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	OXFORD CAMBRIDGE AND RSA EXAM Advanced GCE BIOLOGY Central Concepts		INATIONS 2804	
	Tuesday Candidates answer o Additional materials: Electronic calcular Ruler (cm/mm)		Morning	1 hour 30 minutes
Candidat Name	e			
Centre Number			Candida Number	te

TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

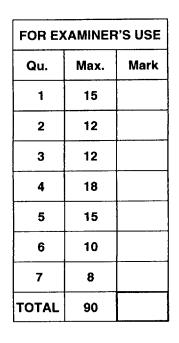
- Write your name in the space above.
- Write your Centre number and Candidate number in the boxes above.
- Answer all the questions.
- Write your answers, in blue or black ink, in the spaces provided on the question paper.

DO NOT ANSWER IN PENCIL. **DO NOT** WRITE IN THE BARCODE. **DO NOT** WRITE IN THE GREY AREAS BETWEEN THE PAGES.

Read each question carefully before starting your answer.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.



This question paper consists of 17 printed pages and 3 blank pages.

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Answer all the questions.

In the majority of plants, the leaf is the main photosynthetic organ. 1

(a) List four ways in which the structure of a dicotyledonous leaf is adapted for gas exchange.

1 2 3 4[4]

In an experiment to investigate the effect of light intensity on the rate of photosynthesis, the following procedure was carried out by some students.

- Discs were cut from the photosynthetic tissue of the brown alga Fucus serratus, a common rocky shore seaweed, using a cork borer.
- Ten discs were placed in each of four beakers filled with 50 cm³ of sea water. The discs are denser than sea water and therefore sink to the bottom of the beaker.
- Each beaker was illuminated with a bench lamp placed at different distances (d) from the beaker.
- The time, in minutes, at which the third disc from each batch reached the surface (t) was recorded.
- The rate of photosynthesis was determined by calculating 1000/t.

A student's set of results is shown in Table 1.1.

distance of beaker from lamp (d) / cm	light intensity 1/d ²	time for third disc to reach the surface(t)/min	rate of photosynthesis 1000 / t
5	0.04	23	43.5
10	0.01	36	27.8
15	0.004	52	19.2
20		88	

Table 1.1

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(b)	Calculate the values for light intensity and rate of photosynthesis when the distance between beaker and lamp was 20 cm. Record the values in the shaded boxes in Table 1.1. [2]	For Examiner's Use
(c)	Explain why the discs float after being illuminated for a length of time.	
	[3]	
(d)	Using the data in Table 1.1, describe the relationship between light intensity and the rate of photosynthesis.	
	[2]	
(e)	State the environmental factor limiting the rate of photosynthesis in this experiment.	
	[1]	
(f)	State the evidence from Table 1.1 you used to support your answer to (e).	
	[1]	
(g)	Suggest why the student is not likely to find an increase in the rate of photosynthesis when two lamps are placed 5 cm from the beaker.	
	[2]	
	[Total: 15]	

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- In mammals, changes in both the internal and external environment are detected by 2 receptors.
 - (a) State the general name given to changes in the environment that can be detected by receptors.

......[1]

(b) Explain why it is important for mammals to be able to detect changes in their internal environment.

.....[3]

(c) In this question, one mark is available for the quality of written communication.

Receptors are often described as biological transducers, structures which convert energy from one form into another.

Explain how receptors in mammals convert energy into action potentials. Use named examples of receptors in your answers.

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3 Glycolysis takes place in the cytoplasm of the cell. Fig. 3.1 is an outline of the process.

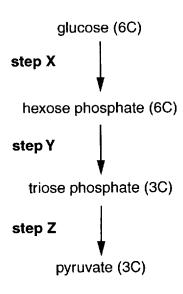


Fig. 3.1

(a)	State at which step or steps the following occur:
	ATP is utilised
	ATP is formed
	reduced NAD (NADH ₂) is formed[3]
(b)	Describe what happens to the pyruvate so that the Krebs cycle can continue.
	[4]

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(c) Under anaerobic conditions, the reduced NAD cannot be oxidised using oxygen. However, without it being oxidised glycolysis will stop and no ATP will be formed.

Explain how the reduced NAD is oxidised under anaerobic conditions in mammalian muscle tissue and in yeast.

mammalian muscle tissue
yeast
[5]

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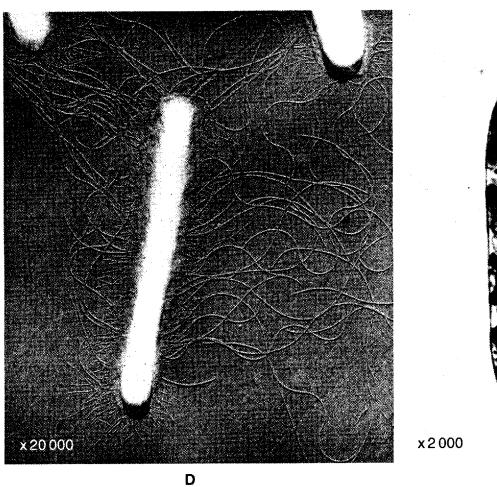
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4 Fig. 4.1 shows two unicellular organisms labelled **D** and **E**. These organisms are members of different kingdoms.





- (a) (i) Study Fig. 4.1 and identify the kingdom to which each organism belongs. Write your answers in the table below.
 - (ii) Complete the table by stating two features which are characteristic of the organism in the kingdom you have stated.

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2	2
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In February 2001, the BBC reported that scientists had discovered a 'new species' of camel in a remote part of Asia. These camels differ from domesticated Bactrian camels in the following ways:

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- 3% of their DNA base sequences are different
- their humps are further apart
- they have hairier knees

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there is no freshwater in the area and they survive by drinking salty water.

One possibility is that domesticated camels were bred from this wild stock many generations ago.

(b) Describe how changes in DNA could occur.

(c) Describe what further evidence is required to show that this 'new species' is a different species from the domesticated camels.

.....[3]

The ada	Downloaded from http://www.thepaperbank.co.uk 10 BBC also reported: 'The salt water is not ideal for the camels and they have had to pt to drink it. Some young animals are unable to adapt and they die as a result'.	For Examiner's Use
(d)	Explain the effect on body tissues of drinking only salty water.	058
	[2]	
(e)	Suggest two physiological adaptations that would allow some camels to survive when their only source of water is salty.	
	1	
	2	
	[2]	
(f)	Explain how genetic variation in the ancestral wild camel population enabled the development of this 'new species'.	
	[2]	

[Total: 18]

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5 Copper trim and sable trim are coat patterns found in Australian Shepherd dogs. This pattern is most noticeable on the muzzle, at the eyebrows, inside the ears, on the legs and under the tail.

Coat pattern is controlled by three alleles of a gene:

A – no trim

as - sable trim

a^c - copper trim

The alleles form a series with:

- A dominant to both a^s and a^c
- allele **a^s** dominant to **a^c**.

There are six possible genotypes involving these alleles.

(a) Write out the six possible genotypes with their correct phenotypes in the space below.

genotype phenotype

(b) If two dogs showing no trim but carrying the recessive allele for copper trim are crossed, there is a 25% chance that they will produce a copper trim puppy. Complete the following genetic diagram to show this cross.

parental phenotypes	no trim	no trim
parental genotypes		
gametes		

offspring genotypes

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(i)	State the cross needed to determine the dog's genotype.
(;;)	Evaluin why the offenring of this gross will reveal the geneture of the deg
(11)	Explain why the offspring of this cross will reveal the genotype of the dog.
	[3]
	inheritance of coat pattern in Australian Shepherd dogs illustrates the principle of tiple alleles at a single locus.
Exp	lain the meaning of:
mult	tiple alleles
•••••	
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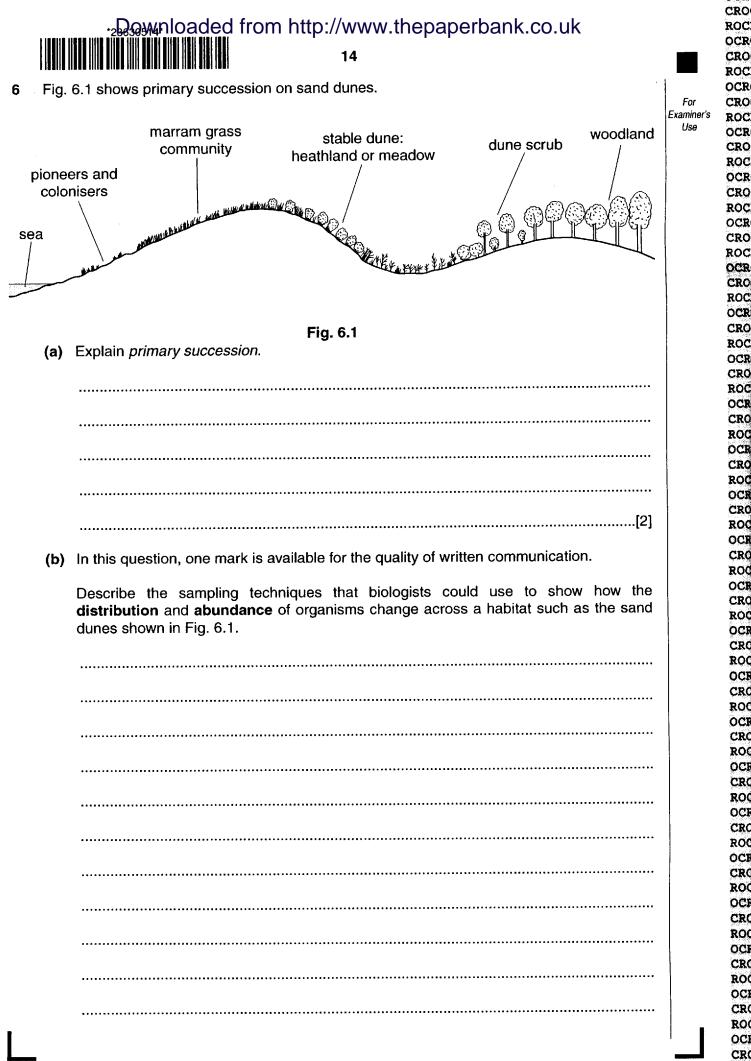
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[Total: 10]

Turn over for Question 7

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7 An investigation was carried out into the effects of two plant growth substances, gibberellins and auxins, on apical dominance. The terminal (apical) buds of a number of pea plants were Examiner's removed and discarded. The tops of each of the remaining shoots were given one of the following treatments:

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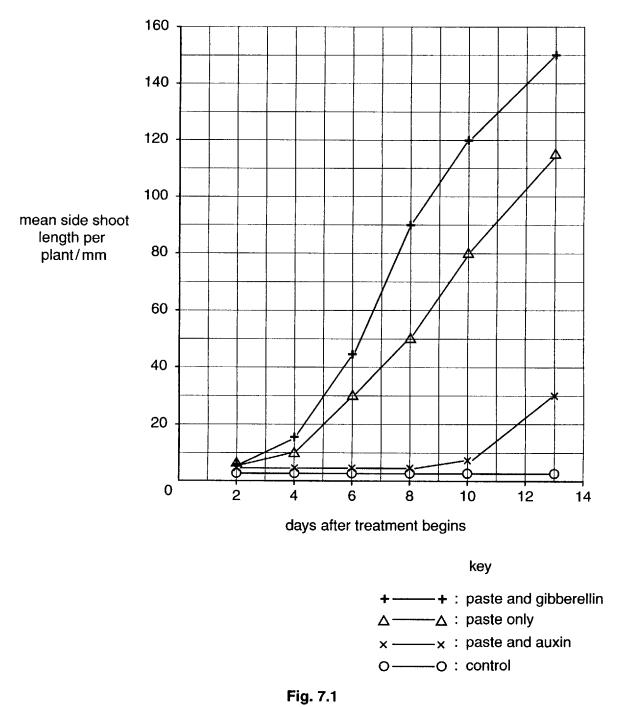
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- coated with a paste containing gibberellin
- coated with a paste containing auxin (IAA)
- coated with a paste without any plant growth substance

In addition, a control group of plants did not have their terminal buds removed and were not coated with paste.

The growth of the side shoots was measured at regular time intervals and a mean value calculated. The results are shown in Fig. 7.1.



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a)	Explain why the side shoots grow when the terminal buds are removed.
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	[3]
(b)	Side shoots show greater growth when paste containing gibberellin is applied than when paste without any plant growth substance is applied.
	Calculate the percentage increase in growth due to gibberellin in 8 day old seedlings compared with seedlings with paste only. Show your working.
	answer% [2]
(c)	$r_{\rm exc}$ r_{\rm
(c)	Using data from Fig. 7.1, describe and explain the effect of auxin (IAA) on the growth o
(c)	Using data from Fig. 7.1, describe and explain the effect of auxin (IAA) on the growth or side shoots.
(c)	Using data from Fig. 7.1, describe and explain the effect of auxin (IAA) on the growth or side shoots.
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