1.6 Organisms Respond to Changes in their Environments: 10-minute Pack

AQA 7402 · Calculator allowed · about 10 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Woodlice are commonly found in damp, dark places such as under logs, stones and loose bark. A student studied the behavioural response of woodlice to differences in humidity using a choice chamber divided into a dry side and a humid side (with light and temperature kept the same on both sides). For woodlice found in each side, the student recorded the mean rate at which individual woodlice changed direction (the turning rate).

(a) State what is meant by a kinesis. **(1)**

(b) The student recorded a mean turning rate of 9.6 turns per minute for woodlice in the dry side of the chamber and 1.2 turns per minute for woodlice in the humid side. Using these data, evaluate whether the turning rates alone explain woodlice accumulating in the humid side of the chamber over time. **(4)**

(c) Explain one advantage to the woodlouse of relying on a simple kinesis, rather than a taxis, to respond to changes in humidity. **(2)**

(d) State one difference between a taxis and a kinesis. **(1)**

(Total for Question 1 is 8 marks)

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Mark scheme · 1.6 Organisms Respond to Changes in their Environments: 10-minute Pack

Question 1

(a) a non-directional response in which the rate of movement (or rate of turning) changes according to the intensity of the stimulus, not the direction of movement (oe) **B1**

(a) Answer: A kinesis is a non-directional response in which the organism's rate of movement or turning changes with the intensity of the stimulus.

(b) in the dry side, the higher turning rate (9.6 turns/min) means woodlice change direction more frequently **B1**

(b) in the humid side, the lower turning rate (1.2 turns/min) means woodlice change direction less frequently; this does not show that they remain there **B1**

(b) movement speed and the directions or angles of turns are not supplied, so the rates alone do not establish how likely woodlice are to cross between the two sides **B1**

(b) the turning rates alone do not explain accumulation in the humid side; movement speed, trajectories or time spent in each side would be needed to evaluate this explanation (oe) **B1**

(b) Answer: Woodlice turn more frequently in dry air (9.6 turns per minute) than in humid air (1.2 turns per minute). Fewer turns in humid air do not show that woodlice remain there. Without movement speeds and the directions or angles of turns, the rates alone cannot establish how often woodlice cross between the sides or explain accumulation in the humid side.

(c) a kinesis does not require the woodlouse to detect the direction of the stimulus (useful because humidity does not spread as a clear directional gradient in the way light or a chemical source might) (oe) **B1**

(c) so a kinesis can still keep the woodlouse in suitable conditions using a much simpler nervous response/less complex sensory processing, which is less costly for a simple invertebrate (oe) **B1**

(c) Answer: A kinesis does not need the direction of the humidity gradient to be detected, so it can be produced by a much simpler nervous system than a directional taxis would require.

(d) a taxis is a directional response (movement towards or away from the stimulus), whereas a kinesis is non-directional (only the rate of movement/turning changes) (oe) **B1**

(d) Answer: A taxis involves directed movement towards or away from a stimulus; a kinesis involves a change in the rate of movement or turning with no fixed direction.

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