

APOLLO

Chemical signalling

HL

Biology

First assessment 2025

14 questions | questions

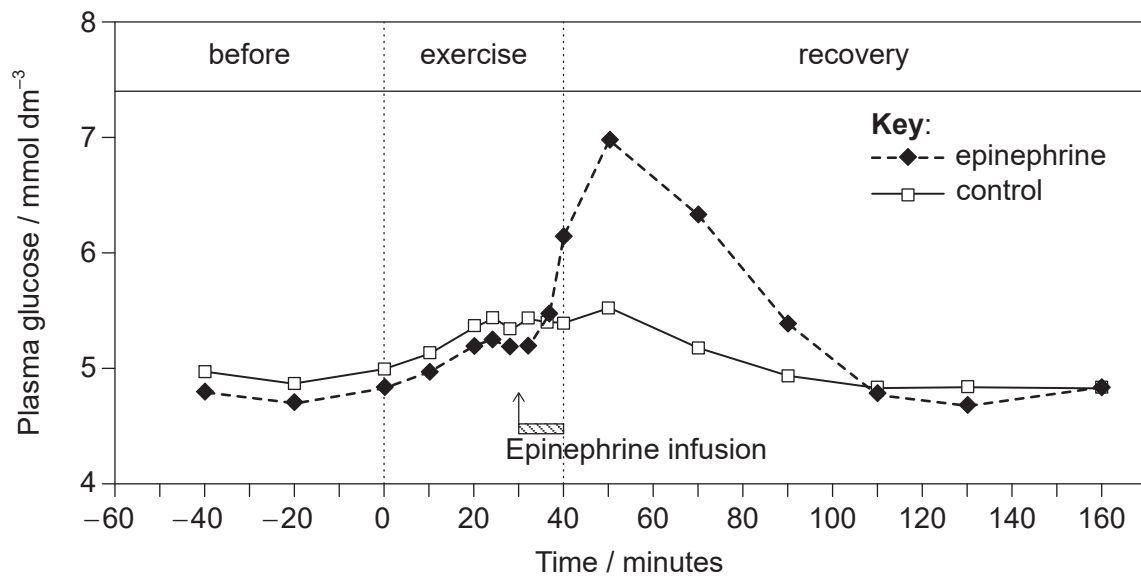
28. Which chemical causes positive feedback to ensure rapid ripening of fruit?

- A. Auxin
- B. Cytokinin
- C. Epinephrine
- D. Ethylene

32. What controls the developmental changes during puberty?

- I. Increased release of gonadotropin-releasing hormone (GnRH) by the hypothalamus
 - II. Luteinizing hormone (LH) leading to increased sex hormone production
 - III. Gonadotropin-releasing hormone (GnRH) triggering the onset of increased luteinizing hormone (LH)
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

18. The graph shows changes in blood plasma glucose concentration before exercise, during exercise and during recovery with and without epinephrine (adrenaline) infusion. Epinephrine infusion was started 30 minutes into the exercise routine.



[Source: Kreisman, S.H., Ah Mew, N., Arsenault, M., Marliss, E.B., et al., 2000. *AJP Endocrinology and Metabolism* 278(5): E949–57. <https://doi.org/10.1152/ajpendo.2000.278.5.E949>. Reference redacted. Source adapted.]

Which action of epinephrine would result in the observed changes to plasma glucose concentration?

- A. Second messenger is deactivated.
- B. A G protein is activated, and cyclic AMP (cAMP) is produced.
- C. Second messenger stimulates the production of ATP.
- D. Cyclic AMP (cAMP) deactivates the G protein.

26. What plays a direct role in promoting the ripening of fruit?

- A. Oestradiol
- B. Auxin
- C. Cytokines
- D. Ethylene

- 28.** Jetlag occurs when the circadian rhythm of a person changing time zones is disrupted. For what reason might they have difficulty sleeping after sunset?
- A. The hypothalamus is secreting too much melanin.
 - B. The pineal gland is not secreting sufficient melatonin.
 - C. The lack of sunlight inhibits the production of vitamin D.
 - D. The pituitary gland is secreting too much oxytocin.

- 29.** What correctly describes the action of auxin in phototropism?
- A. Auxin efflux carriers actively transport auxin in and out of cells.
 - B. Auxin promotes hydrogen ion secretion into the cytoplasm.
 - C. Auxin efflux carriers are positioned in the plasma membrane on one side of the cell.
 - D. Auxin breaks beta-glucose links in the cell wall.

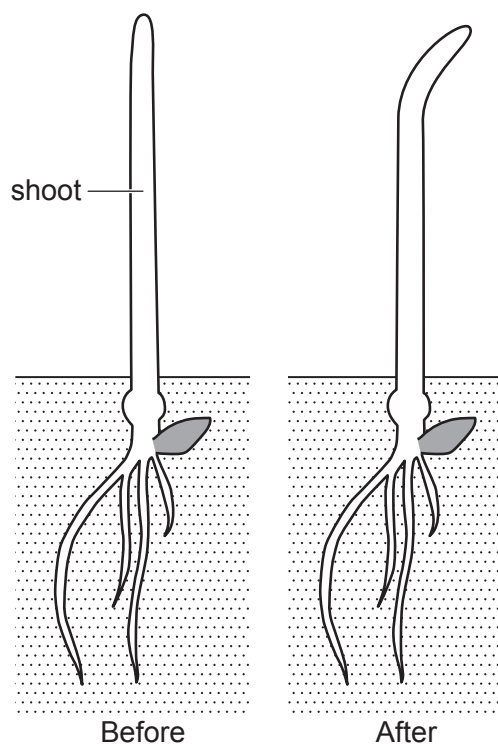
Turn over

17. What is an example of quorum sensing?

- A. Expression of incomplete dominance by *Mirabilis jalapa* flowers
- B. Spring growth of the Arctic mouse-ear chickweed *Cerastium arcticum*
- C. Bioluminescence in the marine bacterium *Vibrio fischeri*
- D. Biochemical control of lactase synthesis in *Escherichia coli* bacteria

Turn over

27. The image shows the response of a plant shoot to light exposure.



[Source: Kutschera, Ulrich & Niklas, Karl. (2009). Evolutionary plant physiology: Charles Darwin's forgotten synthesis. *Naturwissenschaften*. 96. 1339–1354, Springer Nature. Available at <https://link.springer.com/article/10.1007/s00114-009-0604-z>.]

What facilitates this response?

- I. Auxin efflux carriers are located on one side of the cell.
 - II. Auxin promotes hydrogen ion secretion.
 - III. Cell walls become acidified and cellulose cross links are loosened.
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

Turn over

17. Mutualistic bacterium *Vibrio fischeri* lives in the light organ of some squid species. As a result of quorum sensing, bioluminescence is produced, which camouflages squid from predators.

How does quorum sensing trigger bioluminescence?

- A. At high population density, bacteria secrete ligands that bind to receptors in the squid's light organ.
- B. Above a critical *V. fischeri* density, signalling molecules activate bacterial genes involved in bioluminescence.
- C. A high concentration of bacterial signalling molecules causes the expression of bioluminescence genes in the squid DNA.
- D. When at risk, the squid's light organ sends signals to stimulate production of bioluminescence in bacteria.

Turn over

27. What can cause hormone secretion from the pineal gland?

- A. The intake of glucose
- B. The sound of classical music
- C. The onset of darkness
- D. A decrease in body temperature

- 18.** What activates a tyrosine kinase pathway in a cell following binding to a receptor?
- A. Odorant molecules
 - B. Epinephrine
 - C. Taste molecules
 - D. Insulin

21. What is the cause of positive phototropism?

- A. Increased concentration of auxin on the side of the stem closest to the light
- B. Degradation of auxin on the side of the stem closest to the light
- C. Increased concentration of auxin on the side of the stem furthest from the light
- D. Degradation of auxin on the side of the stem furthest from the light

Turn over

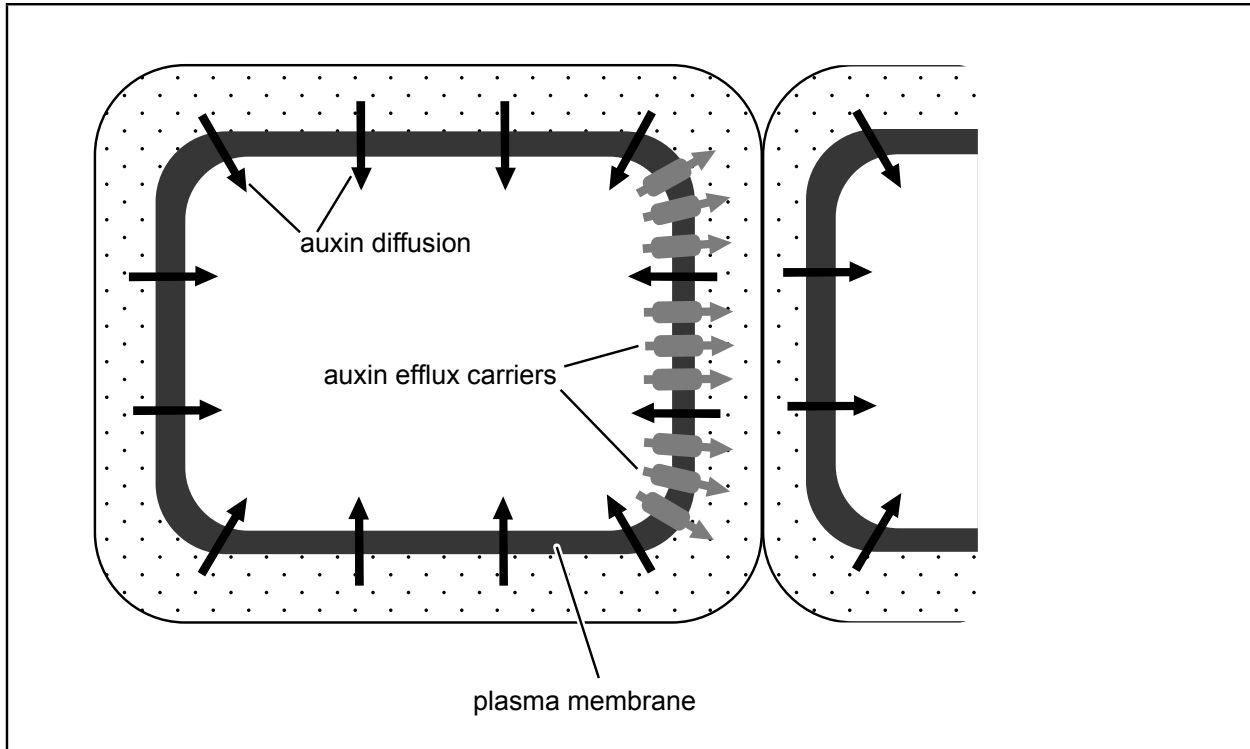
22. Which role does positive feedback play in fruit ripening?

- A. The production of ethylene leads to fruit ripening, which stops the production of ethylene.
- B. The production of ethylene leads to fruit ripening, which causes more ethylene production.
- C. The production of RuBP leads to fruit ripening, which stops the production of RuBP.
- D. The production of RuBP leads to fruit ripening, which causes more RuBP production.

Section A

Answer **all** questions. Answers must be written within the answer boxes provided.

3. The diagram shows the movement of auxin across the plasma membrane of a plant cell as well as the position of auxin efflux carriers.



- (a) (i) Annotate the diagram, using an arrow, to show the direction of the net flow of auxin through the cell. [1]
- (ii) Identify an environmental factor that causes auxin efflux carriers to be concentrated on one side of a cell. [1]

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- (b) (i) Predict the difference that could be seen using a microscope between plant meristematic cells grown in media with and without auxin. [1]

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- (ii) State the hormone that interacts with auxin to integrate shoot growth. [1]

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Turn over