

Monday 21 May 2012 – Morning

**GCSE GATEWAY SCIENCE
BIOLOGY B**

B731/02 Biology modules B1, B2, B3 (Higher Tier)

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



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.

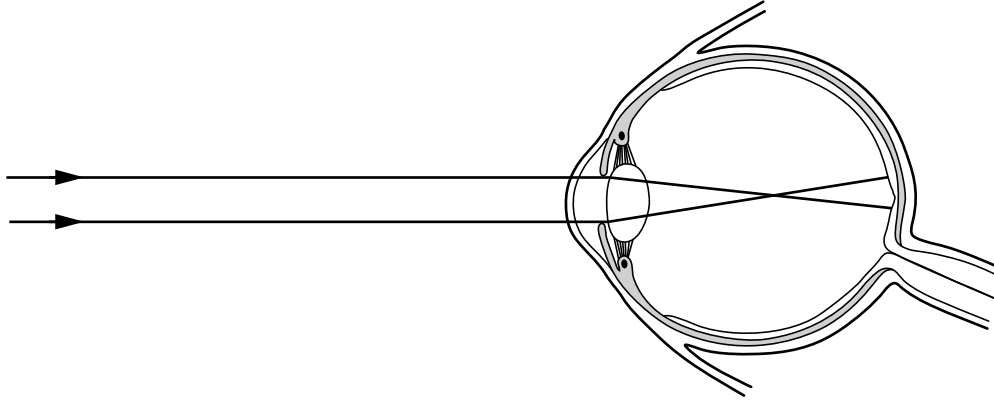
INFORMATION FOR CANDIDATES

- 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) Explain how the lens being the wrong shape can cause **short-sight**.

.....

 [2]

- (ii) Short-sight can be corrected by wearing glasses.

Write down the type of lens used in these glasses.

..... [1]

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

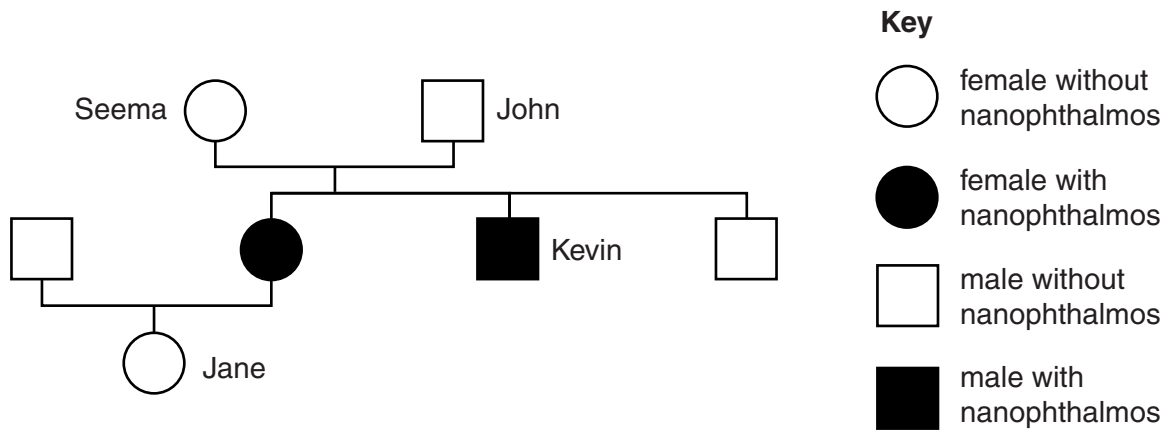
It is called nanophthalmos.

This is caused by a recessive allele.

- (i) What is an allele?

.....
 [1]

(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?

.....

.....

..... [2]

(iii) Jane is a carrier of nanophthalmos.

Jane marries Simon who has nanophthalmos.

What is the probability of their first child having the disorder?

You must draw a genetic diagram to work out your answer.

(Use **N** for the allele for normal vision and **n** for the allele for nanophthalmos.)

probability = %

[3]

[Total: 9]

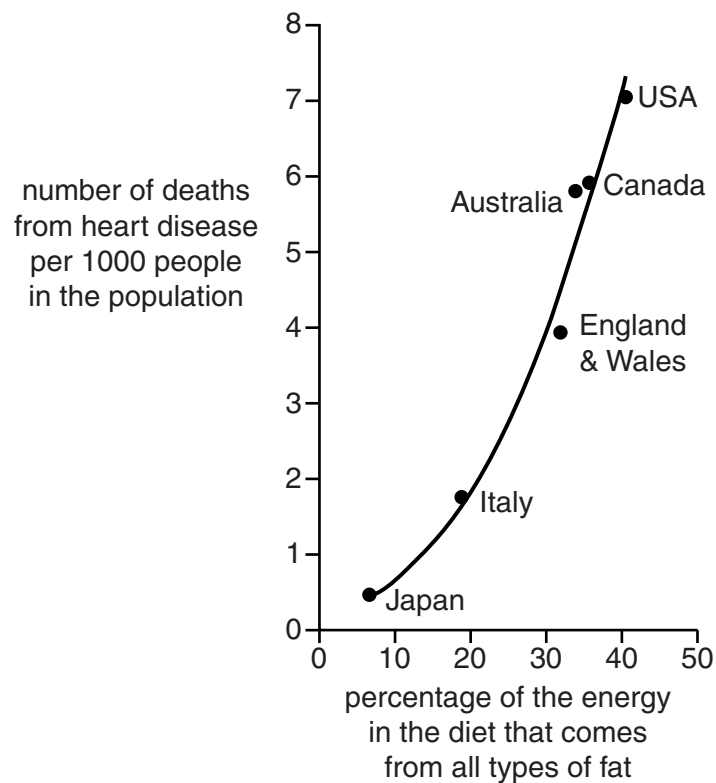
2 In 1953, a famous scientist called Ancel Keys investigated the cause of heart disease.



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.



Keys concluded that eating large amounts of saturated fat causes heart disease.

Keys' investigation has caused debate between scientists.

Some scientists have criticised his investigation.

Other scientists have provided an explanation to back up his conclusion.

Discuss the arguments that each group of scientists could use.



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

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..... [6]

[Total: 6]

- 3 (a) Tim and Daisy are discussing the illegal drug cannabis.



Tim

I think cannabis should be a class B drug.
Cannabis makes reflexes slower.
It can speed up heart rate and cause vasodilation.
It can also affect long-term memory.



Daisy

I don't think cannabis should be a class B drug.
It is less addictive than smoking tobacco.
It only produces mild hallucinogenic effects.

- (i) Tim thinks cannabis should be a class B drug.

Explain why illegal drugs are put into different classes.

.....

.....

..... [2]

- (ii) Daisy says that cannabis has hallucinogenic effects.

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

..... [1]

- (iii) Tim says cannabis causes **vasodilation**.

What is vasodilation?

.....

..... [1]

- (b) Cannabis prevents the release of a neurotransmitter chemical in the brain.

Explain how this could prevent the proper functioning of the brain.

.....

.....

..... [2]

- (c) 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

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

Work out the therapeutic ratio for cannabis for a 100 kg man.

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

Write your answer in the table.

[2]

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

Use the data to explain your answer.

.....

.....

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..... [2]

[Total: 10]

Section B – Module B2

- 4 This question is about classifying.

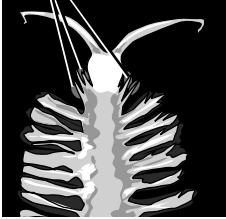
Read the article about a species that was first discovered in 2009.



green structures

2009 The Year of the Green Bomber

green structures



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) A similar species of worm lives in shallow waters. It does **not** have green oval structures.

Scientists think that *Swima bombiviridis* evolved from the ancestors of the species that lives in shallow waters.

Explain how a population of worms with green oval structures may have become a separate species.

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.....

.....

.....

..... [3]

[Total: 9]

5 This question is about lizards.

(a) Look at the picture. It shows a frilled lizard in the cool early morning.



Frilled lizards are adapted to changing temperatures.

The frill is full of blood capillaries and is a thin layer of skin that can be extended or closed.

In early morning, when the air is cold, the lizard climbs onto a rock and extends its frill to absorb heat from the Sun.

Later in the day it is very hot and the lizard's behaviour changes to prevent overheating.

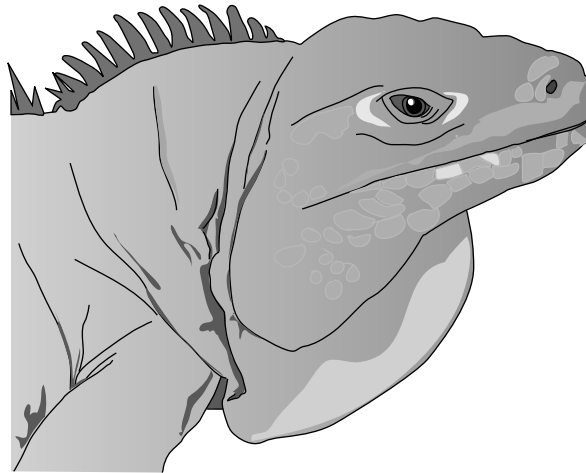
Suggest how the lizard's behaviour changes and explain how this helps the frilled lizard regulate its body temperature.



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

..... [6]

(b) Look at the picture of a Caribbean iguana.



Read the article about a project to help Caribbean iguanas.

The main threats to the survival of Caribbean iguanas are habitat loss and predation by cats and dogs which eat the young iguanas.

Two conservation programmes are proposed.

The first conservation programme, called **headstarting**, involves collecting young iguanas from the wild and raising them in captivity until they are large enough to survive in the wild.

The second programme involves **captive breeding** from a small number of adults in a zoo. The young iguanas produced are released into the wild.

Winston is in charge of setting up the programme.

He believes that captive breeding would be more effective than headstarting.

Use the information to evaluate how successful captive breeding might be.

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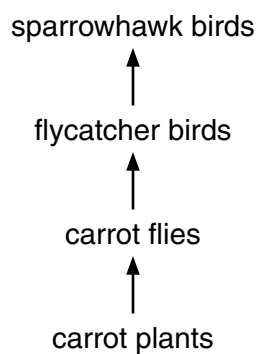
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..... [3]

[Total: 9]

6 Look at the food chain.



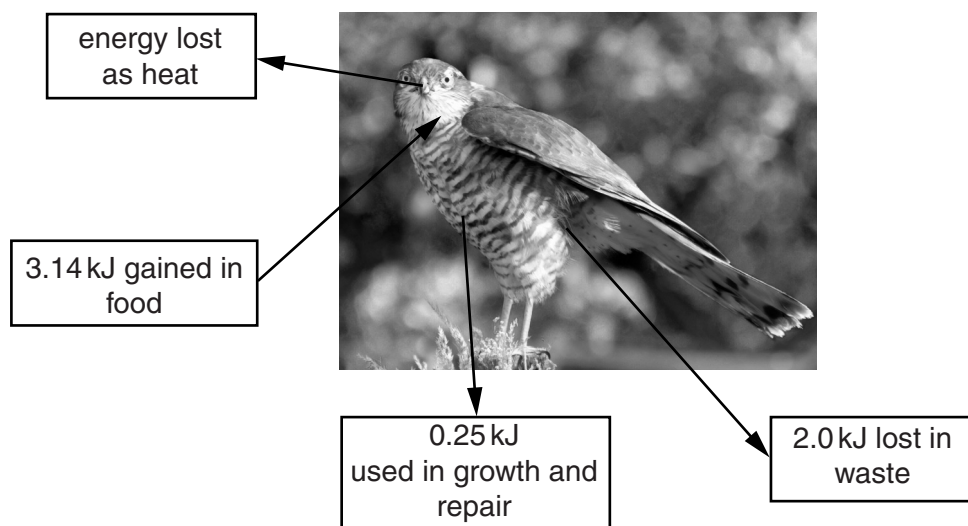
(a) Studying food chains often involves constructing pyramids of biomass.

What information is needed to construct a pyramid of biomass?

..... [1]

(b) Look at the diagram.

It shows all the energy transferred to and from a sparrowhawk.



(i) What process in the sparrowhawk's body releases heat?

..... [1]

- (ii) Calculate the energy lost as heat.

answer..... kJ

[1]

- (iii) Some of the energy gained in food is transferred to growth and repair in the sparrowhawk.

Work out the percentage of the energy gained in food which is transferred to growth and repair.

answer %

[2]

- (iv) This food chain has four trophic levels.

Use your answers to part (ii) and part (iii) to explain why it does **not** have any more.

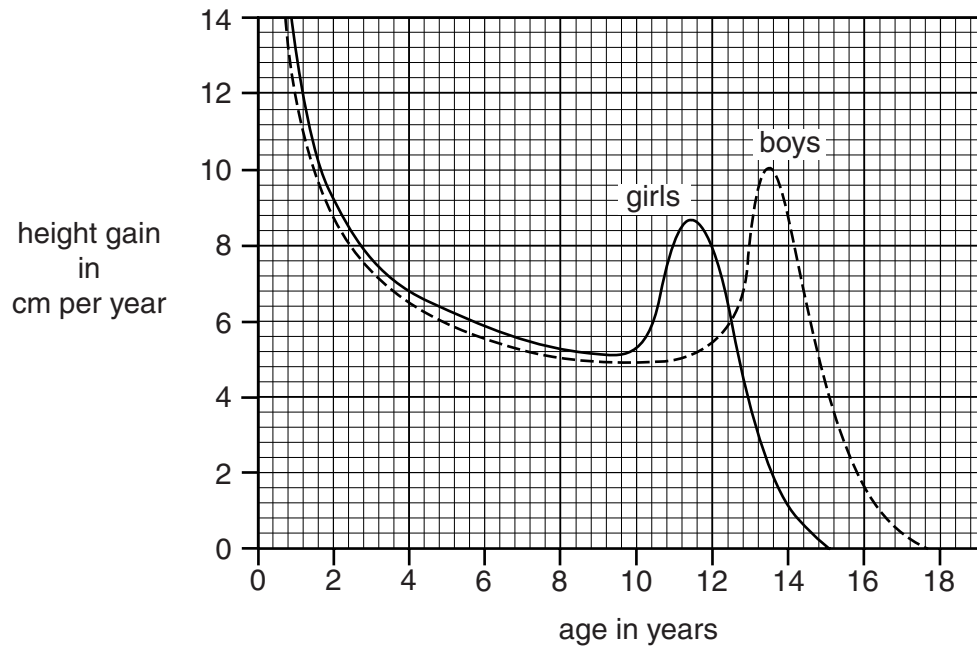
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 [2]

[Total: 7]

Section C – Module B3

- 7 (a) The graph shows the average height gained per year by girls and boys at different ages.



Use the graph to answer these questions.

- (i) At what age do girls start adolescence?

..... years

[1]

- (ii) At what age do boys grow at their fastest rate?

..... years

[1]

- (iii) At which age is there the greatest difference in the rate of growth between girls and boys?

..... years

How can you tell this from the graph?

.....

..... [2]

(b) Girls and boys grow by their cells dividing.

(i) What is the name of this type of cell division?

..... [1]

(ii) Just before cells divide, DNA replication occurs.

Describe how DNA replication occurs.

You may use labelled diagrams to help you answer.

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

[Total: 8]

- 8** 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.

- (a)** 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.

..... [6]

- (b)** Collecting data from the survivors of the atomic bombs has provided information linking nuclear radiation and cancer.

Bobby says that it is not right to collect data from the survivors.

Jilly says we should collect this data from the survivors.

Justify **Jilly's** case.

..... [2]

[Total: 8]

- 9 Jo runs in the 100 metres race at school.

At the end of the race she sits down but is still breathing much more quickly than she normally does.

- (a) Explain why she needs to keep breathing much more quickly than normal.

.....

.....

.....

.....

.....

..... [3]

- (b) Jo's friend Sam does **not** take part in the race.

This is because he has a 'hole in the heart'.

This means that some blood moves straight from the right side of his heart to the left.

Explain why a 'hole in the heart' would make it difficult for Sam to run in the race.

.....

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..... [3]

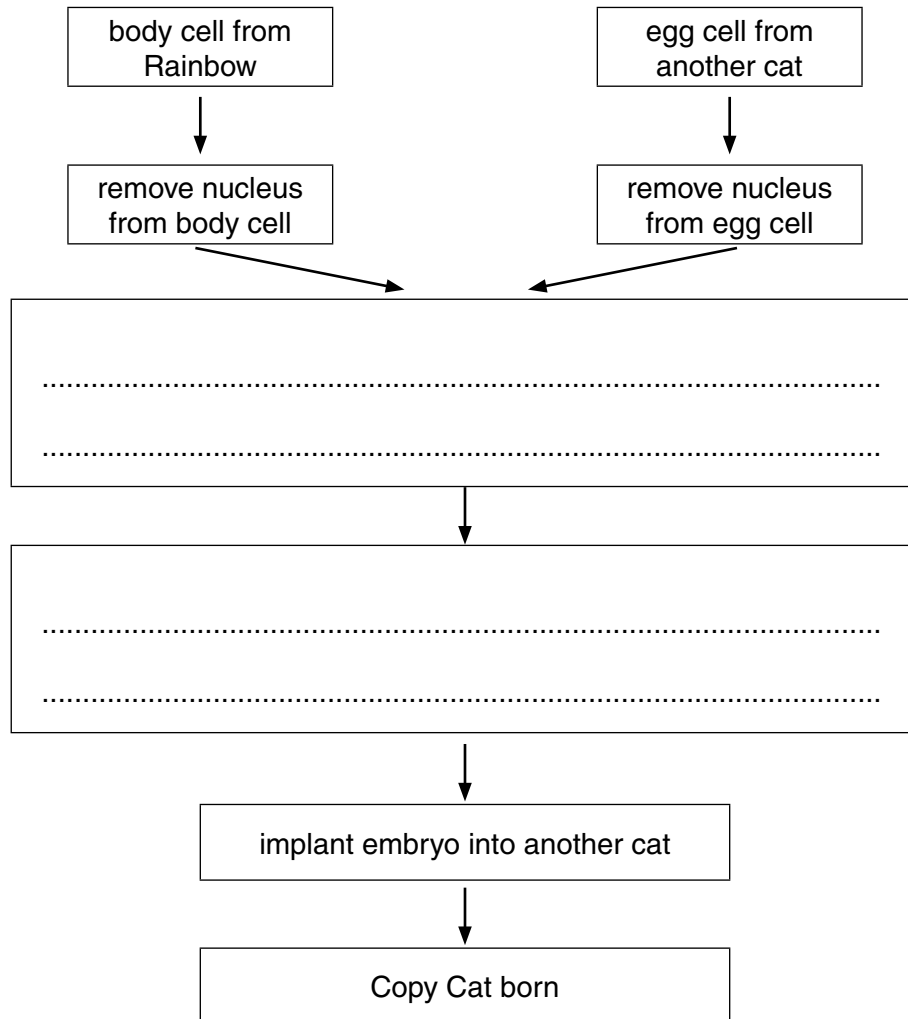
[Total: 6]

10 The following article appeared in a newspaper.

In 2001, scientists in Texas cloned a pet cat, Rainbow, producing a kitten they called Copy Cat.

Copy Cat was the only surviving animal of 87 embryos that were created using the same cloning technique that had been used to produce Dolly the sheep.

(a) Complete the flow chart to show how Copy Cat was produced.



[2]

(b) The scientists could **not just** use a body cell from Rainbow and make that grow into an embryo.

Why can a body cell **not** grow into an embryo?

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..... [1]

[Total: 3]

END OF QUESTION PAPER

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