

1.4 The Brain

Name: _____ Class: _____ Date: _____

Total: 11 marks

KEY WORDS plasticity 可塑性 • hemispheric specialisation 半球特化 • amygdala 杏仁核 • cerebellum 小脑
• eeg 脑电图

Objective

Build the skills to answer exam questions on **brain structures** 脑结构 and their functions.

You must be able to:

- match a brain region to a function it supports
- explain what **plasticity** 可塑性 means and when it is greatest
- describe what **hemispheric specialisation** 半球特化 does and does not imply
- state what each main imaging or recording method measures

1 Worked examples

Study these first. Each one shows the method for a task used later.

■ Regions and functions

The **brainstem** controls basic survival functions such as breathing. The **cerebellum** coordinates balance and practised movement. The **limbic system** — including the **amygdala** and **hippocampus** — supports emotion and memory formation. The **cerebral cortex** supports higher processing, divided into four lobes.

■ Plasticity

The brain reorganises in response to experience and injury. Plasticity is greatest in childhood but continues throughout life, which is why some function can be recovered after damage.

■ Hemispheric specialisation

The left hemisphere is typically more involved in language, the right in spatial processing. This is a difference of **degree**, not a division into two separate people: the hemispheres are connected and work together in almost every task.

■ What each method measures

EEG records electrical activity with excellent timing but poor location. **fMRI** infers activity from blood flow, with good location but slower timing. A **lesion** study infers function from what is lost after damage.

2 Practice

2.1 State one function of the cerebellum and one of the amygdala. [2]

2.2 Explain what is meant by plasticity. [2]

2.3 A patient recovers some speech after damage to a language area.

(a) State the property of the brain that makes this possible. [1]

(b) State one reason recovery is usually more complete in a child. [1]

3 Exam-style questions

3.1 A researcher needs millisecond timing of a brain response. The best method is [1]

- A fMRI
 - B EEG
 - C a lesion study
 - D a case study
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3.2 The claim that people are “left-brained” or “right-brained” is best described as [1]

- A well supported by hemispheric specialisation
 - B an oversimplification of a difference of degree
 - C true only for language
 - D a finding from fMRI
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3.3 A patient with hippocampal damage can hold a conversation but cannot recall it an hour later.

(a) State the memory function the hippocampus supports. [1]

(b) Explain what this case shows about how memory is organised. [2]

Solutions

2.1 cerebellum: coordinates balance and practised movement; amygdala: supports emotional processing, especially fear.

2.2 the brain's capacity to reorganise its structure and connections in response to experience or injury; greatest in childhood but continuing across life.

2.3 (a) plasticity. (b) a child's brain reorganises more readily, so other regions can take over the function.

3.1 B. EEG records electrical activity directly, with excellent temporal resolution.

3.2 B. specialisation is a difference of degree between connected hemispheres.

3.3 (a) forming new long-term memories. (b) memory is not a single system: the ability to form new memories can be lost while immediate conversation and older memories remain intact.