Adaptations - Interdependence - Competition

Question Paper 1

Level	GCSE (9-1)
Subject	Combined Science – Trilogy - Biology
Exam Board	AQA
Topic	4.7 Ecology
Sub-Topic	Adaptations – Interdependence - Competition
Difficulty Level	Gold Level
Booklet	Question Paper 1

Time Allowed: **53 minutes**

Score: **/ 53**

Percentage: **/100**

Grade Boundaries:

Q1. In January 2011 more than 600 000 people collected results for the UK national bird survey.

People recorded the number of each species of bird they saw in 1 hour on 1 day in their garden.

Some of the results are shown in the table below.

Species	Mean number of birds seen per garden	Percentage of gardens in which the bird was seen
House sparrow	4.1	64.5
Starling	3.9	51.3
Blackbird	3.2	95.2
Goldfinch	1.5	33.5

(a) A student looked at the table and said:

"In the UK, house sparrows are more common than blackbirds."

Suggest **three** reasons why the student's statement may **not** be true.

.....

.....

.....

.....

.....

.....

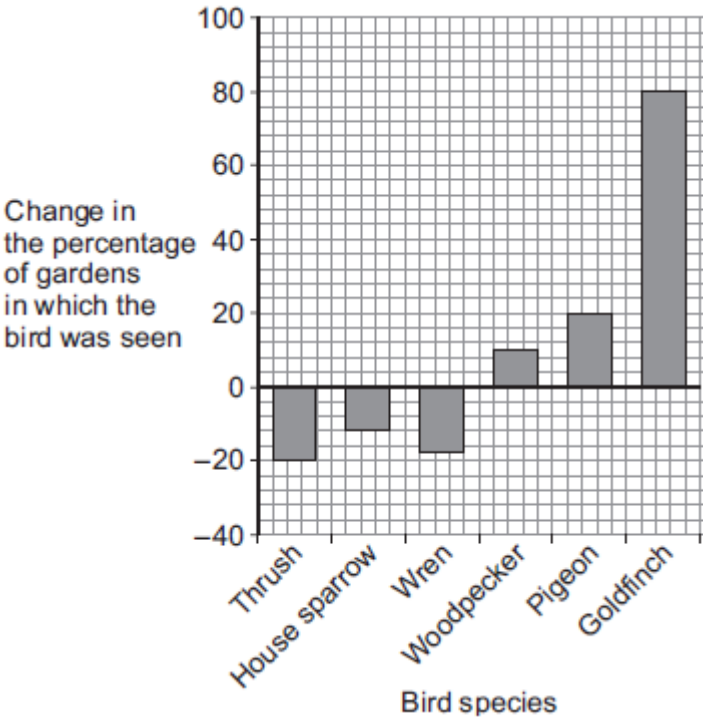
.....

.....

(3)

(b) A survey in 2012 was done in the same way as the 2011 survey.

The graph below shows changes in the percentages of gardens in which some birds were seen from 2011 to 2012.



(i) Calculate the percentage of gardens in which goldfinches were seen in 2012.

Use information from the graph and the table.

.....

.....

Answer = ... %

(2)

(ii) Suggest **two** reasons why goldfinches were seen in more gardens in 2012 than in 2011.

.....

.....

.....

.....

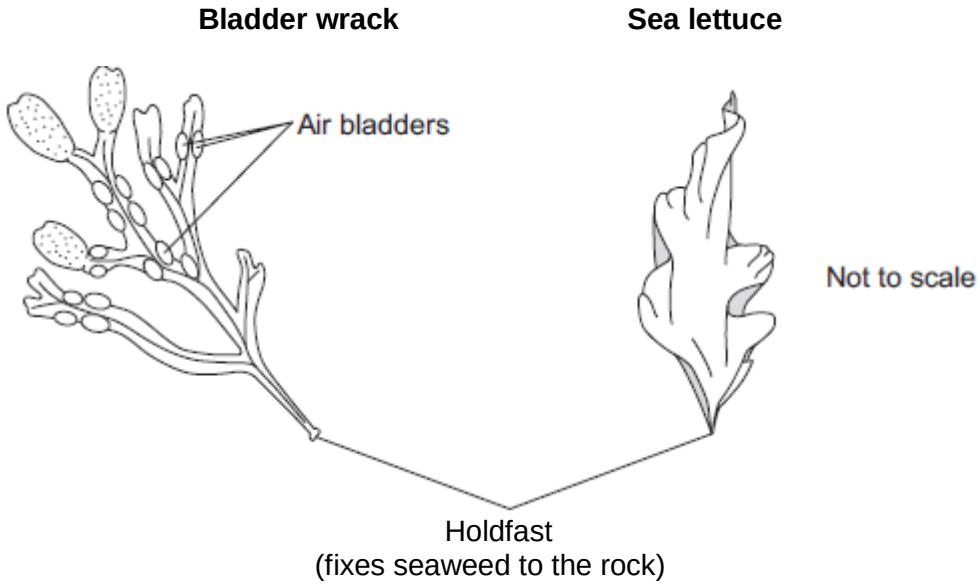
(2)
(Total 7 marks)

Q2. At the seashore, the tide comes in and goes out twice each day.

Some students investigated whether two different species of seaweed could live only at certain positions on a rocky shore.
Seaweeds are plant-like organisms that make their food by photosynthesis.

Figure 1 shows the two species of seaweed that the students investigated.

Figure 1



(a) The students:

1 placed a 50-metre tape measure on the rocks at right angles to the sea

2 placed a quadrat next to the tape measure

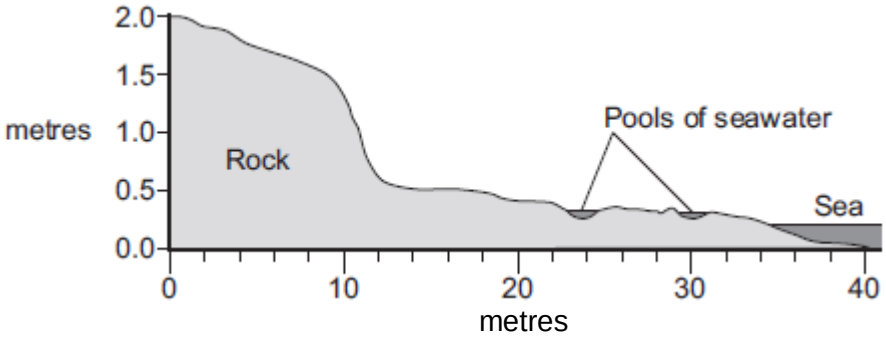
3 recorded whether each species was present or not.

The students repeated steps 2 and 3 every metre down the shore.

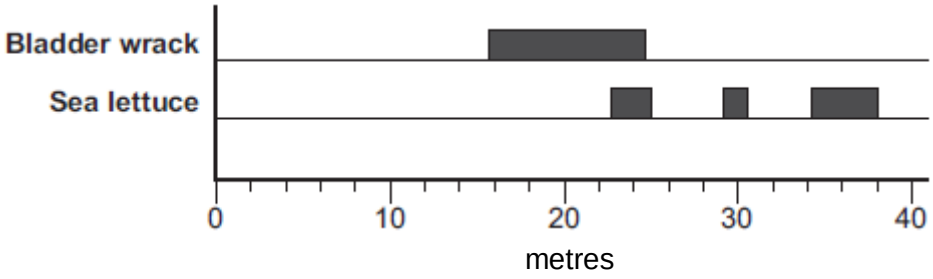
Figure 2 shows a section of the seashore and the students' results.

Figure 2

Section of the seashore



Students' results



(i) The students placed the quadrat at regular intervals along a transect line rather than placing the quadrat at random positions anywhere on the rocky shore.

Explain why.

.....

.....

.....

.....

(2)

(ii) How could the students have improved their investigation to ensure that they produced valid data?

.....

.....

.....

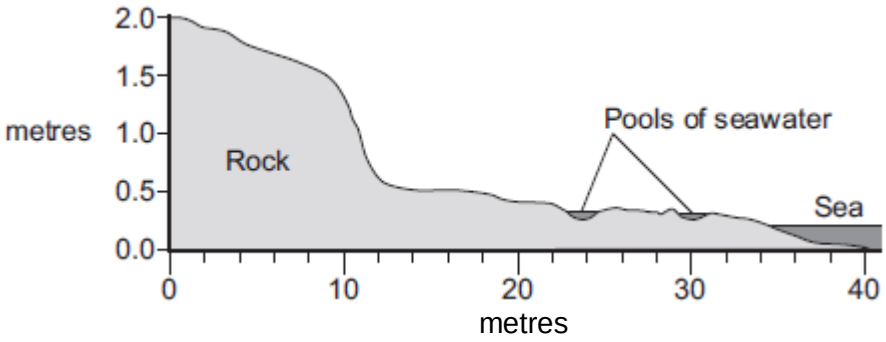
.....

(2)

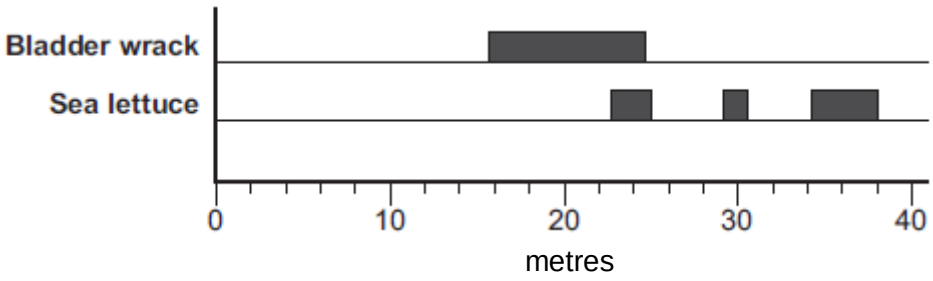
(iii) **Figure 2** is repeated here to help you answer this question.

Figure 2

Section of the seashore



Students' results



The students concluded that bladder wrack is better adapted than sea lettuce to survive in dry conditions.

What is the evidence for this conclusion?

Use information from **Figure 2**.

.....

.....

.....

.....

(2)

(b) The bladder wrack has many air bladders.
The air bladders help the bladder wrack to float upwards when the sea covers it.

Suggest how this helps the bladder wrack to survive.

.....

.....

.....

.....

(2)
(Total 8 marks)

Q3. On a rocky shore, when the tide goes in and out, organisms are exposed to the air for different amounts of time.

(a) On hot, windy days when the tide is out the concentration of the salt solution in rock pools may become very high.

What term is used to describe organisms that can survive in severe conditions such as very high concentrations of salt solution?

.....

(1)

(b) Periwinkles are types of snail.
Students surveyed the different types of periwinkle living on a rocky shore.

The diagram shows the results of the students' survey.
The highest position that the sea water reaches on the shore is called the high tide level.
Each bar represents the range of habitats for each type of periwinkle.

Position on shore	Small periwinkle	Rough periwinkle	Common periwinkle	Flat periwinkle
High tide level ↓ Low tide level				

(i) Which **two** types of periwinkle are likely to compete with each other to the greatest extent?

.....

(1)

(ii) Explain your answer to part (b)(i).

.....

.....

(1)

(iii) The small periwinkle can survive much nearer to the high tide level than the flat periwinkle.

Suggest **two** reasons why the flat periwinkle cannot survive near to the high tide level.

1.....

.....

.....

2.....

.....

.....

(2)
(Total 5 marks)

Q4. Darwin suggested the theory of natural selection.

(a) Explain how natural selection occurs.

.....

.....

.....

.....

.....

.....

.....

(3)

(b) Latitude is a measure of distance from the Earth's equator.

Scientists investigated the effect of latitude on:

- the time taken for new species to evolve
- the number of living species.

The table shows the scientists' results.

Latitude in degrees North of equator	Time taken for new species to evolve in millions of years	Relative number of living species
0 (at the equator)	3–4	100
25	2	80
50	1	30
75 (in the Arctic)	0.5	20

As latitude increases environmental conditions become more severe.

(i) Describe the patterns shown by the data.

.....

.....

.....

.....

.....

.....

(2)

(ii) Suggest explanations for the patterns you have described in part (b)(i).

.....

.....

.....

.....

.....

.....

(2)
(Total 7 marks)

Q5. The photographs show four different species of bird.

Great tit

© JensGade/iStock

Blue tit

© Marcobarone/iStock

Coal tit

© MikeLane45/iStock

Long-tailed tit

© Andrew Howe/iStock

The table gives information about the four species of bird in winter.

Bird species	Mean body mass in grams	Mean energy needed in kJ per day	Mean percentage of day spent feeding
Great tit	21	84.2	75
Blue tit	12	62.4	81
Coal tit	9	49.5	88
Lond-tailed tit	7	42.0	92

(a) (i) Calculate the energy needed per day per gram of body mass for the blue tit.

.....

.....

.....

Answer = ... kJ per day per gram of body mass

(2)

(ii) Describe the trend for energy needed per day per gram of body mass for the four species of bird.

.....

.....

.....

(1)

(iii) Suggest an explanation for the trend you have described in part (a)(ii).

.....

.....

.....

.....

(2)

(b) Describe and explain the trend shown by the data for the time spent feeding in winter for the birds.

.....

.....

.....

.....

(2)

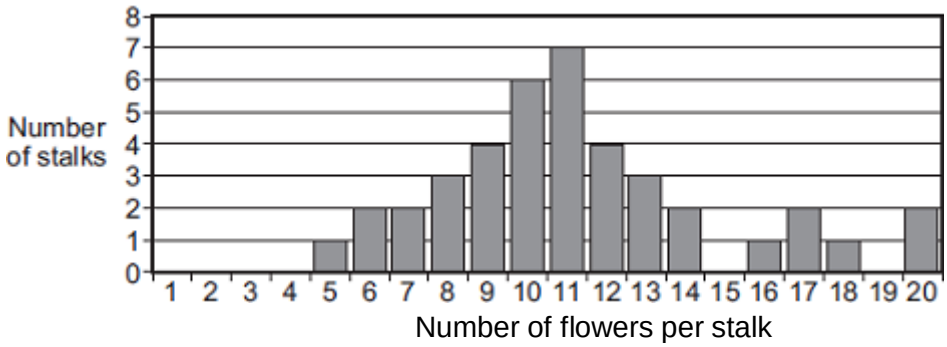
(Total 7 marks)

Q6. Some students studied bluebell plants growing in two different habitats.

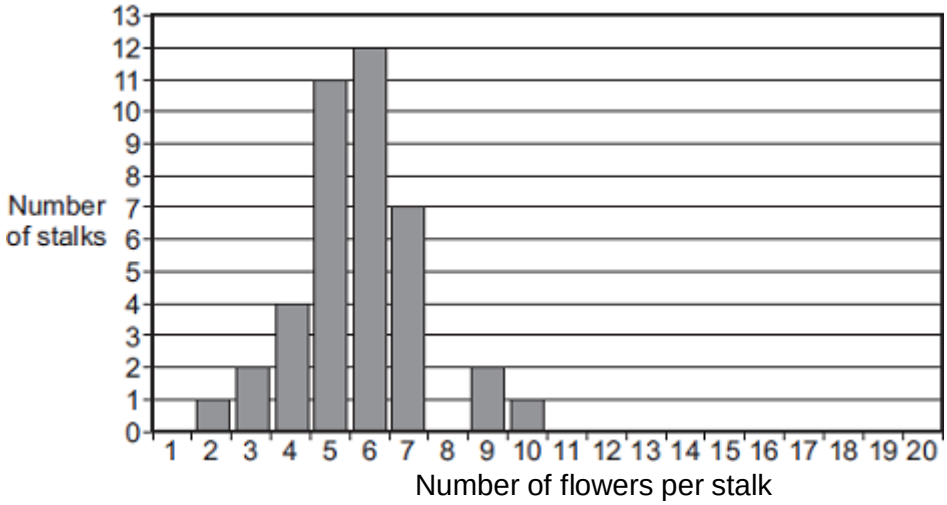
Habitat **A** was a sunny field next to woodland.
Habitat **B** was a shady, moist woodland.

A bluebell plant can have several flowers on one flower stalk. The students counted the number of flowers on each of 40 bluebell flower stalks growing in each habitat.
The bar charts show the results.

Habitat A: Sunny field next to woodland



Habitat B: Shady, moist woodland



(a) The students wanted to collect valid data.
Describe how the students should have sampled the bluebell plants at each habitat to collect valid data.

.....

.....

.....

.....

.....

(2)

(b) (i) The students used the bar charts to find the mode for the number of flowers per stalk in the two habitats.

The mode for the number of flowers per stalk in habitat **A** was 11.

What was the mode for the number of flowers per stalk in habitat **B**?

Mode = ...

(1)

(ii) The students suggested the following hypothesis:

'The difference in the modes is due to the plants receiving different amounts of sunlight.'

Suggest why.

.....

.....

.....

.....

(2)

(iii) Suggest how the students could test their hypothesis for the two habitats.

.....

.....

.....

.....

(2)

(c) Suggest how receiving more sunlight could result in the plants producing more flowers per stalk.

.....

.....

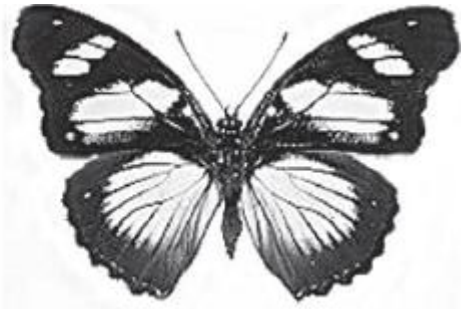
.....

.....

(2)
(Total 9 marks)

Q7. The drawings show two different species of butterfly.

Amauris



Hypolimnas

- Both species can be eaten by most birds.

- *Amauris* has an unpleasant taste which birds do **not** like, so birds have learned **not** to prey on it.
- *Hypolimnas* does **not** have an unpleasant taste but most birds do **not** prey on it.

(a) Suggest why most birds do **not** prey on *Hypolimnas*.

.....

.....

.....

.....

(2)

(b) Suggest an explanation, in terms of natural selection, for the markings on the wings of *Hypolimnas*.

.....

.....

.....

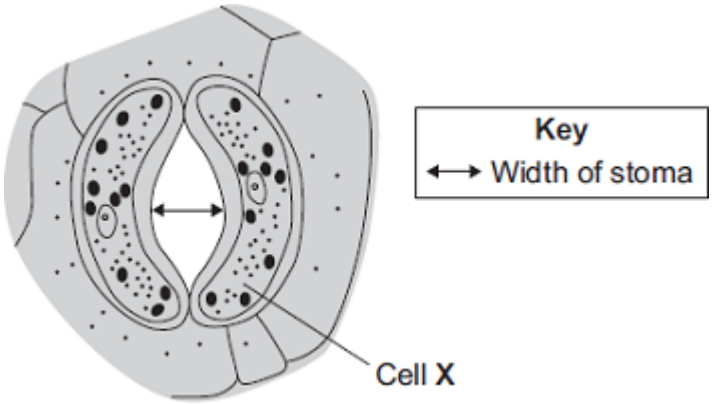
.....

.....

.....

(3)
(Total 5 marks)

Q8. Plant leaves have many stomata.
The diagram shows a stoma.



(a) Name cell **X** . ……..

(1)

(b) The table shows the mean widths of the stomata at different times of the day for two different species of plant.
Species **A** grows in hot, dry deserts.
Species **B** grows in the UK.

	Time of day in hours	Mean width of stomata as a percentage of their maximum width	
		Species A	Species B
Dark	0	95	5
	2	86	5
	4	52	6
Light	6	6	40
	8	4	92
	10	2	98
	12	1	100
	14	0	100
	16	1	96
	18	5	54
Dark	20	86	6
	22	93	5
	24	95	5

The data in the table show that species **A** is better adapted than species **B** to living in hot, dry deserts.

Explain how.

.....

.....

.....

.....

.....

.....

.....

.....

(4)
(Total 5 marks)