SimplyPsychology

Mark scheme — A-level Psychology 7182/2

Paper 2 · Section B focus paper · Biopsychology

A-level topic mock · 2026 · Maximum mark: 48

Biopsychology is A-level only (AQA spec 4.2.2) — it is not assessed at AS. Indicative content is not exhaustive; credit any other valid points. Levels-based questions (Q10 and Q11) require holistic judgement using the descriptors. Specialist vocabulary (CNS, PNS, somatic/autonomic, sympathetic/parasympathetic, sensory/relay/motor neurons, synaptic transmission, neurotransmitters, excitation/inhibition, endocrine system, fight-or-flight, adrenaline, fMRI/EEG/ERPs/post-mortem, localisation, hemispheric lateralisation, plasticity, functional recovery) follows AQA's 2025 *Subject specific vocabulary*.

B Biopsychology

0 1

AO1 · 1 mark · multiple choice

> *Which one of the following best describes the role of the parasympathetic nervous system?*

Answer: D — Returns the body to a calm "rest and digest" state after stress.

A = somatic nervous system; B = sensory neurons (PNS); C = sympathetic nervous system.

0 2

AO1 · 1 mark · multiple choice

> *Which one of the following is a feature of relay neurons?*

Answer: B — They connect sensory and motor neurons within the central nervous system.

A = motor neurons; C = sensory neurons; D = endocrine glands, not neurons. Relay neurons make up around 97% of all neurons.

0 3

AO1 · 1 mark · multiple choice

> *Which one of the following best describes the role of adrenaline in the fight-or-flight response?*

Answer: B — It is released by the adrenal medulla and prepares the body for action.

A = melatonin (pineal); C = thyroxine (thyroid); D = testosterone (testes).

0 4

AO1 · 3 marks short answer

> *Outline the process of synaptic transmission. Refer to neurotransmitters and to excitation or inhibition.*

Marks for this question: AO1 = 3 marks

- **1 mark** for accurate description of the process: an **action potential** travels down the presynaptic axon to the terminal button, triggering the release of **neurotransmitters** from vesicles into the **synaptic gap**. The neurotransmitters diffuse across the gap and bind to receptors on the postsynaptic neuron.
- **1 mark** for accurate reference to neurotransmitters (e.g. naming one — serotonin, dopamine, GABA, noradrenaline, acetylcholine).
- **1 mark** for accurate description of excitation or inhibition:
  - **Excitatory** neurotransmitters (e.g. noradrenaline) make the postsynaptic neuron *more* likely to fire — an EPSP.
  - **Inhibitory** neurotransmitters (e.g. GABA, serotonin) make the postsynaptic neuron *less* likely to fire — an IPSP.
  - Whether the neuron fires depends on the **summation** of all signals received.

0 5

AO2 · 4 marks application

> *Explain Maya's physical reactions using your knowledge of the fight-or-flight response. Refer to the ANS and adrenaline.*

Marks for this question: AO2 = 4 marks

- **4 marks** — Clear, coherent explanation engaging effectively with the stem; identifies the sympathetic branch of the ANS AND the role of adrenaline; links to specific physical reactions described.
- **3 marks** — Clear engagement but lacking detail.
- **2 marks** — Mechanism described but limited application.
- **1 mark** — Brief, partial answer.

Indicative content:

- **Threat detection**: the footsteps trigger the **amygdala**, which signals the **hypothalamus** to activate the **sympathetic branch of the ANS**.
- **Adrenaline release**: sympathetic signals reach the **adrenal medulla**, which releases **adrenaline** into the bloodstream. This is the **sympathomedullary pathway (SAM)**.
- **Linking to Maya's specific reactions**:
  - **Heart racing** — adrenaline increases heart rate, pumping more oxygenated blood to muscles ready for fight or flight.
  - **Faster breathing** — bronchioles dilate, increasing oxygen intake.
  - **Dilated pupils** — improving vision in low light (night-time park).
  - **Dry mouth** — digestion is suppressed; saliva production reduces (non-essential under threat).
  - **Walking faster** — the behavioural "flight" response itself.
- **Function**: mobilises Maya's body for rapid action — adaptive evolutionary response to perceived threat.

Top-band answers will link AT LEAST TWO of Maya's specific physical reactions to specific effects of adrenaline AND mention the sympathetic branch of the ANS as the trigger.

0 6

AO1 · 4 marks short answer

> *Outline localisation of function in the brain. Refer to at least three centres.*

Marks for this question: AO1 = 4 marks

- **1 mark** for outlining the concept: **localisation of function** = specific functions are controlled by specific, identifiable regions of the brain.
- **3 marks** for accurate description of at least three of the following (1 mark each):
  - **Motor cortex** — back of the frontal lobe; controls voluntary movement of the opposite side of the body.
  - **Somatosensory cortex** — front of the parietal lobe; receives sensory information (touch, temperature, pain) from the skin.
  - **Visual cortex** — occipital lobe (back of the brain); processes visual information from both eyes.
  - **Auditory cortex** — temporal lobe; processes sound from both ears.
  - **Language centres — Broca's area** (left frontal lobe; speech *production*) and **Wernicke's area** (left temporal lobe; speech *comprehension*).

If Broca's AND Wernicke's are mentioned, treat as two separate language centres.

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0 7

AO1 · 3 marks short answer

> *Briefly outline the function of the endocrine system. Refer to one gland and one hormone.*

Marks for this question: AO1 = 3 marks

- **1 mark** for accurate outline: the endocrine system is the body's **slower, longer-lasting** communication system. It uses **hormones** released by **glands** into the **bloodstream** to influence target cells throughout the body.
- **1 mark** for naming one gland and accurately stating its function. Examples:
  - **Pituitary gland** ("master gland") — base of brain; releases hormones that control other endocrine glands.
  - **Adrenal glands** — on top of each kidney; release adrenaline and cortisol.
  - **Thyroid gland** — neck; regulates metabolism.
  - **Pineal gland** — brain; regulates sleep–wake cycle.
  - **Ovaries / Testes** — reproductive hormones (oestrogen, progesterone / testosterone).
- **1 mark** for naming one hormone produced by the gland identified, e.g. *adrenal medulla → adrenaline*; *pineal → melatonin*; *thyroid → thyroxine*.

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0 8

AO1 · 3 marks short answer

> *Outline how a researcher could use fMRI to study the brain.*

Marks for this question: AO1 = 3 marks

- **1 mark** for the basic mechanism: fMRI uses powerful **magnetic fields and radio waves** to detect changes in **blood oxygenation** in the brain.
- **1 mark** for the haemodynamic principle: active brain regions need more oxygen, so **blood flow increases** to those areas (the **haemodynamic response**). fMRI produces detailed 3D images showing which areas are active.
- **1 mark** for practical use: the participant lies still in the scanner; the researcher gives a cognitive task (e.g. remembering a list, viewing images); the resulting scan shows which brain areas were active during the task — allowing inferences about **localisation of function**.

Credit reference to spatial resolution (~1 mm) being excellent but temporal resolution (~5 second lag) being poor.

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0 9

AO1 · 4 marks short answer

> *Outline Sperry's (1968) split-brain research. Explain what this research suggests about hemispheric lateralisation.*

Marks for this question: AO1 = 4 marks

- **1 mark** for the sample/procedure context: Sperry studied **11 split-brain patients** whose **corpus callosum** had been surgically severed (commissurotomy) to treat severe epilepsy. With the corpus callosum severed, the two hemispheres could no longer communicate.
- **1 mark** for the procedure: Sperry presented images to **one visual field at a time**. Stimuli in the left visual field were processed by the right hemisphere; stimuli in the right visual field by the left hemisphere.
- **1 mark** for accurate findings: stimuli shown to the **right visual field** (left hemisphere) could be **named aloud**. Stimuli shown to the **left visual field** (right hemisphere) could not be named but could be **identified by touch** with the left hand.
- **1 mark** for clear conclusion: the two hemispheres have **specialised functions**. **Language is lateralised to the left hemisphere**; the right hemisphere can recognise objects but cannot verbalise them. The hemispheres normally collaborate via the corpus callosum.

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AO1, AO3 · 8 marks 8-mark comparison

> *Compare fMRI and EEG as ways of studying the brain. Refer to at least two points of comparison.*

Marks for this question: AO1 = 4 marks, AO3 = 4 marks

Level	Marks	Descriptor
4	7–8	Knowledge of both techniques is accurate and well detailed. Comparison is effective with at least two clear points of contrast. Clear, coherent, focused; specialist terminology used effectively.
3	5–6	Knowledge generally accurate. Comparison mostly effective but may be one-sided in places.
2	3–4	Some accurate knowledge. Comparison limited; may be largely descriptive of each technique in turn.
1	1–2	Knowledge limited; little or no actual comparison.
0	0	No relevant content.

Indicative content — at least TWO points of comparison should be drawn. Both techniques are non-invasive but they trade off precision in different ways:

- **What they measure**: fMRI measures *blood oxygenation* (an indirect proxy for neural activity); EEG measures *electrical activity* directly from scalp electrodes.
- **Spatial resolution**: fMRI has **excellent spatial resolution** (~1 mm; produces 3D images that can localise activity precisely); EEG has **poor spatial resolution** (picks up signals from large regions of cortex; cannot pinpoint deep brain structures).
- **Temporal resolution**: fMRI has **poor temporal resolution** (~5-second lag between activity and detected blood flow); EEG has **excellent temporal resolution** (1 ms — captures real-time brain activity).
- **Cost**: fMRI is **very expensive** (~£300 per hour); EEG is **cheap** and portable.
- **Practical use**: fMRI requires the participant to lie still in a noisy, claustrophobic scanner; EEG is non-claustrophobic and can be used in more natural settings — but is vulnerable to interference from muscle movements.
- **Clinical applications**: EEG is the standard tool for diagnosing **epilepsy** and **sleep disorders**; fMRI is used for pre-surgical mapping of brain functions and for cognitive neuroscience research on localisation.
- **Conclusion**: top-band answers will note the complementary trade-off — fMRI for *where*, EEG for *when*. Researchers choose the technique based on whether spatial or temporal precision matters most for their question.

1 1

AO1, AO2, AO3 · 16 marks 16-mark

> *Discuss plasticity and functional recovery of the brain. Refer to the case of Daniel as part of your discussion.*

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

Level	Marks	Descriptor
4	13–16	Knowledge of both plasticity and functional recovery is accurate and generally well detailed. Application to Daniel is effective and integrated across the stem. Discussion is thorough and effective with strong evaluation. Clear, coherent and focused.
3	9–12	Knowledge evident with some accuracy. Application mostly effective. Discussion mostly effective but limited in places.
2	5–8	Some accurate knowledge of one or both. Application limited and partial. Discussion superficial.
1	1–4	Knowledge limited; little or no application or discussion.
0	0	No relevant content.

Indicative AO1 content — must cover both *plasticity* and *functional recovery*:

- **Plasticity (neuroplasticity)**: the brain's ability to change and reorganise as a result of experience and learning. Synaptic connections are created, strengthened or pruned in response to use ("use it or lose it"). The brain remains plastic throughout life.
- **Key research on plasticity**:
  - **Maguire et al. (2000)** — London taxi drivers had significantly larger posterior hippocampi (spatial memory) than controls; size correlated with years of experience.
  - **Draganski et al. (2006)** — medical students showed increased posterior hippocampus and parietal cortex grey matter during exam preparation; the increase reversed when studying stopped.
  - **Boyke et al. (2008)** — 60-year-olds who learned to juggle showed increased grey matter in the visual cortex — plasticity remains possible in older adulthood.
- **Functional recovery**: the brain's ability to redistribute or transfer functions from damaged areas to undamaged ones, often after stroke or traumatic brain injury. Most rapid in the first weeks after injury and slows thereafter (but doesn't stop).
- **Mechanisms of functional recovery**:
  - **Neuronal unmasking** (Wall 1977) — "dormant" synapses become activated when neighbouring damaged neurons stop signalling.
  - **Axonal sprouting** — undamaged neurons grow new branches (collateral sprouting) to replace lost connections.
  - **Recruitment of homologous areas** — the equivalent area on the opposite hemisphere takes over the lost function.

- **Stem-cell-based recovery** — adult neurogenesis (especially in the hippocampus) generates new neurons.

Indicative AO2 content — engagement with Daniel:

- **Stroke location**: damage to the left hemisphere → loss of fluent speech (Broca's area) and loss of movement on the right side of the body (left motor cortex controls right side). This is consistent with the established left-lateralisation of language and contralateral motor control.
- **Recruitment of homologous areas** — Daniel's brain scans show that "brain activity associated with speech had increased in areas of his right hemisphere" — textbook example of the right hemisphere taking over functions previously performed by the damaged left. This is one of the four mechanisms of functional recovery.
- **Role of rehabilitation** — Daniel's recovery required "intensive speech therapy and physiotherapy". This shows functional recovery is not automatic — it depends on practice/stimulation, consistent with the "use it or lose it" principle of plasticity.
- **Time-course** — recovery took 18 months. This is consistent with the finding that recovery is most rapid early and continues (more slowly) for years.
- **Age** — Daniel was 45. Elbert et al. (2001) found younger brains recover faster and more completely than older brains, but adult plasticity (and Maguire/Boyke evidence) shows recovery is still possible.

Indicative AO3 content:

- **Strength — real-world evidence (Maguire et al. 2000)**: London taxi drivers had enlarged posterior hippocampi — and size correlated with years of experience. Direct in-vivo evidence of adult plasticity.
- **Strength — major applied value (neurorehabilitation)**: Constraint-induced movement therapy after stroke (forcing patients to use the affected limb), intensive speech therapy and brain-training all draw on plasticity research. Substantial economic and clinical benefit — reducing long-term care costs and improving return-to-work rates.
- **Strength — explains lifelong learning**: Boyke et al. (2008) — 60-year-olds learning to juggle grew new grey matter. Plasticity is not limited to childhood.
- **Limitation — negative plasticity**: plasticity is not always beneficial. **Phantom limb pain** in amputees results from maladaptive reorganisation. Kolb and Whishaw (1998) reported reduced grey matter in long-term drug users — addiction may itself be a form of negative plasticity.
- **Limitation — age-related limits on recovery**: Elbert et al. (2001) showed younger brains recover faster and more completely. Daniel's recovery at 45 is good but not full — consistent with this finding.
- **Limitation — individual differences (Schneider et al. 2014)**: traumatic brain injury patients with higher levels of education ("cognitive reserve") were significantly more likely to make a full recovery. Recovery depends on lifestyle, education and personal factors as well as the injury itself.
- **I&D link — nature/nurture**: plasticity demonstrates the interactionist nature of brain function. Genes provide the underlying neural architecture but experience reshapes it — a clear example of nature and nurture interacting at the level of biology.

Top-band answers will (1) define both plasticity and functional recovery accurately, (2) cite at least one named study (Maguire is most common), (3) explicitly identify Daniel's right-hemisphere activation as "recruitment of homologous areas", (4) link his recovery to the "use it or lose it" principle via intensive therapy, (5) include at least two substantial

evaluation points (Maguire as a strength + negative plasticity/age limits as a limitation), and (6) reach a conclusion (typically that plasticity and functional recovery are well-evidenced and have major applied value, qualified by age effects and individual differences).

END OF MARK SCHEME · Maximum mark: 48