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Biology

Unit: 4BI0

Paper: 2BR

Monday 11 June 2018 – Morning Time: 1 hour	Paper Reference 4BI0/2BR
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You must have: Calculator	Total Marks
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Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- Show all the steps in any calculations and state the units.

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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Answer ALL questions.

- 1 Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

Mosquitoes and the Zika virus

More than a million people die each year from pathogens spread by mosquitoes. These pathogens are responsible for causing diseases such as malaria, dengue fever and yellow fever. The pathogens are spread when a female mosquito feeds on the blood of an infected person and then flies away to bite another person.

- 5 Male mosquitoes do not bite humans.

The Zika virus is also spread by mosquitoes. Recently, this virus has been linked to a significant increase in the number of babies born with microcephaly in Brazil. Microcephaly is a condition in which the brain does not develop normally. The Zika virus can pass from the mother to the developing fetus and babies are

- 10 born with a smaller head than usual.

There is no medicine or vaccine to treat people infected with the Zika virus. People are encouraged to hang mosquito nets over their beds, and also to use other methods to avoid being bitten by mosquitoes. Some people believe it would be simpler to solve the problem by specicide. The extinction of 30 disease-carrying mosquito species would

- 15 save many lives.

Scientists have genetically modified (GM) the males of the mosquito species, *Aedes aegypti*, which carries the Zika virus. These GM males carry a gene that harms their offspring. The offspring die before they can reproduce and spread disease. About three million of these GM mosquitoes were released at a site on the Cayman Islands between 2009 and 2010. Scientists reported a 96% reduction in mosquitoes compared with nearby areas. Scientists have also tried releasing large numbers of sterile male mosquitoes to reduce the spread of disease.

- 20

Mosquito eradication may affect food chains. Mosquitoes that feed mainly on plant nectar are important pollinators. Mosquitoes are also a food source for birds and bats, while mosquito larvae are eaten by fish and frogs.

- 25

Rainforests contain a large number of plant and animal species. These habitats are under threat of deforestation. Some scientists believe that mosquitoes have reduced this threat because mosquitoes make tropical rainforests almost uninhabitable for humans.

- 30 Scientists in the UK are developing a sound sensor that can detect each different species of mosquito from the noise made by its unique wing beat. They plan to give people in rural Indonesia sound sensors to identify mosquitoes that carry pathogens. The sound sensor triggers the release of insecticide, which helps to reduce outbreaks of disease.

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(a) The pathogens that cause Zika and dengue fever are both viruses.

State two structures that are found in all viruses.

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(b) Name the organ that the Zika virus passes across to get from the mother to the developing fetus (line 9).

(1)

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(c) Scientists are trying to develop a vaccine for the Zika virus.

Explain how vaccinating a woman could prevent her baby being born with microcephaly.

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(d) Suggest what is meant by the term **specicide** (line 14).

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(e) Suggest how the release of sterile male mosquitoes could reduce the spread of disease (lines 21 to 22).

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(f) Explain why mosquitoes can be described as primary consumers and secondary consumers.

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(g) Explain the benefits of using sound sensors to help reduce outbreaks of disease (lines 30 to 31).

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(Total for Question 1 = 15 marks)

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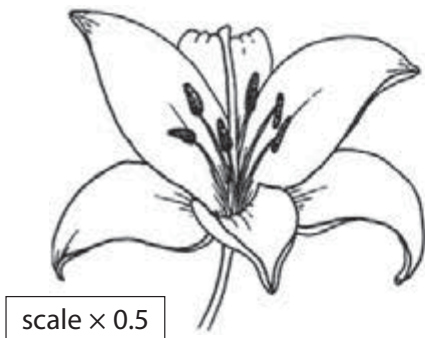
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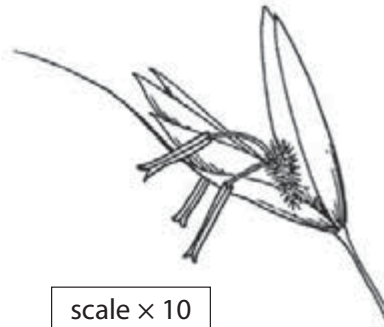


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2 The diagram shows two different types of flower.



Flower A



Flower B

(a) Use the diagram to explain which of these flowers is insect-pollinated.

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(b) Fertilisation may occur after a flower has been pollinated.

The table lists six stages in the process of plant reproduction.

Put numbers in the boxes to show the order of the stages.

The last stage has been done for you.

(4)

Stage	Order
pollen tube grows down style	
nuclei move down pollen tube	
pollen grain germinates	
zygote formed	
petals wither	6
pollen grain lands on stigma	

(Total for Question 2 = 7 marks)



P 5 3 1 4 8 A 0 7 1 6

3 Cold weather in winter kills many small birds in the UK.

Many people put food on bird tables to provide the energy needed for birds to survive in cold weather.

The table shows the average (mean) body mass and energy requirements for three species of bird.

Bird species	Average body mass in g	Average energy requirement in kJ per g per day
Coal tit	8.8	5.2
Blue tit	10.6	4.6
Great tit	19.7	0.1

(a) Explain which species is most at risk of being killed by cold weather.

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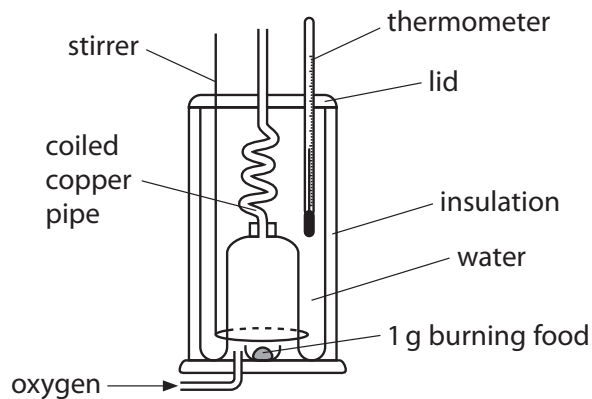
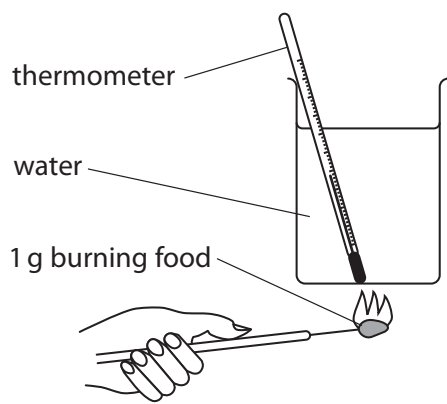
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(b) A student uses two methods to investigate the energy content of bird food.

The diagram shows the student's methods.



Explain why method B produces more accurate results than method A.

(5)

(Total for Question 3 = 9 marks)



P 5 3 1 4 8 A 0 9 1 6

- 4 A student investigates the effect of pesticide on the number of insects living in soil. The student collects 5 cm³ soil samples from a wheat field where pesticide is not used. She also collects 5 cm³ soil samples from a wheat field where pesticide is used. The table shows the student's results.

	Average number of insects per 5 cm ³ of soil
pesticide not used	136
pesticide used	98

- (a) Calculate the percentage change in the number of insects when pesticide is used.

Show your working.

(2)

percentage change =

- (b) Name the dependent variable in the student's investigation.

(1)

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(c) Describe a method the student could use to obtain a valid comparison of the number of insects in each wheat field.

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(d) Some farmers use selective breeding to increase the grain size of their wheat. Explain how the process of selective breeding can be used to increase grain size.

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5 A doctor recommends eating these foods for a balanced diet.

- five portions of fruit and vegetables every day
- starchy carbohydrates such as potatoes, bread, rice and pasta
- milk and dairy products
- protein sources such as beans, eggs and meat
- two portions of fish every week, one of which should be oily fish
- oils and fats only in small amounts

(a) (i) Explain the biological reasons for including oils and fats only in small amounts. (2)

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(ii) Suggest why carbohydrates such as bread should be wholegrain if possible. (2)

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(iii) Explain why is it especially important for pregnant women to include milk and dairy products in their diet. (2)

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(b) Explain what is meant by the term **balanced diet**.

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(c) Suggest how the diet of a manual labourer doing physical work should differ from the diet of an office worker.

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(Total for Question 5 = 10 marks)

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6 The blood system is used for transport and protection against disease.

The table shows some components of blood and their functions.

(a) Complete the table by giving the missing information.

(5)

Component	Function
lymphocytes	
phagocytes	
	transports urea
	help in clotting
red blood cells	

(b) Describe the structural differences between red blood cells and white blood cells that help them carry out their functions.

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(Total for Question 6 = 9 marks)

TOTAL FOR PAPER = 60 MARKS

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