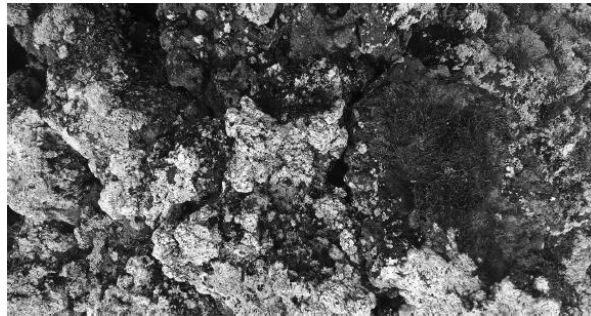


Questions

Q1.

Lanzarote is a volcanic island in the Atlantic Ocean. It lies near the coast of West Africa. The photograph shows lichens growing on volcanic rock in Lanzarote.



Lichens are organisms composed of a fungus and algae living together. Lichens colonise bare rock.

Devise an investigation to show how the lichen distribution is affected by a named abiotic factor.

(6)

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(Total for question = 6 marks)

(iii) Explain which statistical test would be most suitable to test this null hypothesis.

(2)

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(Total for question = 8 marks)

Q3.

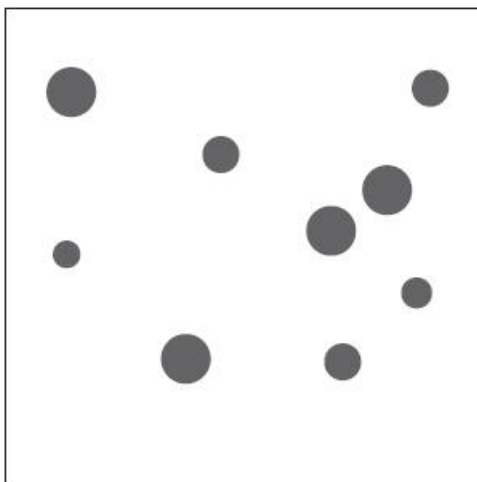
The drawing shows a plant called white clover, *Trifolium repens*.



A student used a 50 cm × 50 cm quadrat to compare the abundance of white clover in a trampled area of grassland and an untrampled area of grassland.

Each area measured 90 m × 45 m.

The diagram shows the distribution of white clover plants in one quadrat from the area of trampled grassland. Each circle represents one clover plant.



(i) Use the results from this quadrat to calculate the total number of white clover plants present in the area of trampled grassland.

(2)

Answer

(ii) The student used the same method to calculate the total number of white clover plants in the area of untrampled grassland.

The student decided that the calculated values were not accurate.

Explain how you would modify the method to obtain more accurate results.

(3)

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(Total for question = 5 marks)

Q4.

Answer the question with a cross in the box you think is correct . If you change your mind about an answer, put a line through the box . If you change your mind about an answer, put a line through the box and then mark your new answer with a cross .

The photograph shows a glacier that is melting. As the glacier gradually melts, it leaves behind bare rock.



(Source: © CHARLES D. WINTERS/SCIENCE PHOTO LIBRARY)

Scientists sampled the soil from areas that had been uncovered for different lengths of time after the glacier ice had melted.

The table shows the results from the samples.

Length of time since glacier melted / years	Soil depth / cm	Mass of nitrate in soil / mg m^{-2}	Mass of leaf litter that falls to ground each year / $\text{g m}^{-2} \text{yr}^{-1}$
5	5.2	3.8	1.5
15	6.4	4.1	1.7
40	7.0	5.3	12.8
100	9.2	21.8	277.0
150	10.8	35.4	335.0
200	15.1	53.3	277.0
250	16.2	61.4	261.0

Which of the following should be used to determine if there is an association between length of time since the glacial ice has melted and soil depth?

- A chi squared
 B correlation coefficient
 C standard deviation
 D t-test

(1)

(Total for question = 1 mark)

Mark Scheme

Q1.

Question Number	Acceptable Answers	Additional Guidance	Mark
	<p>An answer that makes reference to six of the following:</p> <ul style="list-style-type: none"> relevant abiotic factor named (1) select {sample sites with environmental differences /one site with environmental gradient} (1) {quadrats / point frame} used {at random /in a transect} (1) to measure presence or absence of lichens (1) method used to measure abiotic factor described (1) t test carried out to measure significant difference (1) other named variable controlled or measured (1) 	<p>eg light intensity, temperature, distance from sea, altitude</p> <p>Allow calculation of percentage cover described</p> <p>Allow correlation test carried out to measure correlation if appropriate Allow standard deviations compared.</p>	(6)

Q2.

Question Number	Answer	Additional Guidance	Mark
(i)	there is no difference in the (mean) height of <i>Galium verum</i> growing in meadow and dunes (1)	Accept reference to no significant difference in the (mean) height of <i>Galium verum</i> growing in meadow and dunes	Exp (1)

Question Number	Answer	Additional Guidance	Mark
(ii)	<p>An answer that includes the following:</p> <ul style="list-style-type: none"> • use of random numbers to select sampling site (1) • use of (frame or point) quadrat (to define sampling area) in meadow and dune (1) • measurement of height of <i>Galium verum</i> (1) • large sample size or use of running mean (1) • attempt to {control / measure} named variable (1) 	<p>Accept description of setting up grid and using co- ordinates for random sampling</p> <p>Accept closest plant to point selected in meadow and dune</p> <p>eg at least 10 plants in each place</p> <p>eg shading / slope / grazing / trampling / time of year / rainfall / use of herbicide Ignore soil type / pH / time of day</p>	Exp (5)

Question Number	Answer	Additional Guidance	Mark
(iii)	<p>An explanation that includes the following points</p> <ul style="list-style-type: none"> • t-test (1) • (because it) tests for the difference between the means of two sets of values (1) 	<p>Accept other suitable test eg Mann Whitney U test</p> <p>Accept it tests for a (significant) difference between two sample sets</p>	Exp (2)

Q3.

Question Number	Answer	Additional Guidance	Mark
(i)	<ul style="list-style-type: none"> calculate the area of quadrat and calculate the area of grassland to calculate the number of quadrats in grassland (1) multiply number of quadrats in area of grassland by number of clover (1) <p>Or</p> <ul style="list-style-type: none"> number of clover plants per m² (1) multiply by total area of grassland in m² (1) 	<p><u>Example of calculation</u></p> $50 \times 50 = 2500 \text{ cm}^2 / 0.25 \text{ m}^2$ and $90 \times 45 = 4050 \text{ m}^2$	(2)
		$4050 \times 4 = 16200$ $16200 \times 9 = 145800$	
		$9 \times 4 = 36$	
		$36 \times (90 \times 45) = 145800$	
		Correct answer with no working gains full marks	

Question Number	Answer	Additional Guidance	Mark
(ii)	<p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none"> use {several quadrats / larger quadrat} (1) therefore larger area sampled (1) place quadrats at random / use random number generation (1) therefore achieve a consistent measure of the mean (1) 	<p>Accept use of running mean</p>	(3)

Q4.

Question Number	Answer	Additional Guidance	Mark
	<p>The only correct answer is: B correlation coefficient</p> <p><i>A is incorrect because chi squared compares frequencies</i> <i>C is incorrect as standard deviation is a measure of dispersion</i> <i>D is incorrect as t-test compares mean values</i></p>		1 comp