A2 Psychology Exam Preparation

Biopsychology

Exam style questions and Mark Schemes

Beechen Cliff School

For your information;

This booklet contains exam questions from specimen papers and past papers from both the new specification and the old one for AS and A2. Several may be very similar, I just wanted to provide you with all of the questions I have available. Mark schemes are in question order at the back of this booklet.

Exam questions from the old spec are slightly different in phrasing and mark scheme but are still useful practice and preparation.

Old spec questions have RED boxes around them.
Read the item and then answer the questions that follow.

**Figure 1** shows the left hemisphere of the human brain. Six areas of cortical specialisation are labelled A, B, C, D, E and F.

**Figure 1: Left hemisphere of the human brain**

Using your knowledge of localisation of function in the brain, identify the area of cortical specialisation. Shade one box only for each area.

05. 1 Broca's area

A ○ B ○ C ○ D ○ E ○ F ○ [1 mark]

05. 2 Somatosensory cortex

A ○ B ○ C ○ D ○ E ○ F ○ [1 mark]

05. 3 Visual cortex

A ○ B ○ C ○ D ○ E ○ F ○ [1 mark]

05. 4 Wernicke's area

A ○ B ○ C ○ D ○ E ○ F ○ [1 mark]

05. 5 Motor cortex

A ○ B ○ C ○ D ○ E ○ F ○ [1 mark]

06 The electroencephalogram (EEG) and event-related potentials (ERPs) both involve recording the electrical activity of the brain.

Outline one difference between the EEG and ERPs. [2 marks]
Read the item and then answer the question that follows.

Sam is a police officer. She has just started working the night shift and after a week, she finds that she has difficulty sleeping during the day and is becoming tense and irritable. Sam is also worried that she is less alert during the night shift itself.

Using your knowledge of endogenous pacemakers and exogenous zeitgebers, explain Sam’s experiences. [4 marks]

The human female menstrual cycle is an example of one type of biological rhythm; it is called a:

A. circadian rhythm
B. infradian rhythm
C. ultradian rhythm [1 mark]

Outline the structures and processes involved in synaptic transmission. [6 marks]

Split brain patients show unusual behaviour when tested in experiments. Briefly explain how unusual behaviour in split brain patients could be tested in an experiment. [2 marks]

Briefly evaluate research using split brain patients to investigate hemispheric lateralisation of function. [4 marks]

Outline the role of adrenaline in the fight or flight response. [4 marks]

Robert suffered a stroke at the age of 55. After the stroke he was paralysed down his right side, though he could move his left arm and leg easily. Robert could clearly understand what was said to him, but was unable to produce any speech.

Discuss how knowledge of hemispheric lateralisation and language centres in the brain has helped our understanding of cases such as Robert’s. Refer to Robert’s case in your answer. [16 marks]
Identify the two components of the peripheral nervous system, and explain two differences in their organisation and/or functions.  

[4 marks]

Josie is twelve. Last year she was involved in a serious road accident and suffered head injuries that caused problems with speech and understanding language. Now, a year later, Josie has recovered most of her language abilities.

Using your knowledge of plasticity and functional recovery of the brain after trauma, explain Josie’s recovery.  

[4 marks]

Which of the following, A, B, C, or D, is a feature of functional magnetic resonance imaging? Shade one box only.

A  Directly measuring the electrical activity of neurons using electrodes implanted in the brain.  

B  Directly measuring the electrical activity of neurons using electrodes on the scalp.  

C  Indirectly measuring the electrical activity of neurons by recording changes in brain blood flow.  

D  Indirectly measuring the electrical activity of neurons by recording changes in neurotransmitter release.  

[1 mark]

Identify two glands that form part of the endocrinal system and outline their functions.  

[4 marks]

Discuss what research has shown about localisation of function in the brain.  

[8 marks]

Raoul has recently been prescribed a drug for a mental illness. He looks on the internet to find out more about the drug but he does not understand the phrase ‘synaptic transmission’.

Write a brief explanation of synaptic transmission in the brain to help Raoul understand how his drug might work.  

[3 marks]
1. Complete the diagram below so that it shows stages of the sympathomedullary pathway and the pituitary-adrenal system. For each stage, write the appropriate letter in the correct box.

HYPOTHALAMUS

A  adrenal medulla
B  adrenal cortex
C  decreases heart rate and blood pressure
D  liver stores energy
E  cortisol/corticosteroids released
F  adrenaline and noradrenaline released
G  pituitary gland
H  gets body ready for ‘fight or flight’
I  immune system suppressed

(4 marks)

1 (a) Read the following statements and decide whether they are TRUE or FALSE.

1 (a) (i) Motor (efferent) neurons carry messages to the central nervous system. (Tick the correct box)

<table>
<thead>
<tr>
<th>TRUE</th>
<th>FALSE</th>
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</thead>
</table>

(1 mark)

1 (a) (ii) The nucleus of a neuron is found outside the cell body (some). (Tick the correct box)

<table>
<thead>
<tr>
<th>TRUE</th>
<th>FALSE</th>
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</thead>
</table>

(1 mark)

1 (b) Briefly outline the process of synaptic transmission.
05 Using your knowledge of localisation of function in the brain, identify the area of cortical specialisation. Shade one box only for each area.

[6 marks]

Marks for these questions: AO1 = 5

05.1 A
05.2 C
05.3 D
05.4 E
05.5 B

06 The electroencephalogram (EEG) and event-related potentials (ERPs) both involve recording the electrical activity of the brain.

Outline one difference between the EEG and ERPs.

[2 marks]

Marks for this question: 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.

07 Using your knowledge of endogenous pacemakers and exogenous zeitgebers, explain Sam’s experiences.

[4 marks]

Marks for this question: AO2 = 4

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<tr>
<th>Level</th>
<th>Marks</th>
<th>Description</th>
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<tbody>
<tr>
<td>2</td>
<td>3–4</td>
<td>Knowledge of the role of endogenous pacemakers and exogenous zeitgebers and how they interact to affect the normal sleep-wake cycle is clear and mostly accurate. The material is used appropriately to explain Sam’s experiences/symptoms. The answer is generally coherent with effective use of specialist terminology.</td>
</tr>
<tr>
<td>1</td>
<td>1–2</td>
<td>Some knowledge of the role of endogenous pacemakers and exogenous zeitgebers in the sleep-wake cycle is evident. The material is not always linked explicitly or effectively to Sam’s experiences/symptoms. The answer lacks accuracy and detail. Use of specialist terminology is either absent or inappropriate.</td>
</tr>
<tr>
<td>0</td>
<td>No relevant content</td>
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</tbody>
</table>

Content:
- endogenous pacemakers – internal biological rhythms
- exogenous zeitgebers – external factors, eg light
- moving to night shift means pacemakers try to impose inbuilt rhythm of sleep, but are now out of synchrony with the zeitgeber of light
- disruption of biological rhythms has been shown to lead to disrupted sleep patterns, increased anxiety and decreased alertness and vigilance.
08 The human female menstrual cycle is an example of one type of biological rhythm; it is called a:

[1 mark]

Marks for this question: AO1 = 1

B

09 Outline the structures and processes involved in synaptic transmission.

[6 marks]

Marks for this question: AO1 = 6

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<tr>
<td>3</td>
<td>5–6</td>
<td>Knowledge of both structures and processes involved in synaptic transmission, including reference to both presynaptic and postsynaptic processes, is generally accurate and mostly well detailed. The answer is clear and coherent. Specialist terminology is used effectively.</td>
</tr>
<tr>
<td>2</td>
<td>3–4</td>
<td>Knowledge of both the structures and processes involved in synaptic transmission is evident. Focus is on pre or postsynaptic processes. There are some inaccuracies. There is some appropriate use of specialist terminology.</td>
</tr>
<tr>
<td>1</td>
<td>1–2</td>
<td>Knowledge of structures and/or processes involved in synaptic transmission is limited and lacks detail. There are inaccuracies. Specialist terminology is either absent or inappropriately used.</td>
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<td>No relevant content.</td>
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</table>

Content: the synaptic cleft; pre and postsynaptic membranes; postsynaptic receptor sites, neurotransmitters in vesicles in the presynaptic terminal, release of neurotransmitters into the synaptic cleft when stimulated by nerve impulses (action potentials) arriving at the presynaptic terminal, combination of neurotransmitters with postsynaptic receptors; postsynaptic effects either excitatory (depolarisation) or inhibitory (hyperpolarisation).

Diagrams can describe the structure effectively but text is necessary to explain the processes.
10 Split brain patients show unusual behaviour when tested in experiments. Briefly explain how unusual behaviour in split brain patients could be tested in an experiment. [2 marks]

Marks for this question: 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.

11 Briefly evaluate research using split brain patients to investigate hemispheric lateralisation of function. [4 marks]

Marks for this question: AO3 = 4

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<tbody>
<tr>
<td>2</td>
<td>3–4</td>
<td>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.</td>
</tr>
<tr>
<td>1</td>
<td>1–2</td>
<td>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.</td>
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<td>No relevant content.</td>
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</table>

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.
Outline the role of adrenaline in the fight or flight response. [4 marks]

Marks for this question: AO1 = 4

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<thead>
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</thead>
<tbody>
<tr>
<td>2</td>
<td>3–4</td>
<td>Knowledge of the role of adrenaline in the fight or flight response is clear and mostly accurate.</td>
</tr>
<tr>
<td>1</td>
<td>1–2</td>
<td>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.</td>
</tr>
<tr>
<td>0</td>
<td></td>
<td>No relevant content.</td>
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</tbody>
</table>

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).
Discuss how knowledge of hemispheric lateralisation and language centres in the brain has helped our understanding of cases such as Robert’s. Refer to Robert’s case in your answer. [16 marks]

Marks for this question: AO1 = 6, AO2 = 4 and AO3 = 6

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<tbody>
<tr>
<td>4</td>
<td>13–16</td>
<td>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.</td>
</tr>
<tr>
<td>3</td>
<td>9–12</td>
<td>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.</td>
</tr>
<tr>
<td>2</td>
<td>5–8</td>
<td>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.</td>
</tr>
<tr>
<td>1</td>
<td>1–4</td>
<td>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.</td>
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<td>No relevant content.</td>
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</table>

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.

| 07 | Identify the two components of the peripheral nervous system, and explain two differences in their organisation and/or functions. | [4 marks] |

Marks for this question: AO1 = 2 and AO3 = 2

One mark each for components of the peripheral nervous system - the somatic nervous system (SNS) and the autonomic nervous system (ANS).

Plus

One mark each for relevant difference explained.

Possible differences:
- The SNS has sensory and motor pathways, while the ANS is purely motor;
- The ANS controls internal organs and glands of the body while the SNS controls skeletal muscle, movement etc;
- ANS control centres are in the brain stem whilst SNS carries commands from the motor cortex.

Credit other relevant differences.

There must be explicit focus on ‘differences’ between SNS and ANS for marks to be awarded, rather than independent references to each.
Using your knowledge of plasticity and functional recovery of the brain after trauma, explain Josie’s recovery.

[4 marks]

Marks for this question: AO2 = 4 marks

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<tbody>
<tr>
<td>2</td>
<td>3–4</td>
<td>Knowledge of plasticity and functional recovery of the brain after trauma is clear and mostly accurate. The material is applied appropriately. The answer is generally coherent with effective use of terminology.</td>
</tr>
<tr>
<td>1</td>
<td>1–2</td>
<td>Some knowledge of plasticity and functional recovery of the brain after trauma is evident. Application is not always effective. The answer lacks accuracy and detail. Use of terminology is either absent or inappropriate.</td>
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<td>No relevant content</td>
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</table>

Possible content

- When the brain is still maturing recovery from trauma is more likely. Josie is young.
- Transfer of functions to undamaged areas ('neural reorganisation') which can explain her recovery.
- Growth of new neurons and/or connections to compensate for damaged areas ('neural regeneration') which can explain her recovery.
- Plasticity allows the brain to cope better with 'indirect' effects of brain damage eg swelling, haemorrhage following road accident.

Top band answers may refer to one of the above points in detail or to more in less detail. Reference to relevant studies on plasticity, would be an effective way to illustrate key points, but is not necessary for full marks.

Which of the following, A, B, C, or D, is a feature of functional magnetic resonance imaging? Shade **one** box only.

[1 mark]

Marks for this question: AO1 = 1 mark

Correct answer: C
Identify two glands that form part of the endocrine system and outline their functions. 

Marks for this question: AO1 = 4 marks

<table>
<thead>
<tr>
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<th>Description</th>
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</thead>
<tbody>
<tr>
<td>2</td>
<td>3–4</td>
<td>Knowledge of the functions of two glands in the endocrine system is clear and mostly accurate. The answer is generally coherent with effective use of terminology.</td>
</tr>
<tr>
<td>1</td>
<td>1–2</td>
<td>Some knowledge of the functions of two glands in the endocrine system is evident. The answer lacks accuracy and detail. Use of terminology is either absent or inappropriate.</td>
</tr>
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<td>0</td>
<td>No relevant content.</td>
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</tbody>
</table>

One mark each for identification of glands

Plus

One mark each for description of functions of the glands. This may be in terms of the hormones released and/or their regulation of internal organs and processes or an outline of the effects on behaviour.

Possible content

- Pituitary gland releases ACTH, vasopressin, luteinizing hormone. Controls release of hormones from other glands.
- Adrenal gland and adrenaline/noradrenaline, causing physiological changes associated with arousal, fight and flight.

Credit also other glands - pancreas and insulin, ovaries and oestrogen/progesterone, testes and testosterone.
Discuss what research has shown about localisation of function in the brain. [8 marks]

Marks for this question: AO1 = 3 and AO3 = 5

<table>
<thead>
<tr>
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<th>Marks</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>7-8</td>
<td>Outline of what research has shown about localisation of function in the brain is accurate and generally well detailed. Discussion is effective. The answer is clear, coherent and focused. Specialist terminology is used effectively. Minor detail and/or expansion of argument sometimes lacking.</td>
</tr>
<tr>
<td>3</td>
<td>5-6</td>
<td>Outline of what research has shown about localisation of function in the brain is evident. There are occasional inaccuracies. There is some effective discussion. The answer is mostly clear, organised and focused. Specialist terminology mostly used effectively.</td>
</tr>
<tr>
<td>2</td>
<td>3-4</td>
<td>Outline of what research has shown about function in the brain is present. Focus is mainly on description. Any discussion is of limited effectiveness. The answer lacks clarity, accuracy and organisation in places. Specialist terminology used inappropriately on occasions.</td>
</tr>
<tr>
<td>1</td>
<td>1-2</td>
<td>Outline what research has shown about of localisation of function in the brain 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.</td>
</tr>
<tr>
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<td>No relevant content.</td>
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</tbody>
</table>

Possible content

- Some functions are more localised than others eg somatosensory and motor functions are highly localised to particular areas of cortex.
- Other functions seem more widely distributed eg the language system (though some components may be localised eg speech comprehension)
- Localisation can involve restricted areas of cortex eg motor control, or broader aspects eg right hemisphere visuo-spatial functions

Possible discussion

- Use of research evidence eg Lashley’s classic work on equipotentiality of the cortex; Hubel and Wiesel’s work on distributed functions of the visual system
- Human clinical case studies of loss of specific abilities after restricted brain damage eg aphasia, amnesia
- Simpler functions are likely to be more localised in the brain, eg motor control as compared with eg personality, consciousness
- The brain is so complex that no one part acts independently of the rest, so strict localisation is impossible
- General commentary on whether localisation or “holistic” approaches are more appropriate
- Limitations of methods/scanning techniques used to investigate localisation

Credit other relevant material.
Raoul has recently been prescribed a drug for mental illness. He looks on the internet to find out more about the drug but he does not understand the phrase ‘synaptic transmission’.

Write a brief explanation of synaptic transmission in the brain to help Raoul understand how his drug might work. [3 marks]

Marks for this question: AO2 = 3

Content:

1 mark for any three of the following points:

- Transmission involves impulses crossing a space or gap between an axon terminus and the adjacent neuron (the synapse/synaptic cleft)
- Neurotransmitters are chemicals released from vesicles on the presynaptic neuron
- They travel/diffuse across the synapse and lock onto receptor sites on receiving/postsynaptic neuron
- Some neurotransmitters increase the rate of firing in the receiving neurons and others decrease the rate of firing
- Psychoactive drugs work by affecting (increasing or inhibiting) the transmission of neurotransmitters across the synapse

For full marks there must be some reference to drugs affecting synaptic transmission.

Credit diagrams in so far as they contribute to the explanation.

Question 1

AO1 = 4 marks Knowledge of pituitary-adrenal system

A = Adrenal medulla: F, H
B = Adrenal cortex: E, I
Question 1ai

[AO1 = 1]

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<th>FALSE</th>
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Question 1aii

[AO1 = 1]

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<tbody>
<tr>
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</table>

Question 1b

[AO1 = 2]

AO1 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.