WJEC CBAC

GCSE

4461/02

SCIENCE A/BIOLOGY

BIOLOGY 1
HIGHER TIER

P.M. MONDAY, 10 June 2013

1 hour

Suitable for Modified Language Candidates

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	6	
2.	6	
3.	6	
4.	6	
5.	6	
6.	6	
7.	6	
8.	4	
9.	8	
10.	6	
Total	60	

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication used in your answer to questions **4**. and **10**.

*Answer **all** questions.*

1. *(a)* What is a *tropism*? [2]

....

....

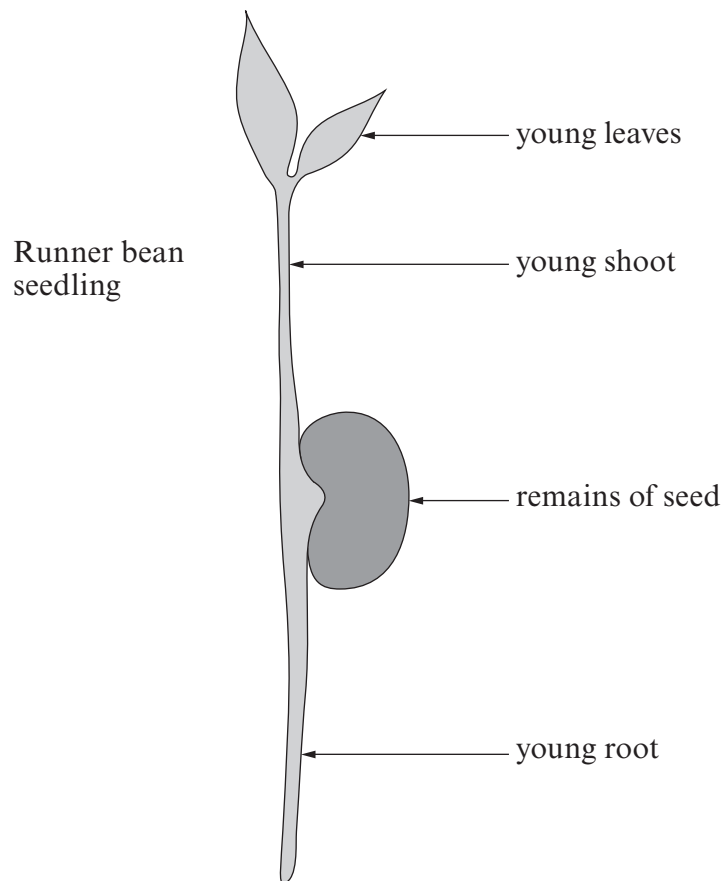...

(b) A number of runner bean seedlings were grown in soil in a laboratory. After 5 days the seedlings were removed from the soil and their young roots were washed. The straightest of the seedlings was then selected.

Runner bean seedling

young leaves

young shoot

remains of seed

young root

The runner bean seedling was positioned horizontally and pinned to a cork block as shown below.

LIGHT

cork block
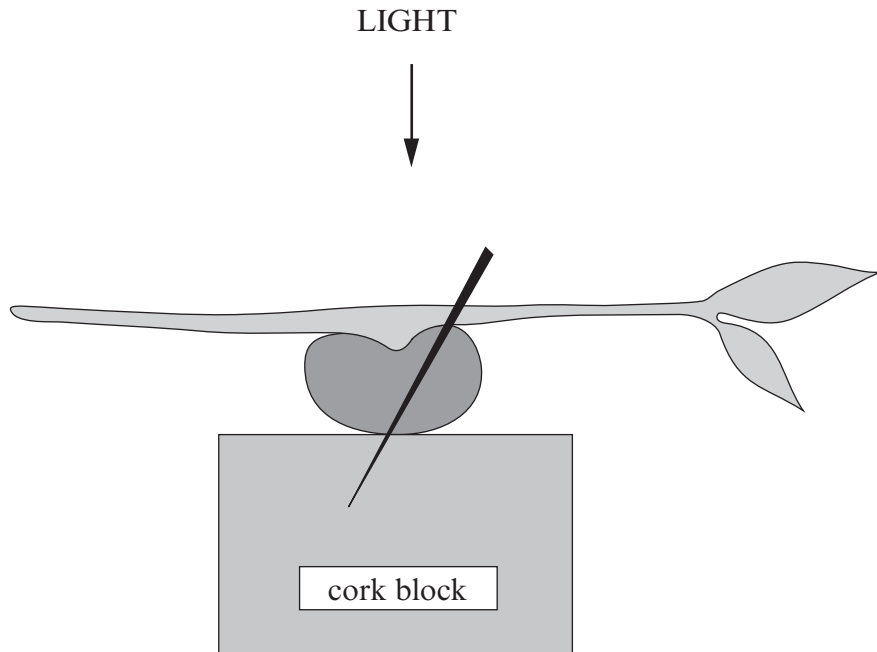
(i) After 3 days the seedling was examined.
Complete the diagram below by sketching the expected appearance of the young root **and** shoot. [2]

cork block
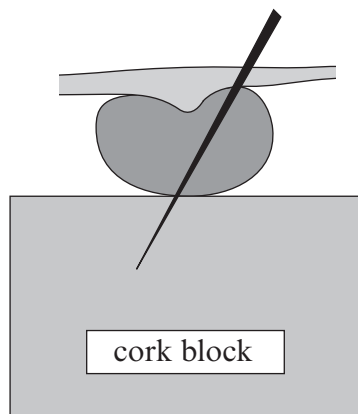
(ii) Name the response shown by

I the root, ... [1]

II the shoot. .... [1]

6

2. The chart below shows the relationship between being overweight and increased chance of an early death in the human population in the UK.
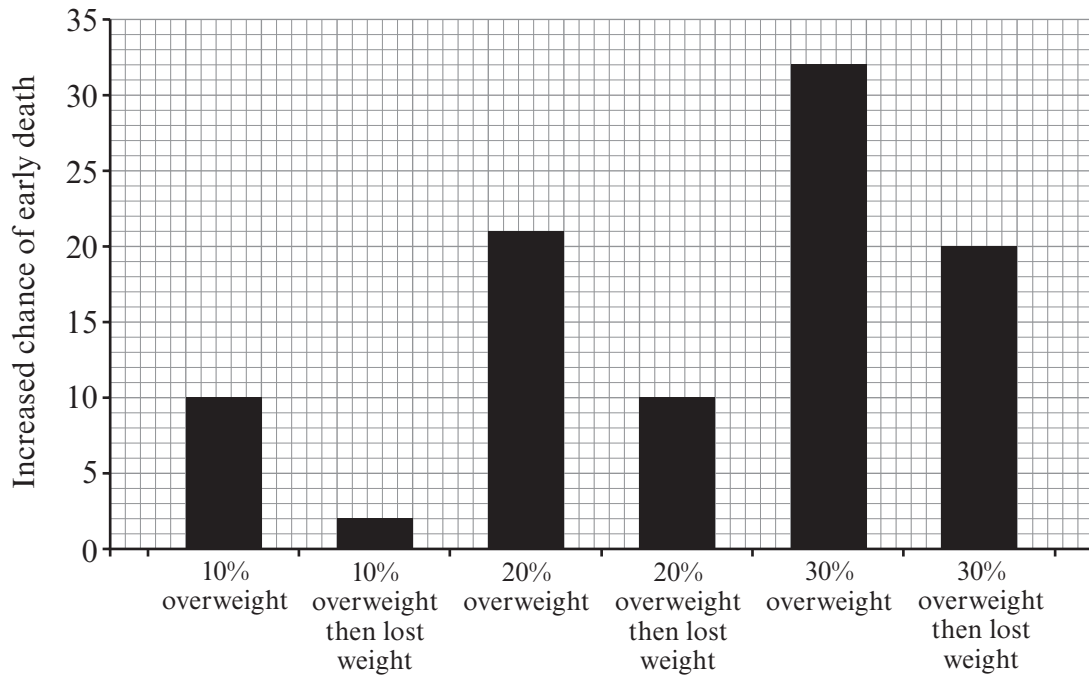
(a) Use the evidence in the chart. State **two** relationships between being overweight and an increased chance of early death. [2]

(i) ....

(ii) ....

(b) The recommended daily energy intake for a man is 10 500 kJ.
The table below shows the energy content of some foods.

food	energy (kJ)
milk 100 g	272
1 egg	15
1 bacon rasher	200
soup 100 g	300
bread & butter 1 slice	520
marmalade 100 g	500
chocolate 100 g	3300

food	energy (kJ)
fried fish 100 g	550
chips 100 g	1065
apple pie 100 g	1200
custard 100 g	500
cheese 100 g	1682
biscuits 100 g	500
sugar /teaspoon	170

John is a 42 year old man who is severely obese. His typical lunch is shown in the table below:

©*iStockphoto*

John's lunch	energy content (kJ)
large portion of chips 300 g	3195
4 slices of bread and butter	....
large fried fish 250 g	1375
2 cups of black coffee with 4 teaspoons of sugar per cup	1360
portion of apple pie 200 g	....
portion of custard 50 g	....
Total energy content of John's lunch	....

(i) Complete the table above. Use the table opposite to calculate the energy content of the foods John has eaten. Calculate the total energy content of his lunch. Some of the table has been completed for you. [2]

(ii) John has exceeded his recommended daily energy intake in this single meal alone. Calculate how many kJ he has eaten above the recommended daily energy intake. [1]

.... kJ

(iii)　John's eating habits are typical of many adults living in developed countries.
The graph below shows the trends in being overweight, obese and severely obese
among adults aged 20 - 74 in the USA between 1960 and 2007.
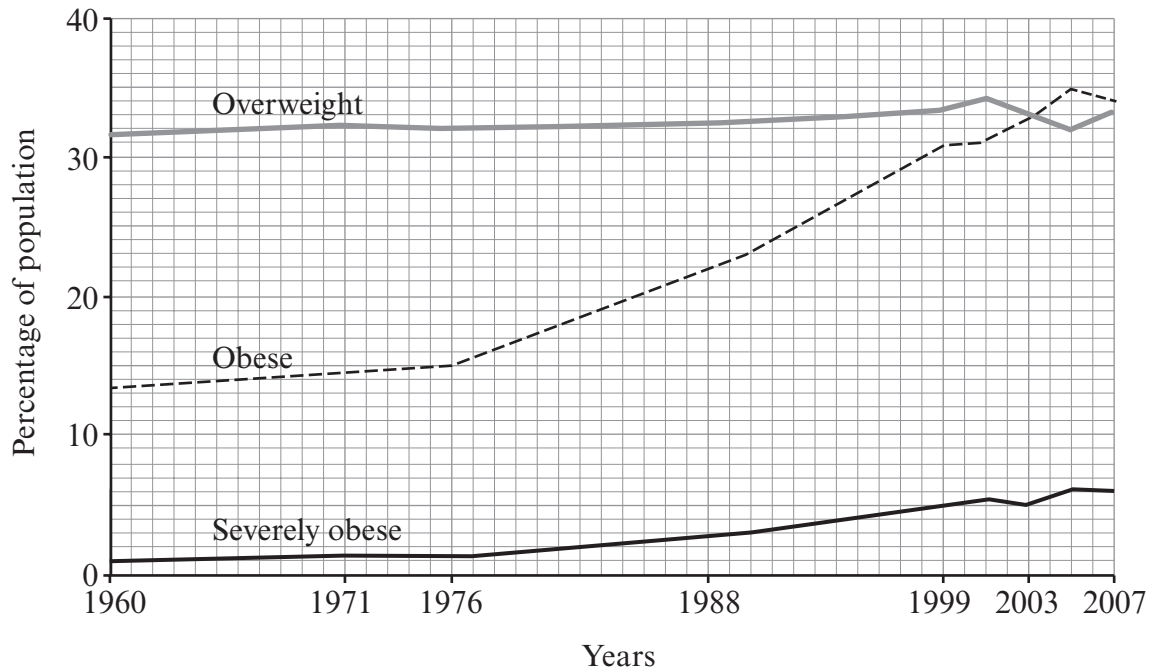
Use the graph above to **calculate** the increase in the percentage of obese adults in
the USA between 1976 and 2007. [1]

.... %

3. The diagrams below show the skin in two different environmental conditions.

| Diagram **P** | Diagram **Q** |

hair

B

blood vessel   **A**
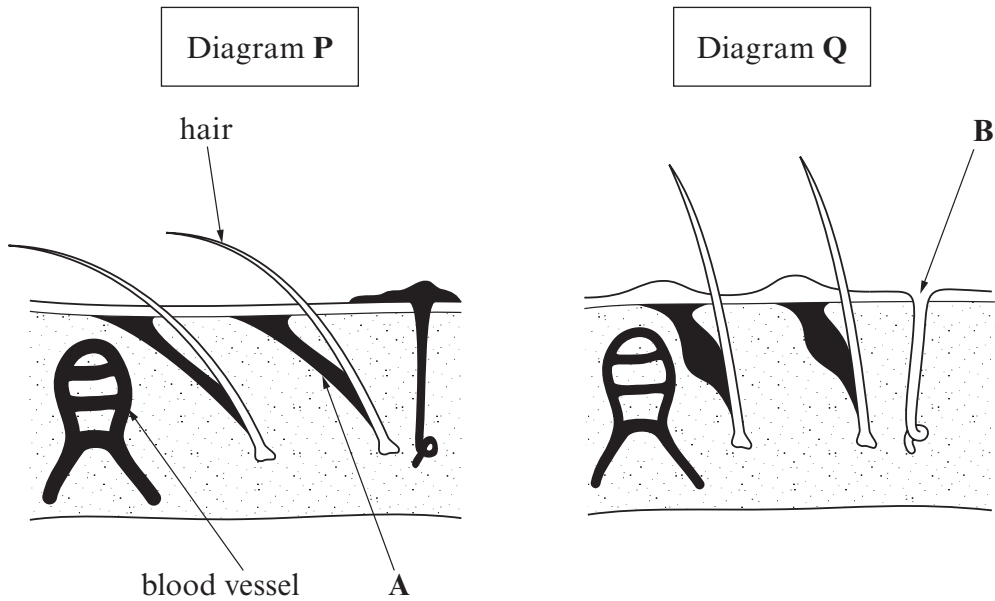
(a) Name the parts **A** and **B** labelled on the diagrams. [2]

A ....

B ....

(b) Diagram **P** shows how the skin responds to cool the body down.
Identify **two** of these responses and explain how each cools the body.

(i) Response .... [1]

Explanation of cooling effect. .... [1]

....

(ii) Response .... [1]

Explanation of cooling effect. .... [1]

....

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4. The diagram shows the basic outline of the carbon cycle.

Use the diagram above **and your own knowledge**. Explain **in detail** how carbon is cycled in nature. Start your account with carbon dioxide being taken up by green plants. [6 QWC]

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5. In mice the allele for black colour **(B)** is dominant over the allele for white colour **(b)**. Two heterozygous black mice are mated together. They produce 8 young mice.

(a) (i) Which of the following results would you expect to see? [1]

Underline the correct answer.

A   4 black and 4 white

B   6 black and 2 white

C   all black

D   2 black and 6 white

(ii) Complete the Punnett square below to help explain your answer to part *(a)*(i). [2]

Gametes		

Images: ©Emilia Stasiak/Shutterstock

(b)   The sex of mice is determined by which sex chromosomes are present.

(i)   State the sex chromosomes present in the body cells of   [1]

I   the father, ...

II   the mother.   ....

(ii)   Complete the Punnett square below to show the expected sex chromosomes of the offspring.   [2]

Gametes		

6. In the 1850s it was thought that there were two species of elephants living on Earth. In the 1950s some scientists suggested that three species of elephants existed. These were:

1. *Elephas indicus*, the Indian elephant

2. *Loxodonta africana*, the African plains elephant

3. *Loxodonta cyclotis*, the African forest elephant

In 2011, an analysis of the chemical structure of chromosomes of African, Indian and fossil elephants was carried out. This provided evidence that African and Indian elephants had a common ancestor 2.5 million years ago and confirmed that three species of elephants exist today.

(a) Name: [2]

   (i)   the chemical in the chromosomes that was analysed;

   ....

   (ii)   the units made of this chemical which make up chromosomes.

   ....

The diagram below is a simplified family tree. It shows the evolution of elephants and their ancestors. Each letter represents a species.
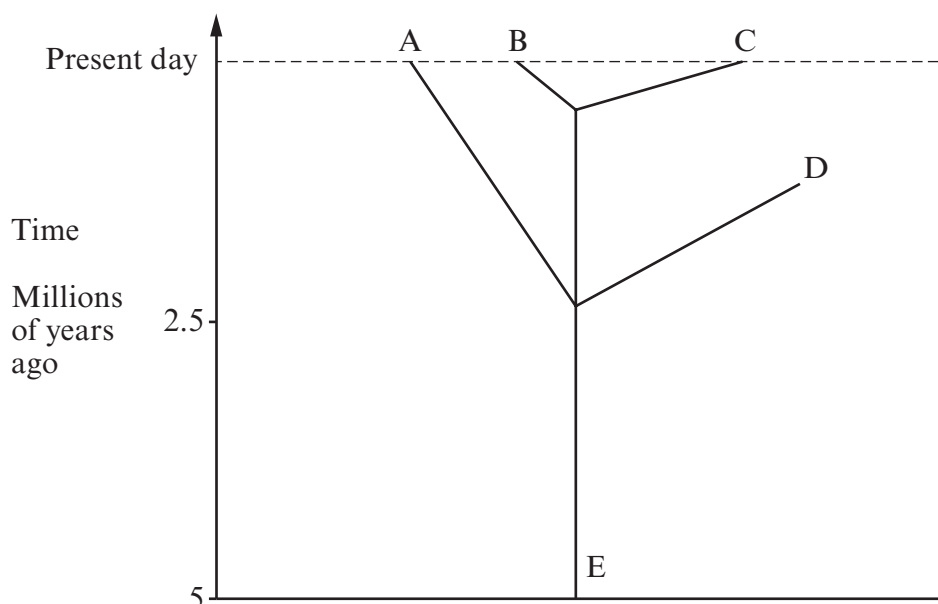
(b)   Use all of the information given opposite. Answer the following questions.   [4]

Which **letter** or **letters** in the diagram opposite represent:

(i)   a common ancestor to more than one species;   ....

(ii)   an extinct species;   ....

(iii) *Elephas indicus*;   ....

(iv)   the **two** closest related species?   .... and ....

7. Measurements of some chemical factors of water were made in a river at points above and below a sewage outfall. This was done to monitor environmental pollution. The results are shown in the graph below.
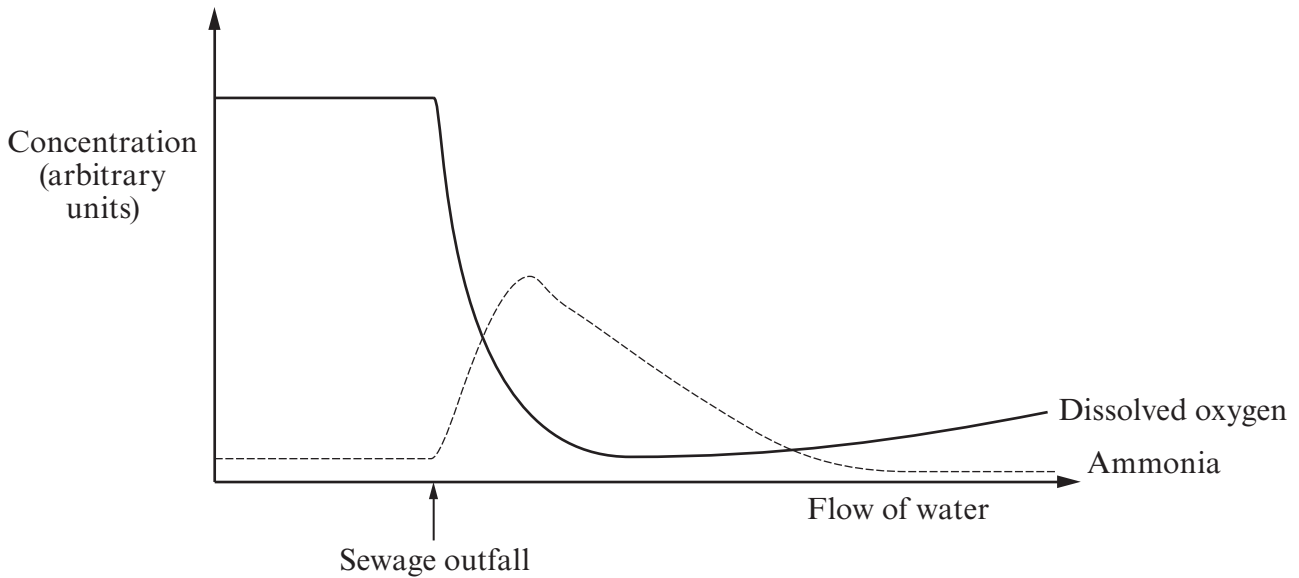
(a) Use the graph **and your own knowledge** of water pollution. Explain why the sewage caused the decrease in the dissolved oxygen. [2]

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....

(b) Use the graph **and your own knowledge** of the nitrogen cycle. Describe and explain the changes in concentration of ammonia shown in the graph. [4]

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8. A scientist investigated the transfer of energy between an oak tree and organisms living on it. She recorded the data in the following table:

use of the energy	kJ per m² per year
absorbed by the oak tree	4 600 000
transferred to carbohydrates	44 000
transferred to herbivores	2 920
transferred to carnivores	700

(a) Calculate the percentage of the energy absorbed by the oak tree that is transferred to carbohydrates. Show your working and give your answer to the **nearest whole number**.

[2]

Answer .... %

(b) Explain why only a small proportion of the total energy is transferred to the carnivores.

[2]

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9. It is important to keep the concentration of glucose in the blood constant. The flow diagram shows how this happens.
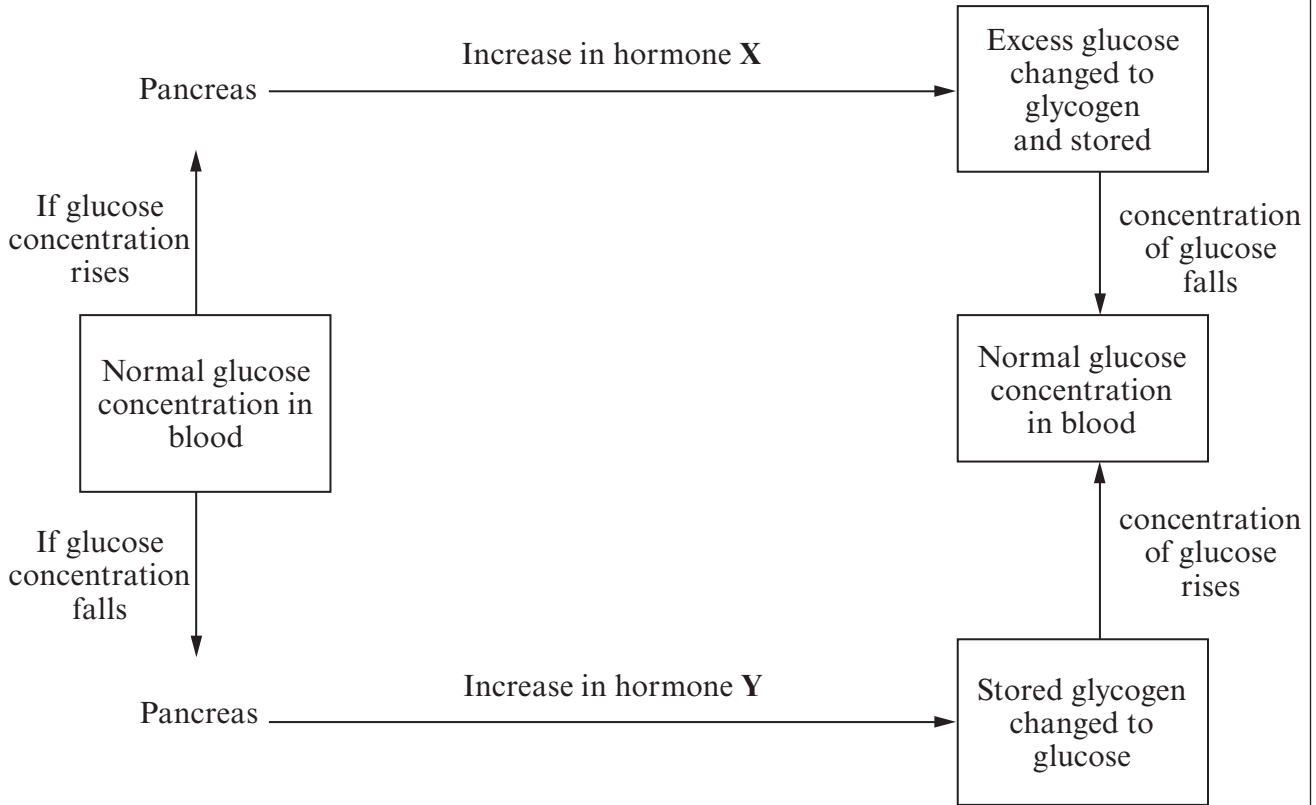
(a) What term would you use to describe the control mechanism shown in the diagram? [1]

....

(b) Name the hormones, **X** and **Y**, shown in the diagram. [2]

(i) **X** ....

(ii) **Y** ....

(c) Name the organ of the body which stores glycogen. [1]

....

(d) If the body is unable to change excess glucose into glycogen, the glucose is excreted in urine. Describe how you would test a urine sample for glucose.

(i) Procedure. [2]

....

....

....

(ii) Expected observations: [2]

If glucose is present ....

If glucose is absent ....

8

10. Henderson Island in the Pacific Ocean is very small and has eight endangered species of birds. Rats live on the island and eat 95% of the birds' eggs. Scientists hope to kill all of the rats on the island by using a poison.

In Wales, a population of rats, resistant to the poison were discovered in the 1960s.

Explain how this resistance developed and spread throughout Britain. Suggest why using poison as a method of control on Henderson Island might be more successful. [6 QWC]

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END OF PAPER