

**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 26 January 2009**  
**Morning**

**Duration:** 1 hour 30 minutes

Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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**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**

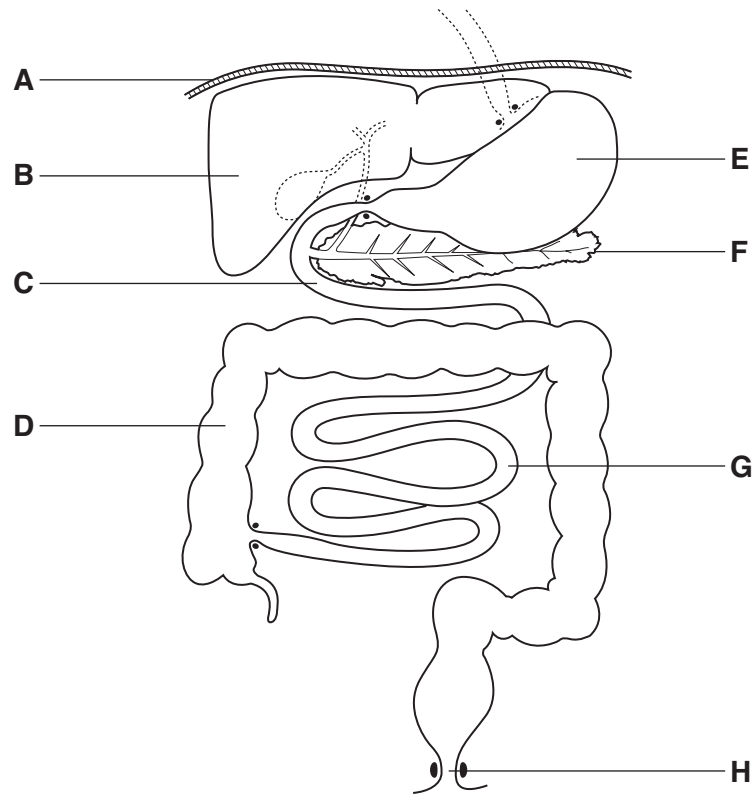
- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **90**.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **20** pages. Any blank pages are indicated.

**FOR EXAMINER'S USE**

Qu.	Max.	Mark
1	16	
2	18	
3	11	
4	17	
5	17	
6	11	
<b>TOTAL</b>	<b>90</b>	

Answer **all** the questions.

- 1 (a) Fig. 1.1 shows the digestive system of a human.



**Fig. 1.1**

Using the letters **A** to **H** in Fig. 1.1, state the **main** location for each of the activities below.

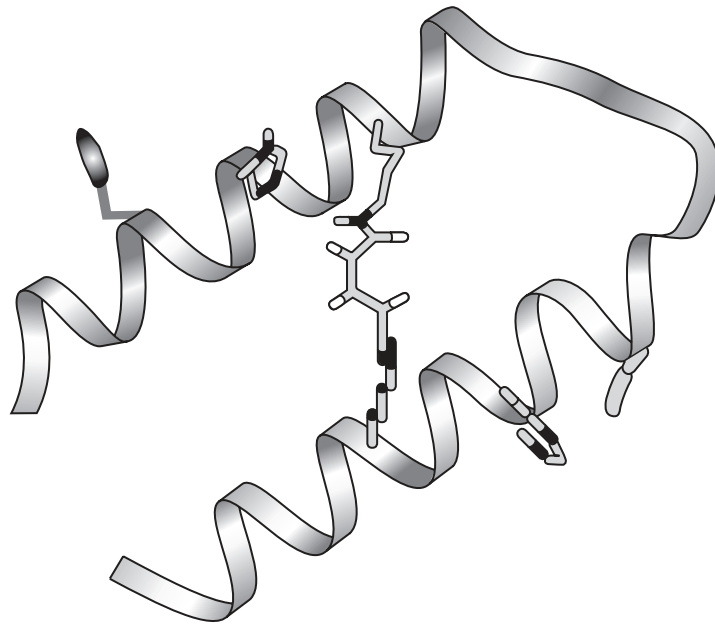
The first one has been done for you.

egestion	H
digestion by lipase	
absorption of glucose	
digestion by exopeptidases	
absorption of inorganic ions	
digestion by amylase	
synthesis of trypsinogen	

[6]

- (b) Pancreatic polypeptide (PP) is produced and secreted by endocrine cells in the pancreas. One molecule of PP consists of 36 amino acids.

Fig. 1.2 shows a diagram of part of a molecule of PP from a pig.



**Fig. 1.2**

Using Fig. 1.2 and your knowledge of proteins, describe the structure of molecules such as PP.

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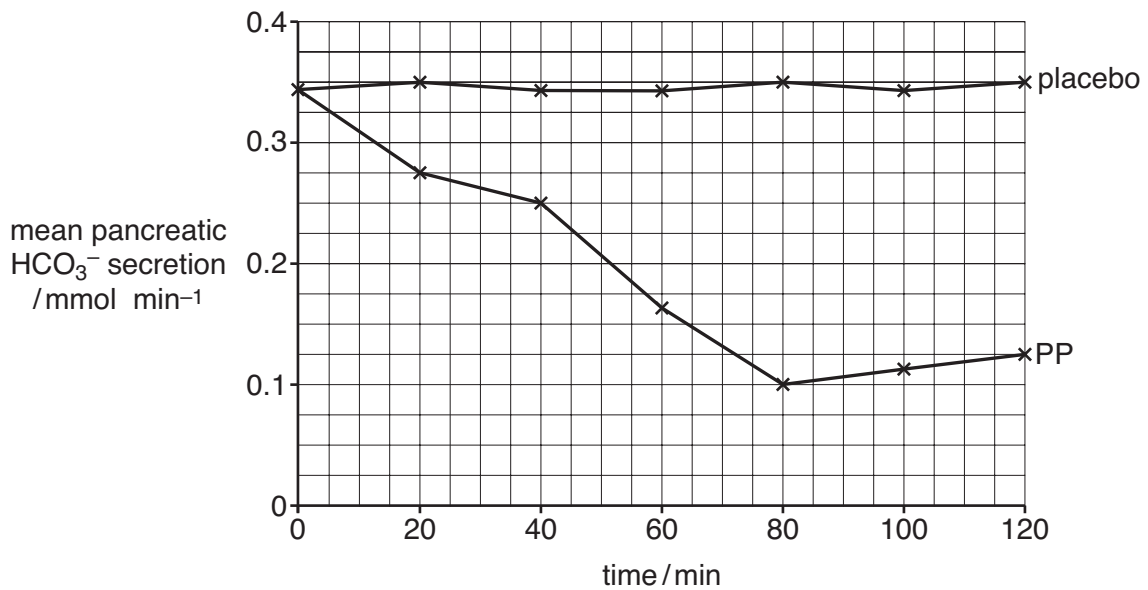
..... [3]

- (c) An investigation was carried out into the effects of PP on the secretion of hydrogencarbonate ions ( $\text{HCO}_3^-$ ) by the pancreas. This was carried out on ten healthy volunteers over a two-hour period.

The volunteers had not consumed food in the previous 12 hours.

- PP was given to five volunteers by using a continuous drip into a vein for two hours.
- An inactive substance, known as a placebo, was given to the other five volunteers in the same way, also for two hours.
- The secretion of pancreatic  $\text{HCO}_3^-$  was monitored for all ten volunteers over the two-hour period.

Fig. 1.3 shows the results of the investigation.



**Fig. 1.3**

Using the information in Fig. 1.3, describe **and** explain the effects of PP on pancreatic secretion.

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..... [4]

- (d) Some people with a non-malignant (benign) pancreatic tumour have raised levels of PP.

Explain what is meant by a *non-malignant (benign) tumour*.

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..... [2]

- (e) People with raised levels of PP may have a low body mass index (BMI) and a low appetite for food.

Suggest how PP may be useful as a drug.

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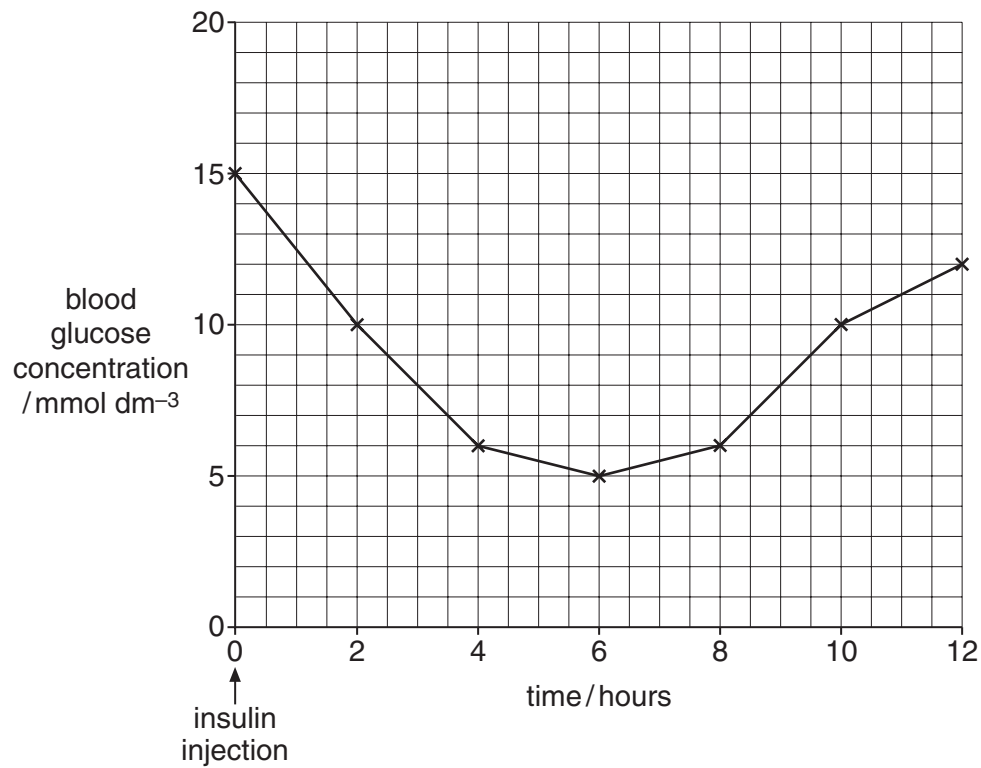
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[Total: 16]

- 2 (a) Dogs can have diabetes mellitus, a disease that results in a raised concentration of glucose in the blood.

Fig. 2.1 shows the blood glucose concentration of a dog for 12 hours after being injected with insulin.



**Fig. 2.1**

- (i) Describe the results shown in Fig. 2.1.

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..... [2]

- (ii) Diabetic dogs have a tendency to drink a lot of water and lose body mass.  
Suggest why this happens.

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..... [5]

- (b) The three main blood vessels of the liver are:

**hepatic vein**

**hepatic artery**

**hepatic portal vein**

- (i) Name the blood vessel that transports insulin, made in the pancreas, to the hepatocytes.  
..... [1]

- (ii) Name the blood vessel that will have the highest concentration of urea.  
..... [1]

[8]

**[Total: 18]**

- 3 Fig. 3.1 shows side views of a human brain and a rat brain.

The brains are not drawn to the same scale.

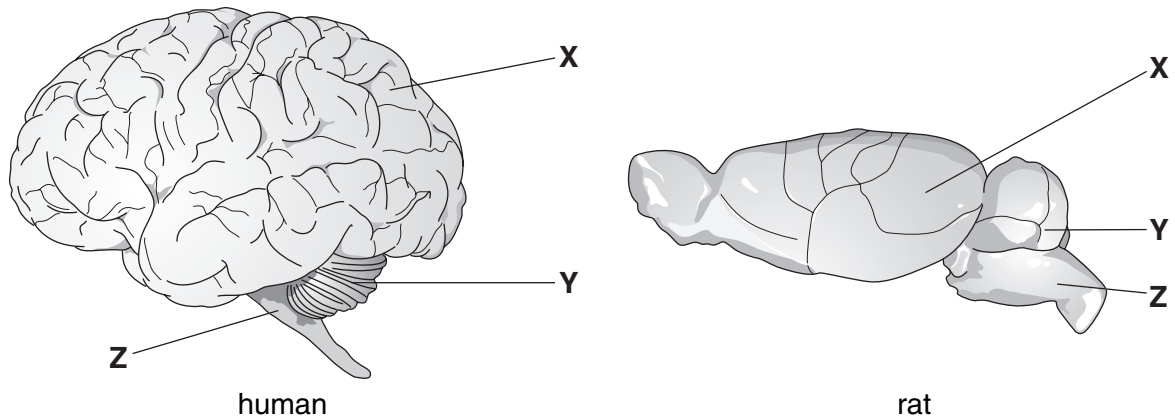


Fig. 3.1

- (a) Name structure **X** and describe the differences in structure **X** between the human brain and the rat brain as shown in Fig. 3.1.

structure **X** .....

differences .....

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..... [3]

- (b) Some Jack Russell terrier dogs have an inherited disorder that can affect structure **Y** in the dog's brain. Structure **Y** does not function as it should.

Suggest the symptoms of this disorder that may occur in these dogs.

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..... [2]

- (c) Describe **two** functions of structure **Z** in Fig. 3.1.

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..... [2]

- (d) Table 3.1 shows the relationship between brain mass and body mass in five mammals.

**Table 3.1**

mammal	brain mass / g	body mass / kg	ratio brain mass / g : body mass / kg
wolf	10	40	0.25 : 1
elephant	5000	7000	0.71 : 1
porpoise	1800	105	
human	1800	70	25.70: 1
rat	3	0.3	

Calculate the ratio of brain mass to body mass for the porpoise and the rat. Write your answer in the space provided in Table 3.1. [2]

- (e) It was discovered that some children, belonging to the same family, were unable to experience pain.

These children lack an allele of a gene required to produce voltage-gated sodium channel proteins in sensory neurones that form synapses with pain receptors.

Suggest how this lack of voltage-gated sodium channel proteins prevents these children from experiencing pain.

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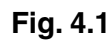
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[Total: 11]



- [1]

**[5]**



**[Total: 17]**

- 5 (a) Fig. 5.1 shows a computer-assisted drawing of a small part of the human retina.

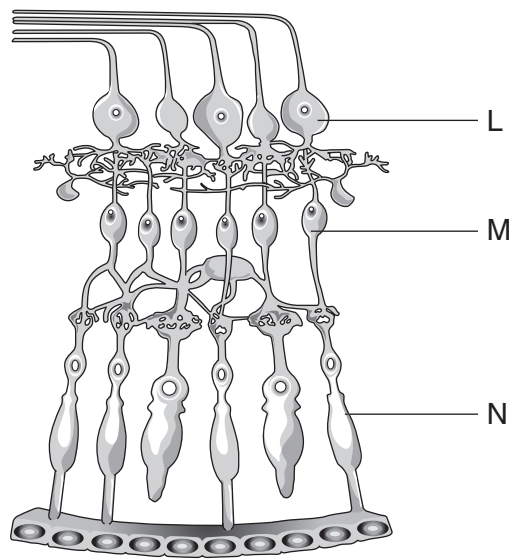


Fig. 5.1

Name cells **L**, **M** and **N**.

**L** .....

**M** .....

**N** ..... [3]

- (b) Retinitis pigmentosa (RP) is the name given to a group of inherited eye diseases that affect the retina, causing degeneration of photoreceptor cells.

As these cells degenerate and die, people with RP experience progressive vision loss. Most forms of RP initially cause a degeneration of cell type **N**.

Describe the symptoms of loss of vision that may be experienced in the early stages of RP as cell type **N** degenerates.

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 ..... [2]

(c) RP describes three inherited eye disorders, all with similar symptoms but with different inheritance patterns. The inheritance patterns are:

- autosomal dominant
- autosomal recessive
- X-linked recessive.

Complete the table below to indicate the likely inheritance pattern for four individuals, all of whom have RP.

individual	family history of RP	likely inheritance pattern
1	only present in male family members	.....
2	not present in last three generations	.....
3	present in one parent	.....

[3]

(d) Some people with RP have been fitted with an artificial retina. It consists of a miniature camera attached to a pair of dark glasses. The camera sends a signal to a silicon chip attached to the retina. Electrodes from the chip then stimulate cells in the retina.

Using your knowledge of the retina and Fig. 5.1, suggest the cells that will be stimulated by the electrodes **and** explain why you have made this choice.

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..... [3]

- (e) A cataract is the clouding of a normally clear lens in the eye.

Fig. 5.2 shows a photograph of a cataract.



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**Fig. 5.2**

- (i) Explain how the lens may become cloudy.

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..... [3]

- (ii) Describe the most effective treatment for cataracts.

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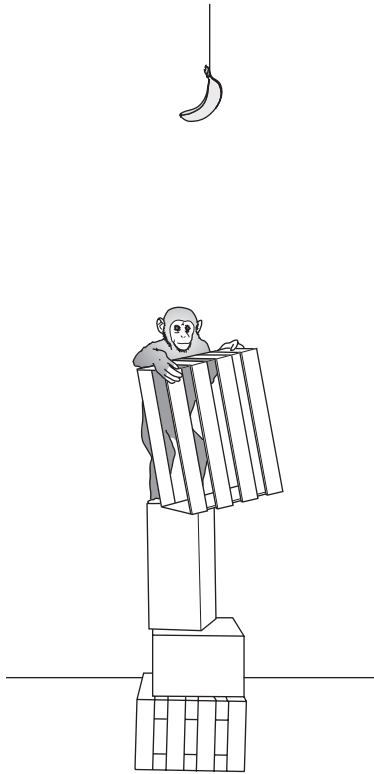
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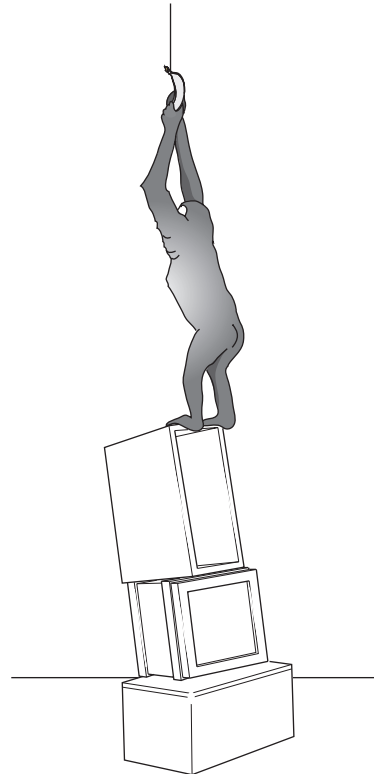
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- 6 (a)** Wolfgang Köhler studied learning in chimpanzees, over 80 years ago.

Fig. 6.1 and Fig. 6.2 are drawings based upon photographs taken by Köhler.



**Fig. 6.1**



**Fig. 6.2**

Describe **and** explain the learning processes taking place in Fig. 6.1 and Fig. 6.2.

[4]

- (b) Describe what is meant by a reflex action **and** explain why reflexes are advantageous.

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..... [4]

- (c) Listed below are three situations. For each situation, state whether **classical conditioning** or **operant conditioning** has taken place **and** explain why you have made your choice.

- (i) A dog jumps onto furniture, but never does this when its owner is present.

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..... [1]

- (ii) After surviving a serious car accident, a woman's pulse rate increases whenever she hears screeching brakes.

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..... [1]

- (iii) Sheep run to an empty food container when they hear a tractor engine.

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..... [1]

[Total: 11]

**END OF QUESTION PAPER**

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