



Homeostasis: practice questions

5 questions · 17 marks · mark scheme at the back

For IB Diploma Biology SL undefined. **HL only** is additional higher level content, for HL students only.

Name

Total / 17

1 PAPER 1A STYLE

[1 mark]

Why is negative feedback, not positive feedback, used in homeostasis?

- A. ☐ It amplifies changes so that the response is faster.
- B. ☐ It returns a variable to the set point from values above and below it.
- C. ☐ It keeps a variable exactly at the set point without any fluctuation.
- D. ☐ It only works when a variable rises above the set point.

2 PAPER 1A STYLE

[1 mark]

Which is an effect of glucagon on its target cells?

- A. ☐ Muscle cells insert more glucose transporters into their membranes.
- B. ☐ Liver cells convert glucose to glycogen.
- C. ☐ Liver cells break down glycogen and release glucose into the blood.
- D. ☐ β cells increase their secretion of insulin.

3 PAPER 1B STYLE

[5 marks]

Two adults each drank a solution containing 75 g of glucose after fasting overnight. Their blood glucose concentration was then measured every 30 minutes (data for practice). (a) Calculate the percentage increase in blood glucose for person A between 0 and 30 minutes. [1] (b) Describe the changes in blood glucose for person A. [2] (c) Person B has type 2 diabetes. Explain the differences between the results for B and A. [2]

Blood glucose concentration (mmol L ⁻¹)		
Time (min)	Person A	Person B
0	5.0	7.5
30	8.0	12.5
60	6.5	14.0
90	5.5	13.0
120	5.0	11.5

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4 PAPER 2A STYLE

[3 marks]

Outline two risk factors for type 2 diabetes and one method of treatment.

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Explain how the body temperature of a human is returned to normal after exposure to cold conditions.

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Mark scheme

One mark for each point unless a maximum is given. Words in brackets are not needed for the mark.

1. [1]

B B [1]

2. [1]

C C [1]

3. [5]

- (a) $(8.0 - 5.0) \div 5.0 \times 100 = 60\%$ [1]
- (b) rises to a peak (8.0 mmol L^{-1}) at 30 minutes [1]
- (b) then falls back to the starting value / 5.0 mmol L^{-1} by 120 minutes [1]
- (c) B starts higher / rises higher / stays high (above 11 mmol L^{-1} at 120 min) [1]
- (c) B's target cells are resistant / less responsive to insulin [1]
- (c) so liver / muscle cells absorb less glucose / convert less to glycogen [1]
- (c) A secretes insulin which returns glucose to the set point by negative feedback [1]
- [max 5]

4. [3]

- obesity / high body mass [1]
- physical inactivity / lack of exercise [1]
- diet high in sugar / fat / refined carbohydrates [1]
- increasing age / family history / genetic factors / ethnicity [1]
- treatment: low-sugar diet / regular exercise / weight loss / drugs that improve insulin sensitivity / insulin injections [1]
- [max 3: max 2 for risk factors]

5. [7]

- negative feedback control [1]
- peripheral thermoreceptors in the skin detect the fall in temperature [1]
- hypothalamus detects / compares with the set point (about 37°C) [1]
- hypothalamus sends nerve impulses to effectors [1]
- vasoconstriction of arterioles supplying skin capillaries [1]
- less blood near the surface so less heat lost (by radiation) [1]
- shivering: rapid contractions of skeletal muscle generate heat from respiration [1]
- uncoupled respiration in brown adipose tissue releases heat instead of producing ATP [1]
- hair erection traps an insulating layer of air [1]
- hypothalamus stimulates the pituitary (TSH) to increase thyroxine secretion [1]
- thyroxine raises the metabolic rate so more heat is generated [1]
- sweating reduced / stops [1]
- behavioural responses, e.g. putting on clothes / seeking warmth [1]
- [max 7]