AP® Biology
2003 Sample Student Responses
Form B

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FORM B 32PB2

2 A.

2. Hormones play important roles in regulating the lives of many living organisms.

(a) For TWO of the following physiological responses, **explain** how hormones cause the response in plants.

- increase in height
- adjustment to change in light
- adjustment to lack of water

(b) For TWO of the following physiological responses, **explain** how hormones cause the response in animals.

- increase in height
- adjustment to change in light
- adjustment to lack of water

(c) **Describe** TWO different mechanisms by which hormones cause their effects at the cellular level.

a) Hormones cause important physiological responses in plants. Hormones cause an adjustment to change in light, or phototropism. The hormone that causes this change is auxin, a growth hormone. If the sun hits a plant full-on, then auxin stays in the center and the plant grows straight. However if the sun hits a plant at an angle, then auxin moves to the shady part of the plant. The plant is then stimulated to grow where the hormone auxin is, which causes the plant to bend towards the light. Hormones effecting the height of plants is called gravitropism. Auxin is also involved in this as is is a vital growth hormone. Gravitropism effects both roots and stem, however height only has to do with stem growth. Due to gravitropism and the hormone auxin, when a plant is stimulated to grow by light, nutrients and water, auxin moves to the underside of the stem providing growth by stimulation.

b) When light increases, hormones stimulate pupils to decrease to let less light in. When light decreases, hormones also stimulate pupils to increase to let more light in. When water is needed hormones stimulate kidneys

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to produce more concentrated urin to conserve water.

c) Hormones stimulate animal response. Hormones can also cause negative feedback which stops animal responses. An example of ~~stimulation~~ both is the hypothalimus which causes ~~the~~ beginning and ending of the mentral cycle. If levels of hormones estrogen and progesterone are low/or high then hypothalimus will either stimulate or stop production of lutenizing hormone and follicle stimulating hormone. Each hormone has a different purpose on the cellular level when gametes are being created.

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2B1

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(b) For TWO of the following physiological responses, **explain** how hormones cause the response in animals.

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(c) **Describe** TWO different mechanisms by which hormones cause their effects at the cellular level.

Hormones play important roles in regulating the lives of organisms. They maintain homeostasis in our body and prepare our body and relieve our body from stressful events.

In plants, auxins and gibberellines play an important role in the increase of height. Auxins stimulates elongation by weakening the cell membranes and making it leaky to H^+ ions ~~[illegible]~~ and making water to flow in by osmosis. Besides elongation ~~A~~ auxins promote fruit development. Gibberellins are similar in function to auxins. They stimulate elongation and play a role in fruit development. In short, these two hormones work together and stimulates elongation in plants.

Plants also have hormones that adjust them to changes in light. Phototropism, a plant's growth response to light occurs because of the hormone auxin. Auxin tents to move to the shady region of the plant and promote cell elongation there causing the plant to grow toward the source of light.

Plants respond to lack of water, by closing stomata

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and blocking transpiration to occur. This is stimulated by abscisic acid. Abscisic acid is a hormone that is released by plants in response to stress such as excessive water loss.

In animals, there are other hormones that respond to the previous three cases. Height, in animals, is stimulated by a hormone from the anterior pituitary gland, the growth hormone. This hormone stimulates growth throughout the body.

In adjustment to change in light, animals have a hormone called melatonin which adjusts the animal to a new circadian rhythm or change in light. For instance, when we move to a new country where time is different, melatonin helps us adjust to the difference of day and night.

In adjustment to lack of water, animals release the ADH (ant. diuretic hormone) from the posterior pituitary gland. This causes reabsorption of more water to occur in the kidneys.

There are two mechanisms that carry these hormones to their target cells and they are endocrine cells and neurotransmitters. Endocrine cells transport hormone vesicles directly in the circulatory system. The hormone moves from the circulatory system into the target cells. Neurotransmitters are transported by synapses. These move through the synaptic cleft into the protein receptors on the posterior nerve cell and initiates a response.

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2C.

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(b) For TWO of the following physiological responses, **explain** how hormones cause the response in animals.

- increase in height
- adjustment to change in light
- adjustment to lack of water

(c) **Describe** TWO different mechanisms by which hormones cause their effects at the cellular level.

(a) In plants, the hormone responsible for the increase in height is called auxin, also known as indolacetic acid (IAA). Auxin causes the cell wall of plants to become more flexible, so that an increase in cytoplasm and/or ~~water~~ turgor pressure will cause the cell to elongate.* The hormone responsible in plants for the physiological change in plants due to light is phytochrome. Phytochrome complexes note the length of night (lack of light) [redacted] In night-length-dependent flowering plants, and tell the plant whether to flower based on this information. When a long night is punctured by a flash of red light, phytochrome senses two short nights, causing short-night plants to flower. However, if two beams of light are flashed, one red and the other far red, then the phytochrome senses a long night, and signals long-night plants to flower.

(b) The adjustment to lack of water in humans is performed by an interaction of a variety of hormones. The hypothalamus notes the [redacted] increased concentration of substances in the blood and the decrease in concentration of H_2O, so it sends a tropic hormone to the ~~anterior~~ posterior pituitary gland, signaling

* Plants can continue to increase in height indefinitely if resources allow.

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it to release ADH — anti-diuretic hormone. ADH is sent to the kidneys, where H_2O is absorbed from the liquid waste materials. ADH tells the kidneys to increase concentrations of salts in the medulla, so that ~~wate~~ more water will flow by osmosis ~~the~~ out of the urea-H_2O solution, making urine more concentrated and allowing the body to retain more H_2O. Some ~~of~~ organisms such as desert mice ~~are~~ are so efficient at conserving H_2O that their urine is practically solid. Increase in height in humans is also controlled by hormones. The peak growth times in a human is around the time of birth and around the time of puberty — ~~the~~ maturation into an adult. In other animals, the increase in height is also due to circadian rhythms and an inner biological clock. ~~but sometimes animal~~ When environmental and internal conditions are ~~not~~ good, the hypothalamus sends a tropic hormone to the pituitary, telling it to secrete growth hormone. Growth hormone (GH) is sent to bones and other body parts to signal the division and elongation of cells, which cause an increase in height.

(c) At the cellular level, ~~th~~ there are 2 ways a hormone can affect cell activity. In steroid hormones, the hormones are able to penetrate the plasma & nuclear membranes, and bind to proteins causing ~~replic~~ transcription of specific DNA sequences, which will be used to make the nesessary polypeptides. Another way hormones act at the cellular level is that they attach to protein receptors in the plasma membrane, activiting a signal transduction pathway. Sometimes,

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a second messenger such as cAMP may be used. This signal transduction pathway causes certain enzymes to be activated, producing the needed products.