

Gene expression · supported focus

Supported focus · HL

Supported scope

- 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.
- State model conditions and distinguish fictional data from measurements.

Gene Control · 1.1

Reasoning

Two cells with the same genome make different proteins. Regulation changes which information is used and when. Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

Gene Control · 2.1

Reasoning

Gene expression can be regulated at transcription and later stages. A transcription factor can affect transcription through interactions with DNA and other proteins. Epigenetic modifications can influence expression without changing the underlying DNA sequence. transcription factor: A protein that influences transcription; epigenetic modification: A change affecting expression without changing the DNA sequence.

Gene Control · 3.1

Reasoning

Distinguish a measured mRNA change from a protein or functional change. Translation, degradation and protein modification can all intervene. Regulation is specific to a cell context and environmental conditions. Compare treated and control expression data after checking normalization and replicates. Use evidence from a supplied perturbation to discuss causal models, rather than equating every association with a direct mechanism.

Gene Control · 4.1

Reasoning

State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution. Known: normalized transcript abundance is 12 in treatment and 3 in control. Fold change = $12/3 = 4$. Equal normalized abundance does not require equal absolute cell counts in the two raw samples.

Gene Control · 4.2

Reasoning

Transcript abundance is 15 in treatment and 5 in control. Find fold change. Use the same sequence: known quantities $\rightarrow$ model $\rightarrow$ relation $\rightarrow$ substitution $\rightarrow$ unit and interpretation.

Gene Control · 5.1

Reasoning

An epigenetic change is not automatically a DNA-sequence mutation. More mRNA does not guarantee proportionally more active protein. Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

Gene Control · 5.2

Reasoning

Every change in gene expression is a mutation. This claim is false: An epigenetic change is not automatically a DNA-sequence mutation. More mRNA does not guarantee proportionally more active protein.

Gene Control · 5.3

Reasoning

Gene expression: regulate products, not just genes: Distinguish a measured mRNA change from a protein or functional change. Translation, degradation and protein modification can all intervene. Regulation is specific to a cell context and environmental conditions.

Gene Control · diagram



- Original teaching diagram: Gene expression: regulate products, not just genes
- Use the labels and the stated model together.

Gene Control · original transfer

Your turn

Normalized expression changes from 4 to 12 units. Distinguish fold change from percentage increase. What can be inferred about absolute transcript counts?

Gene Control · transfer reasoning

Method and interpretation

Fold change³; increase $(12-4)/4 \times 100 = 200\%$. Absolute counts need normalization and sample-size information. Expression association alone does not demonstrate a causal regulatory mechanism.

Check yourself

- Explain transcription factor using the stated model.
- Explain epigenetic modification using the stated model.
- Change one value in the original transfer; explain which assumption still matters.