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Student number

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Name _____

Date _____

Attempt/Time taken _____

GCSE BIOLOGY

Topic Paper: 7.1 Adaptations, interdependence and competition
Part 1

Time allowed: 35 minutes

Materials

For this paper you must have:

- the Periodic Table/Data Sheet, provided as an insert (enclosed)
- a ruler with millimetre measurements
- a calculator, which you are expected to use where appropriate.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- All working must be shown.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The Periodic Table/Data Sheet is provided as in insert.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering questions you need to make sure that your answer:
 - is clear, logical, sensibly structured
 - fully meets the requirements of the question
 - shows that each separate point or step supports the overall answer.



32 Marks



Q1. 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?

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(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	I	I	I

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

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(1)

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

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(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.

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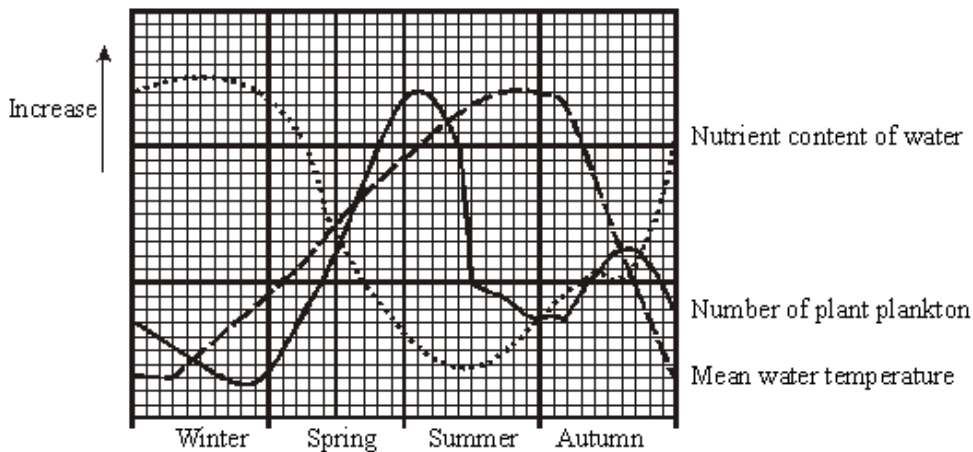
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(2)
(Total 5 marks)

Q2. Plant plankton are aquatic microscopic organisms that photosynthesise. The graph shows the numbers of plant plankton in the North Sea at different times of the year.



Use the data and your knowledge of photosynthesis and growth to explain:

(a) why numbers of plant plankton were low in winter but increased rapidly during the spring,

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(3)



(b) the reduction in numbers of plant plankton in the early summer.

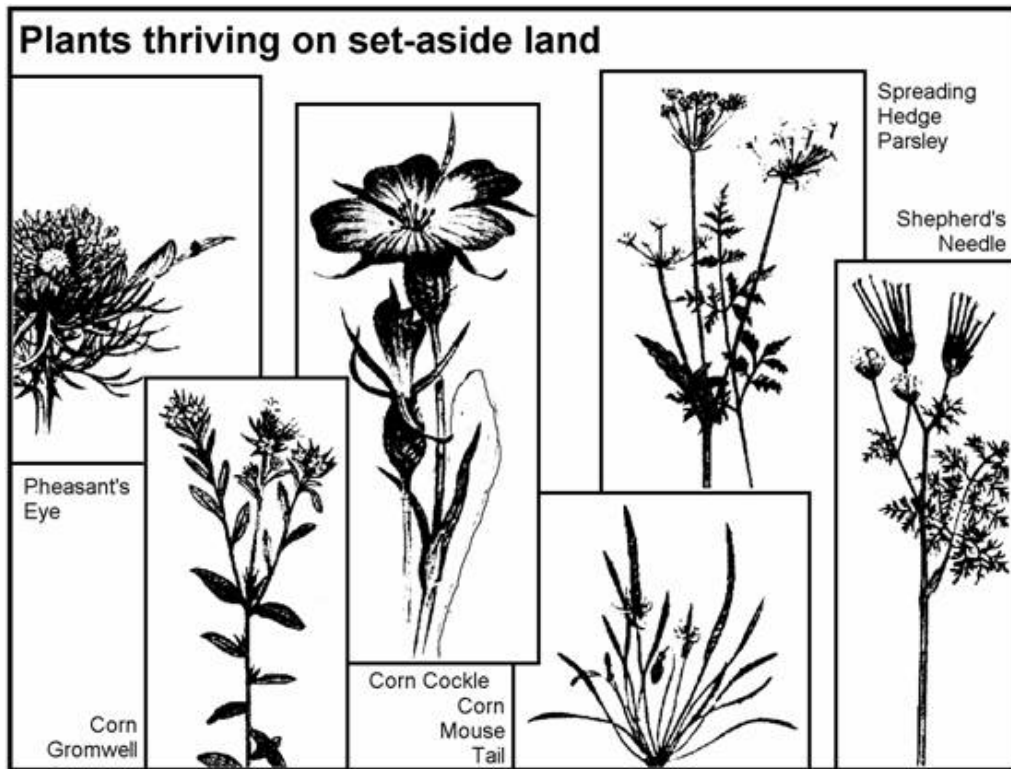
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(1)
(Total 4 marks)



Q3.

The drawings and text for this question are based on an article from The Independent newspaper.

Some of Britain's rarest wild flowers are likely to make a come-back thanks to an EC set-aside regime in which 15 per cent of arable land has been taken out of production.

As a result of this set-aside, shepherd's needle, pheasant's eye, corn gromwell, corn cockle, spreading hedge parsley and corn mouse tail are now thriving once again. They were once common in and around cereal fields and were even regarded as weeds, but were swept to near extinction by the intensification of agriculture after the Second World War. Their small, pale flowers are hardly seen. These plants cannot compete in fields where modern cereal crops are cultivated. Nor, however, do they flourish in semi-natural or wild habitats where nature is left to its own devices. They need farmland which is lightly tilled and cut once a year.



Dr Nick Sotherton, lowland research manager with the Game Conservancy Council, says that these species will flourish under the new rotational set-aside regime, in which farmers are compensated for taking land out of production in an attempt to end crop surpluses.

EC agriculture ministers are meeting to decide how much land should be used for rotational set-aside – in which a field is taken out of production for just one year before being replanted – and how much should be set-aside permanently. The ultimate set-aside is a wood, and Britain is seeking a forestry option.

The Game Conservancy Council says that the rotational scheme can benefit ground nesting birds as well as rare flowers that will not be helped by longer-term set-aside. But Richard Knight of the Wildlife Advisory Group, says “Non-rotational is better because it gives flora and fauna a chance to get well established”.

“Intensification of agriculture” has led to the creation of artificial ecosystems.

- (a) Explain how the creation of artificial ecosystems may have led to the near-extinction of the plants seen in the picture above.

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(4)

- (b) What would you recommend to ministers meeting to decide a policy involving rotational set-aside and permanent set-aside? Explain the reasons for your answer.

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(4)

(Total 8 marks)



Q4. In just a decade the population of the African elephant dropped from 1.3 million in 1979 to 625 000 in 1989. The ivory trade was a major cause of this. The international trade in ivory was banned in 1989 in an attempt to arrest the fall in elephant numbers. The ban does not, however, have universal support, particularly amongst African countries. The extracts below give some opinions about the ban on killing elephants.

Extract 1

Massive publicity for the plight of the elephant in the US and Europe resulted in people refusing to buy ivory products. As a result the world price of ivory fell. Poaching levels fell noticeably in five out of six countries studied since the introduction of the ban.

Extract 2

If the case for wildlife is justified on economic grounds alone, then protected areas could give way to many more profitable forms of land use. Wildlife, and especially an animal as intelligent as the elephant, has an absolute right to life and a value that cannot be measured solely in economic terms.

Extract 3

South African governments consider wildlife a natural resource which must earn its keep alongside other competing forms of land use both by bringing in tourists and from the killing of excess animals for food and other animal products. Zimbabwe for example keeps elephant numbers to a level which can be supported by the vegetation available. Before the ban, ivory and hide were exported to gain valuable foreign currency. The planned use of wildlife for the benefit of local people and as a means of conservation for elephants is of great importance in that country.

Extract 4

Banning the trade in ivory, these countries argue, removes one of the main economic justifications for giving over large areas of land to wildlife and has resulted in heavy financial losses for those countries which conserve elephants. These countries are asking that they should again be allowed to trade in ivory and hides to provide the funding to conserve elephants.

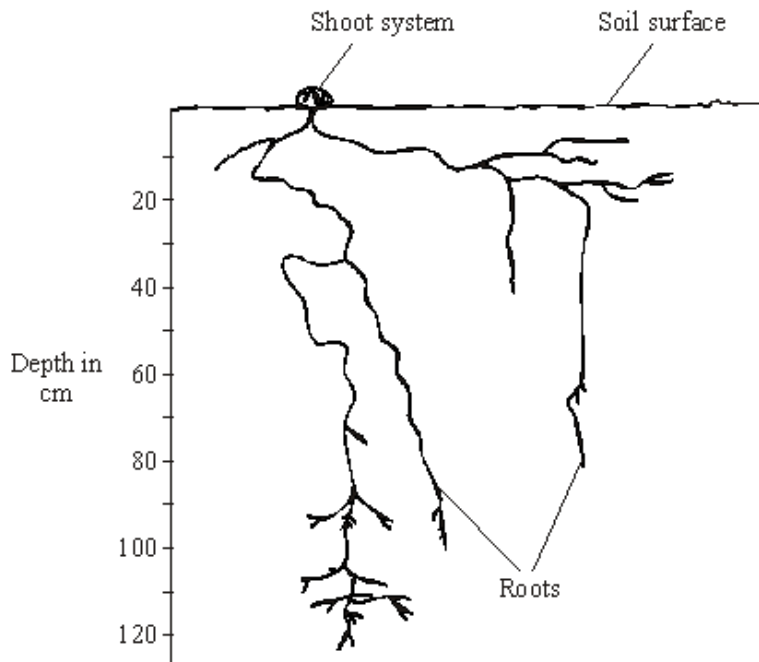
Extract 5

Arguments about the need to preserve elephants for their intelligence or for their appearance carry little weight in a rural population faced with widespread famine. In the long run it appears that African wildlife will have to benefit those who live alongside it, and pay its way if governments are to invest in it.

Read the extracts then state whether you think that the ban on ivory and hide trading should be lifted. Justify your decision by referring to all the extracts.

(Total 7 marks)

Q5. The diagram shows the desert plant, *Fredolia*.



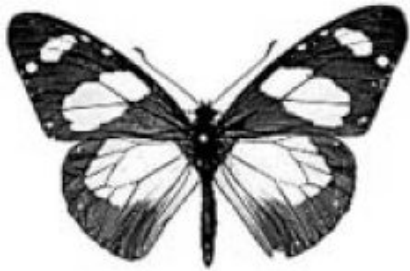


Describe and explain **three** adaptations of *Fredolia*, which you can see in the diagram, that help it to survive in dry conditions.

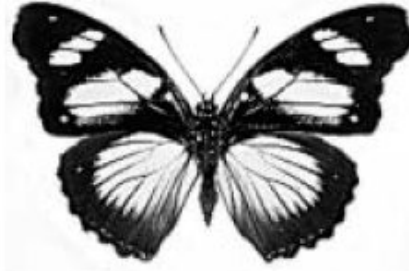
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- 2
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- 3
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(Total 3 marks)

Q6. The drawings show two different species of butterfly.



Amauris



Hypolimnas

Both species can be eaten by most birds.

Amauris has a foul taste which birds do not like, so birds have learned not to prey on it.

Hypolimnas does **not** have a foul taste but most birds do not prey on it.

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

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(2)



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

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(3)
(Total 5 marks)



Q7. The photograph shows a sand gazelle.



The sand gazelle lives in the Arabian Desert where temperatures often reach 45 °C.

(a) The sand gazelle feeds only at dawn and at dusk. At other times it stays in the shade.

Suggest how this helps the animal to conserve water.

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(2)

(b) During the dry season, the sand gazelle's liver and heart shrink in size. This reduces the amount of oxygen that the body needs.

Suggest how needing less oxygen helps the animal to conserve water.

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(2)

(Total 4 marks)