Write your name here

Surname	Other names

Centre Number | Candidate Number

Edexcel GCE

Biology

Advanced

Unit 4: The Natural Environment and Species Survival

Tuesday 11 June 2013 – Morning
Time: 1 hour 30 minutes

Paper Reference
6BI04/01R

You do not need any other materials.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 90.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

P43327A

1/1/1/1/

P 4 3 3 2 7 A 0 1 2 0

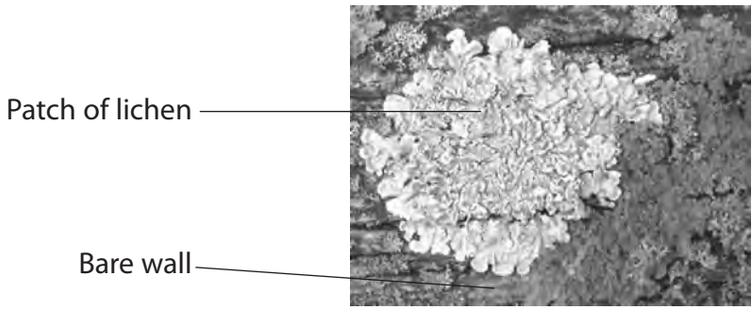
PEARSON

Answer ALL questions.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 Lichen consists of two organisms, an alga and a fungus, growing together. The alga photosynthesises producing carbohydrate for the two organisms and the fungus absorbs and retains water so that the lichen does not dry out.

The photograph below shows a patch of lichen growing on a wall.



Magnification ×1

Algae and fungi are eukaryotic organisms.

(a) Place a cross ☒ in the box next to the names of cell structures that would be used to classify algae and fungi as eukaryotic organisms.

(1)

☒ **A** cytoplasm and large (80S) ribosomes

☒ **B** cytoplasm and small (70S) ribosomes

☒ **C** nucleus and large (80S) ribosomes

☒ **D** nucleus and small (70S) ribosomes

(b) Place a cross ☒ in the box next to one difference in cell structure between these two eukaryotic organisms.

(1)

☒ **A** algae have chloroplasts, fungi do not

☒ **B** algae have circular DNA, fungi have linear DNA

☒ **C** fungi have chloroplasts, algae do not

☒ **D** fungi have circular DNA, algae have linear DNA

(c) Lichens can reproduce sexually and asexually. Sexual reproduction involves meiosis and asexual reproduction involves mitosis.

Suggest advantages to lichens of being able to reproduce both sexually and asexually.

(2)

(d) The diagram below shows the conditions at four positions, A, B, C and D, on a building.

A. Shaded area next to a dripping pipe

B. Area exposed to bright sunlight

D. Shaded area, protected from the wind

C. Area exposed to bright sunlight and protected from the wind

(i) Place a cross ☒ in the box next to the position where the lichen is likely to be most abundant.

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(ii) The abundance of lichen on the walls of this building can be measured by determining the percentage cover of lichen.

Suggest how the percentage cover of lichen could be determined.

(3)

(iii) Explain how light intensity could be measured at the surface of the wall.

(2)

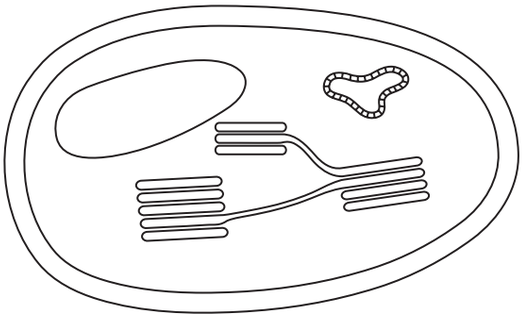
(iv) Suggest how the data collected could be used to show whether there is a relationship between the abundance of lichen and light intensity.

(3)

(Total for Question 1 = 13 marks)

2 Cells that photosynthesise contain many chloroplasts.

The diagram below shows a chloroplast.



(a) (i) Draw a line on the diagram to show where photophosphorylation takes place.

Label the line P.

(1)

(ii) Place a cross ☒ in the box next to the molecule produced by photophosphorylation.

(1)

☒ **A** ATP

☒ **B** NADP

☒ **C** oxygen

☒ **D** water

(b) (i) State where carbon fixation takes place in a chloroplast.

(1)

.....

(ii) The equation for carbon fixation is shown below.

$$\text{molecule Y} + CO_2 \longrightarrow 2 \times \text{molecule Z}$$

Name the molecules Y and Z.

(2)

molecule Y .....

molecule Z .....

(iii) Name the enzyme involved in carbon fixation.

(1)

.....

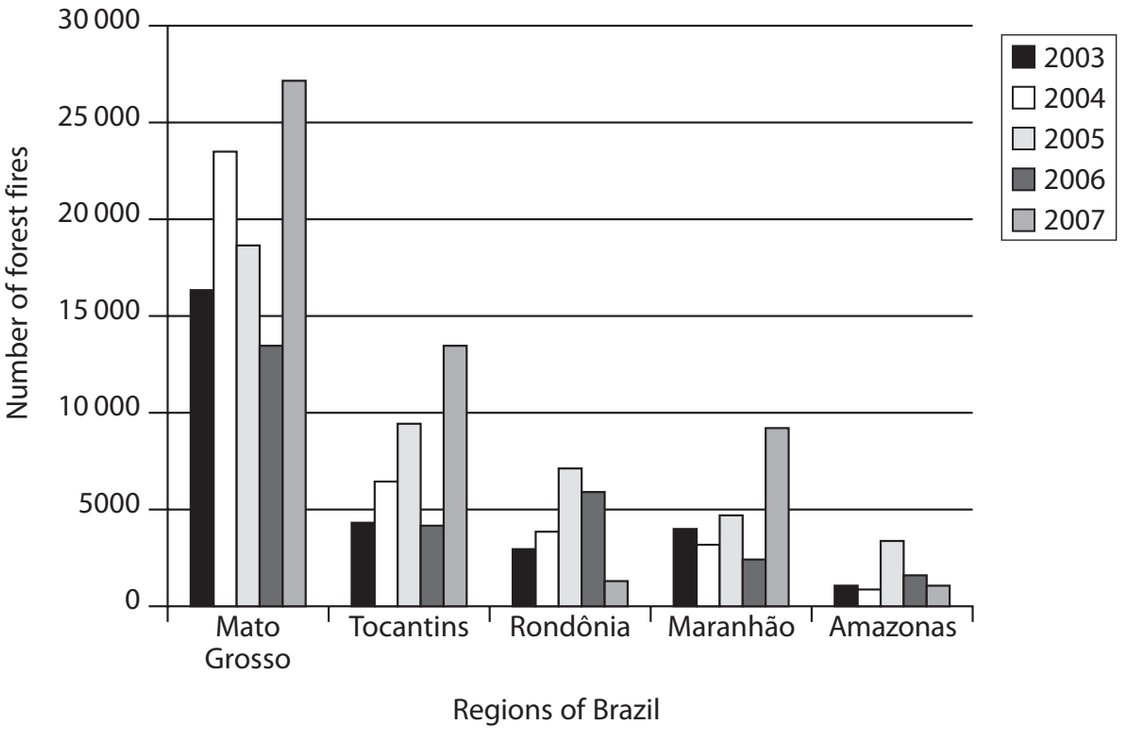
*(iv) Suggest how molecule Z, the product of carbon fixation, can be used to synthesise starch.

(5)

(Total for Question 2 = 11 marks)

3 Global warming is a worldwide problem that affects climate and the environment.

(a) The graph below shows the number of forest fires in five regions of Brazil, for 2003 to 2007.



(i) Place a cross ☒ in the box next to the best conclusion that can be drawn from these results about the number of forest fires in Brazil.

(1)

☒ **A** The number of forest fires has generally decreased

☒ **B** The number of forest fires has generally increased

☒ **C** The number of forest fires in Mato Grosso each year is always higher than in other areas

☒ **D** There are no clear trends

*(ii) Explain how forest fires may lead to global warming.

(5)

(b) (i) Explain why the use of biofuels may help to reduce global warming.

(3)

(ii) Explain **one** disadvantage of using biofuels to reduce global warming.

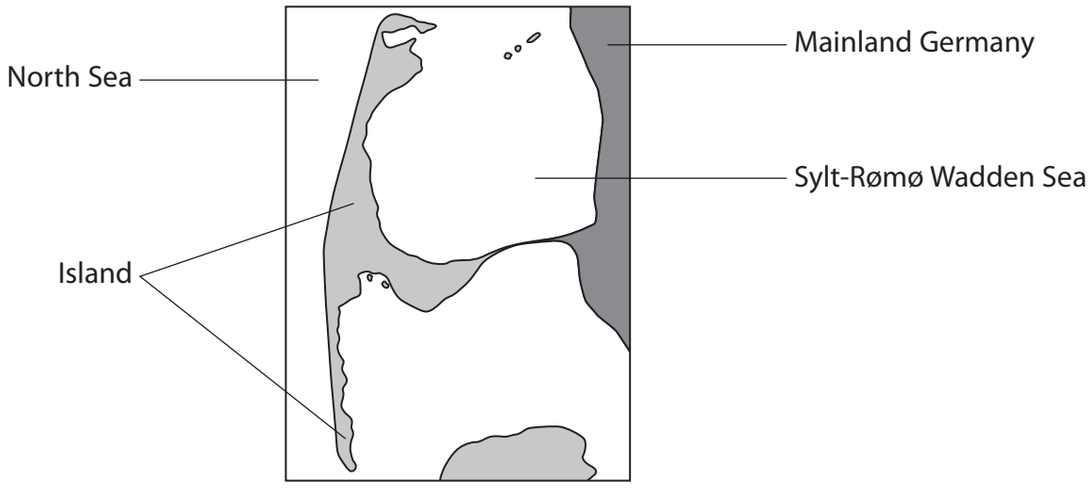
(2)

(Total for Question 3 = 11 marks)

4 The Sylt-Rømø Wadden Sea, shown in the diagram below, has a high gross primary productivity (GPP) which is monitored constantly.

The Sylt-Rømø Wadden Sea is protected from the North Sea by an island.

There are no large rivers flowing into the Sylt-Rømø Wadden Sea.



(a) Explain the meaning of the term **gross primary productivity (GPP)**.

(2)

.....

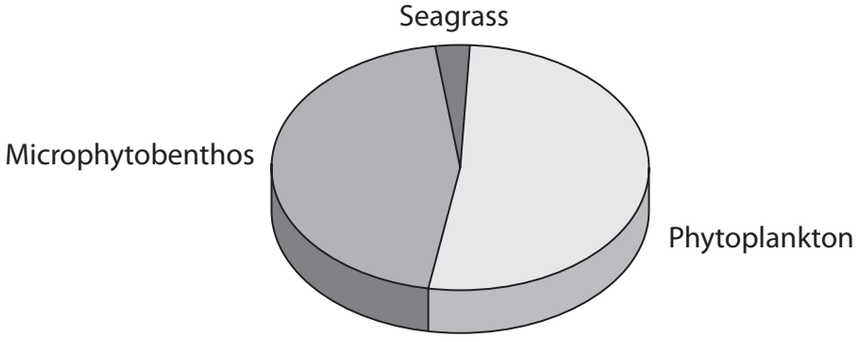
.....

.....

.....

(b) Seagrass, microphytobenthos and phytoplankton are the producers found in the Sylt-Rømø Wadden Sea.

The chart below shows the distribution of GPP between these producers.



(i) Using the chart, describe the distribution of GPP in this sea.

(2)

(ii) The total GPP for this sea is 840×10^6 kJ m^{-2} y^{-1}.

Explain how GPP for the phytoplankton could be calculated.

(2)

(iii) Suggest why GPP for this sea is very high.

(2)

(c) Explain why net primary productivity (NPP) is lower than GPP.

(2)

(Total for Question 4 = 10 marks)

5 The sequence of bases in DNA determines the sequence of amino acids in a polypeptide.

The table below shows the genetic code for each amino acid.

TTT TTC	Phe	TCT TCC TCA TCG	Ser	TAT TAC	Tyr	TGT TGC	Cys
TTA TTG	Leu			TAA TAG	Stop	TGA	Stop
						TGG	Trp
CTT CTC CTA CTG	leu	CCT CCC CCA CCG	Pro	CAT CAC	His	CGT CGC CGA CGG	Arg
				CAA CAG	Gln		
ATT ATC ATA	Ile	ACT ACC ACA ACG	Thr	AAT AAC	Asn	AGT AGC	Ser
				AAA AAG	Lys	AGA AGG	Arg
ATG	Met						
GTT GTC GTA GTG	Val	GCT GCC GCA GCG	Ala	GAT GAC	Asp	GGT GGC GGA GGG	Gly
				GAA GAG	Glu		

(a) The diagram below shows the DNA base sequence coding for part of a polypeptide.

A	T	G	G	G	C	A	T	T

(i) Using the information in the table, state the order of amino acids for this part of the polypeptide.

(1)

.....

(ii) Explain what is meant by the term **non-overlapping genetic code**.

(1)

.....

.....

(b) (i) Explain why there are **three** bases in each of the codes shown in the table.

(2)

.....

.....

.....

.....

(ii) Suggest an advantage for most amino acids having more than one code. Give an explanation for your answer.

(2)

(c) Explain the role of the base sequences TAA, TAG and TGA.

(4)

(d) Explain how the amino acids are joined together in a polypeptide.

(3)

(Total for Question 5 = 13 marks)

6 Bacteria and viruses can cause human diseases.

(a) Distinguish between the structure of bacteria and viruses

(3)

(b) Infection with a bacterium can result in the development of active immunity to that bacterium. This results in the production of antibodies by plasma cells.

(i) Describe how infection with a bacterium results in the production of plasma cells.

(4)

(ii) Explain how antibodies help a person to recover from an infection.

(2)

(iii) A person who has had an organ transplant has to take immunosuppressive drugs. This prevents the immune system from destroying the organ transplant. Some of these drugs work by inhibiting the production of cytokines.

Suggest what effect these drugs could have on a person infected with a bacterium or a virus.

(4)

(Total for Question 6 = 13 marks)

7 Eating food that is contaminated with microorganisms can cause food poisoning.

(a) Not all contaminated food causes food poisoning. Suggest explanations for this.

(3)

(b) The norovirus causes a type of food poisoning, commonly called stomach flu. Norovirus is a non-enveloped RNA virus.

The virus stays in the small intestine and causes symptoms approximately 24 hours after eating the contaminated food.

Stomach flu can be caused by eating food containing as few as 20 viral particles.

(i) Suggest how new viral particles are formed inside the host cells.

(4)

(ii) Suggest why so few viral particles are enough to cause symptoms after 24 hours.

(2)

(iii) The risk of transmitting food poisoning microorganisms can often be reduced by using alcohol-based handwashes.

Suggest why alcohol-based handwashes do **not** reduce transmission of the norovirus.

(2)

(Total for Question 7 = 11 marks)

8 The group of birds, known as warblers, contains many species which are very similar in external appearance.

The chiffchaff, *Phylloscopus collybita*, and the willow warbler, *Phylloscopus trochilus* are two species of warbler.

These warblers are so similar that many experts can identify them only by listening to their characteristic songs. Their songs are used during breeding to mark territory and attract mates.

The photographs below show these two warblers.

Chiffchaff

Willow warbler

Magnification × 0.75

(a) Explain the meaning of the term **species**.

(1)

.....

.....

.....

(b) Suggest how these two types of warbler became separate species.

(4)

(c) Suggest why these two species of warbler are so similar in external appearance.

(3)

(Total for Question 8 = 8 marks)

TOTAL FOR PAPER = 90 MARKS

BLANK PAGE