

1.3 The Neuron and Neural Firing

Name: _____ Class: _____ Date: _____

Total: 11 marks

KEY WORDS neuron 神经元 • neurotransmitter 神经递质 • axon 轴突 • all-or-none 全或无
• dendrites 树突

Objective

Build the skills to answer exam questions on the **neuron** 神经元 and **neural firing** 神经放电.

You must be able to:

- label the parts of a neuron and state what each does
- explain the **all-or-none** 全或无 principle
- describe what happens at the **synapse** 突触
- match a **neurotransmitter** 神经递质 to a function it influences

1 Worked examples

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

■ The parts of a neuron

Dendrites receive signals. The **cell body** integrates them. The **axon** carries the signal away, wrapped in a **myelin sheath** that speeds transmission. **Terminal buttons** release neurotransmitters.

■ All-or-none

A neuron either fires at full strength or does not fire. Increasing the stimulus does not make one action potential larger; it makes the neuron fire **more often**. Intensity is coded by rate, not by size.

■ At the synapse

An action potential reaches the terminal, neurotransmitter is released into the **synaptic gap**, it binds to receptors on the next neuron, and is then reabsorbed (**reuptake**) or broken down. The next neuron becomes more or less likely to fire.

■ Excitatory and inhibitory

An **excitatory** signal pushes the receiving neuron toward firing; an **inhibitory** signal pushes it away. A neuron fires when excitatory input exceeds inhibitory input by enough to reach **threshold**.

2 Practice

2.1 State the function of dendrites and of the axon. [2]

2.2 Explain the all-or-none principle. [2]

2.3 A drug blocks the reuptake of a neurotransmitter.

(a) State what happens to the amount of that neurotransmitter in the synaptic gap. [1]

(b) State the likely effect on the receiving neuron. [1]

3 Exam-style questions

3.1 A more intense stimulus is signalled to the brain mainly by [1]

- | | |
|---|---|
| A | B |
| C | D |
- A** larger action potentials
 - B** a faster rate of firing
 - C** slower firing
 - D** thicker myelin

3.2 The myelin sheath principally [1]

- | | |
|---|---|
| A | B |
| C | D |
- A** releases neurotransmitters
 - B** speeds conduction along the axon
 - C** receives incoming signals
 - D** stores memories

3.3 A neuron receives both excitatory and inhibitory input.

(a) State the condition under which it fires. [1]

(b) Explain why inhibitory signals are as important as excitatory ones. [2]
