

**ADVANCED GCE****BIOLOGY**

Mammalian Physiology and Behaviour

**2805/05**

Candidates answer on the Question Paper

**OCR Supplied Materials:**

None

**Other Materials Required:**

- Electronic calculator
- Ruler (cm/mm)

**Monday 25 January 2010****Afternoon****Duration:** 1 hour 30 minutesCandidate  
ForenameCandidate  
Surname

Centre Number

Candidate Number

**INSTRUCTIONS TO CANDIDATES**

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- 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.
- Do **not** write in the bar codes.
- 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.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **24** pages. Any blank pages are indicated.

Examiner's Use Only:

1			
2			
3			
4			
5			
6			
<b>Total</b>			



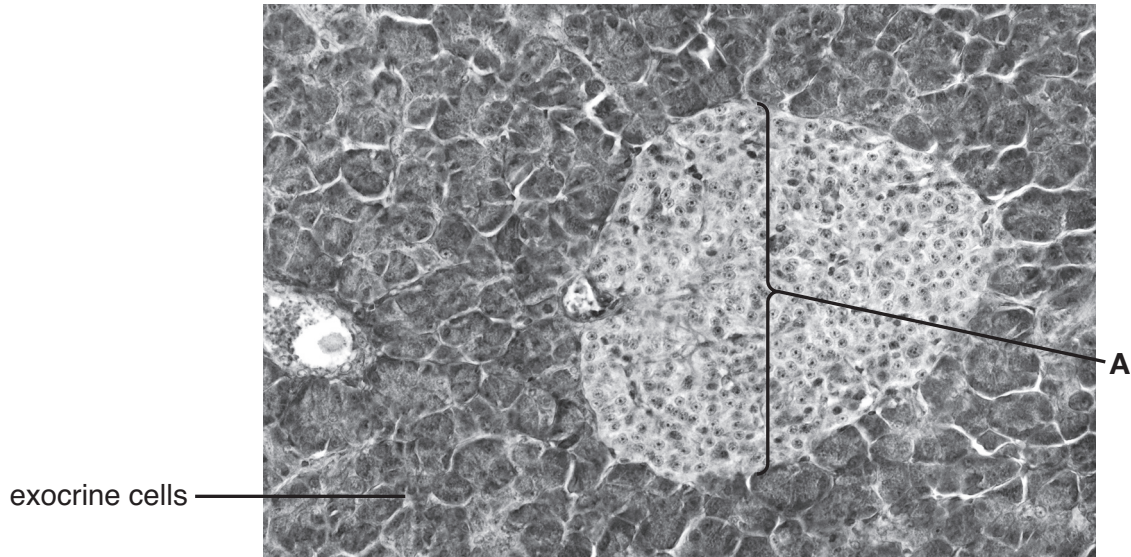
**BLANK PAGE**

**PLEASE DO NOT WRITE ON THIS PAGE**

Answer **all** the questions.

- 1 (a) The pancreas is a gland that plays an important role in the digestion of food.

Fig. 1.1 shows a section through part of the pancreas.



**Fig. 1.1**

- (i) Name **A**.

..... [1]

- (ii) The exocrine cells in Fig. 1.1 produce enzymes that are in an inactive form.

Explain why these enzymes need to be secreted in an inactive form.

.....  
 .....  
 .....  
 .....  
 .....  
 ..... [3]

- (b) A study was carried out on a group of people to measure the concentration of the hormone, cholecystokinin (CCK) in the blood.

The concentration of CCK was measured:

- 30 minutes before eating a carbohydrate meal
- while the meal was being eaten
- at 30 minute intervals after eating the meal.

The results are summarised in Fig. 1.2.

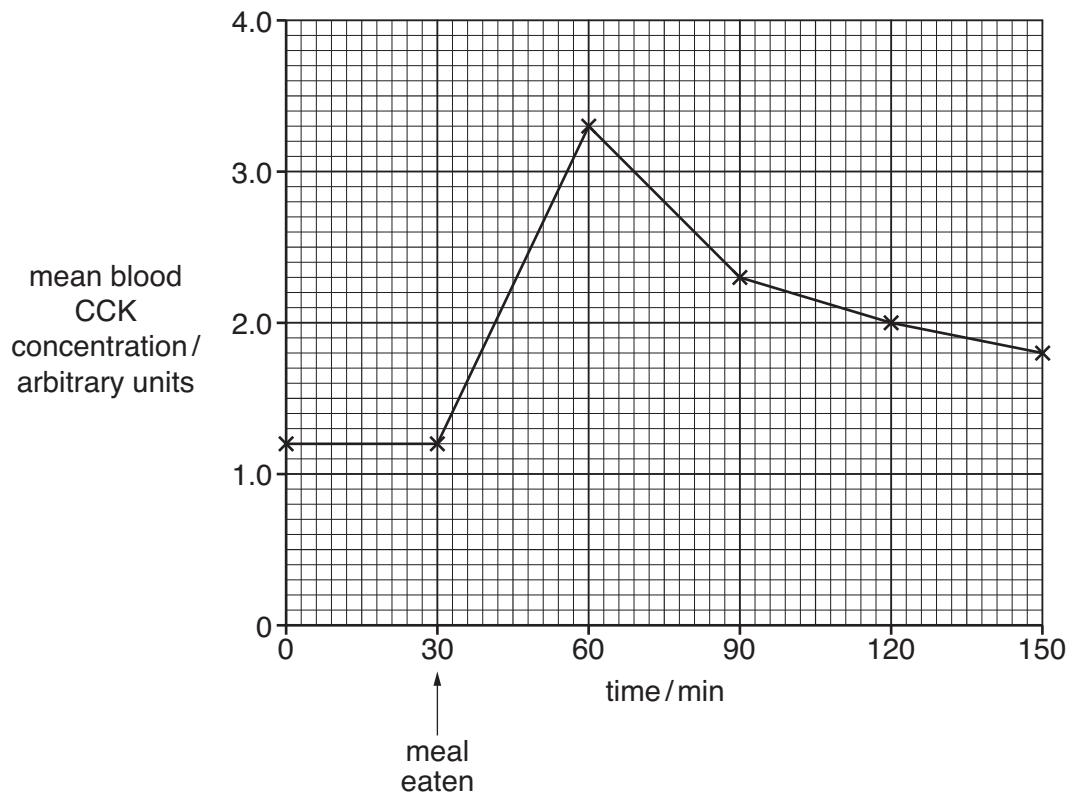


Fig. 1.2

- (i) Suggest **two** factors that should be taken into consideration when selecting people for this study.

.....

.....

.....

..... [2]

- (ii) Calculate the rate of increase of mean blood CCK concentration, in arbitrary units per minute, between 30 and 60 minutes.

Show your working.

Answer = ..... arbitrary units  $\text{min}^{-1}$  [2]

- (iii) After the meal is eaten, the blood CCK concentration increases rapidly.

Describe the stimulus that leads to an increased production of CCK **and** explain why more CCK is needed after the meal is eaten.

.....

.....

.....

.....

.....

.....

.....

.....

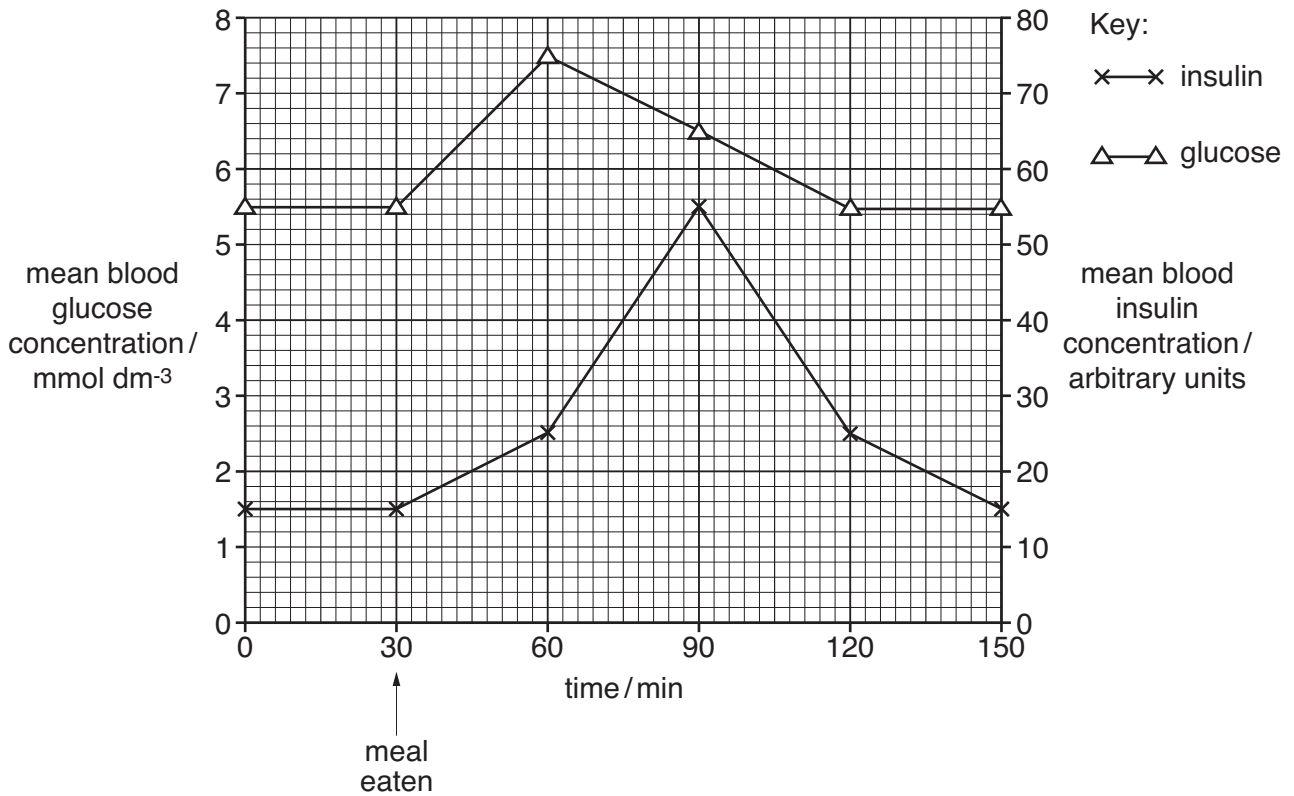
.....

.....

..... [5]

(c) The same study also measured the concentrations of glucose and insulin in the blood.

The results are summarised in Fig. 1.3.



**Fig. 1.3**

Explain the relationship between the concentration of glucose and the concentration of insulin shown in Fig. 1.3.

.....

.....

.....

.....

.....

.....

..... [3]

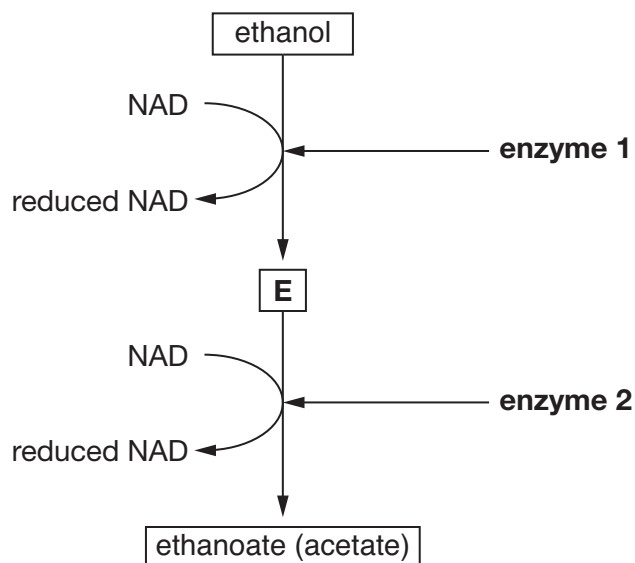
[Total: 16]

**7**  
**BLANK PAGE**

**PLEASE DO NOT WRITE ON THIS PAGE**

- 2 (a) An important function of hepatocytes (liver cells) is the detoxification of potentially harmful substances such as ethanol (alcohol).

Fig. 2.1 below outlines how ethanol is detoxified.



**Fig. 2.1**

- (i) Enzymes 1 and 2 catalyse the same type of reaction. Name the type of reaction.  
 ..... [1]
- (ii) Name substance **E**.  
 ..... [1]
- (iii) Describe how ethanoate (acetate) is metabolised by the hepatocytes.  
 .....  
 .....  
 .....  
 .....  
 .....  
 ..... [3]
- (iv) Suggest **two** possible functions of reduced NAD in hepatocytes.  
 1 .....  
 2 ..... [2]



**(b)** The liver can develop a cancerous tumour.

**(i)** Suggest **one** factor that can increase the chances of a person developing **liver** cancer.

..... [1]

**(ii)** Explain how the factor you have suggested in **(b)(i)** may lead to the development of cancer.

.....

.....

.....

.....

.....

..... [3]

**QUESTION 2(c) BEGINS ON PAGE 10**

- (c) Cholesterol molecules are transported in the blood as lipoproteins. Some lipoproteins are high density lipoproteins (HDLs) and others are low density lipoproteins (LDLs).

The liver regulates the blood cholesterol concentration. The total blood cholesterol concentration is calculated by adding together the concentrations of HDLs, LDLs and triglycerides.

Blood tests were carried out on three people, **F**, **G** and **H**, early in the morning before they had eaten. The concentrations of HDLs, LDLs and triglycerides in their blood were measured.

Fig. 2.2 shows the results of the blood tests.

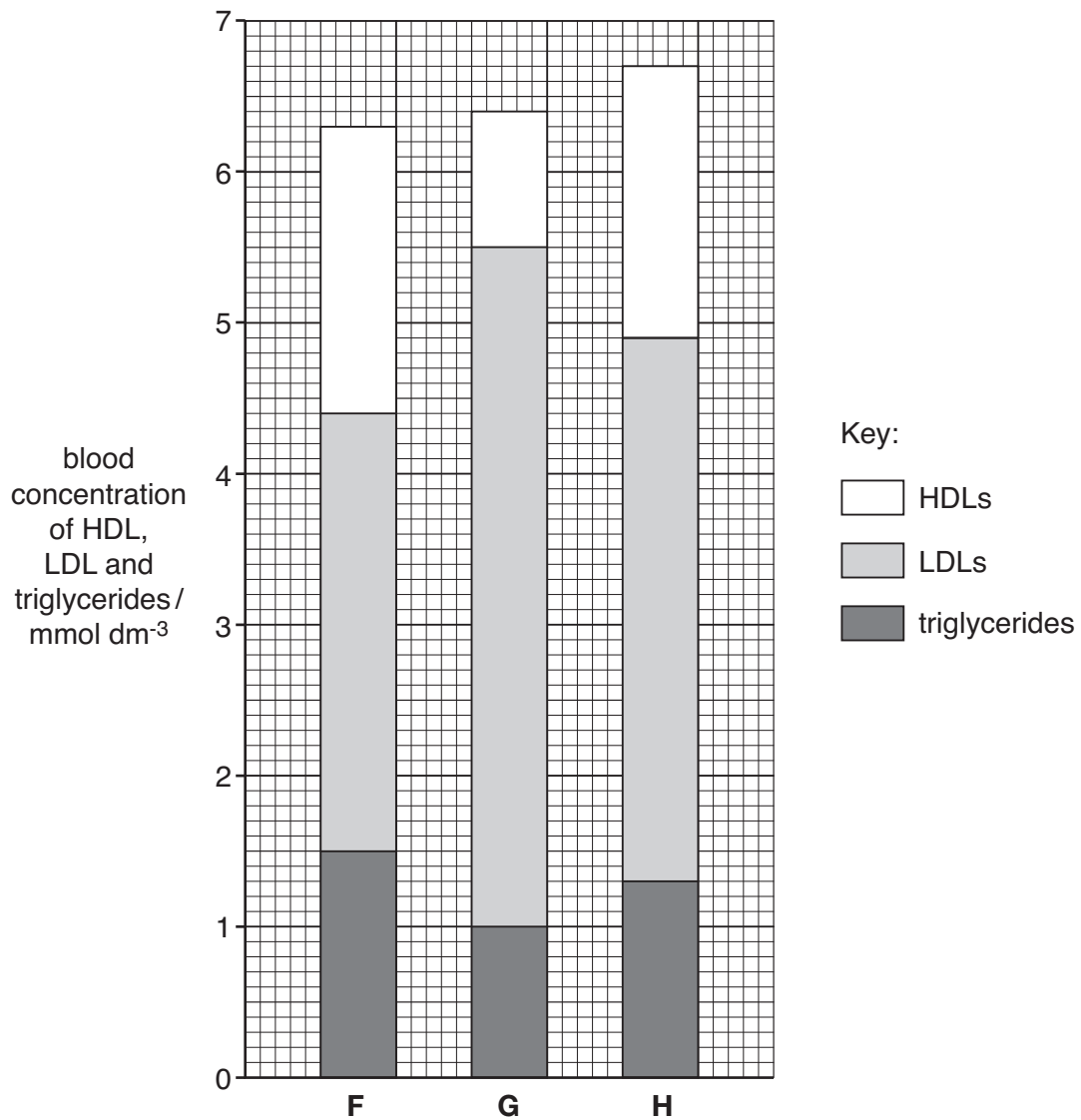


Fig. 2.2

The target values for a healthy person are:

- an HDL concentration greater than  $1.0 \text{ mmol dm}^{-3}$
- an LDL concentration of less than  $3.0 \text{ mmol dm}^{-3}$
- a triglyceride concentration of less than  $2.0 \text{ mmol dm}^{-3}$
- a total cholesterol concentration of less than  $5.0 \text{ mmol dm}^{-3}$
- a ratio of  $\frac{\text{LDL}}{\text{HDL}}$  under 4.5.

(i) Using the information in Fig. 2.2, complete the table below for person **G**.

**F** and **H** have already been done for you.

person	HDL concentration/ $\text{mmol dm}^{-3}$	LDL concentration/ $\text{mmol dm}^{-3}$	triglyceride concentration/ $\text{mmol dm}^{-3}$	total cholesterol concentration/ $\text{mmol dm}^{-3}$	$\frac{\text{LDL}}{\text{HDL}}$ ratio
<b>F</b>	1.9	2.9	1.5	6.3	1.5
<b>G</b>	.....	.....	.....	.....	.....
<b>H</b>	1.8	3.6	1.3	6.7	2.0

[2]

(ii) State a major health risk to people who have a high blood cholesterol concentration.

..... [1]

(iii) Using **all** the information in the table and the target values, place **F**, **G** and **H** in a rank order of health risk.

Put the person with the greatest health risk first.

..... [2]

[Total: 16]

- 3** A study carried out at the University of Nottingham compared the length of the index finger to the length of the 'ring' finger and investigated a possible link to the risk of developing osteoarthritis (OA).

- Researchers examined the medical notes of a sample of 2 000 people.
- The sample comprised an equal number of men and women, with an average age of 67 years.
- 1 000 people had symptoms of OA of the hip or knee, whilst the other 1 000 people had no observed symptoms of OA.
- The lengths of the index and ring fingers were measured for all people in the sample.

The results are summarised in Table 3.1.

**Table 3.1**

	risk of OA	gender
index longer than ring	average	mostly women
index = ring	average	equal numbers of men and women
index shorter than ring	double	mostly men

- (a)** What conclusions can be drawn from this study?

.....

.....

.....

..... [2]

- (b)** Suggest why researchers included 1 000 people who had no observed symptoms of OA in the sample.

.....

..... [1]

..... [7]

### Quality of Written Communication [1]

- (d) Joints are held together by ligaments that contain collagen.

Describe the structure and properties of collagen.

.....

.....

.....

.....

.....

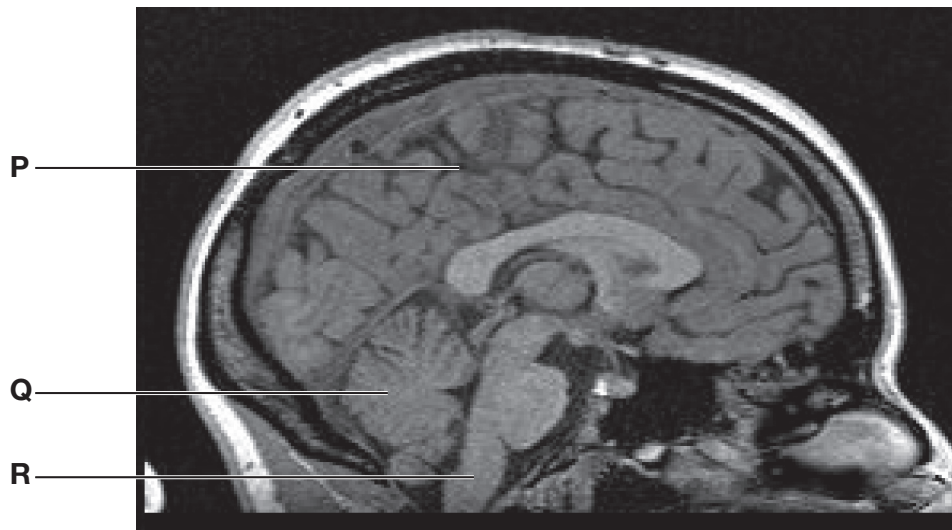
.....

.....

..... [4]

[Total: 15]

- 4 Fig. 4.1 shows a side view of an MRI scan through a human brain.



**Fig. 4.1**

- (a) Name the parts of the brain labelled **P**, **Q** and **R**.

**P** .....

**Q** .....

**R** ..... [3]

- (b) The posterior pituitary gland releases the hormone ADH which plays an important part in homeostasis.

- (i) Explain what is meant by the term *homeostasis*.

.....  
 .....  
 .....  
 ..... [2]

- (ii) Outline the role played by ADH in homeostasis.

.....

.....

.....

.....

.....

.....

.....

..... [4]

- (c) A survey carried out in the USA found that the body mass index (BMI) and waist size can influence the onset of Alzheimer's disease.

Table 4.1 summarises the results of the survey.

**Table 4.1**

BMI	waist size	risk of developing Alzheimer's disease
normal	normal	normal risk
normal	large	90% greater risk
overweight	normal	80% greater risk
overweight	large	230% greater risk
obese	large	360% greater risk

- (i) What conclusions can be drawn from this study?

.....

.....

.....

.....

.....

.....

..... [3]



- (ii) Name **one** disease, **other than Alzheimer's disease**, that may result from obesity.

..... [1]

[Total: 13]

**QUESTION 5 STARTS ON PAGE 18**

- 5 (a) Leber Congenital Amaurosis (LCA) is a **rare** inherited degenerative disease of the retina resulting in reduced vision.

Explain how two parents with normal vision can have a child with LCA.

.....

.....

..... [2]

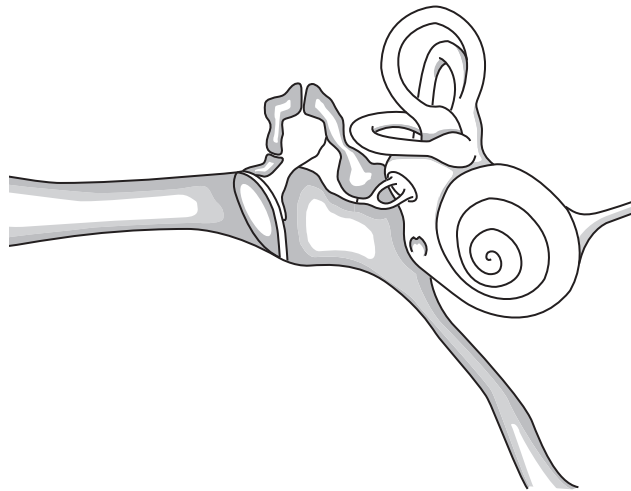
- (b) People with LCA can only see objects that are **brightly** illuminated.

Recently, gene therapy has been used to regenerate cells in the retina of people with LCA.

Name the type of photoreceptor cell in the retina that is regenerated by the treatment.

..... [1]

- (c) Fig. 5.1 shows a model of the internal ear of a mammal.



**Fig. 5.1**

**Draw label lines on Fig. 5.1** to identify the tympanic membrane (tympanum) and the cochlea.

Use a **T** to identify the tympanum and a **C** to identify the cochlea.

**[2]**

Describe the role played by the structures of the **inner** ear in providing the brain with information about the **movement** of the head.

[8]

© OCR 2010

**Turn over**

- (e) Ringing in the ears is very common and is known as tinnitus. A major cause of tinnitus is exposure to loud noise over a long period of time.

Name the cells in the inner ear likely to be damaged by loud noise **and** suggest why this may lead to tinnitus.

.....

.....

.....

..... [2]

[Total: 16]

- 6 (a) The passage below outlines operant conditioning.

Use words in the box to complete the passage.

negative	positive	immediate	delayed	good
reward	bad	association	random	stimuli
visual	opposition	punishment	activities	

Operant conditioning forms an ..... between a behaviour and a consequence, whereas classical conditioning links two different types of ..... . Consequences have to be ..... for operant conditioning to work with animals. If the consequence is a ..... , then the frequency of the behaviour will increase. This is called ..... reinforcement. Also, ..... reinforcement can be used to stop a behaviour by either using a ..... or by removing something good. [7]

- (b) Table 6.1 lists acts of behaviour that are carried out by mammals. For each act of behaviour, write down in the table the **type** of behaviour displayed by the mammal.

act of behaviour	type of behaviour
a dolphin is trained to perform a trick by being rewarded with a fish	.....
a puppy searches for its mother's teat	.....
a cat's foreleg jerks back when its paw touches a hot radiator	.....
whenever the toilet flushes in a house the shower becomes very hot and the person jumps back; eventually the sound of the toilet flushing causes the person to jump back	.....

[4]

QUESTION 6(c) STARTS ON PAGE 22

- (c) Wolfgang Köhler investigated the behaviour of chimpanzees.

Describe briefly his **conclusions** on the ways in which chimpanzees learn to solve problems.

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 14]

END OF QUESTION PAPER

**BLANK PAGE**

**PLEASE DO NOT WRITE ON THIS PAGE**

**PLEASE DO NOT WRITE ON THIS PAGE**



**Copyright Information**

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations, is given to all schools that receive assessment material and is freely available to download from our public website ([www.ocr.org.uk](http://www.ocr.org.uk)) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.