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Monday 21 May 2012 – Morning

GCSE GATEWAY SCIENCE
BIOLOGY B

B731/01 Biology modules B1, B2, B3 (Foundation Tier)

B722290612

Candidates answer on the Question Paper.
A calculator may be used for this paper.

OCR supplied materials:
None

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: 1 hour 15 minutes

B731012

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

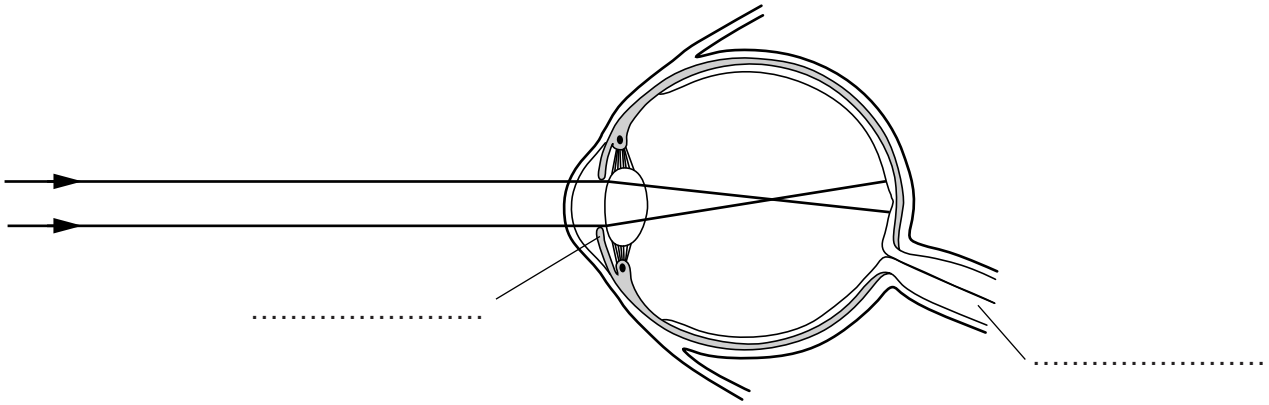
INFORMATION FOR CANDIDATES

- Your quality of written communication is assessed in questions marked with a pencil (✎).
- 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 **75**.
- This document consists of **20** pages. Any blank pages are indicated.

Answer **all** the questions.

Section A – Module B1

1 **(a)** The diagram shows an eye of a short-sighted person looking at a distant object.



(i) Complete the diagram by adding the **two** missing labels.

Choose the labels from this list.

iris **lens** **optic nerve** **pupil** **retina** **[2]**

(ii) The following statements give some features of short-sight.

Put ticks (✓) next to the **two** correct statements.

Use the diagram to help you.

Distant objects cannot be seen clearly.	☐
The colour of an object cannot be judged.	☐
The eyes cannot focus on close objects.	☐
Light rays are focused before the retina.	☐
Light rays are focused before the lens.	☐
Objects can only be seen by one eye.	☐

[2]

(b) Scientists have found a rare genetic disorder that can cause short-sight.

It is called nanophthalmos.

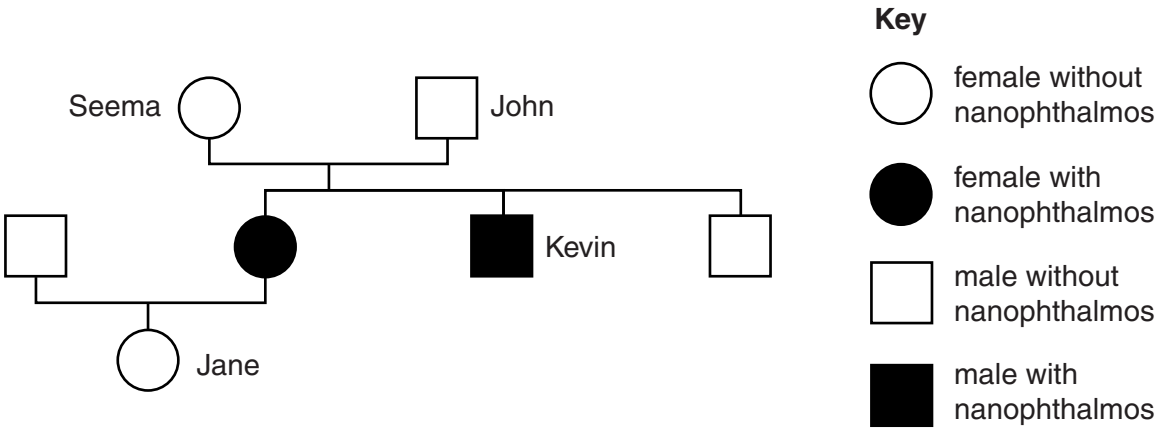
This is caused by a recessive copy of a gene.

(i) Write about where in a cell genes are found.

.....

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

(ii) Look at this part of a family tree showing some people with nanophthalmos.



Nanophthalmos is caused by a recessive allele.

How can you tell this from this family tree?

.....

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

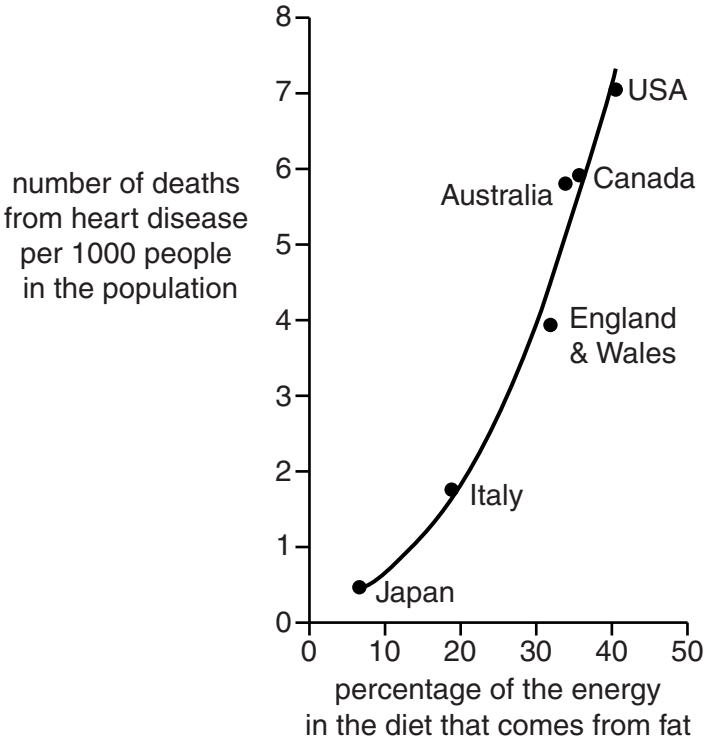
[Total: 8]

2 In 1953, a famous scientist called Ancel Keys investigated the cause of heart disease.

He noticed that the number of deaths from heart disease varied in different countries.

He wondered if it was to do with diet.

So he gathered some data from different countries and plotted this graph.



(a) Write about Keys' results.

In your answer include

- what the graph seems to show
- how scientists would now explain the results of this study.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

(b) Some scientists have criticised Keys' study.

Put a tick (✓) in the box next to a fair criticism of Keys' study.

he chose to plot only 6 results from the many countries that he studied	☐
each country had a different number of people living in it	☐
fat in the diet does not provide much energy	☐
it is impossible to tell if people die from heart disease	☐

[1]

[Total: 7]

3 Tim and Daisy are discussing the illegal drug cannabis.

Tim

I think cannabis should be a class B drug.
Cannabis makes reflex actions slower.
It contains the chemical THC which makes it hard to give up.
It can also affect long-term memory.

Daisy

I don't think cannabis should be a class B drug.
It is easier to give it up than it is to give up tobacco.
It only produces mild hallucinogenic effects.

(a) (i) Tim says that cannabis slows reflex actions.

What is a reflex action?

.....

.....

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

(ii) Daisy says that cannabis has hallucinogenic effects.

Write down the name of one **other** drug that has hallucinogenic effects.

..... **[1]**

(iii) Daisy says that tobacco is harder to give up than cannabis.

Suggest why this is.

.....

.....

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

(b) Scientists have tried to work out how dangerous cannabis is.

(i) Giving cannabis to rats kills them when the dose is about 750 mg per kg of rat.

Work out the dose that would kill a 100 kg person (the lethal dose).

(Assume that cannabis has the same effect on humans as rats.)

answer = ... mg **[1]**

(ii) Scientists compare the danger of drugs by working out their **therapeutic ratio**.

This is worked out by

$$\text{therapeutic ratio} = \frac{\text{lethal dose}}{\text{smallest dose needed to have an effect}}$$

The data in the table is for a 100 kg man.

drug	lethal dose for a 100 kg man in mg	smallest dose needed to have an effect in mg	therapeutic ratio
alcohol	300 000	30 000	10
cannabis		15	
heroin	48	8	6

Using your answer to part **(i)**, work out the therapeutic ratio for cannabis.

answer ..... **[1]**

(iii) Which drug do the scientists think is most dangerous?

Use the data to explain your answer.

.....

.....

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

(iv) Suggest **one** argument against the use of rats in this study.

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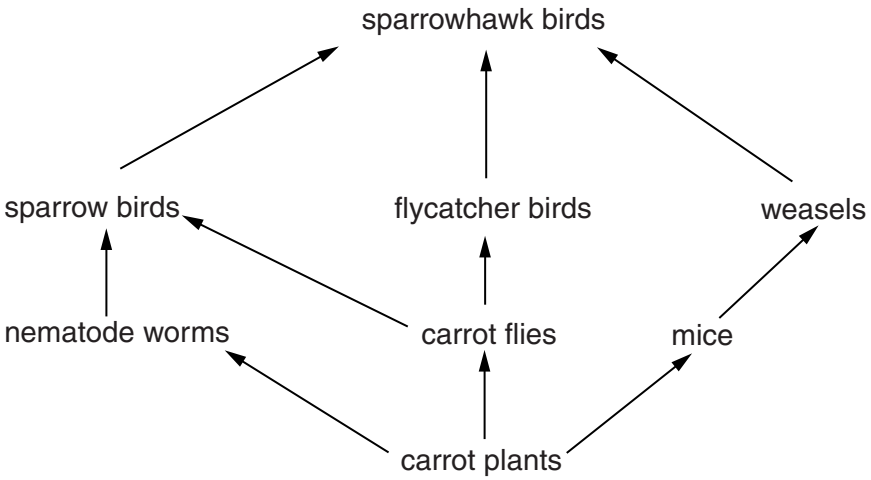
..... **[1]**

[Total: 10]

Section B – Module B2

4 Carrot plants are part of a food web.



(a) How many trophic levels are in this food web?

..... **[1]**

(b) Carrot flies cause damage to carrot plants.

Farmers spray the plants.

This kills most of the carrot flies.

The population of **sparrow** birds goes down.

Explain why.

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

(c) The chemicals which killed the carrot flies caused sparrowhawks to lay eggs with weakened shells.

This caused sparrowhawks to become endangered.

Some carrot plants do not need to be sprayed with chemicals because they are resistant to carrot flies.

Biologists carried out trials on four resistant varieties.

Look at the table of results.

carrot plant variety	yield in kg per metre^2			
	field 1	field 2	field 3	mean
Fly away	5.2	5.1	5.0	5.1
Maestro	4.3	4.1	4.5	4.3
Resistafly	5.6	5.4	4.6	5.2
Sytan	4.2	3.8	4.0	4.0

(i) What evidence in the table shows that Resistafly might be the best variety to grow?

..... **[1]**

(ii) Show which variety has the biggest **range of yield** in the three fields.

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

(iii) From the results of these trials, some biologists think Resistafly is the best variety of carrot to grow. They think it will improve yields without harming the sparrowhawks further.

It may be too soon for the biologists to come to this conclusion.

Suggest why.

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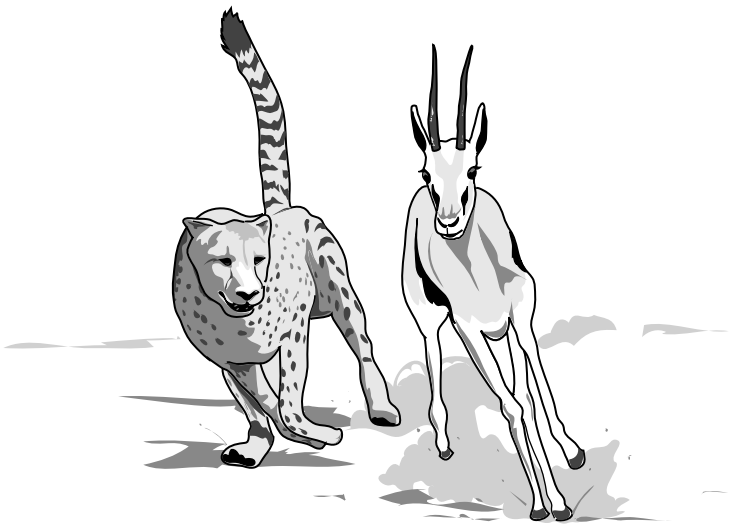
..... **[2]**

[Total: 8]

5 Look at the picture.

It shows a cheetah and a Thomson's gazelle.



(a) Use your scientific knowledge and the picture to explain how the prey is adapted to avoid being caught by the predator.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

(b) In 1978 the population of the Thomson's gazelle was 916,000 worldwide.

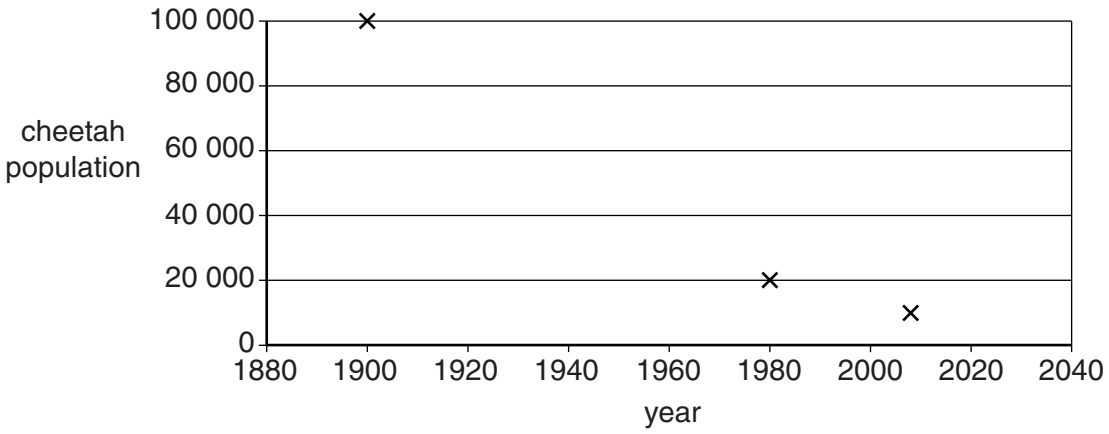
In 2005 there was only 40% of this number left.

What was the worldwide population of Thomson's gazelle in 2005?

..... **[1]**

(c) Look at the graph.

It shows the estimated worldwide population of cheetahs between 1880 and 2040.



(i) Explain what has happened to the estimated worldwide population of cheetahs.

Use information from the graph and your answer to part (**b**).

.....

.....

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

(ii) The graph was produced in 2010.

What does the graph predict will happen to the cheetahs by 2040?

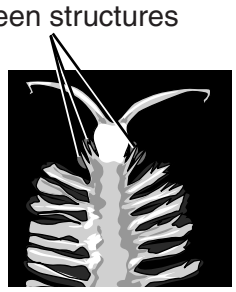
..... **[1]**

[Total: 10]

6 This question is about classifying.

Read the article about a species that was first discovered in 2009.

2009 The Year of the Green Bomber



The 'green bomber' is an annelid worm that lives at depths below 1800 metres in the seas off California. At these depths it is very dark.

Otherwise known as *Swima bombiviridis*, the green bomber worm gets its name from the green oval structures near its head. When the worm sheds them, they briefly glow in the dark with a brilliant, green light.

The green oval structures are thought to be helpful in escaping from predators.

(a) *Swima bombiviridis* is a newly discovered species.

What is meant by the term species?

.....

.....

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

(b) *Swima bombiviridis* has been named using the binomial system.

What do the two parts of the name identify?

Put ticks (✓) in the boxes next to the **two** correct answers.

class	☐
family	☐
genus	☐
order	☐
species	☐

[2]

(c) *Swima bombiviridis* is more likely to survive at depths below 1800 metres than other worms. This is because of its green oval structures.

Suggest how the green oval structures make it more likely to survive.

.....

.....

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

(d) Some *Swima bombiviridis* worms produce more green oval structures than others.

Suggest how this might affect future generations of *Swima bombiviridis*.

.....

..... **[1]**

[Total: 7]

Section C – Module B3

7 Louise investigates how exercise affects her pulse rate.

She runs around the school field as fast as she can.

She then sits down and measures her pulse rate every minute for ten minutes.

The table shows her results.

time after the exercise stops in minutes	pulse rate in beats per minute
0	124
1	94
2	78
3	68
4	64
5	62
6	60
7	58
8	62
9	60
10	60

(a) (i) What is Louise's resting pulse rate?

..... beats per minute **[1]**

(ii) How can you tell this from Louise's results?

.....

..... **[1]**

(b) (i) What is Louise's recovery time?

..... minutes **[1]**

(ii) How can you tell this from Louise's results?

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..... **[1]**

(c) Explain why Louise's pulse rate **decreases** after exercise.

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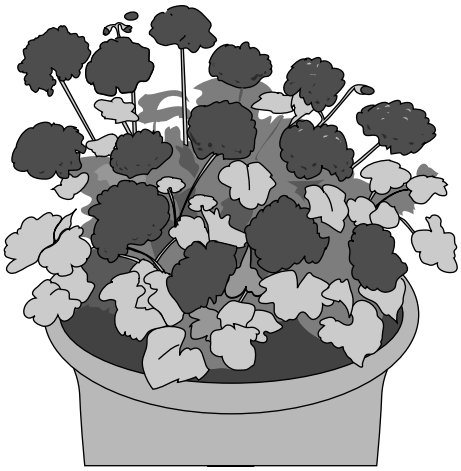
..... **[3]**

[Total: 7]

8 Bob has a garden centre.

He grows plants called pelargoniums by taking cuttings.



(a) (i) Describe how to take a cutting to grow a new plant.

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

(ii) Write down **one disadvantage** of growing new plants by taking cuttings, compared with growing them from seeds.

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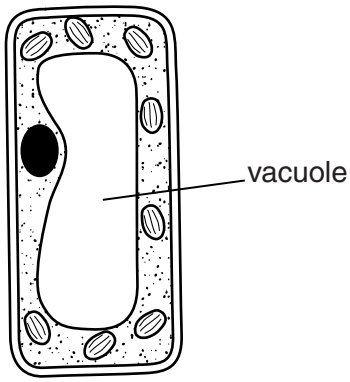
..... **[1]**

(b) The diagram shows a cell from a pelargonium leaf.



Describe the function of the vacuole.

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

(c) The way that plants grow is different from the way that animals grow.

Describe how plant growth is different.

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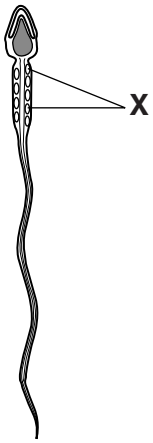
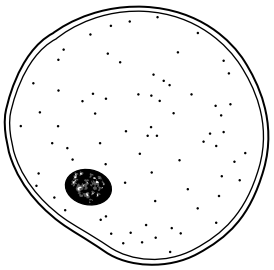
..... **[2]**

[Total: 7]

9 The diagrams show a sperm cell and an egg cell. They are not to the same scale.



sperm cell



egg cell

(a) Name the parts labelled **X** on the sperm cell.

..... **[1]**

(b) Women usually release one egg cell each month.

Men usually produce about 100 million sperm cells each day.

Why is it important that more sperm cells than egg cells are produced?

.....

..... **[1]**

(c) Although women usually release one egg each month, other female animals often release many more.

One female cod fish may release 5 million eggs at the same time into the sea.

Suggest why fish need to release many more eggs than humans.

.....

.....

.....

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

(d) Cod egg cells contain 23 chromosomes.

How many chromosomes will there be in each body cell in a cod?

..... **[1]**

[Total: 5]

10 In the Second World War, atomic bombs were dropped on Japan.

Many of the survivors developed illnesses such as cancer because of the nuclear radiation.

Cancer is caused by changes to DNA in body cells.

Suggest why changes to DNA may cause illnesses such as cancer.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

[Total: 6]

END OF QUESTION PAPER

PLEASE DO NOT WRITE ON THIS PAGE