

Exercise walk-through

5.4

Homeostasis, feedback and thermoregulation (statements 7.14, 7.16–7.17)

Pearson Edexcel · International A-Level · Biology

Four stages, one purpose

Stage	Where	Yield
Glycolysis	cytoplasm	2 ATP + 2 reduced NAD
Link reaction	matrix	CO ₂ + reduced NAD
Krebs cycle	matrix	ATP + reduced NAD + reduced FAD
Oxidative phosphorylation	cristae	most ATP; O ₂ to water

Recombinant DNA: cut, paste, select

Cut : the same restriction enzyme opens plasmid and gene



Paste : complementary sticky ends sealed by DNA ligase



Transform : heat shock carries plasmids into bacteria



Select : antibiotic marker - only transformants survive

Check yourself

Your turn

Why is the human insulin gene made from mRNA before inserting into bacteria?

- A. bacteria cannot splice introns, and mature mRNA has none
- B. mRNA is more stable than DNA
- C. mRNA is double-stranded and easier to cut
- D. restriction enzymes only cut RNA

Exercises 2.1·2.3

2.1 Define homeostasis. [2]

2.2 State one difference between negative and positive feedback. [2]

2.3 Name the structure that monitors blood temperature. [1]

Exercises 2.1·2.3

2.1 Define homeostasis. [2]

2.1 Maintaining the internal environment in dynamic equilibrium within narrow limits, despite external change.

2.2 State one difference between negative and positive feedback. [2]

2.2 Negative feedback returns a variable toward its set point; positive feedback pushes it further away / amplifies the change.

2.3 Name the structure that monitors blood temperature. [1]

2.3 The hypothalamus.

Exercises 3.1·3.2

3.1 Describe the body's responses to a fall in core temperature, naming the centre that coordinates them, two effectors, and how each response conserves or generates heat. [5]

3.2 Explain why negative feedback, but not positive feedback, can maintain a variable within narrow limits, using blood glucose as the example. [4]

Exercises 3.1·3.2

3.1 Describe the body's responses to a fall in core temperature, naming the centre that coordinates them, two effectors, and how each response conserves or generates heat. [5]

3.1 The hypothalamus's heat gain centre coordinates; skeletal muscles shiver, generating heat by respiration; skin arterioles constrict, reducing blood flow to the surface so less heat is lost; hair erects, trapping an insulating layer.

3.2 Explain why negative feedback, but not positive feedback, can maintain a variable within narrow limits, using blood glucose as the example. [4]

3.2 Negative feedback acts in both directions: above the set point one hormone lowers the variable, below it another raises it – insulin and glucagon hold glucose between narrow limits. Positive feedback amplifies one direction only, so the variable moves ever further from the set point until the process ends – it cannot stabilise anything.

Exercise 3.3

3.3 Adrenaline is released before a race. Describe two effects of adrenaline on the cardiovascular and respiratory systems, and explain how each improves performance for a sprint. [5]

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3.3 Heart rate and stroke volume increase, raising cardiac output and oxygen delivery to muscle; airways dilate, reducing resistance and increasing ventilation; glycogenolysis raises blood glucose for rapid respiration.