

Chemical signalling

International Baccalaureate · IB Diploma · Biology · HL

Scope and prerequisites

This handout covers selected HL topics for the course first assessed in 2025; it is not the whole syllabus.

Prerequisites: read the stated quantities and units, and use arithmetic and the model conditions below.

The examples are original and fictional: they are not real measurements or real student investigations.

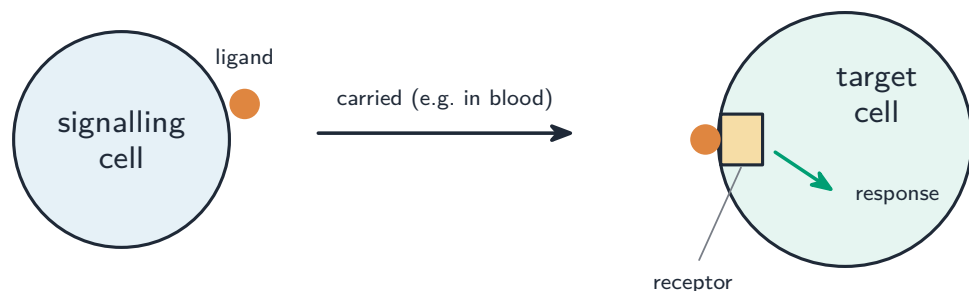
Cell signalling: a receptor selects the response

■ What would explain this observation?

- Two cell types encounter the same signal but respond differently. Their **receptors** and internal pathways determine what follows.

■ Build the model

- A signalling molecule binds a compatible receptor.
- Receptor activation can initiate **signal transduction** through intracellular molecules.
- The resulting response may change enzyme activity, transport or gene expression.
- A signal need not enter the cell to cause an effect.
- receptor: A molecule that binds a compatible signal.
- signal transduction: Conversion of signal reception into intracellular changes.



Only a cell with the matching receptor responds to the signal

■ Choose evidence that can test it

- Distinguish signal reception, transduction and response.
- Amplification can allow a small extracellular change to produce a larger intracellular effect.
- Different receptors or pathways can give different responses to one signal.

In the lab: Use an attributed dataset comparing signal concentration and response. Include an untreated control and, where supplied, receptor-blocking evidence. Do not infer the whole pathway from a concentration-response graph alone.

■ Work from known quantities

- Known: response increases from 20 to 80 units.
- Fold change = $80/20 = 4$.
- Percentage increase = $(80-20)/20 \times 100 = 300\%$.
- A fourfold final value is not a 400% increase.

Your turn: Response rises from 10 to 50 units. Calculate the fold change.

■ Check the conclusion and its limits

- A receptor is not interchangeable with every signalling molecule.
- Greater signal concentration does not imply unlimited response once the system saturates.

Not true: Fourfold final response means a 400% increase from baseline. A fold change is a ratio of final to initial; a percentage increase is the change relative to the initial value. A fourfold final value means a 300% increase, so “fourfold” and “400%” are not interchangeable.

Key:

- A signalling molecule binds a compatible receptor.
- Distinguish signal reception, transduction and response.
- Watch for: A receptor is not interchangeable with every signalling molecule.

■ Write from a threefold rise

- A response rises from 12 units to 36 units.
- Find the fold change and the percentage increase. A threefold value is not a 300 percent increase.