

B16- Adaptations, interdependence and competition- Exam Practice 2

Q1.

- (a) Which term describes organisms that can tolerate very hot or very cold places?

Draw a ring around the correct answer.

**an environmental
species**

**an extremophile
species**

**an indicator
species**

(1)

- (b) **Figure 1** shows photographs of an Adelie penguin and a chinstrap penguin. Adelie penguins and chinstrap penguins live in the Antarctic at temperatures below 0 °C.

Figure 1

Adelie penguin



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Chinstrap penguin

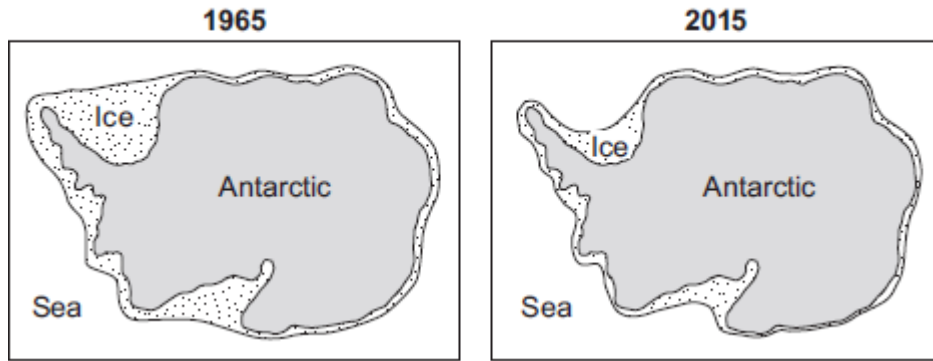


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Adelie penguins spend most of their time on the ice around the Antarctic.
Chinstrap penguins live mainly in the sea around the ice.
Since 1965 the number of Adelie penguins has **decreased** by 6 million.

Figure 2 shows changes to the ice around the Antarctic over the past 50 years.

Figure 2



- (i) Use information from **Figure 2** to explain why the number of Adelie penguins has decreased since 1965.

(2)

- (ii) Suggest what has happened to the number of chinstrap penguins since 1965.

Draw a ring around your answer. **increase / decrease**

Give a reason for your answer.

(1)

- (c) The number of penguins can be used to monitor changes in temperature of the environment.

Temperature readings could also be taken using a thermometer.

What is the advantage of using penguins, instead of a thermometer, to monitor changes in temperature of the environment?

Tick (✓) **one** box.

Living organisms show long-term changes.

Thermometers cannot measure temperatures below 0 °C.

Thermometers do not give accurate readings.

(1)

(Total 5 marks)

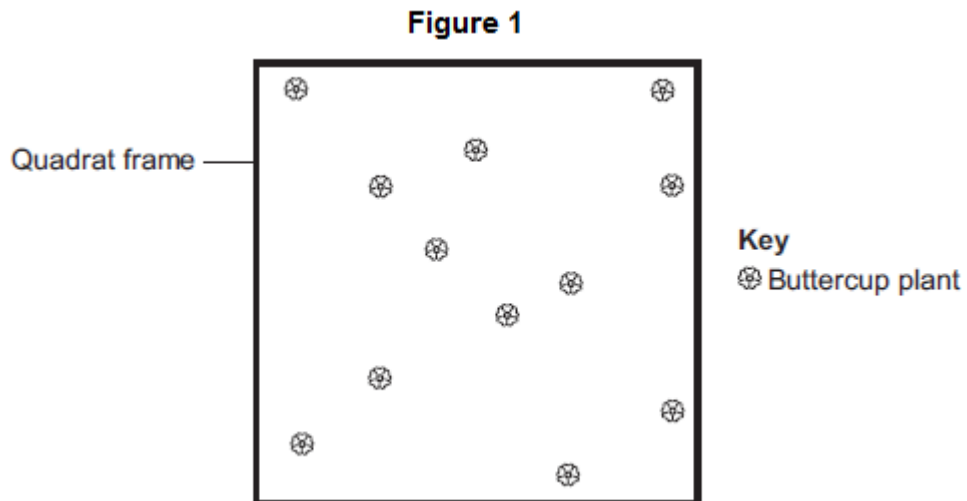
Q2.

A grassy field on a farm measured 120 metres by 80 metres.

A student wanted to estimate the number of buttercup plants growing in the field.

The student found an area where buttercup plants were growing and placed a 1 m × 1 m quadrat in one position in that area.

Figure 1 shows the buttercup plants in the quadrat.



The student said, 'This result shows that there are 115 200 buttercup plants in the field.'

- (a) (i) How did the student calculate that there were 115 200 buttercup plants in the field?

(2)

- (ii) The student's estimate of the number of buttercup plants in the field is probably not accurate. This is because the buttercup plants are not distributed evenly.

How would you improve the student's method to give a more accurate

estimate?

(2)

(b) Sunlight is one environmental factor that might affect the distribution of the buttercup plants.

(i) Give **three other** environmental factors that might affect the distribution of the buttercup plants.

1. _____

2. _____

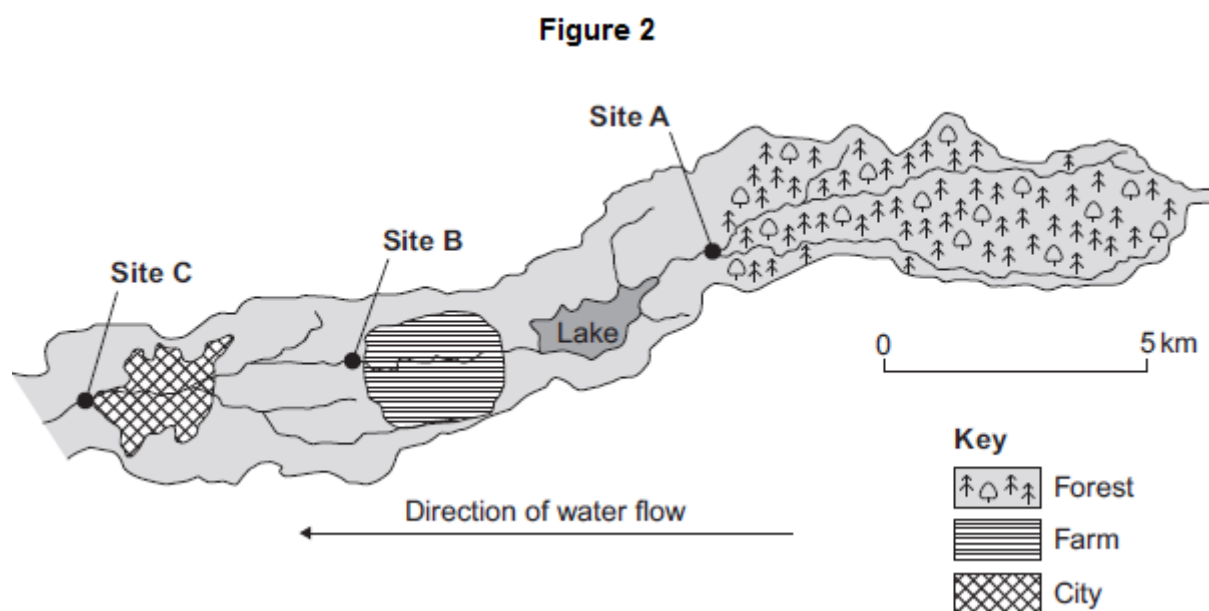
3. _____

(3)

(ii) Explain how the amount of sunlight could affect the distribution of the buttercup plants.

(3)

(c) **Figure 2** is a map showing the position of the farm and a river which flows through it.

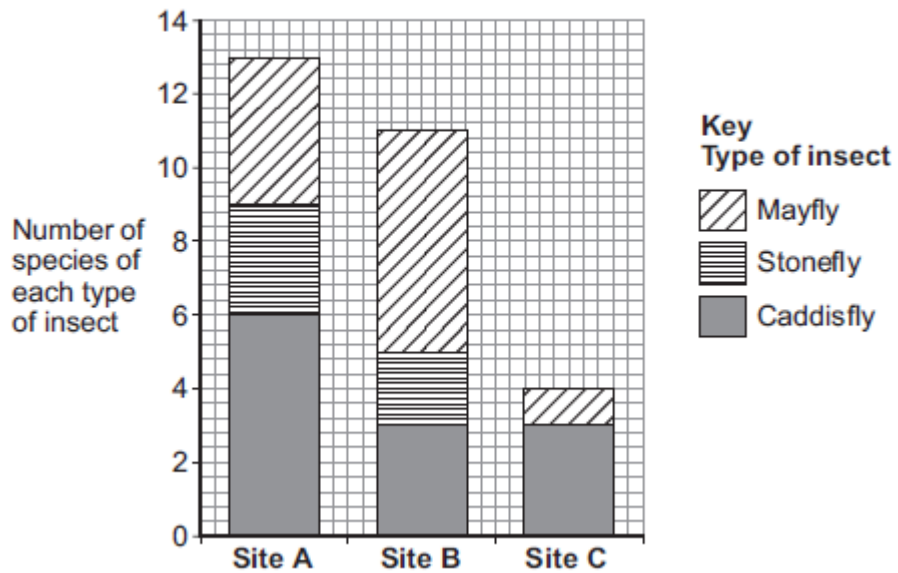


Every year, the farmer puts fertiliser containing mineral ions on some of his fields. When there is a lot of rain, some of the fertiliser is washed into the river.

(i) When fertiliser goes into the river, the concentration of oxygen dissolved in the water decreases.

Explain why the concentration of oxygen decreases.

Figure 3



- (i) How many more species of mayfly were there at Site **B** than at Site **A**?

_____ (1)

- (ii) Suggest what caused this increase in the number of species of mayfly.

(1)

- (iii) The scientists stated that the number of species of stonefly was the best indicator of the amount of oxygen dissolved in the water.

Use information from **Figure 3** to suggest why.

(1)
(Total 19 marks)

Combined Higher Questions

Q3.

Organisms have adaptations that enable them to survive in extreme conditions.

(a) The photograph shows an arctic fox.



This fox lives in the arctic, where it is very cold.

Suggest **two** ways in which the arctic fox is adapted for life in very cold conditions. Explain how each adaptation helps the arctic fox to survive in very cold conditions.

Adaptation 1 _____

How this adaptation helps the arctic fox to survive in very cold conditions.

Adaptation 2 _____

How this adaptation helps the arctic fox to survive in very cold conditions.

(4)

(b) The photograph shows an antelope that lives in a sandy desert.



The antelope is prey to large cats such as cheetah.

Suggest **two** adaptations that help this antelope to avoid being killed by predators. Explain how each adaptation helps the antelope to avoid being killed by predators.

Adaptation 1 _____

How this adaptation helps the antelope to avoid being killed by predators.

Adaptation 2 _____

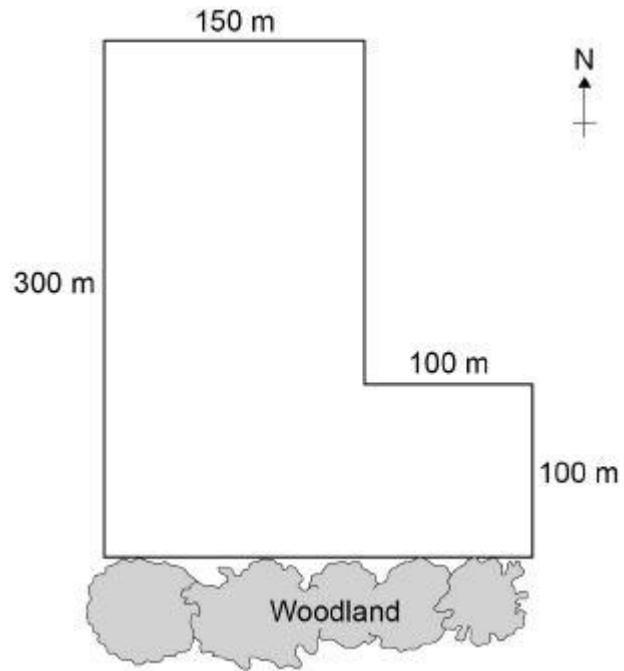
How this adaptation helps the antelope to avoid being killed by predators.

(4)
(Total 8 marks)

Q4.

Some students investigated the size of a population of dandelion plants in a field.

The diagram below shows the field.



The students:

- placed a 1 m × 1 m square quadrat at 10 random positions in the field
- counted the number of dandelion plants in each quadrat.

The table below shows the students' results.

Quadrat number	Number of dandelion plants
1	6
2	9
3	5
4	8
5	0
6	10
7	2
8	1
9	8
10	11

(a) Why did the students place the quadrats at random positions?

(1)

Mark schemes

Q1.

- (a) an extremophile species 1
- (b) (i) smaller ice area
allow smaller amount of ice
allow less ice 1
- (so) less habitat
allow fewer places to live / nest 1
- (ii) **either** increase
as more sea to live in
or
as less competition for food
- or** decrease
as less space (ice) to lay eggs
or
predators more likely to eat them
- there is no mark for increase / decrease alone. The mark is for an appropriate reason linked to increase / decrease*
if increase / decrease not ringed the mark may be awarded if it is clear in the explanation which is intended 1
- (c) Living organisms show long-term changes. 1
- [5]**

Q2.

- (a) (i) counts / 12 1
- $\times 120 \times 80 / \times 9600$
or
 \times area of field 1
- (ii) (more) quadrats / repeats 1
- placed randomly
ignore method of achieving randomness 1
- (b) (i) any **three** from:
- temperature / warmth / heat
 - water / rain
 - minerals / ions / salts (in soil)

		<i>allow nutrients / fertiliser / soil fertility</i>	
		<i>ignore food</i>	
		• pH (of soil)	
		• trampling	
		• herbivores	
		<i>ignore predators</i>	
		• competition (with other species)	
		• pollution qualified e.g. SO ₂ / herbicide	
		• wind (related to seed dispersal).	
		<i>ignore space / oxygen / CO₂ / soil unqualified</i>	3
(ii)		light needed for photosynthesis	1
		for making food / sugar / etc.	1
		effect on buttercup distribution eg more plants in sunny areas / fewer plants in shady areas	1
(c)	(i)	fertiliser / ions / salts cause growth of algae / plants	1
		(algae / plants) block light	1
		(low light) causes algae / plants to die	1
		microorganisms / bacteria feed on / break down / cause decay of organic matter / of dead plants	
		<i>do not allow germs / viruses</i>	1
		(aerobic) <u>respiration</u> (by microbes) uses O ₂	
		<i>do not allow anaerobic</i>	1
(ii)		sewage / toxic chemicals / correct named example eg metals / bleach / disinfectant / detergent etc	
		<i>allow suitable named examples eg metals such as Pb / Zn / Cr / oil / SO₂ / acid rain / pesticides / litter</i>	
		<i>ignore chemicals unqualified</i>	
		<i>ignore waste unqualified</i>	
		<i>ignore human waste / domestic waste / industrial waste unqualified</i>	1
(d)	(i)	2	1
	(ii)	more food	
		<i>allow other sensible suggestion eg more species colonise from tributary streams after forest</i>	1

- (iii) number of stonefly species decreases (from **A** to **B** / **B** to **C** / **A** to **C**) as more pollution enters river / less oxygen
allow fewer species in more polluted water
ignore none are found at site C

1

[19]

Q3.

(a) 1 mark for each adaptation and 1 mark for its correct linked advantage

- long / thick hair / fur (1)
for insulation (1)
allow keeps warm
- small ears (1)
for reduced heat loss (1)
- small feet (1)
for reduced heat loss (1)
ignore wide feet
ignore prevent sinking
- white fur / coat (1)
for camouflage / poor emitter (1)
- small SA/V ratio (1)
reduces heat loss (1)
- thick layer of fat (1)
insulates / keeps warm (1)

max 4

(b) 1 mark for each adaptation and 1 mark for its correct linked advantage

- horns (1)
for defence (1)
- long legs (1)
for speed / escape / vision (1)
- light colour (1)
for camouflage (1)
allow pattern
- eyes on side of head (1)
for wider field of vision (1)
- hooves (1)
for speed / escape (1)
- large ears (1)
to hear predators better (1)

max 4

[8]

Q4.

- (a) there is an uneven distribution of dandelions
or
(more) representative / valid
or
avoid bias
or
more accurate / precise mean
ignore accurate / precise unqualified
ignore repeatability / reproducibility / reliability /
fair test 1
- (b) (correct mean per m² =) 6 or 6.0 1
- (correct field area =) 55 000 (m²) 1
- mean × area – e.g. 6(.0) × 55 000
allow incorrect calculated values for mean and /
or field area 1
- 330 000
allow correct calculation from previous
calculation 1
- 3.3×10^5
allow calculated value in standard form 1
an answer of 3.3×10^5 scores 5 marks
an answer of 330 000 scores 4 marks
- (c) **Level 3:** The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced. 5–6
- Level 2:** The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced. 3–4
- Level 1:** The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear. 1–2
- No relevant content** 0
- Indicative content**
- placing of quadrat
 - large number of quadrats used
 - how randomness achieved – e.g. table of random numbers **or** random number button on calculator **or** along transect
 - quadrats placed at coordinates **or** regular intervals along transect
 - in each of two areas of different light intensities **or** transect running

- through areas of different light intensity
- for each quadrat count number of dandelions
- for each quadrat measure light intensity
- compare data from different light intensity

to access **level 3** the key ideas of using a large number of quadrats randomly, or along a transect, and counting the number of dandelions in areas of differing light intensity need to be given to produce a valid outcome

(d) any **two** from:

- temperature
allow heat
- water
allow moisture / rain
- (soil) pH
allow acidity
- minerals / ions
allow e.g. magnesium ions or nitrate
allow salts / nutrients
- winds
- herbivores
allow trampling
ignore carbon dioxide
ignore space
ignore competition unqualified
*do **not** accept oxygen*

2

[14]