

Assessment Schedule – 2023

Biology: Demonstrate understanding of the responses of plants and animals to their external environment (91603)

Assessment Criteria

Achievement	Achievement with Merit	Achievement with Excellence
<p><i>Demonstrate understanding</i> involves:</p> <ul style="list-style-type: none"> the process(es) within each response and / or the selective advantage provided for the organism in relation to its ecological niche. 	<p><i>Demonstrate in-depth understanding</i> involves:</p> <ul style="list-style-type: none"> how the responses occur why the responses provide a selective advantage for the organism in relation to its ecological niche. 	<p><i>Demonstrate comprehensive understanding</i> involves:</p> <ul style="list-style-type: none"> linking biological ideas to explain why the responses provide a selective advantage for the organism in relation to its ecological niche; and linking of ideas may involve justifying, relating, evaluating, comparing and contrasting, and analysing.

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 8	9 – 13	14 – 18	19 – 24

Evidence

Question One

Evidence	Achievement	Achievement with Merit	Achievement with Excellence
<p>Tulips can be animal- or wind-pollinated. Birds, mammals, and insects such as bees are more active on warm sunny days, meaning there would be more pollen transfer from one tulip to another. This, in turn, means more chance of fertilisation, leading to increased variation and number in the species and an increase in population size.</p> <p>Tropic behaviours are growth responses in plants. The plant responds to an abiotic factor in the environment, and growth occurs in a direction which results in a benefit for the plant. In this case, negative geotropism is growth away from the directional stimulus of gravity. This would keep the cut stems upright, holding up the flower and leaves. The positive phototropism results in growth towards light, which is beneficial for pollination / photosynthesis / seed dispersal.</p> <p>Nastic / reversible movements of plants are in response to external stimuli that are independent of the direction of the stimuli. The non-directional movement of the plant in response to the light is known as photonasty, and the non-directional response to temperature is thermonasty.</p> <p>By exhibiting both photonasty and thermonasty, the tulip would use energy to open the flower only on days when successful pollination is most likely. Without these nastic responses, there would be no protection from damaging weather (e.g. hail) or nocturnal animals possibly taking pollen and nectar but not being good pollinators, so pollen may be wasted / lost leading to a reduction of successful reproduction.</p>	<p>Describes:</p> <ul style="list-style-type: none"> • tropism • nastic response • thermonasty or photonasty • positive phototropism • positive phototropism advantage • negative geotropism • negative geotropism advantage • the need for warm conditions for pollinators to be more active. 	<p>Explains:</p> <ul style="list-style-type: none"> • advantage of tulip exhibiting negative geotropism • advantage of tulip exhibiting positive phototropism • advantage of thermonasty (including definition) re flower opening / pollination • advantage of photonasty (including definition) re flower opening / pollination. 	<p>Discusses, demonstrating comprehensive understanding of:</p> <ul style="list-style-type: none"> • how named behaviours benefit the tulip, linking to both nastic and tropic responses explained as working in sync to provide best growth and pollination, in warm sunny times when the pollinators are active or it is windy. • the implications of increased pollination leading to greater reproductive success, which then leads to increased variation in the species and an increase in population size.

Not Achieved		Achievement		Achievement with Merit		Achievement with Excellence	
N1	N2	A3	A4	M5	M6	E7	E8
ONE evidence point only at Achievement.	TWO evidence points only at Achievement.	THREE evidence points at Achievement.	FOUR evidence points at Achievement.	TWO evidence points at Merit.	THREE evidence points at Merit.	ONE evidence point at Excellence.	BOTH evidence points at Excellence.

N0 = No response; no relevant evidence.

Question Two

Evidence	Achievement	Achievement with Merit	Achievement with Excellence
<p>A hierarchy is an organisation of individuals in a group according to rank/ dominance. It is often determined by age, sex, or genetic fitness.</p> <p>High-status individuals have high levels of genetic fitness and pass on their fit alleles to the next generation. The alpha male here is the ‘king’ and, by being at the top, he will be able to mate with all females. Should food be scarce, his rank also ensures access to the available food, and he is unlikely to be confronted by other males.</p> <p>The females in a hierarchy would be protected by males, in particular the alpha king; they will also be assured of reproduction with an individual that has ‘fit’ genes.</p> <p>Hierarchies lessen aggression and injury due to full-contact fighting because members know their place in the order.</p> <p>Ritualised fighting occurs in a group and can be innate or learned. Less energy is spent on fighting / recovery, so there would be more energy available for other life processes including reproduction. At times there may be escalation from ritual to full-contact fighting. This may be due to a limited resource or an attempt of a lower-ranked bull to become king. Full-contact fighting may result in injuries or deaths, potentially reducing the size of the herd, and lessening the herd’s chances of success because of lower genetic variation.</p>	<p>Describes:</p> <ul style="list-style-type: none"> • a hierarchy • what is meant by ritualistic behaviours • an advantage to the king • an advantage to the females • intraspecific competition • when the full-contact fighting may occur. 	<p>Explains:</p> <ul style="list-style-type: none"> • how the hierarchy increases the chances of success for the king • how the hierarchy increases the chances of success for the females • how intraspecific competition ensures only the fittest individuals reproduce • how ritualistic fighting doesn’t lead to injury /why you don’t want injured members • that the health of the gene pool is maintained by only the fittest individuals reproducing • the need for escalation in certain times. 	<p>Discusses, demonstrating comprehensive understanding of:</p> <ul style="list-style-type: none"> • hierarchical behaviours, both ritualised and full-contact fighting, and how these contribute to a strong herd (increased survival and reproductive success); including advantages of being in a hierarchy for females and the alpha king • why ritualised fighting might escalate to full-contact fighting, and why the consequences are undesirable, as alleles may be lost from an already small gene pool (i.e. leading to decreased survival and reproductive success).

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N0 = No response; no relevant evidence.

Question Three

Evidence	Achievement	Achievement with Merit	Achievement with Excellence
<p>Homing is the ability to return to a given place over unfamiliar territory. The homing instinct in salmon means they spawn in the same stream they were hatched in. After their time away, salmon migrate back to their river of birth (hatching), navigating by methods such as using the magnetic field, ocean / sea landmarks, polarisation of light, and tracing chemicals.</p> <p>Taxic behaviour in an animal is its movement in a direction in response to a stimulus.</p> <p>The taxic responses in salmon are positive chemotaxis (movement towards a chemical stimulus) and positive rheotaxis (movement towards the current, i.e. swimming upstream).</p> <p>By spawning in the same stream, salmon are returning to a place that is more likely to be safe for young fish. A random river may not have suitable sites for spawning, or the conditions might not suit the Masu salmon. Individuals travelling up a random river may not find mates; while homing to the same river means the multitude of salmon present at the same time, laying eggs and producing sperm, increases the chances of successful fertilisation (as internal fertilisation doesn't occur in these species).</p> <p>Mass spawning means predators are unable to eat all the salmon, a strategy that ensures sufficient salmon survive to leave the river, survive their time in the ocean and reach sexual maturity, and survive the return to reproduce, thereby maintaining the genetic diversity and population size.</p> <p>The vast numbers of young mean the population is likely to continue as the parent numbers will be replaced by the next generation.</p>	<p>Describes:</p> <ul style="list-style-type: none"> • homing • an advantage of homing • a navigation method • taxic behaviour • positive chemotaxic behaviour or positive rheotaxic behaviour • disadvantage of no parental care • an advantage of producing lots of eggs and sperm • describes advantage of spawning in same river • identifies this as an r-strategy 	<p>Explains:</p> <ul style="list-style-type: none"> • homing and advantage • homing mechanism • navigation and advantage • an advantage of a lot of young • advantages of spawning in same river. 	<p>Discusses, demonstrating comprehensive understanding of:</p> <ul style="list-style-type: none"> • reasons why successful homing and returning to the same stream / river is so important for the survival of the young / species • r-strategy and no parental care, with reference to the Masu salmon, and why this is a successful reproductive strategy.

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N0 = No response; no relevant evidence.