

Chemical signalling · supported focus

International Baccalaureate · IB Diploma · Biology · HL

Scope and prerequisites

Supported HL focus. First assessment 2025; current subject brief acquired; full Biology guide not acquired. Remaining guide, assessment and practical requirements retain their recorded holds.

Prerequisites: read the stated quantities and units, use arithmetic and the model conditions below. Each lesson develops its own method before independent transfer.

These are original or explicitly fictional teaching examples, not actual measurements or completed assessed learner investigations.

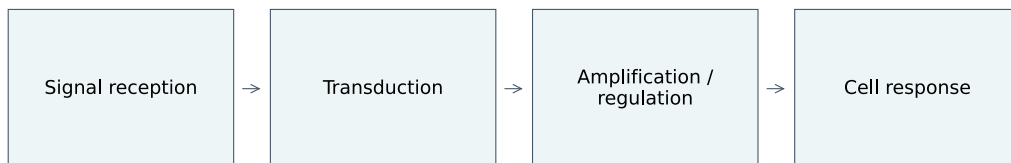
Cell signalling: a receptor selects the response

■ What would explain this observation?

- Two cell types encounter the same signal but respond differently. Their **receptors** and internal pathways determine what follows.
- Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

■ 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.



■ 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.
- 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

- State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution.
- 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.

Example:

Response rises from 10 to 50 units. Calculate the fold change. Use the same sequence: known quantities → model → relation → substitution → unit and interpretation.

■ 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.
- Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

Warn:

Fourfold final response means a 400% increase from baseline. This claim is false: A receptor is not interchangeable with every signalling molecule. Greater signal concentration does not imply unlimited response once the system saturates.

Key:

Cell signalling: a receptor selects the response: 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.