



Mana Tohu Mātauranga o Aotearoa New Zealand Qualifications Authority

Level 3 Biology 2023

91603 Demonstrate understanding of the responses of plants and animals to their external environment

Credits: Five

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of the responses of plants and animals to their external environment.	Demonstrate in-depth understanding of the responses of plants and animals to their external environment.	Demonstrate comprehensive understanding of the responses of plants and animals to their external environment.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

If you need more room for any answer, use the extra space provided at the back of this booklet.

Check that this booklet has pages 2–12 in the correct order and that none of these pages is blank.

Do not write in any cross-hatched area (^{ov write in i}). This area will be cut off when the booklet is marked.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

91603

QUESTION ONE: ABIOTIC RESPONSES

Tulips flower in spring, having been pollinated by wind or animals. Tulips have been studied for decades, and much has been learned of their responses to the abiotic environment. They have been found to show both thermonasty and photonasty, as well as geotropic responses. When cut and placed in a vase, tulips still show geotropism and phototropism.



Discuss how the responses mentioned above help to ensure the success of the tulip.

In your answer, include discussion of:

- the terms tropism and nastic, including definitions
- an advantage for the tulip in exhibiting negative geotropism **and** an advantage in exhibiting positive phototropism
- how exhibiting both thermonasty and photonasty helps to ensure successful pollination in tulips.

There is more space for your answer to this question on the following page.

Biology 91603, 2023

3

Biolog	gy 91603, 2023	HIS AREA. DOWN THE IN THIS AREA. N THIS AREA. DO NOT AREA. DO NOT REA. DO NOT WRITE DONOT WRITE NOT WRITE IN THIS TO WRITE IN THIS NUMB AREA. D T WRITE IN THIS IN THIS AREA. D T WRITE IN THIS IN THIS AREA. D
		NOT WRITE IN T WRITE IN THIS
		REA DO NOT W WRITE IN THIS DO NOT WRITE
		RITE IN THIS ARE N THIS AREA DI ARPA DO NOT
		RITE IN THIS ARE
		TEINTHS ARE NTHISAREA DO AREA DO NOT
		HISAREA QO'N ISAREA QO'N ISAREA DO'NG NOT WRITE IN T NOT WRITE IN T WRITE IN THIS
		HIS AREA DO'NO
		IN THIS AREA D TWRITE IN THIS ITE IN THIS AREA
		WRITE IN THIS TE IN THIS PAREA HIS AREA DO N WRITE IN THIS IN THIS AREA D IN THIS AREA D TWRITE IN THIS TWRITE IN THIS
		NOT WRITE IN T WRITE IN THIS
		NO WARTE IN THE A
		FE IN THIS AREA HIG AREA DO N
		WRITE IN THIS
		WRITE IN THIS TE IN THIS AREA HIS AREA DO N
		DONOTWRITE
		MISAREA DON SAREA DONO NOTWRITE INT
		TEIN THIS AREA
		HISTAN WRITE IN THIS
		WRITE IN THIS
		DO NOT WRITE
		TE IN THIS AREA S AREA BOAR S AREA BOAR TEINTHS BREA DO NOT WRITE NOT WRITE IN THIS R OO NOT WRITE IN NOT WRITE IN THIS TE IN THIS AREA HIS PREA HIS PREA NOT WRITE IN THIS TE IN THIS AREA NOT WRITE IN THIS TE IN THIS REAL OF THIS REAL OF THIS TE IN THIS REAL OF THIS TE IN THIS REAL OF THIS TH
		TEIN THIS AREA THIS AREA DO
		REA DONOT W TE IN THIS AREA
		WRITE W THIS M TE IN THIS AREA THIS AREA DO REA DO NOT W
		WRITE IN THIS A E IN THIS AREA IS AREA DO NO
		IS AND NOT WR
		от учирта и тыр. пере и тар. пере и тар. и т
		DO NOT WRITE
		VRITEIN®THISAR
		REA DO'NOT M THIS AREA DO NOT WRITE
		VRITE IN THIS AREA DO
		DO NOT WRITE DO NOT WRITE II
		ITE IN THIS AREA
		HISAREA DO NU A DO NOT WRITE
	4	DO NOT WRITE NOT WRITE IN TH OT WRITE IN TH TEIN THIS AREA TEIN THIS AREA
		DO NOT WRITE

QUESTION TWO: AGGRESSIVE BEHAVIOUR

The Chillingham wild cattle are the only cattle in the world that have remained pure, with no breeding from any outside population. They still roam wild in their historical surroundings, the 365-acre park at Chillingham in England, which was closed off in the 13th century to provide food and hunting. They are believed to be the descendants of the original oxen which once roamed England. Their estimated population numbers vary between 40 and 60. This is the total world population.

The bulls in the population have a dominance hierarchy. The alpha male is known as the 'king'. Most challenges are settled by ritualised fighting, a display of bellowing, pawing of the ground, and tossing dirt and debris around. Sometimes it escalates to full-contact fighting, resulting in injuries or deaths.



Discuss the behaviours that have led to the success of the herd.

In your answer, include discussion of:

- dominance hierarchy, including a definition
- an advantage of the hierarchy for the king
- an advantage for the females in having a king in the herd
- why fighting is usually ritualised but may escalate to a physical fight at times.

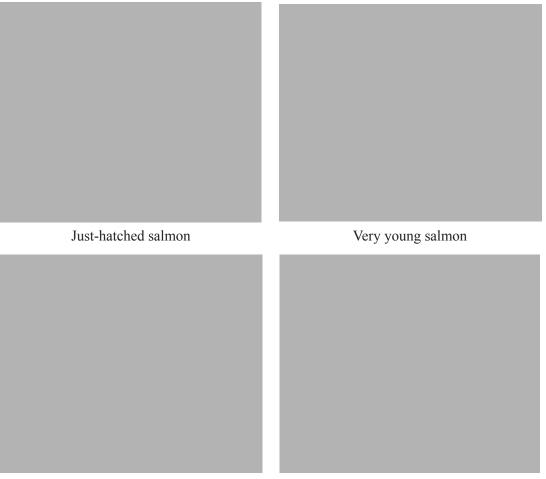
There is more space for your answer to this question on the following pages.

	DONGT WR
6	
-	HISAREA D
	IS AREA DO
	VRITE IN THIS
	REA DO'NO
	NOT WRITE II NRITE IN TH
	NTHIS AREA
	DO NOT WRI OT WRITE IN
	WRITE IN THI
	IS AREA DO
	IN THIS ARE WRITE IN TH
	E IN THIS ARI
	EA DO'NOT
	A DONOTA A A DARA A DARA A A DARA A DARA A A DARA A A DARA A DARA A A DARA
	TE IN THIS N IS AREA DO
	TEINITHS A THIS AREA
	EA DO NOT
	DO NOT WR
	NOT WRITE IN T
	WRITE IN THIS AREA
	TE IN THIS P
	MISAREA DO SAREA DO NOT WRITE
	DOMOTIVR
	HISAREA
	N THIS ARE
	E IN THIS A
	SAREA DG
	DO NOT WE
	WRITE IN T
	HIS AREA
	TÉ IN THIS I
	IS AREA DO
	IS AREA DO IS AREA DO NOT WRITE NOT WRITE WRITEIN
	N THIS AREA
	AREA DON
	TELMITHES THE AREA AREA TO ON AREA TO ON AREA TO ON HIS AREA TO AREA TO SO AREA TO SO ON THE ON THE AREA AREA TO SO ON THE THE AREA AREA TO SO ON THE AREA TO SO THE AREA AREA TO SO THE AREA TO SO THE AREA AREA TO SO THE AREA T
	N THIS AREA AREA DO N
	REA DO NO
	DO NOT W
	T WRITE IN TE IN THIS
Biology 91603, 2023	TEINTHIGA MIGARES TWRITEIN IN HIGARE TWRITE
	IN THIS ARE

HISAREA DO	
AREA DO NOT	
REA DO NOT V	
ONOT WRITE N	-
WRITE	7
- IN THIS	
NTHIS ARCA	
REA DO NOT V	
O NOT WRITE	
VBIT	
THIS A	
HISAKE	
HIS AREA DO NOT	
NOT WAS	
OT WRITE	
5 IN TH	
T WRITE	
DONOT	
DO NOT WRIT	
OT-Wild -	
I I E IN TH	
E IN THIS ARE	
IS AREA DO	
DO NOT WO	
NOT WRITE	
RITE	
THIS A	
N THIS ARE NOT WORK	
DO NOT WP	
NOT WRITE	
IRITERIA	
- IN THIS PA	
DEA DONOTI	
DO NOT WA	
WRIT	
A BARA DO ANTI A	
- IN I HIS ARD	
Dive	
NOT WAL	
TWRNTEN	
n in SullNuTHIS	
E'IN THIS AROA	
IN THIS AREA	
HIS AREA DO	
AREA DO NOT	
A DONOT WA	
D'NOT WRITE II	
WRITE IN THIS	
A DO'NOT WA	
DT WRITE IN T	
A DO NOT WE	
O'NOT WRITE II	
WRITE IN THIS	
RITE IN THIS AF	
AREA, DO NOT	
HIS AREA DO	
AREA DONOT	
A DO NOT WR	
NOI WRITEIN	
WRITE IN THIS	
A DO NO I WA	
JI WRITE IN TH	
JINGT WRITE IN	
THIS	
TE IN THIS AR	
AREA DUNUI	
HIS AREA	
AREA DUNUT	
NOT When	
WRITEN	
DONOT WE	
OT WORK	
DONOT WE	
O NOT WRITE	
WRITE	
EIN THIS	
DO NOT	
AREA DONO	
AREA DONOT	
A DONOT W	
OU NUT WRITE	
VIRITE IN TH	
TE IN THIS ARE	
WRITE	
VRITE IN THIS	
OT WOR	
THE IN TH	
TE IN THIS ARE	
IN THIS AREA	
A DUNGIWA	
AREA DO	
THIS A	
ADD NOT WRITEIN NOT WRITEIN NOT WRITEIN ADD NOT WRITEIN ADD NOT WRITEIN ADD NOT WRITEIN ADD NOT WRITEIN ADD NOT WRITEIN WRITEIN THISA ADD NOT WRITEIN ADD NOT W	
AREA DO NO AREA DO NO EA DONOT WA	

QUESTION THREE: SALMON HOMING BEHAVIOUR

Masu salmon (*Oncorhynchus masou*) is a fish species native to northeast Asia. All salmon have an excellent homing ability, which results in their return to the same stream they hatched in, to produce offspring. This homing ability appears to be due to the imprinting of chemicals present in the home stream when they were young. Once in the river, the female fish release eggs, and male fish swim over the eggs, releasing sperm. This is known as spawning, after which many adults die. There is no parental care for the fertilised eggs or the young salmon once they hatch.



Young salmon migrating downstream to sea

Adult salmon migrating upstream

Discuss how the homing behaviour of the salmon ensures their success as a species.

In your answer, include discussion of:

- a navigation method used by the salmon to move from the sea to the stream, and a taxic response to move up the stream, including a description of each
- an advantage of this homing behaviour
- how having a lot of young is a successful reproductive strategy for the salmon.

There is more space for your answer to this question on the following pages.

9

	ронат иляте пот иляте и иля и тимите и иля периллявлее назглех до м а волот иляте ор мот иляте периллявлее и тимите периллявлее от иляте опот иляте опот опот иляте опот опот иляте опот опот опот опот опот опот опот оп
10	TEINTHSPREA HISPAREA, DON A BONIOT WR
	ро иоч <i>WRITE]</i> от <i>WRITE</i>] <i>Пё IN</i> Тибісьр ⁶²
	ਹੇ ਅਹੁਜ਼ ਅਲੇਪੇਸ਼ ਇਹਲੇ ਇਹਲੇ ਪਰਿਲਰਾ 2014
	VOTVURITE IN T VRITE IN THISAT N THISAREA DI
	n rendor Afra DG. Afra Aint M Jank Ton
	אראדייעידער איז
	יס אסז איזאדען סד איזאר איז איז שאודע איז און אא
	E My This AMEA IS AFRA JOÖ NO A DONOT WA
	IN THIS AREA I WRITEIN/THIS A E ŵ THIS AREA
	โลลีสุมา ได้มาไฟม์ ได้ พระเมือง เป็น เป็น เป็น เป็น เป็น เป็น เป็น เป็น
	Marte W this Aska Herrika Telwarte V
	REĂ DONOT W TE ÎN THIS ÂREĂ S ÂREA BOAIO TEJN THIS ÂREĂ DO THIS ÂREA DO
	דבאע זארא פאפא איז איז איז איז איז איז איז איז איז איז
	ea 'dd write'n 'this r write'n 'this r dd not write'
	ער אפאראין אין אין אין אין אין אין אין אין אין
	HIS ANEA, DD N Witte In THIS IN THIS AREA.D
	TWEITE IN THIS TEIN THIS AREA IN AREA OON
	HIGANER DO N GAREA DONO NOTWATE,MT DONOT WATE
	ער איז
	יב אין דאופ אינער אין אין אופאריב ער אין איז איז איז איז איז איז איז איז איז איז
	NON WRITE IL T WRITE IN THIS TE IN THIS TE IN THIS REAL WRITE IN THIS WRITE IN THIS WRITE IN THIS REAL WRITE IN THIS REAL SATES SATE
	Hig And S Arga ADA NO NOT WRITE, NT O AND WRITE
	NOT WAILE N NOT WAILE N T Waite N The
	Warker Warker Të Na Thispaela Nisarea Warre No This Na Thispaela Na Thispaela Na Thispaela Na Thispaela Tarkare No This Tarkare No Thispaela
	וא דוגא אייי דאידע איין דוגע דרכם איין איין איין איין איין איין איין איי
	Und Harrison Ha
	รับเรื่องสู่ เป็นกับรับ - เป็นเรื่องสู่ เป็นกับรับ
	יים או געריי איז איז איז איז איז איז איז איז איז איז
	אוק אפיבא דען איז זידב איז אוקאראליד א דוויבאל דע א דוויבאלידע
	RITELWINHES ARE HIS AREA DON UTE IN THISARE N THISAREA U N THISAREA O AREA DO BOT WRITE IN THIS DO AOT WRITE NOT WRI
	อุจังจับ พรุญ เงิน พรุญ พรุญ 15 พรุม 1 พรุม 15 พรุม
Biology 91603, 2023	TE W THIS TE W THIS ARE THIS WELL THIS WELL WRITE IN THIS AREA T WRITE

	11
1	Extra space if required. Write the question number(s) if applicable
DN FR	

	Extra space if required. Write the question number(s) if applicable.
ESTION JMBER	write the question number(s) if applicable.
I	
	ledgements from the following sources has been adapted for use in this assessment:
age 2	
mages:	http://www.nodiggardener.co.uk/2013/05/something-for-weekend-nicely-nastic.html
a ge 5 nage:	https://chillinghamwildcattle.com/beasts/fighting/
age 8	
mages:	(just-hatched) https://www.sciencedirect.com/science/article/pii/S0006291X20321963 (very young) https://twitter.com/cgtnofficial/status/1294501668625592321 (migrating downstream) https://kidadl.com/facts/animals/masu-salmon-facts

12

WRITE

DO NOT WRITE II NOT WRITE II WRITE IN THI IN THIS AREA AREA DO NO AREA DO NO

OTWRITEINT RITEINTHISA THISAREA REA DONOTI THISAREA DO THISAREA DO TWRITEINT RITEINTHISA

D NOT WRITE IN TH T WRITE IN TH RITE IN THIS A IN THIS AREA SREA DO NO

IS AREA