



ANSWER BOOK

Hormones: a message broadcast in the blood that only some cells can read

Hormonal communication, plant responses and homeostasis · Unit B15

AQA 3.6.4.1 · OCR A 5.1.1, 5.1.4 · Edexcel A Topic 7 (homeostasis and feedback) · CAIE 14.1

6 questions · 22 marks

NAVY EDITION

SECTION A · Short, 1 to 2 marks

A1 **B1** the hormone is adrenaline. **B1** the second messenger is cyclic AMP. [2]

SECTION B · Standard, 3 to 5 marks

B1 **B1** adrenaline binds to a receptor on the outer surface of the cell surface [5]
membrane and does not enter the cell. **B1** binding changes the tertiary structure of the
receptor, which activates adenylate cyclase on the inner face of the membrane. **B1**
adenylate cyclase converts ATP into cyclic AMP, the second messenger. **B1** cyclic AMP
activates a protein kinase, which phosphorylates and so activates the next enzyme in
the chain. **A1** glycogen phosphorylase is activated and hydrolyses glycogen into
glucose, which leaves the cell.

B2 **B1** a steroid hormone is lipid-soluble, so it diffuses straight through the [4]
phospholipid bilayer of the membrane. **B1** inside the cell it binds to a receptor and the
hormone-receptor complex acts in the nucleus as a transcription factor, switching
genes on or off. **B1** a peptide hormone is not lipid-soluble and cannot cross the bilayer,
so it binds to a receptor on the outer surface of the membrane instead. **A1** the message
must therefore be carried inwards by a different molecule made in the cytoplasm, and
because every step of that chain is enzyme-catalysed the signal is amplified as it goes.

B3 **B1** a receptor detects a deviation of the variable from the norm. **B1** a [4]
coordinator, which may be a hormone, a nerve or both, carries the information to an
effector. **B1** the effector brings about a response that moves the variable in the
direction that removes the original deviation, which is what makes the feedback
negative. **A1** one effector can only push the variable one way and then wait for it to drift
back, whereas two antagonistic hormones correct in both directions and so correct
faster.

B4 **B1** a nervous message travels along neurones to a defined destination, [4]
whereas a hormone is carried in the blood plasma and reaches every tissue. **B1**
impulses travel at up to about 100 m per second, whereas a hormone is limited by the
time the blood takes to circulate, so it is much slower. **B1** a neurone stimulates only the
muscles or glands it connects to, whereas a hormone acts on any cell carrying a
complementary receptor. **B1** the nervous effect is short, because the neurotransmitter
is broken down at once, whereas the hormonal effect lasts until the hormone itself is
broken down and often needs an antagonistic hormone to reverse it.

B5 **B1** thyroid-stimulating hormone acts on the thyroid gland, so a continuous supply of it makes the thyroid secrete thyroxine continuously. **B1** thyroxine in the blood normally inhibits both the hypothalamus and the anterior pituitary, so the hypothalamus will be secreting very little releasing factor. **A1** the tumour is not under that control, so the negative feedback loop is broken: the signal that normally falls when thyroxine rises no longer does, and the thyroxine concentration stays high. [3]
