

Exercise walk-through

5.8

Nervous organisation, receptors and habituation (statements 8.8–8.10)

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 Name the two divisions of the autonomic nervous system. [2]

2.2 State one advantage of rods sharing bipolar cells. [1]

2.3 Put these in order: motor neurone, receptor, relay neurone, effector, sensory neurone. [2]

Exercises 2.1·2.3

2.1 Name the two divisions of the autonomic nervous system. [2]

2.1 Sympathetic and parasympathetic.

2.2 State one advantage of rods sharing bipolar cells. [1]

2.2 Summation of weak signals from several rods lets the bipolar cell reach threshold in dim light.

2.3 Put these in order: motor neurone, receptor, relay neurone, effector, sensory neurone. [2]

2.3 Receptor, sensory neurone, relay neurone, motor neurone, effector.

Exercises 3.1·3.2

3.1 Describe the pathway of a spinal reflex from stepping on a pin to withdrawing the foot, naming each component in order and stating why the response is faster than a voluntary one. [5]

3.2 Explain why a person can read small print in bright light but not dim light, referring to cone and rod distribution and their wiring. [5]

Exercises 3.1·3.2

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3.1 Pin stimulates pain receptors (nociceptors) in the skin; sensory neurone carries the impulse into the spinal cord's grey matter; relay neurone passes it to a motor neurone (the interneuron also branches upward to the brain, but that path is slower); motor neurone carries it to the leg muscles, which contract and withdraw the foot - the arc is short and does not wait for the brain, so it is faster than a voluntary response.

3.2 Explain why a person can read small print in bright light but not dim light, referring to cone and rod distribution and their wiring. [5]

3.2 Small print needs high acuity, which cones deliver at the fovea with one-to-one wiring to bipolar cells; cones need bright light because each works alone; in dim light only rods respond, but their many-to-one wiring blurs the location of the signal.

Exercise 3.3

3.3 A sea slug retracts its gill when touched, but after 20 touches the response fades. Explain this observation, and suggest what has changed at the synapse. [5]

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3.3 The repeated harmless stimulus causes habituation - a decreased response to a repeated stimulus; repeated stimulation of the presynaptic membrane leads to progressively less calcium entry; less neurotransmitter is released into the synapse; the postsynaptic membrane no longer reaches threshold, so no action potential reaches the gill muscle.