

1 Neurons, neurotransmitters, and the divided nervous system – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)
neuron	神经元	_____
all-or-none principle	全或无原则	_____
threshold	阈限	_____
synapse	突触	_____
neurotransmitter	神经递质	_____
reuptake	再摄取	_____
sympathetic nervous system	交感神经系统	_____
parasympathetic nervous system	副交感神经系统	_____

Recall

- You know that a knock on the knee makes your leg jump before you decide anything.
- You have felt your heart race before an exam and slow again afterwards.
- You know that coffee changes how alert you feel.

New ideas

Read these first. Each idea has a short worked example. Then do the Practice below.

■ 1 How a neuron fires

A **neuron** 神经元 fires all at once or not at all. This is the **all-or-none principle** 全或无原则: a weak signal that reaches the **threshold** 阈限 produces exactly the same size of firing as a strong one. Strength is coded by how *often* the neuron fires, not by how hard.

Worked example. A quiet sound and a loud sound both make a neuron fire the same size of signal; the loud sound just makes it fire more times per second.

■ 2 The gap between neurons

Neurons do not touch. A signal crosses the **synapse** 突触 as a chemical called a **neurotransmitter** 神经递质. Afterwards the chemical is taken back in by **reuptake** 再摄取, which clears the gap for the next signal.

Worked example. A drug that blocks reuptake leaves more of the chemical in the gap for longer, so the next neuron keeps being stimulated.

■ 3 Two divisions that work against each other

The **sympathetic nervous system** 交感神经系统 prepares the body for action - heart faster, pupils wider. The **parasympathetic nervous system** 副交感神经系统 restores the resting state. They are not on and off; they are two opposing systems, and the body's state is the balance between them.

Worked example. Your heart races when the teacher hands out the paper, then slows once you start writing - one system rose, then the other took over.

Watch out: The all-or-none principle is about *size*, not about *speed* or *frequency*. Saying that a strong stimulus makes a bigger signal is the commonest error on this topic.

Practice

2.1 State the all-or-none principle. [2]

2.2 A neuron receives a very strong stimulus. Explain how the strength is represented. [2]

2.3 Name the process that clears a neurotransmitter from the synapse. [1]

2.4 A drug blocks that process. State the effect on the next neuron. [2]

2.5 Name the two divisions of the autonomic nervous system and state what each does. [2]

2.6 Explain why the two divisions are described as a balance rather than a switch. [1]
