannot produce speech so we conclude that Broca's area has been damaged leading to Broca's, production or expressive aphasia.



**Possible discussion**

- As language centres are lateralised they can be impaired by damage to the left hemisphere, not to the right. The left hemisphere also controls the muscles of the right side of the body therefore, when brain damage leads to speech problems combined with paralysis of body muscles, it is usually a right sided paralysis.
- Damage to Broca’s area can lead to production/expressive aphasia combined with right sided paralysis.
- Damage to Broca’s and Wernicke’s areas may lead to global aphasia (inability to understand or to produce speech), combined with right sided paralysis.
- Use of research evidence to support explanation.
- Problems associated with different types of research evidence.

**14**

[AO1 = 3]

One mark each for the correct area of cortical specialisation.

- D = Somatosensory centre
- C = Visual centre
- B = Auditory centre

**15**

AO1 = 2

**1 mark** for a correct function of the endocrine system.

- To secrete the hormones which are required to regulate many bodily functions.
- To provide a chemical system of communication via the blood stream.

**1 mark** for elaboration of how the function occurs: such as via release of the required amount of a specific hormone to promote appropriate growth or metabolism or reproduction.

**16**

[AO3 = 4]

Level	Marks	Description
2	3 – 4	Evaluation is relevant and well explained. Answer focuses on the usefulness of split brain research for the study of hemispheric lateralisation. The answer is generally coherent with effective use of terminology.
1	1 – 2	Evaluation is relevant although there is limited explanation and / or limited focus on the purpose of the research. Specialist terminology is not always used appropriately. Award one mark for answers consisting of a single point briefly stated or muddled.
	0	No relevant content.

**Possible evaluation points:**

- the disconnection between the hemispheres was greater in some patients than others
- some patients had experienced drug therapy for much longer than others
- the comparison groups were not considered to be valid as they were often people with no history of epileptic seizures
- the data were artificially produced as in real life a severed corpus callosum can be compensated for by the unrestricted use of two eyes
- the research has added to the unity of consciousness debate
- research relates to small sample sizes.

Credit other relevant evaluation points.

**17**

**[AO2 = 2]**

**2 marks** for a clear, brief explanation including detail of an appropriate experimental procedure and what patients would be required to do.

**1 mark** for a vague explanation which has some detail about an appropriate experimental procedure and what patients would be required to do.

**Possible suggestions:**

- plausible experimental situation / set-up – eg split visual field, dichotic listening
- plausible stimulus – visual, faces, words, auditory, digits, music etc
- plausible task for patient – verbal or visuospatial response, eg drawing, matching etc.

**18**

**[AO1 = 3]**

One mark for reference to perceived threatening / stressful situation (could be through definition or example).

One mark for reference to physiological change.

One mark for example of response / action.

19

[AO1 = 2, AO2 = 2]

### AO1

Up to 2 marks for description of the actions of the autonomic nervous system.

Likely points: one section of the autonomic nervous system (sympathetic nervous system) responds to a perceived threat / it produces physiological changes that prepare the body for fight or flight (the alarm response) (1), and the other section (parasympathetic nervous system) restores normal physiological functioning when the threat has passed (1).

If candidates simply state *fight or flight* and *rest and digest* with no further explanation 1 mark only.

### AO2

Up to 2 marks for application to the description. One mark for application to sympathetic activity – breathing quickens, mouth dries, heart pounds. One mark for application to parasympathetic – breathing slows down / becoming calm.

**Maximum of 2 marks** if 'sympathetic' and 'parasympathetic' sections are mislabelled in AO1 description

20

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Although the essential content for this mark scheme remains the same, mark schemes for the new AQA Specification (Sept 2015 onwards) take a different format as follows:

- A single set of numbered levels (formerly bands) to cover all skills
- Content appears as a bulleted list
- No IDA expectation in A Level essays, however, credit for references to issues, debates and approaches where relevant.

**AO2 = 4**

The stem refers to the body responding to a short-term stressor, the release of adrenaline is responsible for increased heart rate and faster breathing and the dry mouth is linked to the digestive system “shutting down”. Students can refer to the pituitary adrenal system and/or the sympathomedullary pathway. They can also refer to the fight-or-flight response. For full marks there must be explicit engagement with the stem.

<b>AO2 Mark bands</b>
<b>4 marks Effective analysis of unfamiliar situation</b> Effective explanation that demonstrates sound knowledge of the body’s response to stress. There is explicit engagement, which relates to either at least two of the specific changes identified in the stem or the car as the stressor.
<b>3 marks Reasonable analysis of unfamiliar situation</b> Reasonable explanation that demonstrates knowledge of the body’s response to stress with reference to one or more of the changes identified in the stem.
<b>2 marks Basic analysis of unfamiliar situation</b> Basic explanation of the body’s response to stress.
<b>1 mark Rudimentary analysis of unfamiliar situation</b> Rudimentary, muddled, explanation of the body’s response to stress demonstrating very limited knowledge.
<b>0 marks</b> No creditworthy material.

**21**

[AO1 = 5]

- (a) A
- (b) C
- (c) D
- (d) E
- (e) B

**22****AO1 = 4**

Level	Marks	Description
2	3 – 4	Knowledge of the role of adrenaline in the fight or flight response is clear and mostly accurate.
1	1 – 2	Knowledge of the role of adrenaline in the fight or flight response is incomplete/partly accurate. For 1 mark there may be some detail of direct or general effects but not explicitly linked to fight or flight.
	0	No relevant content.

**Possible content:**

- Adrenaline is released from the adrenal medulla in response to activation of the sympathomedullary pathway.
- Adrenaline has a range of effects on the body
- Direct effects of adrenaline
  - increase heart rate
  - constricts blood vessels, increasing rate of blood flow and raising blood pressure
  - diverts blood away from the skin, kidneys and digestive system
  - increases blood to brain and skeletal muscle
  - increases respiration and sweating
- The general effects of adrenaline
  - prepare the body for action, fight or flight,
  - increase blood supply/oxygen, to skeletal muscle for physical action
  - increase oxygen to brain for rapid response planning

Up to 2 marks for accurate detail of the effects of adrenaline on the body eg outline of two different effects, or detailed account of one effect. 2 further marks for an account of the role of adrenaline in the fight or flight response ie providing a context for the various effects of adrenaline on the body (eg last two bullets).

**23****AO1 = 2**

B and C

## Examiner reports

**2** (a) The majority of answers were incorrect. Many students seemed to miss the crucial word, 'to' in the description.

(b) This was answered well.

**3** This popular question was done reasonably well. There were a variety of routes to AO1 and AO2 / 3 credit; AO1 could consist of an outline of underlying mechanisms (endogenous pacemakers interacting with external zeitgebers), consequences of disrupting biological rhythms, or research studies. AO2 / 3 could then consist of relevant research evidence or implications of research studies. Weaker answers often confused the roles of pacemakers and zeitgebers, and failed to interpret research findings accurately.

However, there has been a clear trend of improvement in the use of relevant studies from a range of areas. These include effects of shift work on mood, physical illness and productivity, the beneficial effects of altering shift work patterns, and effects of jet lag on physical health. Some students used studies of sleep deprivation, in particular the case studies of Tripp and Gardner. It is not easy to focus these studies on the question, but credit was given where the implications for the question were explicit and accurate. Effective IDA in this area included the application of findings to, for example, improving the health of workers, or to reduce the effects of jet lag.

**4** Students were familiar with the role of the Autonomic Nervous System (ANS) and most were able to apply this to the source material. Few students, however, accessed full marks for this question due to limited knowledge of the role of the Central Nervous System (CNS), often referring to the structure of the CNS (the brain and spinal cord) rather than the role of the CNS and consequently were unable to link Martha's experience to the CNS. Several students unnecessarily provided two links to the ANS (parasympathetic and sympathetic nervous systems). Examiners also noted that a substantial number of students believed that '... the CNS is part of the brain...'; others did not separate the ANS from the CNS.

**5** More than half the answers to this question gained no credit. Many students did not appreciate the change that takes place from an electrical to a chemical signal and referred to 'jumping across.' A few students mentioned neurotransmitters then completed their answers with reference to binding on the post-synaptic membrane.

**8** There were some extremely impressive answers to this question. Candidates outlined the SCN-pineal system accurately, including the interaction with light and the role of melatonin. Studies such as Siffre and work with hamsters and chipmunks were used as effective commentary, supporting the role of endogenous pacemakers and their interaction with zeitgebers. At the top end research on infradian rhythms such as the menstrual cycle was used as comparison with the control of the sleep-waking cycle.

General commentary included sleep-waking cycles in the Inuit (Eskimos). Effective IDA included the reductionist approach and problems with generalising from animal studies.

Weaker answers failed to outline the relationship between pacemakers and zeitgebers or the functioning of the SCN-pineal system. Some candidates referred to light and pheromones as endogenous pacemakers, showing a complete lack of understanding.

9

This was a poorly answered question as many students did not seem to realise that they were required to evaluate the use of EEGs. Answers were often muddled with EEGs being confused and many students seemed to believe that EEGs show precise areas of functioning / cortical specialisation and are an invasive technique. Very few understood that the primary function of an EEG is to indicate whether brain wave activity is rhythmic or not.

14

Only a quarter of the responses for this question gained full marks and many students annotated the diagram in terms of lobes rather than areas of cortical specialisation.

18

Although many students were able to describe the actions of the sympathetic division accurately referring to the perceived 'threat,' the physiological change and the alternative behaviours available, the choice of examples was not always sensible.

Students who described 'going on a roller coaster / taking an examination,' found it difficult to describe fight or flight behaviours in these situations. Some students stated that 'fight is sympathetic and flight is parasympathetic.'

19

Many answers to this question were quite good, although some did muddle the sympathetic and parasympathetic sections of the ANS.

20

This is an applied question where students have to demonstrate their ability to use the relevant material and apply it to the scenario. The pitfall for many students was that they simply did not engage with the stem, but merely described (often in excellent detail) the sympathomedullary pathway. Better answers were able to make reference to some of the physiological changes mentioned in the question and explain why they occurred.