

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

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English	Write it 3 times (English)		
neuron	_____	_____	_____
all-or-none principle	_____	_____	_____
threshold	_____	_____	_____
synapse	_____	_____	_____
neurotransmitter	_____	_____	_____
reuptake	_____	_____	_____
sympathetic nervous system	_____	_____	_____
parasympathetic nervous system	_____	_____	_____

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** fires all at once or not at all. This is the **all-or-none principle**: a weak signal that reaches the **threshold** 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** as a chemical called a **neurotransmitter**. Afterwards the chemical is taken back in by **reuptake**, 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** prepares the body for action - heart faster, pupils wider. The **parasympathetic nervous system** 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]
