wjec cbac

GCSE

4461/01

W16-4461-01

SCIENCE A/BIOLOGY

BIOLOGY 1
FOUNDATION TIER

A.M. THURSDAY, 7 January 2016

1 hour

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	9	
2.	8	
3.	7	
4.	4	
5.	8	
6.	6	
7.	7	
8.	5	
9.	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.
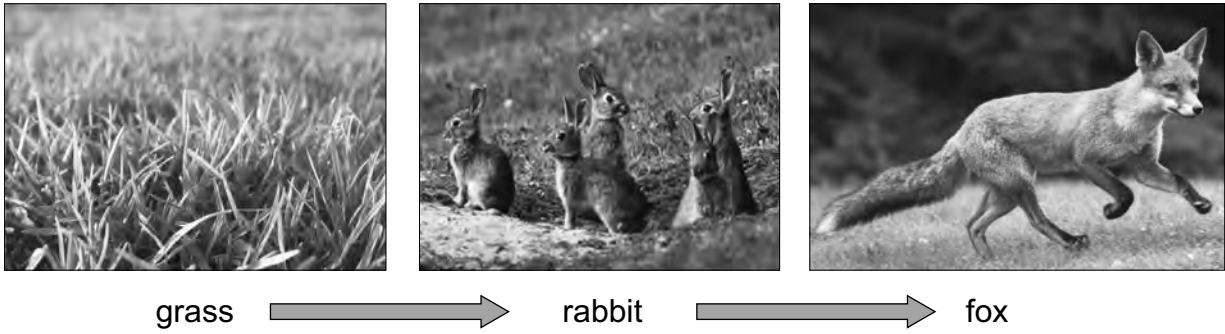
INFORMATION FOR CANDIDATES

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 (QWC) used in your answer to question **9**.

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*Answer **all** questions.*

1.   The diagram shows a grassland food chain.

grass ➡ rabbit ➡ fox

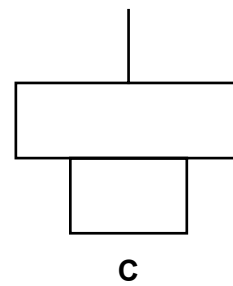*(a)*   Which **one** of the following words describes the rabbits?   [1]

Underline the correct answer.

Rabbits are: producers   herbivores   carnivores

(b)   Which of the following pyramids of number (**A**, **B** or **C**) matches the food chain?   [1]

A   B   C
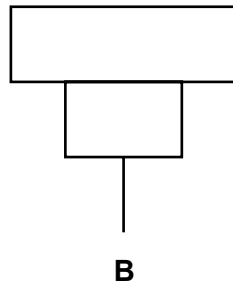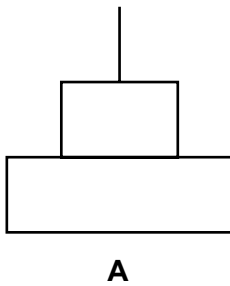
Answer ....

Turn over.

(c) Rhian uses a computer model to investigate the population growth of rabbits on an island. The computer produces a graph of how the number of rabbits on the island might change over ten years.
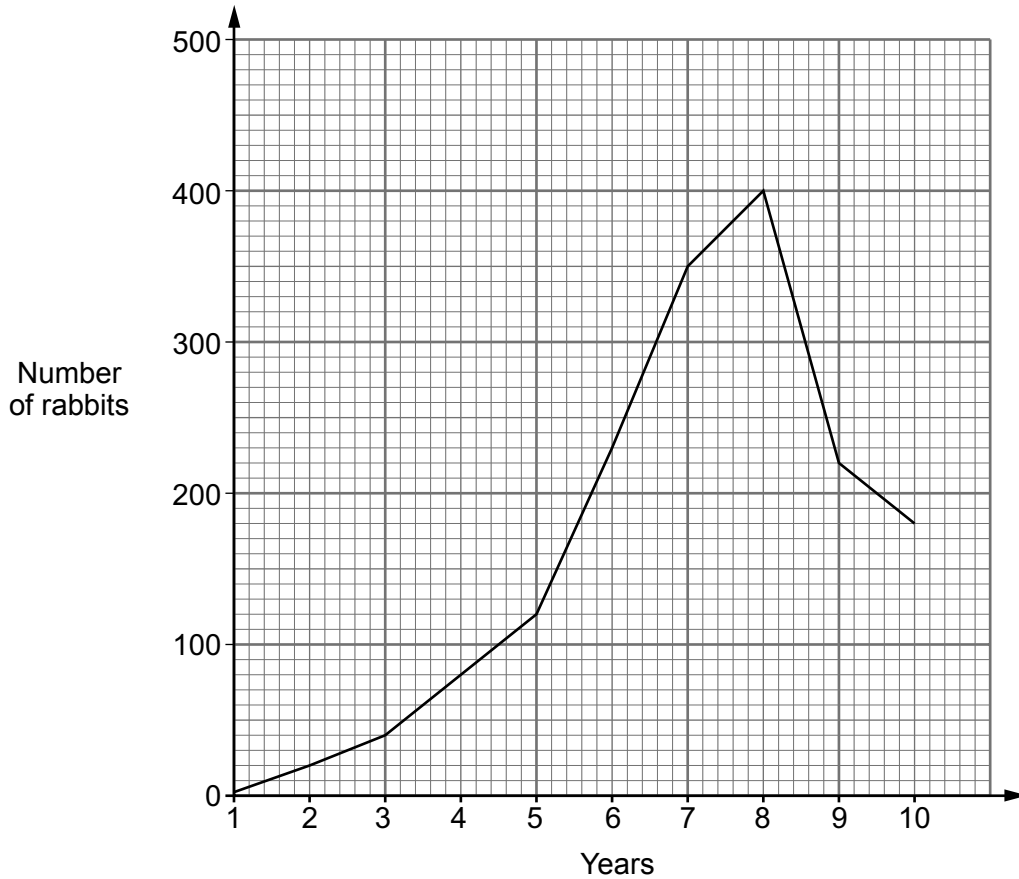
Use the data from the graph to answer the following questions:

(i) In which two year period was population growth the fastest? [1]

Between year .... and ....

(ii) State the number of rabbits on the island in year 8. [1]

....

(iii) The island has an area of $2000\,m^2$.
At the start, there are 2 rabbits on the island, so the area for each rabbit is $1000\,m^2$.
Calculate the area for each rabbit in year 8. [1]

Answer .... m^2

(iv) Calculate the fall in the number of rabbits between years 8 and 10. [1]

Answer ....

(d) Rhian said 'the number of rabbits has fallen because they don't have enough space'.

Apart from lack of space, suggest **three** other reasons that might cause the number of rabbits on the island to decrease. [3]

1. ....

2. ....

3. ....

9

2. The drawing shows an extinct mammal called the woolly mammoth *(Mammuthus primigenius)*.
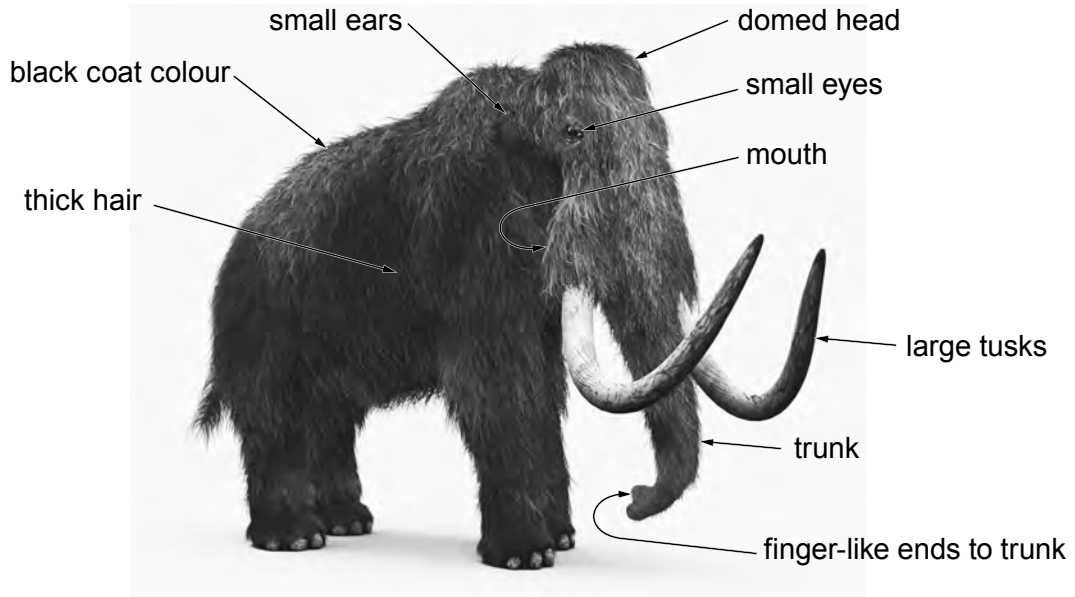
(a) (i) Woolly mammoths lived at a time when the climate was very cold.

Some of the labelled adaptations helped woolly mammoths keep warm.

Choose **two** of the adaptations and state how each one helped woolly mammoths keep warm. [4]

I. ....

....

....

II. ....

....

....

(ii) Woolly mammoths ate plants.

Suggest how the trunk is adapted to help woolly mammoths pick up their food. [1]

....

(b) In May 2013, the frozen body of a woolly mammoth was recovered from thick ice in Russia.
Although the animal died 10 000 years ago, it was still well preserved.

Explain why the animal was well preserved. [3]

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8

3. This question is about the control of blood sugar.

(a) The diagram shows part of the human body with two labelled organs, **X** and **Y**.
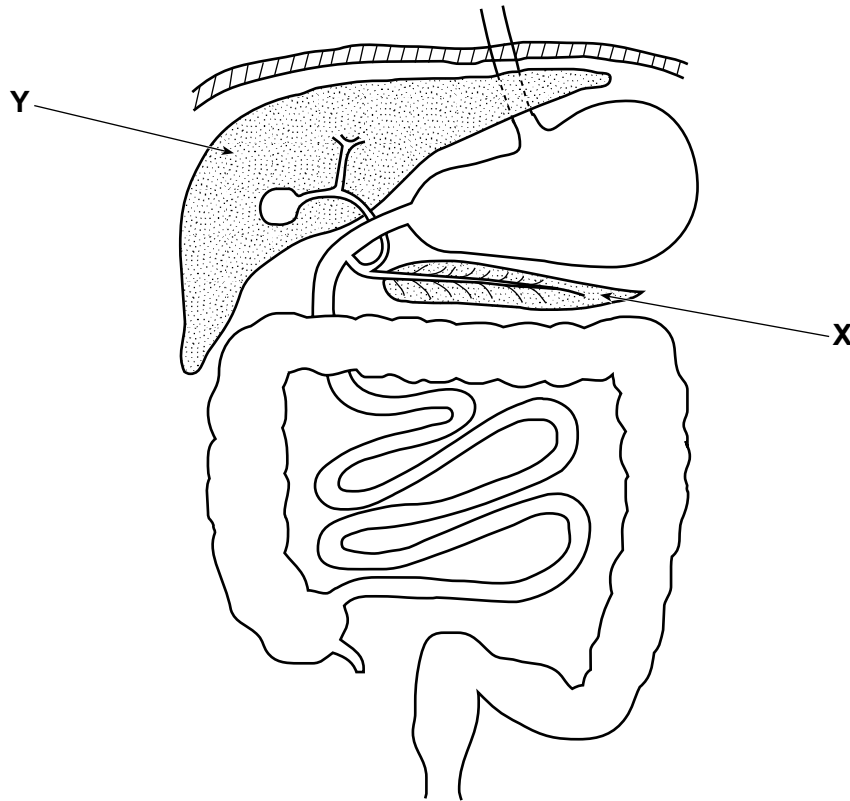
(i) Insulin is produced in organ **X**.

State the name of organ **X**. [1]

....

(ii) Insulin has its effect in organ **Y**.

State the name of organ **Y**. [1]

....

(iii) How does insulin travel from organ **X** to organ **Y**? [1]

....

(b) In Wales, in 2010, the cost of treating diabetes was £500 million.

1. The percentage of the population with type 2 diabetes is increasing.

2. The percentage of the population who are obese is increasing.

3. The population is increasing.

Using the three statements above, which of the following (**A**, **B** or **C**) shows that the cost of treating diabetes will increase in the future? [1]

A. 1

B. 1 and 2

C. 1, 2 and 3

Answer ....

(c) Complete the following sentence. [1]

Diabetes may be diagnosed by testing a sample of urine for presence of

....

(d) Suggest **two** healthy lifestyle choices which might help prevent the development of type 2 diabetes. [2]

....

....

....

....

7

4. The diagram shows the role of a tree in part of the **carbon cycle**.

Gas **X**
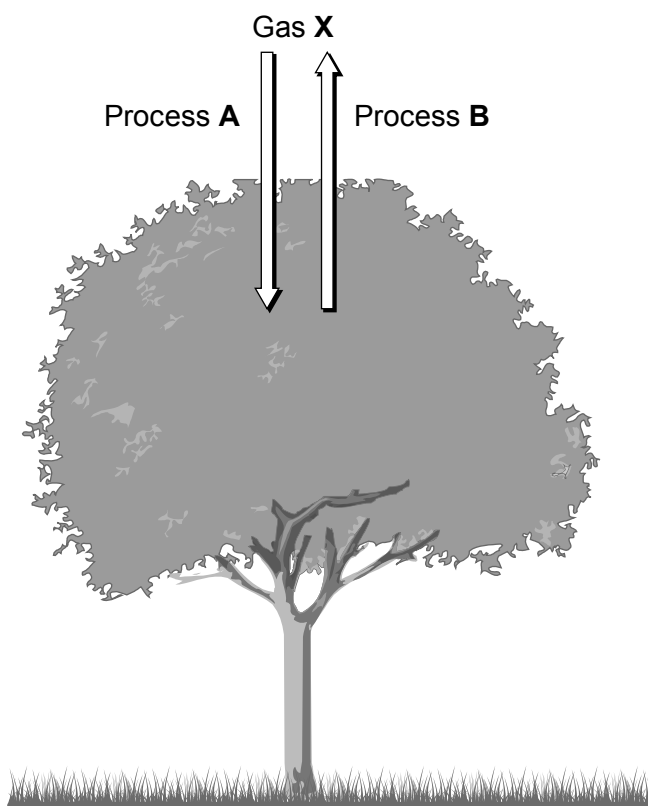
Process **A**   Process **B**

(a) From the diagram of part of the carbon cycle, state the name of:

(i) process **A**, which uses gas **X** to make sugar .... [1]

(ii) process **B**, which releases gas **X** .... [1]

(iii) gas **X** .... [1]

(b) The fallen leaves of the tree are collected and burnt.

How does burning (combustion) affect the carbon cycle? [1]

....

4

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 Turn over.

5. Harri used the apparatus shown below to investigate the sensitivity of the skin to changes in temperature.
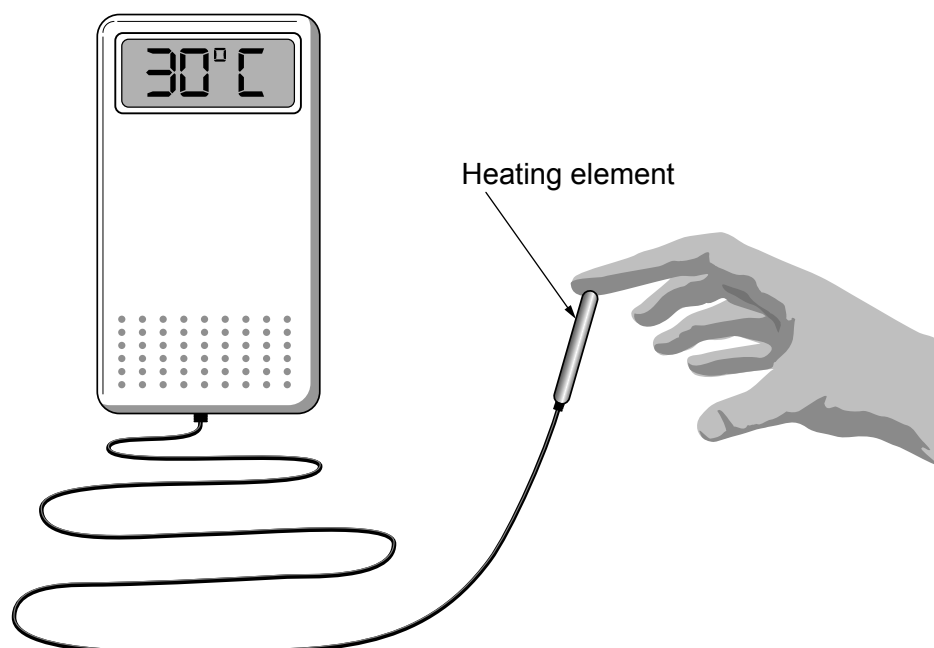
Heating element

This is Harri's method.

- He placed the heating element, set at 30°C, to a fingertip of one student.
- He increased the temperature of the heating element in 0.1°C steps.
- He noted the temperature at which the student said she could feel the increase in temperature.
- He called this temperature the **end temperature**.

He repeated this method on the lips, cheek and elbow.

(a) Harri then tested three other students in his class.
The results are shown in the table below.

student	end temperature (°C)			
	finger tip	lips	cheek	elbow
1	30.5	30.4	30.5	30.8
2	30.4	30.2	30.6	31.0
3	30.4	30.3	30.6	30.9
4	30.6	30.3	30.7	31.4
mean	30.5	30.3	30.6	31.0

Use the data from the table opposite to answer the following:

(i) Which skin part is the most sensitive to temperature change?   [1]

....

(ii) Which skin part has the widest range of readings? .... [1]

(b) Harri then tested five of his teachers. The mean results are shown below.

mean end temperature (°C)			
finger tip	lips	cheek	elbow
30.6	30.3	31.3	32.0

Using only the results in the two tables, describe the effect of ageing on skin sensitivity.
                                                                                                                            [2]

....

....

....

(c) Complete the table below.   [4]

sense organ	stimuli detected
skin	temperature and ....
eye	....
....	sound
tongue	....

(4461-01)   **Turn over.**

6. Phenylketonuria (PKU) is an inherited disease caused by a recessive allele. PKU results in damage to the nervous system in the early years of life.

Key – **N** represents the allele for **not** having PKU

   n represents the allele for having PKU

A couple, neither of whom suffer from PKU, have a child who is found to have PKU.

(a) (i) State the genotype of: [1]

   I. the mother ....

   II. the father ....

(ii) Complete the Punnett square below to show the possible genotypes of the children produced by this couple. [2]

Gametes		

(iii) Place a circle in the Punnett square around the genotype of a child suffering from PKU. [1]

(iv) From your Punnett square, what is the probability of a child **not** having PKU? [1]

   ....

(b) At birth a sample of blood is taken from babies to check for PKU.

Suggest why the screening of newborn babies for genetic conditions like PKU is important. [1]

....

....

6

7. Vitamin A deficiency occurs when humans do not obtain enough of this vitamin from their food. It is very common in developing countries. It can result in blindness and between 250 000 and 500 000 children in these countries go blind each year from vitamin A deficiency. Approximately half of these children die within one year of becoming blind.

Golden Rice is a genetically modified (GM) crop plant which contains high levels of vitamin A. It was developed to help prevent vitamin A deficiency and has been grown in field trials in the Philippines, Taiwan and other countries.

(a) State the meaning of the term genetically modified (GM). [1]

....

....

(b) The graph below shows the mass of additional vitamin A which could be obtained each day if the countries indicated were to replace the rice varieties they grow with Golden Rice.
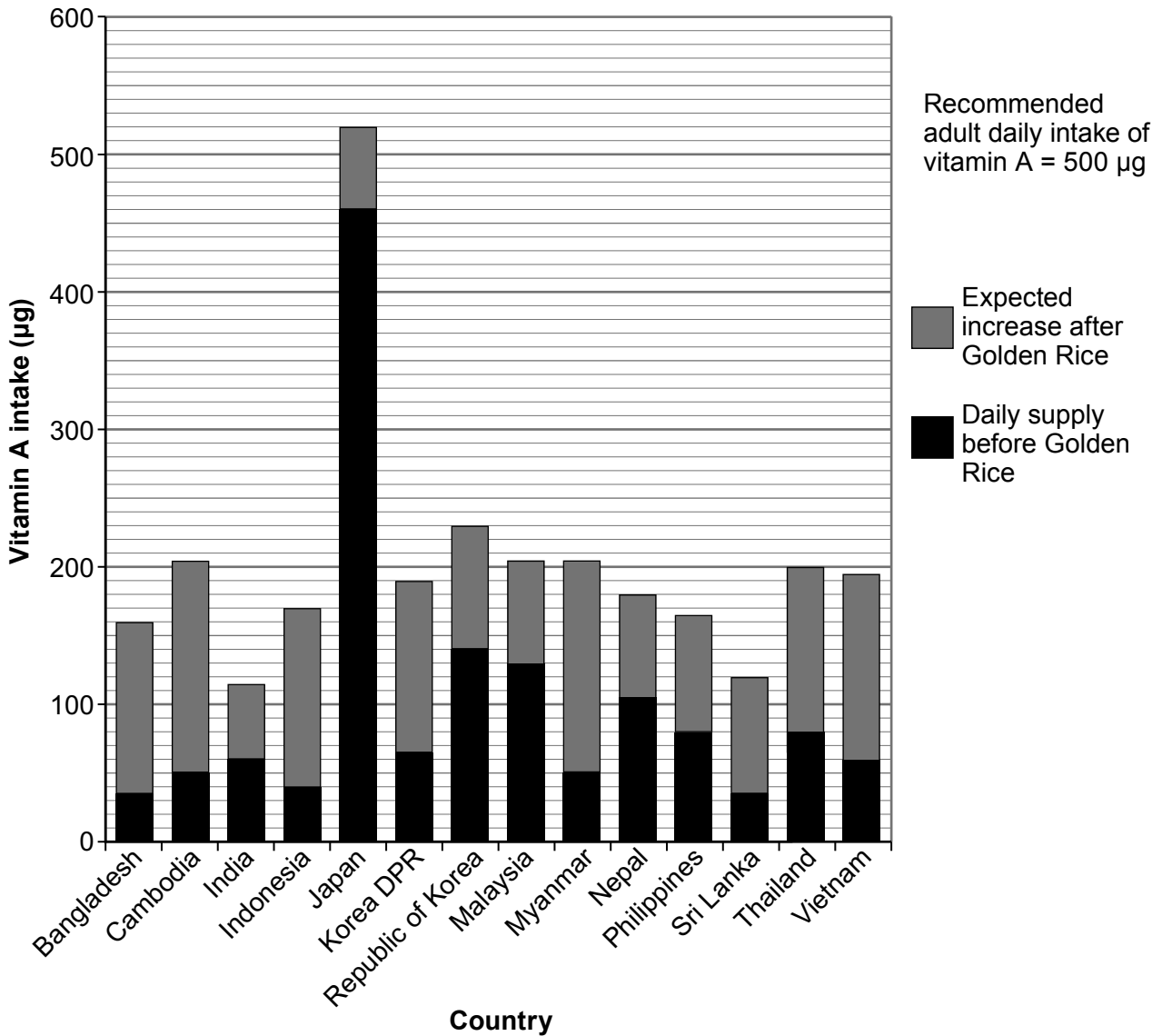
(i) In which of the countries in the graph would the people have sufficient vitamin A each day if they grew Golden Rice? [1]

....

(ii) In how many of the countries shown could the people increase the intake of vitamin A per day by 50% or more if they grew Golden Rice? [1]

....

(iii)   Since the data for the graph were obtained, a new variety of golden rice, Golden Rice 2, has been developed. The table below shows the potential benefits of Golden Rice 2 in Bangladesh.

	Adults	Children under 7 years of age
Recommended daily intake of vitamin A (µg)	500	450
Vitamin A provided by Golden Rice 2 (µg)	775	338
Vitamin A provided by other food eaten (µg)	245	112

Explain the effect of a diet containing Golden Rice 2 on the number of cases of blindness caused by vitamin A deficiency in Bangladesh.   [2]

....

....

(c)   In August 2013 a crop of Golden Rice that was being grown in a field trial was destroyed by protesters in the Philippines. The protesters said they had many concerns about the growth of GM crops.

Suggest what **two** of these concerns might have been.   [2]

....

....

....

7

8. *(a)* (i) What is meant by the term indicator species? [1]

....

(ii) Name **one** factor of water quality which can be assessed by using indicator species. [1]

....

(b) Lichens can be used as indicators of air quality and are often found covering the bark of trees. The amount of tree bark covered with lichen is known as the percentage cover. In the photograph below the lichen is covering about 40% of the bark i.e. the percentage cover is 40%.

Lichen on the bark of a tree

The table below shows the pH of the bark of ash trees and the percentage (%) cover of a lichen which is very sensitive to air quality. The data were collected along a 19 mile line, starting from the centre of a large industrial city.

Distance from city centre (miles)	0	1.0	1.7	3.0	4.7	6.0	6.5	7.0	8.0	9.0	9.5	10.5	12.5	14.5	16.5	19.0
pH	3.2	3.4	3.4	3.5	3.4	3.6	3.6	3.7	3.6	3.9	4.4	4.4	4.3	4.3	4.5	4.5
% cover of lichen	0	0	0	0	0	0	0	0	1	12	23	25	54	57	66	66

Describe and explain the change in the percentage (%) cover of lichen as you move out of the city centre. [3]

....

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9. Explain how human skin helps to control body temperature in hot conditions. Use the features labelled on the diagram below to help with your answer. [6 QWC]

hair

sweat pore

erector muscle

sweat duct

sweat gland

blood vessel

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END OF PAPER

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