**OCR**

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## Monday 19 May 2014 – Afternoon

### GCSE GATEWAY SCIENCE
### BIOLOGY B

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

*\*1163754599\**

| Candidates answer on the Question Paper. A calculator may be used for this paper. | **Duration:** 1 hour 15 minutes |
|---|---|
| **OCR supplied materials:** None | |
| **Other materials required:** • Pencil • Ruler (cm/mm) | |

*\*B73101\**

| 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

* The 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**.
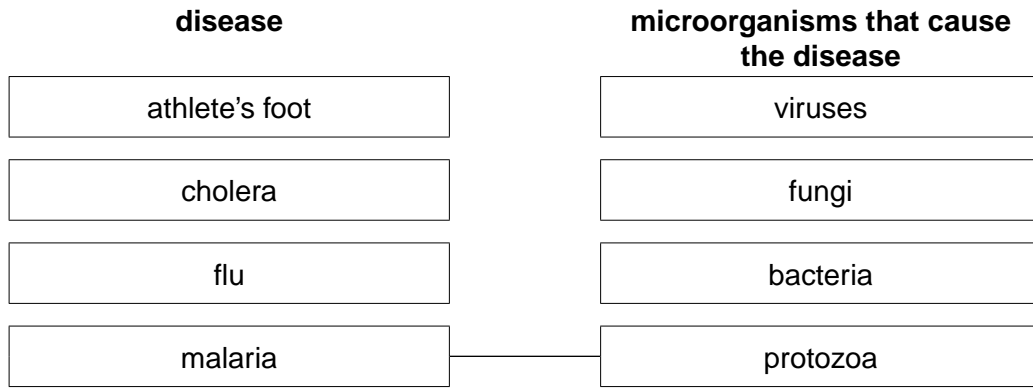* This document consists of **24** pages. Any blank pages are indicated.

OCR is an exempt Charity

**Turn over**

**2**

Answer **all** the questions.

**SECTION A – Module B1**

**1** This question is about disease.

**(a)** Draw straight lines to join each **disease** to the **microorganisms that cause the disease**.

One line has been drawn for you.

| disease | microorganisms that cause the disease |
|---------|----------------------------------------|
| athlete's foot | viruses |
| cholera | fungi |
| flu | bacteria |
| malaria | protozoa |

(malaria connected to protozoa)

**[2]**

**(b)** Malaria causes a fever.

The body temperature is very high during a fever and this may cause death.

Describe how high body temperatures can cause death.

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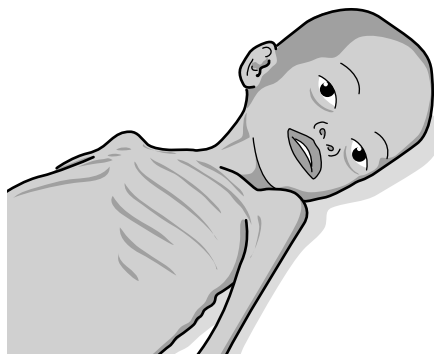
**[Total: 4]**

**3**

2   This question is about human disorders.

   **(a)** Look at the picture of Asad.



He is five years old and lives in Africa.

Asad suffers from marasmus, a disorder caused by starvation.

His muscles have wasted.

This is because his muscle protein is being used as an energy source due to the lack of food.

In a normal diet, food groups other than protein are used as an energy source.

   **(i)** Name **one other** food group used as an energy source.

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

   **(ii)** The estimated average daily requirement (EAR) for protein can be calculated using this formula.

   EAR in g = 0.6 × body mass in kg

   Asad has a body mass of 12.0 kg.

   Use the formula to calculate Asad's EAR for protein.

   Asad's EAR = ................................. g                                          **[1]**

   **(iii)** The usual EAR for protein for a five year old boy is 11 grams a day.

   What percentage of the usual daily requirement for protein is Asad's EAR?

   Put a ring around the best estimate.

   **45%          55%          65%          75%**

   **[1]**

**Turn over**

**4**

 **(b)** Sickle cell anaemia is another disorder that is common in Africa.

 This disorder is **not** caused by a poor diet.

 What causes sickle cell anaemia?

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

 **(c)** Cystic fibrosis is a common disorder in Europe.

 Doctors are trying to find new ways of treating cystic fibrosis in children.

 A new drug has been developed which may improve the symptoms.

 This drug was used in trials with children who have cystic fibrosis.

 Some children showed improved growth and general health.

 Testing drugs on humans involves doctors taking risks.

 Describe the risks with this trial.

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**[Total: 6]**

**3** James and John are identical twins.

This means that they have inherited the same genes from their parents.

The diagram shows some of their characteristics.

| James is 150 cm tall | John has a scar |
| James and John have blue eyes | John's body mass is 60 kg |

James          John
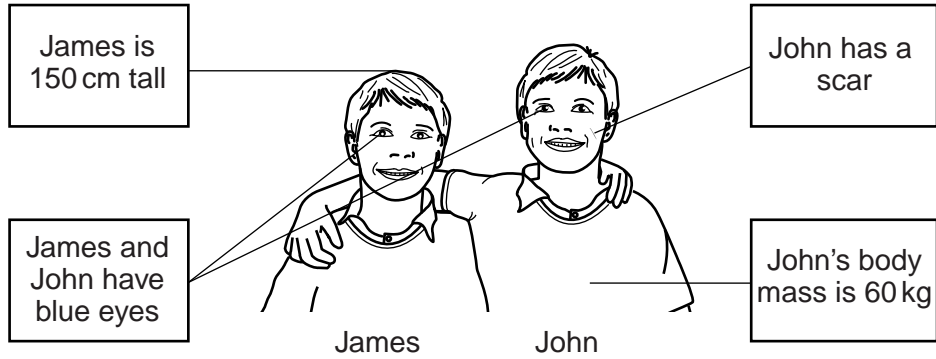
**(a)** John is taller and heavier than James but both have the same colour eyes.

Explain how this is possible.

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**(b)** John is red-green colour blind.

This means that James **must** also be red-green colour blind.

Explain why.

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**[Total: 3]**

**Turn over**

**6**

**4** This question is about heart disease.

Look at the graph.

It shows the number of deaths per year from heart disease in males and females ages 35 to 69 in the UK between **1950** and **2007**.
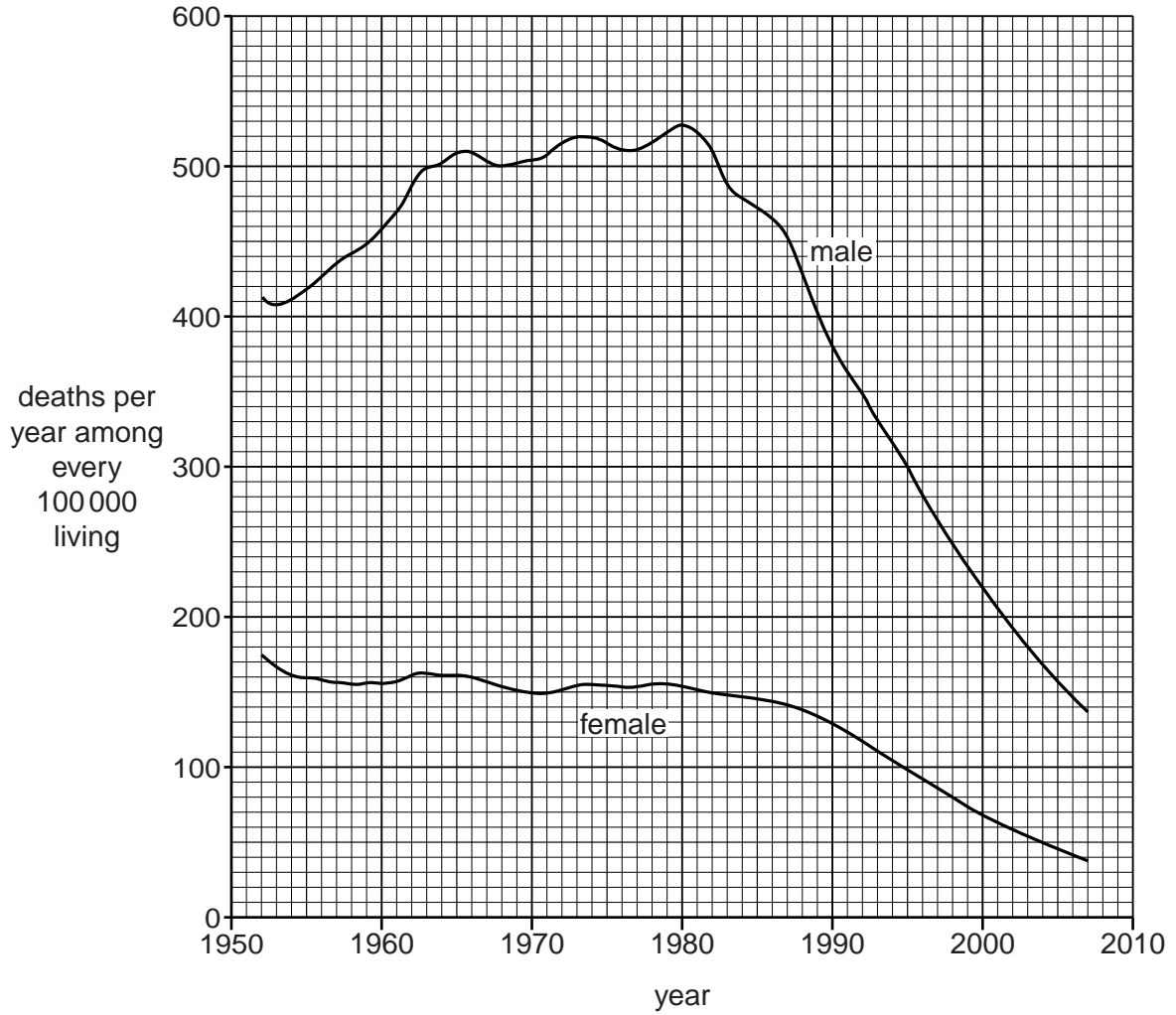


**(a)** Describe the trends shown in the graph.

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**(b)** For how many years have deaths in males shown a continual fall in numbers?

Put a (ring) around the correct answer.

          **22 years**         **27 years**         **32 years**         **37 years**

**[1]**

**(c)** The number of deaths from heart disease has fallen in both males and females.

The fall in the number of female deaths has been less than in males.

Explain why the number of deaths has fallen and suggest a reason for the difference between males and females.

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**[Total: 6]**

                                                    **Turn over**

**8**

**5** Read the information about fruit ripening.

It takes seven days to transport bananas from where they are grown to Britain.
When they arrive, the bananas are still green and unripe.

Before bananas are sold, they are placed in ethylene gas until they turn a yellow-green colour.
Yellow-green bananas are not quite ripe.

When Liz buys bananas, she puts the yellow-green bananas in a bowl with ripe yellow bananas.

Liz says that this makes them ripen faster than leaving them in a bowl on their own.

**Explain** why ethylene is used on bananas before they are sold **and** why Liz's statement about ripening bananas is correct.

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

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**[Total: 6]**

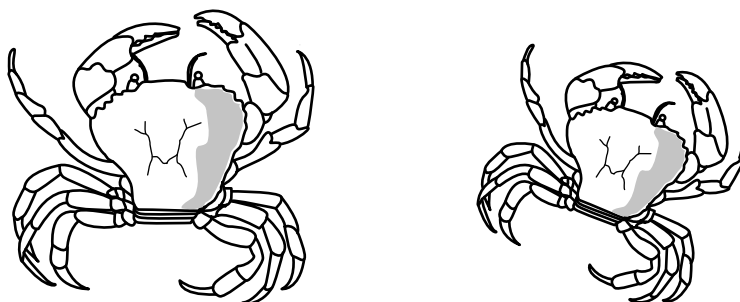## SECTION B – Module B2

**6** This question is about classification.

Biologists use visible features to classify animals.

Look at the picture of two crabs.



**(a) (i)** Crabs belong to a class of arthropods.

Which class of arthropods are crabs in?

Put a tick (✓) in the box next to the correct answer.

arachnids ☐

crustaceans ☐

insects ☐

myriapods ☐

**[1]**

**(ii)** The crabs in the picture are able to breed with each other and produce fertile offspring.

What is the **smallest** group the two crabs could be classified into?

Put a tick (✓) in the box next to the correct answer.
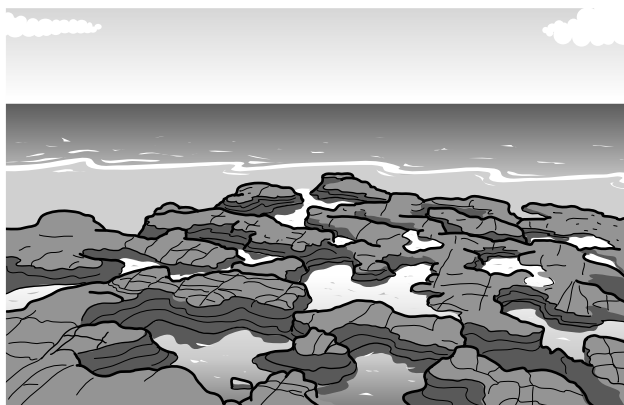
family ☐

genus ☐

kingdom ☐

order ☐

phylum ☐

species ☐

**[1]**

**Turn over**

**(b)** Manjit and Robert investigate where these crabs are found at low tide on a rocky shore.

**low tide on a rocky shore**

They choose eight rock pools in each part of the rocky shore.

They count the number of crabs in each pool.

The lower shore is closest to the sea.

| Part of shore | Number of crabs in each rock pool | | | | | | | | Average (mean) |
|---|---|---|---|---|---|---|---|---|---|
| **Upper** | 1 | 1 | 1 | 0 | 1 | 2 | 0 | 2 | 1 |
| **Middle** | 2 | 3 | 4 | 3 | 5 | 0 | 3 | 4 | |
| **Lower** | 2 | 2 | 4 | 0 | 4 | 0 | 2 | 2 | 2 |

  **(i)** Write down the best part of the shore for the crabs.

  Complete the table to help you answer.

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

  **(ii)** There are more crabs in one part of the shore than the other parts.

  Suggest **two** reasons why.

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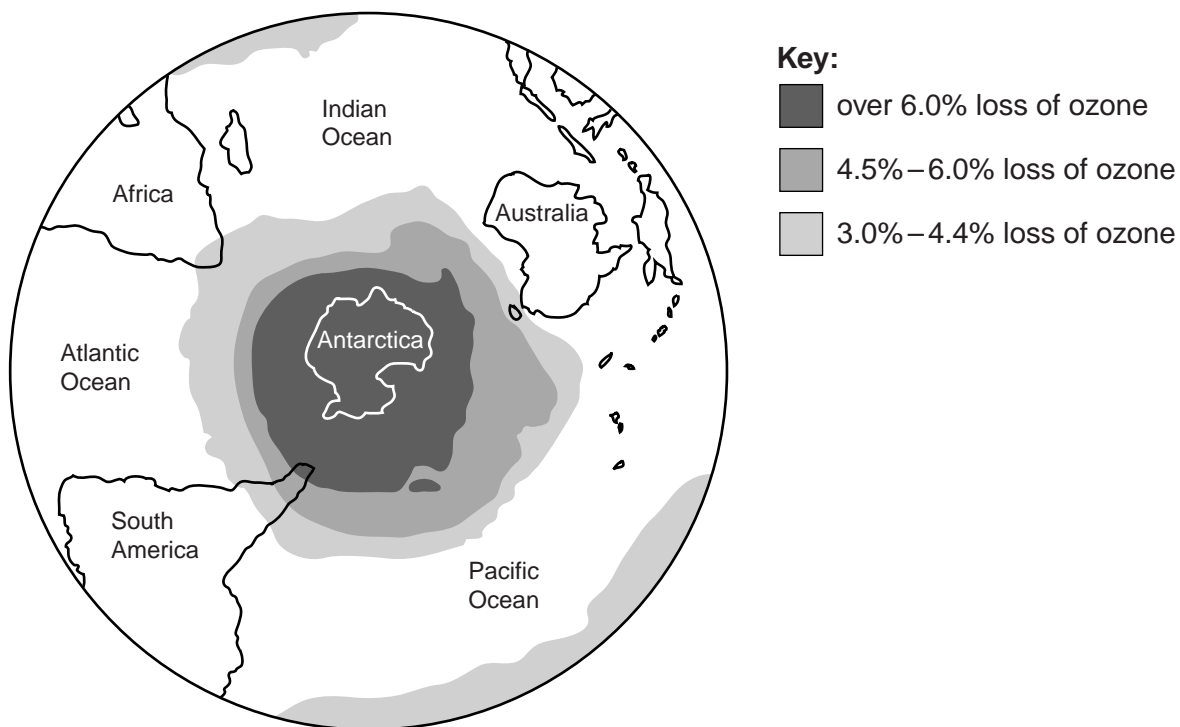
  **[Total: 6]**

**7** This question is about pollution.

**(a)** Look at the picture.

It shows the loss of ozone from the Earth's atmosphere.



**(i)** Write about the reasons why ozone is being lost from the atmosphere.

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**(ii)** People live in Africa, South America and Australia.

Parts of each of these continents are affected by the loss of ozone.

People in one of these three continents will be **most** affected by the loss of ozone.

Use the diagram to decide which continent this is **and** explain how the people will be affected.

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**Turn over**

**12**

**(b)** Burning fossil fuels releases pollutant gases.

Which pollutant gases are released from burning fossil fuels?

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

argon ☐

carbon dioxide ☐

hydrogen ☐

nitrogen ☐
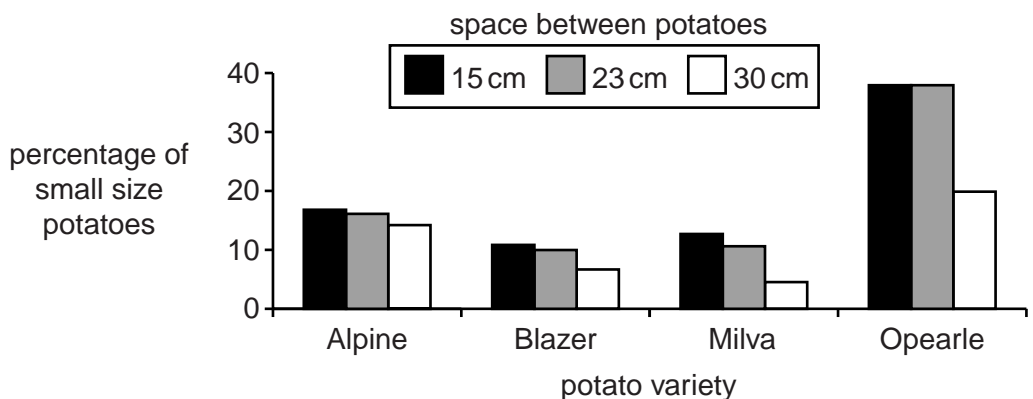
oxygen ☐

sulfur dioxide ☐

**[2]**

**[Total: 6]**

8    A company is testing new varieties of potato to sell to farmers.

The company investigates how the spacing of plants affects the size of potatoes produced.

Look at the graph.

It shows the effect of spacing on the percentage of small potatoes produced.



Small potatoes are difficult for farmers to sell.

The company tells farmers that the best variety is Milva and the plants should be grown 15 cm apart.

Use the graph and your understanding of competition to **explain** if the company is giving the correct advice to farmers.

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

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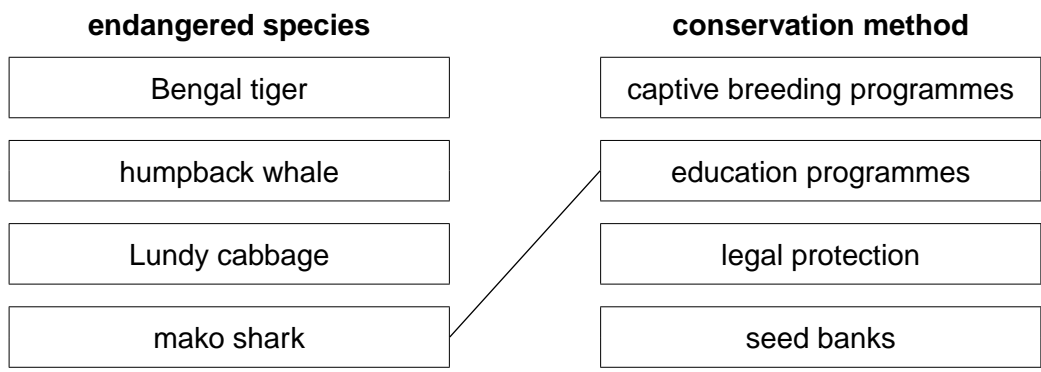
**[Total: 6]**

**Turn over**

**9** This question is about conservation.

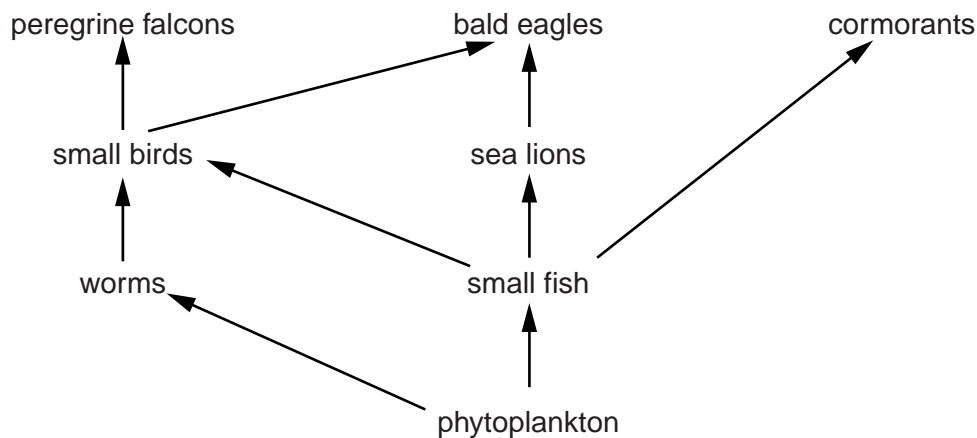**(a)** Draw straight lines to connect each **endangered species** to its best **conservation method**.

One has been done for you.

**endangered species**                    **conservation method**

| | |
|---|---|
| Bengal tiger | captive breeding programmes |
| humpback whale | education programmes |
| Lundy cabbage | legal protection |
| mako shark | seed banks |

**[2]**

**(b)** Look at the food web.

peregrine falcons            bald eagles            cormorants

small birds            sea lions

worms            small fish

phytoplankton

**(i)** The bald eagle is in the fourth trophic level.

Write down **one** organism that is in the second trophic level.

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**(ii)** Write down what is meant by the term **trophic level**.

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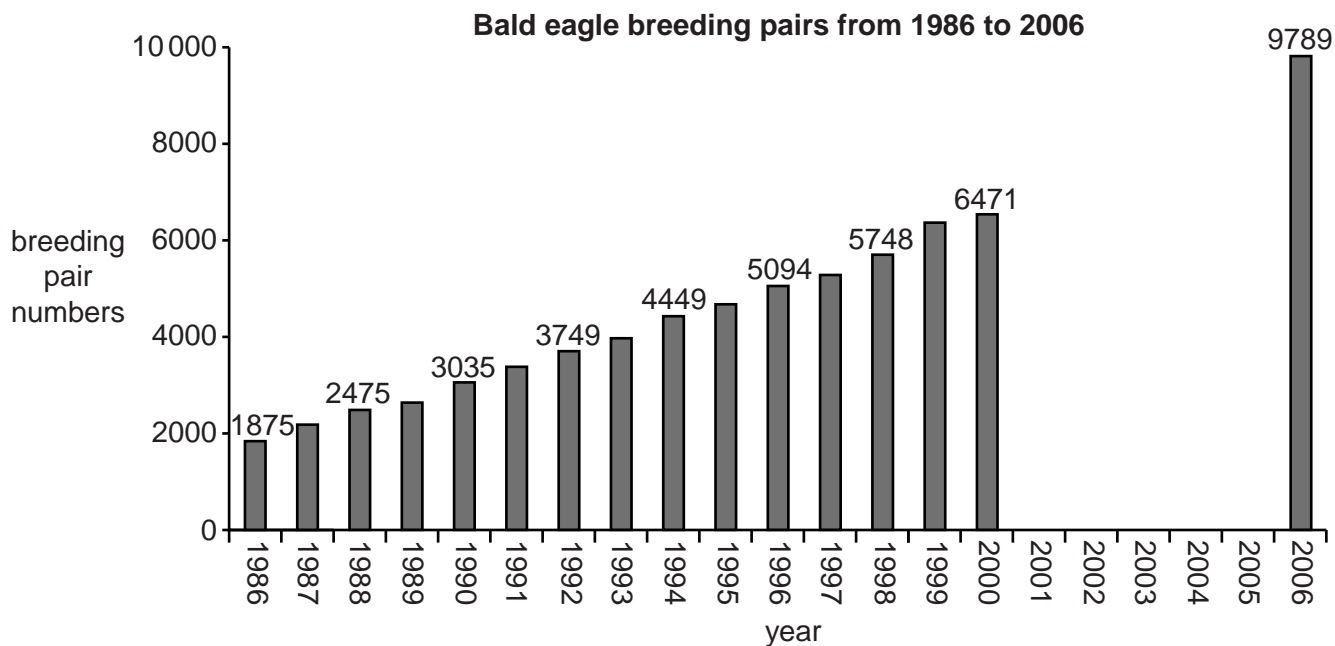**(c)** The bald eagle was an endangered bird in the USA.

It has had legal protection since 1940.

From 1986 until 2000, surveys of bald eagle breeding pairs were done each year.

A final survey was done in 2006.

In 2007 the bald eagle was removed from the USA list of endangered species.

Look at the graph.

**Bald eagle breeding pairs from 1986 to 2006**



Was the decision to remove the bald eagle from the endangered list correct?

Use the evidence in the graph to support your answer.

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**[Total: 7]**

**16**

**SECTION C – Module B3**

**10** This question is about DNA.

Rosalind Franklin was a British scientist.

Her work was important in helping James Watson and Francis Crick work out the structure of DNA.

She used X-rays to discover that DNA has a helix shape.

**(a)** Why is DNA important for all living things?

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**(b)** The structure of DNA is sometimes described as a double helix.

Describe what is meant by a **double helix**.

You can use a diagram to help you answer.

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

**(c)** The structure of DNA as a double helix is called the Watson and Crick model.

Two students are talking about DNA.

I don't think it is fair that the structure of DNA is called the Watson and Crick model.

I think it is fair that the structure of DNA is named after Watson and Crick.
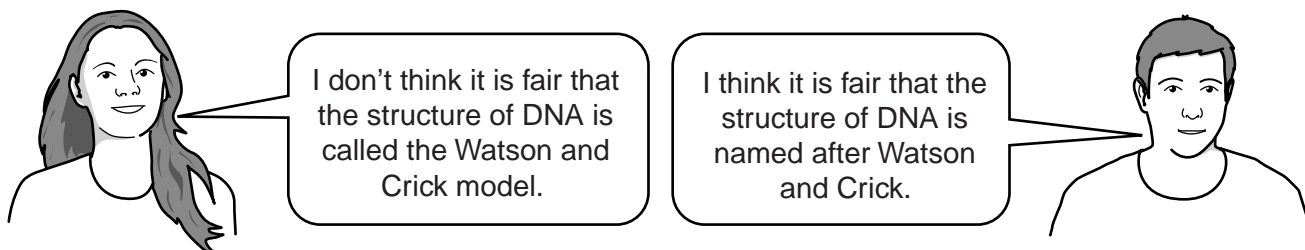
   **(i)** Write down **one** reason why the structure of DNA should **not** be called the Watson and Crick model.

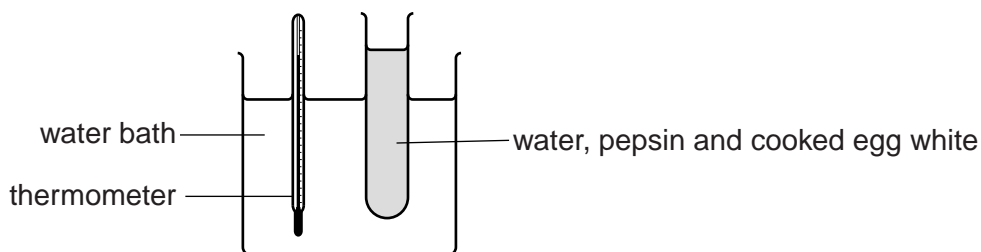........................................................................................................................................

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

   **(ii)** Write down **one** reason why the structure of DNA should be called the Watson and Crick model.

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**[Total: 6]**

**Turn over**

**11 (a)** Egg white contains protein.

Natasha is investigating how a protein-digesting enzyme, called pepsin, breaks down cooked egg white.

water bath ——————— water, pepsin and cooked egg white

thermometer ————————

The pepsin breaks down the cooked egg white.

This makes the mixture in the test tube change from white to colourless.

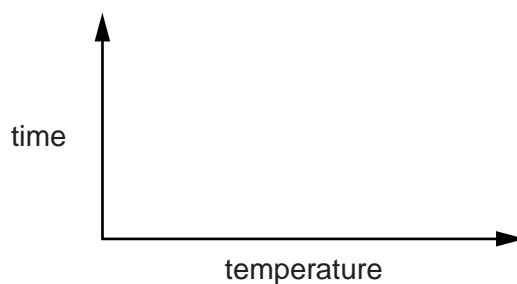Natasha times how long it takes for the mixture to go colourless at different temperatures.

She keeps everything else the same.

The table shows her results.

| Temperature in °C | Time for mixture to go colourless in minutes |
|---|---|
| 20 | 14 |
| 25 | 9 |
| 30 | 6 |
| 35 | 3 |
| 40 | 3 |
| 45 | 6 |

**(i) Sketch** a graph to show these results.

Use these axes. Draw a line. Do **not** plot points.

time

temperature

**[2]**

**(ii)** Look at the results. What is the optimum temperature for the pepsin?

.................... °C **[1]**

**19**

**(b)** Proteins can be broken down in aerobic respiration.

They have a respiratory quotient (RQ) of 0.9.

$$\text{Respiratory quotient (RQ)} = \frac{\text{volume of carbon dioxide produced}}{\text{volume of oxygen used}}$$

When proteins are used in respiration, how does the volume of carbon dioxide produced compare with the volume of oxygen used?

Put a tick (✓) in the box by the correct answer.

The volume of carbon dioxide is greater than the volume of oxygen. ☐

The volume of carbon dioxide is less than the volume of oxygen. ☐

The volume of carbon dioxide is the same as the volume of oxygen. ☐

**[1]**

**[Total: 4]**

**Turn over**

**12** The picture shows a herd of dairy cows.



**(a)** A herd of dairy cows can be improved using selective breeding.

Using **one** suitable characteristic for selection, describe how a herd of dairy cows can be improved using selective breeding.

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

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**(b)** Read the newspaper article.

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**Cows make human milk**

Human breast milk contains high quantities of nutrients that can help a baby's blood system fight infection.

Scientists have genetically modified dairy cows by inserting human genes.

This means that the cows produce milk that is very similar to human breast milk.

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(i) How does **blood** fight infection?

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

(ii) The milk from the genetically modified cows will need to be tested before humans can drink it.

Suggest **one** reason why the milk needs to be tested.

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**[Total: 9]**

**Turn over**

**13** Tom and Jennifer are twins.
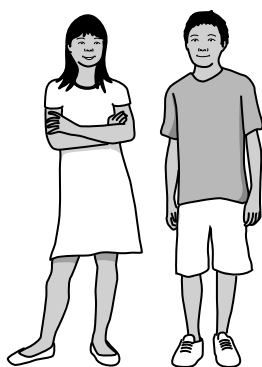


Tom and Jennifer are **not** genetically identical twins.

**(a)** How can you tell that Tom and Jennifer are **not** identical twins?

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**(b)** Tom is genetically similar to Jennifer, but **not** genetically identical.

Explain why Tom is genetically similar to Jennifer but **not** genetically identical.

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**(c)** Describe how non-identical twins are formed from gametes.

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**(d)** Which of the following words describes Tom and Jennifer?

        **clones**        **multicellular**        **mutations**        **unicellular**

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

**[Total: 6]**

**END OF QUESTION PAPER**

**23**

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**24**

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