Exercise walk-through

Cell Communication ▪ 4.1

eXercise

You must be able to

- describe how cells communicate over short and long distances
- name the types of signaling (direct, local, long-distance)
- explain the roles of a **signal** and a **receptor** 受体

Method — Signals and receptors

Cells communicate using chemical **signals** (like hormones). A target cell has a specific **receptor** protein that binds the signal — only cells with the matching receptor respond.

Method — Types of signaling by distance

- **Direct contact** — cells touch and exchange signals through junctions.
- **Local signaling** — a signal diffuses to nearby cells (e.g. neurotransmitters).
- **Long-distance signaling** — hormones travel through the blood to distant target cells.

Method — Specificity

Only cells with the **correct receptor** respond to a signal, which is why a hormone affects some tissues but not others.

Method — A worked example

Insulin (a hormone) travels in the blood (long-distance) and binds receptors on liver and muscle cells, which respond by taking up glucose.

Practice 2.1 ▪ 1 mark

What binds a chemical signal on the target cell?

Solution 2.1

Method: Signals and receptors

Worked steps

A receptor (protein) B1.

Practice 2.2 ▪ 3 marks

Name the three types of signaling by distance.

Solution 2.2

Method: Types of signaling by distance

Worked steps

Direct contact, local signaling, long-distance signaling B1 B1 B1.

Practice 2.3 ▪ 1 mark

Why does a hormone affect only some cells?

Solution 2.3

Method: Specificity

Worked steps

Only cells with the matching receptor can bind the hormone and respond B1.

Exam-style 3.1 ▪ 1 mark

Only cells that respond to a particular signal have the correct

A enzyme

B receptor

C ribosome

D membrane

Solution 3.1

Method: Specificity

A enzyme

B receptor ✓

C ribosome

D membrane

Worked steps

B — receptor.

Exam-style 3.2 ▪ 1 mark

Insulin travels in the blood to reach liver and muscle cells.
(a) Name this type of signaling.
(b) Explain why insulin affects these cells but not others.

Solution 3.2

Method: A worked example

Worked steps

(a) Long-distance (hormonal) signaling B1. (b) Only liver and muscle cells have the insulin receptor, so only they can bind it and respond M1 A1.

Exam-style 3.3 ▪ 2 marks

Explain the difference between local and long-distance signaling.

Solution 3.3

Method: Types of signaling by distance

Worked steps

Local signaling reaches nearby cells by diffusion over short distances; long-distance signaling uses hormones carried in the blood to reach distant target cells M1 A1.