

Exercise walk-through

Introduction to Signal Transduction ■ 4.2

eXercise

You must be able to

- name the three stages: **reception, transduction, response**
- explain that a signal is converted into a cellular change
- describe binding at the receptor as the first step

Method — The three stages

Signal transduction has three steps:

- 1 **Reception** — the signal molecule binds its receptor.
- 2 **Transduction** — the signal is passed and changed through a series of molecules inside the cell.
- 3 **Response** — the cell does something (e.g. turns a gene on, changes activity).

Method — Reception

The signal (**ligand**) binds a specific **receptor**, often on the membrane. This binding **changes the receptor's shape**, starting the pathway.

Method — Transduction relays the message

A chain of molecules passes the signal along, often amplifying it, converting the outside signal into an inside action.

Method — A worked example

Adrenaline binds a receptor (reception) → activates internal messengers (transduction)
→ the cell breaks down glycogen for energy (response).

Practice 2.1 ■ 3 marks

Name the three stages of signal transduction.

Solution 2.1

Method: The three stages

Worked steps

Reception, transduction, response **B1** **B1** **B1**.

Practice 2.2 ■ 1 mark

What happens during reception?

Solution 2.2

Worked steps

The signal molecule binds its receptor **B1**.

Practice 2.3 ■ 1 mark

What is the final stage called?

Solution 2.3

Worked steps

Response **B1**.

Exam-style 3.1 ■ 1 mark

The first stage of signal transduction is

A response

B transduction

C reception

D replication

Solution 3.1

A response

B transduction

C reception 

D replication

Worked steps

C — reception.

Exam-style 3.2 ■ 2 marks

Adrenaline binds a receptor and the cell breaks down glycogen.

- (a) Identify the reception and response steps.
- (b) State what happens during transduction.

Solution 3.2

Method: A worked example

Worked steps

(a) Reception: adrenaline binds the receptor; response: glycogen is broken down **M1 A1**. (b) The signal is relayed and amplified through a chain of internal molecules that carry the message to the response **M1 A1**.

Exam-style 3.3 ■ 2 marks

Explain why binding of the signal changes the receptor, and why this matters.

Solution 3.3

Method: Reception

Worked steps

Binding changes the receptor's shape, which activates it to start the internal pathway; without this change the signal could not be passed on **M1** **A1**.