

<b>Candidate Forename</b>						<b>Candidate Surname</b>					
<b>Centre Number</b>						<b>Candidate Number</b>					

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**  
**ADVANCED GCE**  
**2804**  
**BIOLOGY**  
**Central Concepts**

**WEDNESDAY 16 JUNE 2010: Morning**  
**DURATION: 1 hour 30 minutes**

**SUITABLE FOR VISUALLY IMPAIRED CANDIDATES**

**Candidates answer on the Question Paper**

**OCR SUPPLIED MATERIALS:**

**Fig. 5.1 on the loose sheet**

**OTHER MATERIALS REQUIRED:**

**Electronic calculator**  
**Ruler (cm/mm)**

**READ INSTRUCTIONS OVERLEAF**

## **INSTRUCTIONS TO CANDIDATES**

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **Use black ink. Pencil may be used for graphs and diagrams only.**
- **Read each question carefully and make sure that you know what you have to do before starting your answer.**
- **Answer ALL the questions.**
- **Write your answer to each question in the space provided, however additional paper may be used if necessary.**

## **INFORMATION FOR CANDIDATES**

- **The number of marks is given in brackets [ ] at the end of each question or part question.**
- **The total number of marks for this paper is 90.**
- **You will be awarded marks for the quality of written communication where this is indicated in the question.**

Answer ALL the questions.

- 1 (a) Define the term *interspecific competition*.

\_\_\_\_\_ [1]  
\_\_\_\_\_

Fig. 1.1 shows the shag, *Phalacrocorax aristotelis*, and the cormorant, *Phalacrocorax carbo*, which feed in the same waters and nest on the same cliffs.

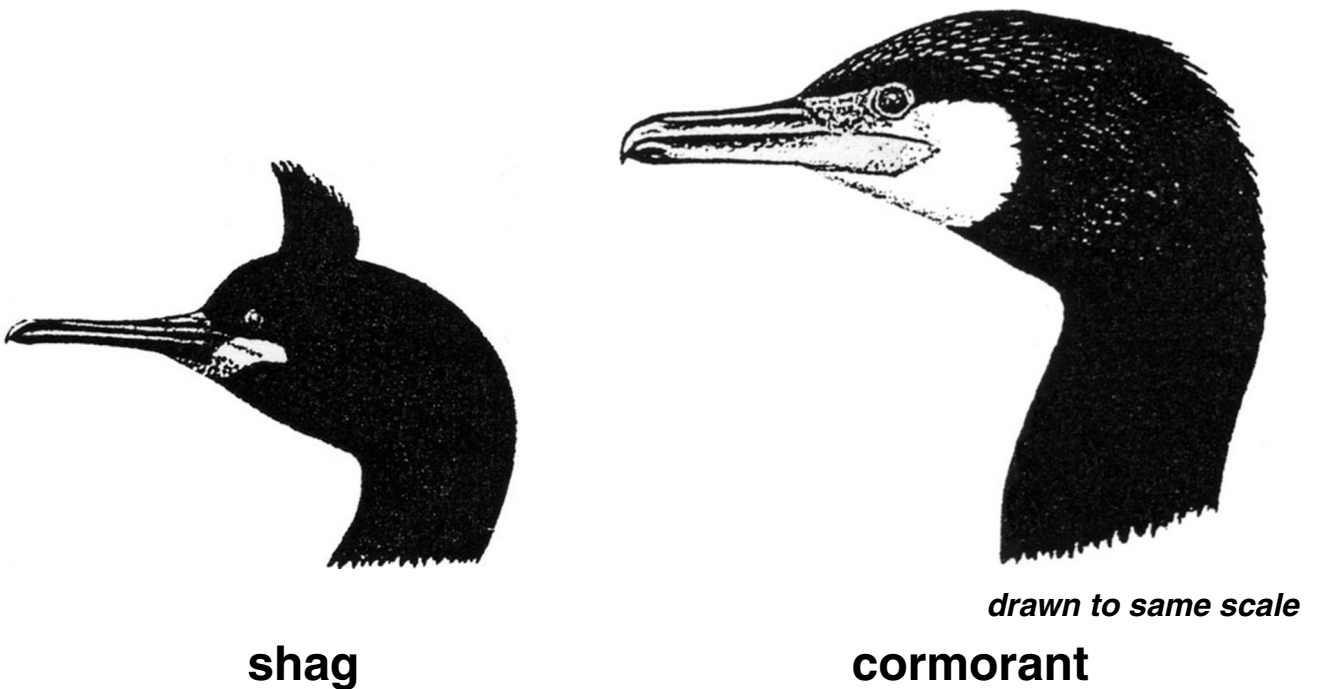


Fig. 1.1

**Table 1.1 shows the prey eaten by these two birds.**

**Table 1.1**

prey		percentage of prey eaten by:	
		shag	cormorant
surface swimming	sand eels	33	0
	herring	49	1
bottom feeding	flat fish	1	26
	shrimps, prawns	2	33

**(b) State why the results for each species of bird do not add up to 100%.**

\_\_\_\_\_ [1]

**(c) With reference to Fig. 1.1 and Table 1.1, describe how the behaviour of shags and cormorants avoids direct competition.**

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\_\_\_\_\_

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\_\_\_\_\_

\_\_\_\_\_ [4]

**(d) Suggest a resource for which these two species show interspecific competition.**

\_\_\_\_\_ **[1]**

**[Total: 7]**

- 2 Human kidneys process  $1200\text{ cm}^3$  of blood every minute. Approximately  $125\text{ cm}^3$  of fluid is filtered from this blood into the renal capsules, resulting in  $1500\text{ cm}^3$  of urine being produced each day.**

- (a) (i) Calculate the volume of filtrate, in  $\text{cm}^3$ , produced by the kidneys in a day.  
Show your working.**

**Volume = \_\_\_\_\_  $\text{cm}^3$  [2]**

- (ii) Calculate the PERCENTAGE of the filtrate that is reabsorbed into the bloodstream.  
Show your working.**

**Answer = \_\_\_\_\_ % [2]**

(b) Table 2.1 shows the composition of fluids in the kidney.

**Table 2.1**

component	concentration/g 100 cm <sup>-3</sup>		
	blood plasma entering glomerulus	filtrate in renal capsule	urine in collecting duct
water	90 – 93	97 – 99	96
proteins	7 – 9	0.0	0.0
glucose	0.1	0.1	0.0
urea	0.03	0.03	2.0
other nitrogenous waste products	0.003	0.003	0.24
sodium ions	0.32	0.32	0.30 – 0.35

(i) State why there are no proteins in the filtrate in the renal capsule.

\_\_\_\_\_ [1]

(ii) Explain why there is glucose present in the filtrate but not in the urine.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [2]

**(iii) Explain why the concentration of urea is greater in the urine than it is in the filtrate.**

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**[2]**

**(iv) Name TWO other nitrogenous waste products found in urine.**

1 

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2 

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**[2]**

**(c) In this question, one mark is available for the quality of the use and organisation of scientific terms.**

**When little water is ingested, when heavy sweating occurs or when a large amount of salt is absorbed from the diet, the water potential of the blood plasma becomes more negative.**

**Describe the sequence of events that results in the water potential of the blood plasma returning to normal.**

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**3 Coat colour in rabbits is determined by a single gene which has four different alleles.  
The gene is NOT sex linked.**

- The allele for agouti colour,  $C^A$ , is dominant to all the other alleles.**
- The allele for albino,  $C^a$ , is recessive to all the other alleles.**
- The allele for chinchilla,  $C^{Ch}$ , is dominant to the Himalayan allele,  $C^H$ .**

**(a) State ALL the possible genotypes for the following phenotypes:**

**chinchilla \_\_\_\_\_**

**agouti \_\_\_\_\_ [2]**

**(b) A young girl owns a pet female Himalayan rabbit. She wants to know whether it is homozygous (pure breeding) for this trait. Her friend owns a male albino rabbit, and says that if they cross the two rabbits and they find any albino offspring she can be sure that the female is not pure breeding.**

**(i) Name the type of cross that they will carry out.**

**\_\_\_\_\_ [1]**

**(ii) The friend's statement is valid. Explain why.**

**You may use genetic diagrams in your answer.**

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**[3]**



- 4 Fig. 4.1 represents the relationship between parts of two nerve cells (neurones).

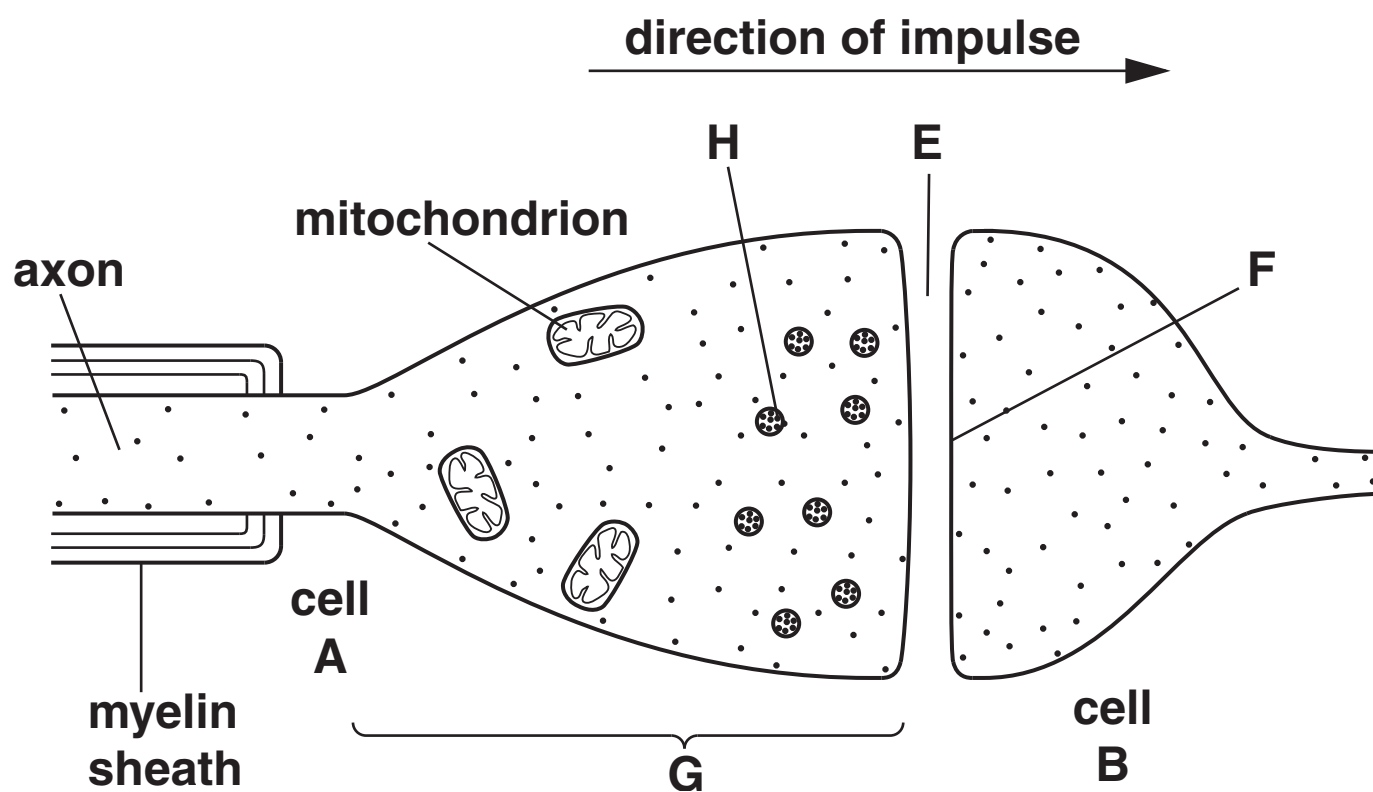


Fig. 4.1

(a) Name E to H.

E \_\_\_\_\_

F \_\_\_\_\_

G \_\_\_\_\_

H \_\_\_\_\_

[4]

**(b) In this question, one mark is available for the quality of spelling, punctuation and grammar.**

**Describe how a nerve impulse passes from cell A to cell B.**

[illegible]

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[7]

**Quality of Written Communication [1]**

**(c) Explain the importance of the myelin sheath in the transmission of a nerve impulse.**

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[3]

**(d) Explain what is meant by the ‘all or nothing’ response of a neurone to a stimulus.**

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[2]

**[Total: 17]**



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**QUESTION 5 STARTS ON PAGE 18**

**5 The light dependent stage of photosynthesis takes place on thylakoid membranes in chloroplasts. These membranes surround the thylakoid space (lumen) and are arranged into stacks known as grana. Fig. 5.1 on the loose sheet summarises the processes that take place at the thylakoid membrane.**

**(a) State the general name of the pigment complexes shown as E and F on the diagram.**

\_\_\_\_\_ [1]

**(b) Name the pigment represented by P680 and P700.**

\_\_\_\_\_ [1]

**(c) Name the type of molecule represented by G.**

\_\_\_\_\_ [1]

**(d) State, USING THE INFORMATION IN Fig. 5.1, why the pH of the thylakoid space (lumen) is lower than that of the stroma.**

\_\_\_\_\_ [1]

**(e) Explain the function of this pH gradient.**

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**[3]**

- (f) Herbicides (weedkillers), such as diquat and paraquat, act on the chloroplast thylakoids. They interfere with electron transport by accepting electrons and preventing the light dependent stage of photosynthesis from taking place.**

**Explain how this causes plants to die.**

[illegible]

(g) Some weed species are NOT killed when herbicides are applied.

Suggest why.

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[2]

[Total: 14]

- 6 The bacterium, *Escherichia coli* (*E. coli*), can use either glucose or lactose as a respiratory substrate.

When grown in a medium containing lactose, but no glucose, the genes coding for the enzymes required to use lactose are switched on.

These genes are located together in the LAC OPERON as shown in Fig. 6.1.

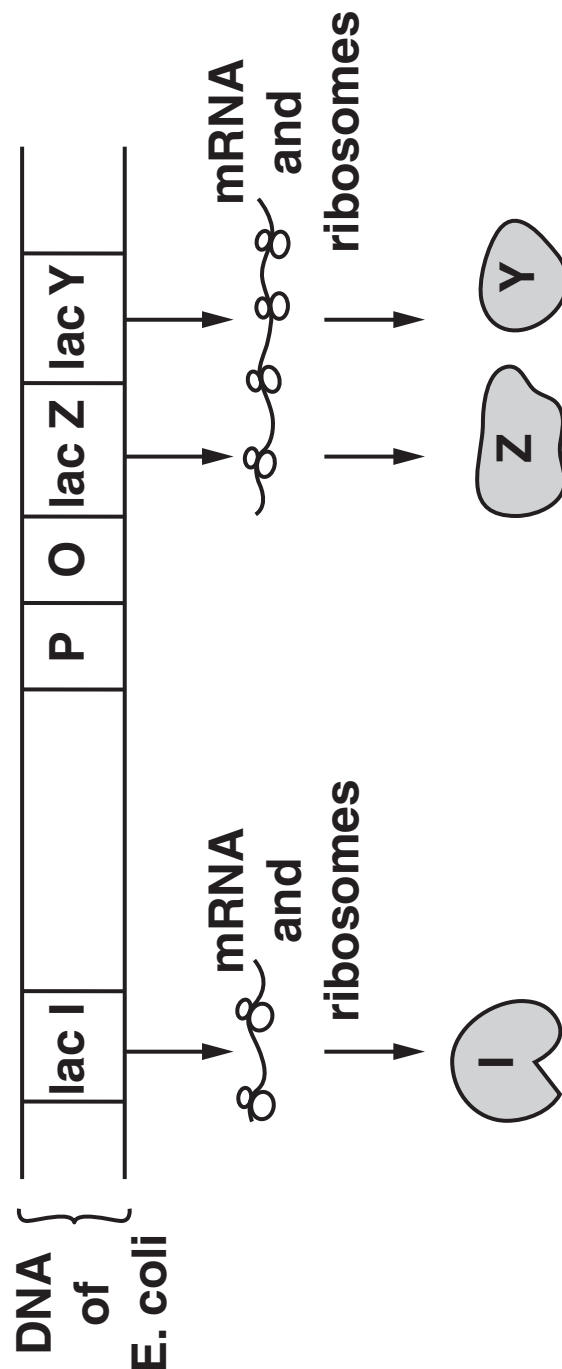


Fig. 6.1

- (a) Complete the table below stating the functions of O, P, I, Z and Y. The function of lac I has been done for you.

	function
lac I	controls production of repressor protein
O – operator	
P – promoter	
I – repressor molecule	
Z – beta galactosidase	
Y – lactose permease	

[5]

- (b) Explain why beta galactosidase and lactose permease are NOT produced when lactose is absent.

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[3]

(c) Outline the events that occur within *E. coli* when lactose is the ONLY respiratory substrate available.

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[4]

[Total: 12]



- 7 (a) State what is meant by the term *respiratory quotient (RQ)*.

\_\_\_\_\_  
\_\_\_\_\_ [1]

- (b) Complete and balance the following equation for the aerobic respiration of COMPOUND A,  $C_{55}H_{100}O_6$ .



- (c) Calculate the RQ for this reaction.

Answer = \_\_\_\_\_ [2]

- (d) Identify, from the RQ value calculated in (c), the type of molecule to which COMPOUND A belongs.

\_\_\_\_\_ [1]

- (e) After surface sterilisation, some seeds were soaked in water for four hours before being left in moist air to germinate. The RQ values of these seeds are shown in Table 7.1.

**Table 7.1**

<b>time</b>	<b>RQ</b>
<b>immediately after soaking</b>	<b>6.34</b>
<b>after 12 hours in air</b>	<b>2.22</b>
<b>after 36 hours in air, radicles appearing</b>	<b>1.02</b>

**Explain the changes in RQ values of these germinating seeds.**

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[4]

[Total: 10]

**END OF QUESTION PAPER**

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