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Friday 7 June 2019 – Afternoon

GCSE (9–1) Combined Science (Biology) A (Gateway Science)

J250/02 Paper 2 (Foundation Tier)

Time allowed: 1 hour 10 minutes

You must have:
- a ruler (cm/mm)

You may use:
- a scientific or graphical calculator
- an HB pencil

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number | | | | | | Candidate number | | | | |

First name(s) _____

Last name _____

INSTRUCTIONS
- Use black ink. You may use an HB pencil for graphs and diagrams.
- Answer **all** the questions.
- Where appropriate, your answers should be supported with working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided. If additional space is required, use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.

INFORMATION
- The total mark for this paper is **60**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended responses will be assessed in questions marked with an asterisk (*).
- This document consists of **20** pages.

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SECTION A

Answer **all** the questions.

You should spend a maximum of 20 minutes on this section.

Write your answer to each question in the box provided.

1 Which cell is adapted to defend the body from infection?

A



B



C



D



Your answer ☐ **[1]**

2 What do antibodies bind to when they defend the body?

A Antigens

B Platelets

C Red blood cells

D White blood cells

Your answer ☐ **[1]**

3 A surface graze on the skin might get infected.

Which of these is usually used to prevent infection of grazed skin?

A Antibiotic

B Antiseptic

C Antiviral

D Vaccination

Your answer ☐ **[1]**

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4 A **pooter** is used to sample populations.

Which type of animal would be sampled using a pooter?

A Beetle

B Bird

C Fish

D Mouse

Your answer ☐ **[1]**

5 Which combination of sex chromosomes is correct for humans?

A female XX male XX

B female XY male XX

C female XX male XY

D female XX male YY

Your answer ☐ **[1]**

6 Huntington's disease is a single gene disorder caused by a dominant allele (H).

The Punnett square shows the genetic cross between two heterozygous parents.

	H	h
H	HH	Hh
h	Hh	hh

What is the probability of these parents having a child with Huntington's disease?

A 0 in 4

B 1 in 4

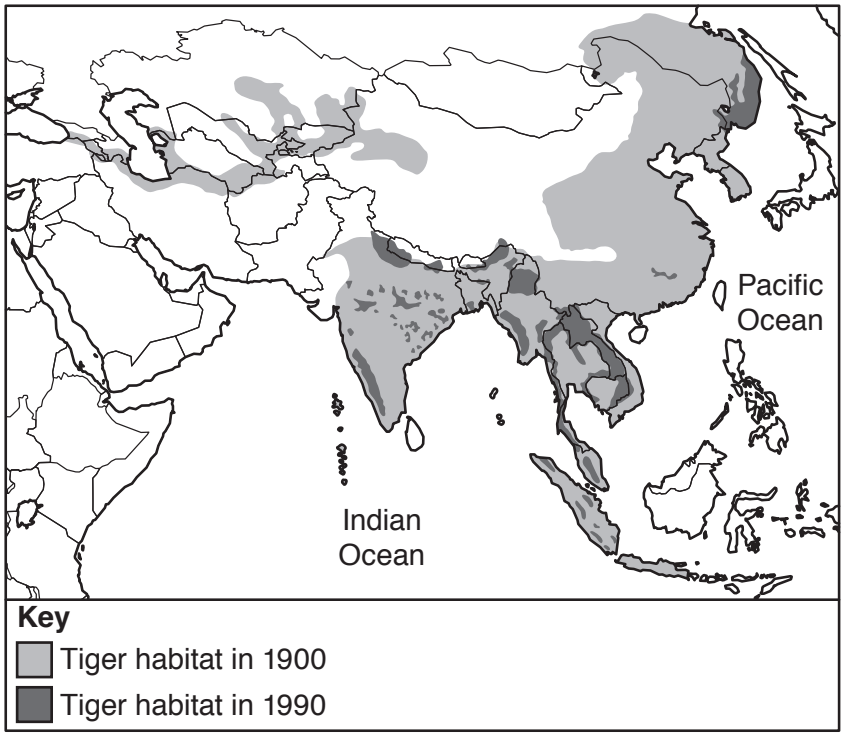
C 2 in 4

D 3 in 4

Your answer ☐ **[1]**

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7 The map shows the world tiger habitat for **1900** and **1990**.



The population of tigers declined rapidly between 1900 and 1990.

Which of these causes in decline is directly linked to evidence from the map?

A Competition for food has increased

B Destruction of habitat

C Increased hunting by humans

D Reduction in food source

Your answer ☐ **[1]**

8 Which word describes the number of chromosomes in a human sperm cell?

A Diploid

B Dominant

C Haploid

D Recessive

Your answer ☐ **[1]**

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9 In 2008 there were 16 600 people with liver disease. Of these, 600 survived liver disease due to a liver transplant.

Calculate the percentage of people with liver disease who survived because of a liver transplant in 2008.

A 3.6%

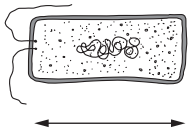
B 3.7%

C 26.7%

D 27.7%

Your answer ☐ **[1]**

10 Look at the bacterial cell that causes disease.



The human eye can see objects 0.1 mm in size.

What **minimum** magnification will be needed before the eye can see this bacterial cell?

A 1.25×

B 12.5×

C 125×

D 1250×

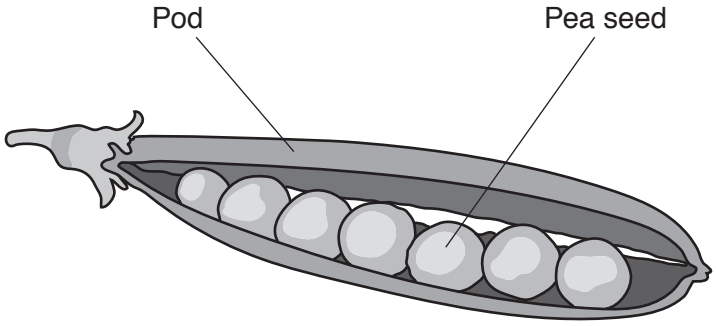
Your answer ☐ **[1]**

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SECTION B

Answer **all** the questions.

11 Two students want to see if the length of a pea pod affects the number of pea seeds inside the pod.



They measure the length of pea pods in millimetres using a ruler. They open the pods and count the pea seeds inside.

(a) (i) What is the **independent** variable in their investigation?

Tick (✓) **one** box.

Age of pea pod. ☐

Length of pea pod. ☐

Number of seeds. ☐

Size of seeds. ☐

[1]

(ii) Write down **two** variables they need to **control** to make the data valid.

1 .....

2 .....

[2]

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(b) The students choose five pea pods with a length of between 45 – 55 mm and count the number of seeds inside each pod.

Look at their results.

	Pod 1	Pod 2	Pod 3	Pod 4	Pod 5	Mean
Length of pod (mm)	52	51	48	52	47	50
Number of seeds	5	6	6	4	4	.....

(i) Calculate the mean number of seeds.

Write your answer in the table.

[1]

(ii) Use your answer to part **(b)(i)** to calculate the length of pod per seed.

Length of pod per seed = ... mm **[2]**

(c) The students repeat the experiment for pea pods between 65 – 75 mm.

The mean number of seeds was 6.7 and length of pod per seed was 11.2 mm.

Write down **two** conclusions from this experiment.

1 .....

.....

2 .....

.....

[2]

(d) How could the students make sure the samples they collect are representative?

.....

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

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(e) The phenotype of peas is controlled by many factors.

(i) Write down **two** environmental factors that could affect pea pod length.

1 .....

2 .....

[2]

(ii) Early genetic studies identified the colour of pea pods as green or yellow.
Results suggested that the colour is an example of single gene inheritance.

Why is it **not** easy to work out the genotype of skin colour in humans?

.....

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

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12 HIV is a virus that causes AIDS.

HIV infects human cells by inserting genes into the cells. The human cells then copy the genes.

(a) In which **part** of a human cell are HIV genes copied?

Put a (ring) around the correct answer.

chloroplast **cytoplasm** **mitochondria** **nucleus**

[1]

(b) In the laboratory, scientists have used gene technology to completely remove HIV genes from infected cells.

(i) Explain how removing HIV genes could affect the spread of HIV.

.....

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

(ii) Suggest why some people are concerned about the use of gene technology in HIV treatment.

.....

.....

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

(c) The Human Genome Project mapped the human **genome**.

(i) Write down what is meant by the term genome.

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

(ii) Knowledge of the human genome could identify the genes affected by HIV.

Write down **two** ways knowledge of the human genome could help with the treatment of HIV.

1 .....

.....

2 .....

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

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***(d)** Some countries have set up centres where a person is counselled and tested for HIV.

The aim is to reduce new infections by 50%.

Describe how HIV is transmitted and how these centres can contribute to reducing the spread of HIV.

.....

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

(e) HIV invades white blood cells stopping them working.

Describe the role of white blood cells in the defence against disease.

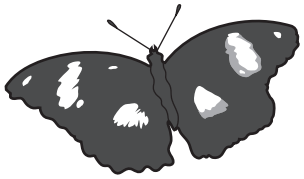
.....

.....

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

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13 (a) The diagrams show two Blue Moon butterflies.





The two butterflies are the same species. However, there are differences between the colour and wing shape of the two butterflies.

What controls the colour and wing shape within the species?

.....

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

(b) Evolution can take thousands of years, but occasionally change happens very quickly.

Read the information.

> Male embryos of the Blue Moon butterfly were attacked by a parasite.
>
> Only 1% of the male butterfly population survived.
>
> Within ten generations (1 year) males had returned to 40% of the butterfly population.
>
> The parasite had not disappeared.

Use ideas about natural selection to describe how the male Blue Moon butterfly population may have returned to 40% within a year.

.....

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.....

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.....

.....

..... **[4]**

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(c) Classification of living organisms has changed over time.

Describe how scientific methods and theories develop over time.

.....

.....

.....

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

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14 (a) The graph in **Fig. 14.1** shows the level of glucose and insulin from a person with **Type 2** diabetes over a four hour time period.

'The Child with a Metabolic Condition', Chapter 31, www.nursekey.com, Nurse Key. Item removed due to third party copyright restrictions. Link to material: https://nursekey.com/wp-content/uploads/2016/08/F000310f031-003-9781437708240.jpg

Fig. 14.1

Write down **two** ways the graph in **Fig. 14.1** shows that the person has Type 2 diabetes, not Type 1.

1 .....

.....

2 .....

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

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(b) The graph in **Fig. 14.2** shows the increase in Type 2 diabetes over a 10-year period.

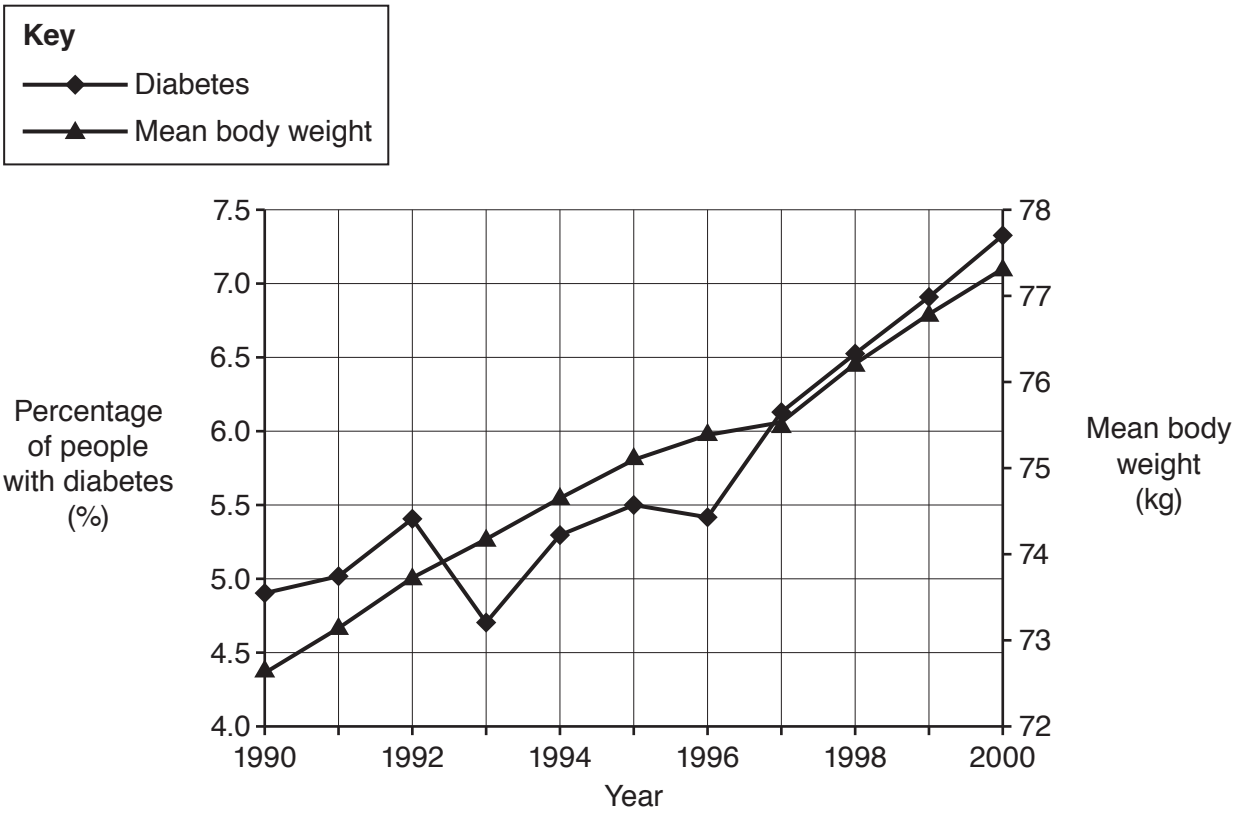


Fig. 14.2

(i) What factor does the graph in **Fig. 14.2** indicate is linked to an **increase** in Type 2 diabetes?

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

(ii) Suggest **one** lifestyle change that could reduce this factor and avoid a person developing Type 2 diabetes.

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

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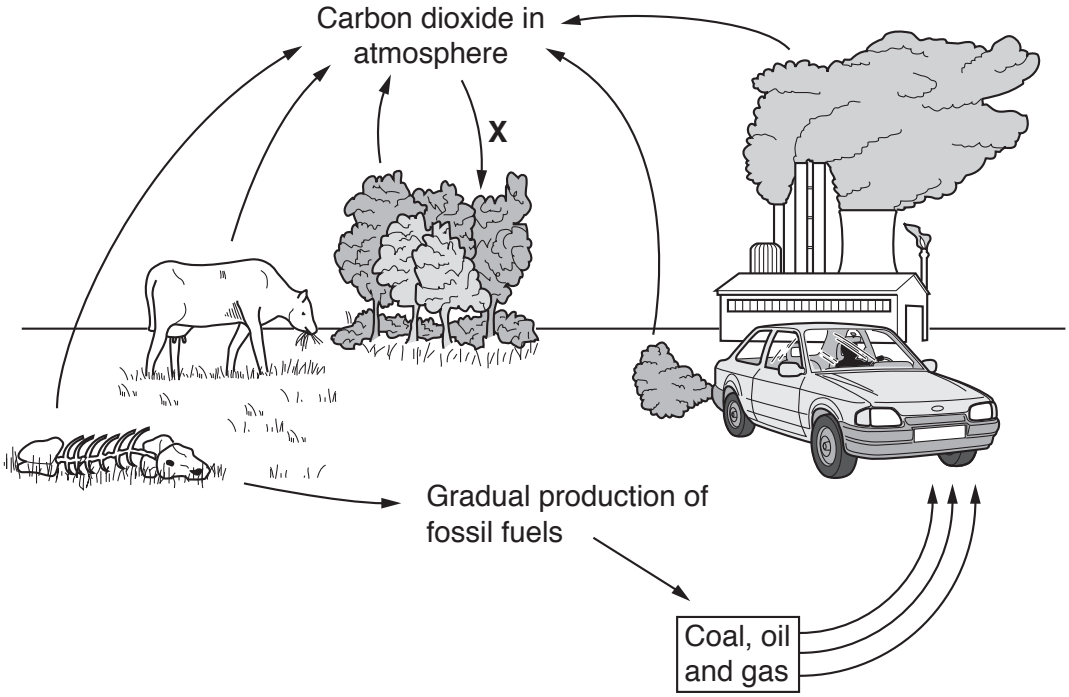
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15 **(a)** Water is cycled in nature.

Name **one** abiotic factor that affects water uptake by a plant.

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

(b) Look at the diagram of the carbon cycle.



(i) Which process is shown by arrow **X** in the diagram above?

Tick (✓) **one** box.

Combustion ☐

Decomposition ☐

Photosynthesis ☐

Respiration ☐

[1]

(ii) Which process releases carbon when organisms **die**?

Tick (✓) **one** box.

Combustion ☐

Decomposition ☐

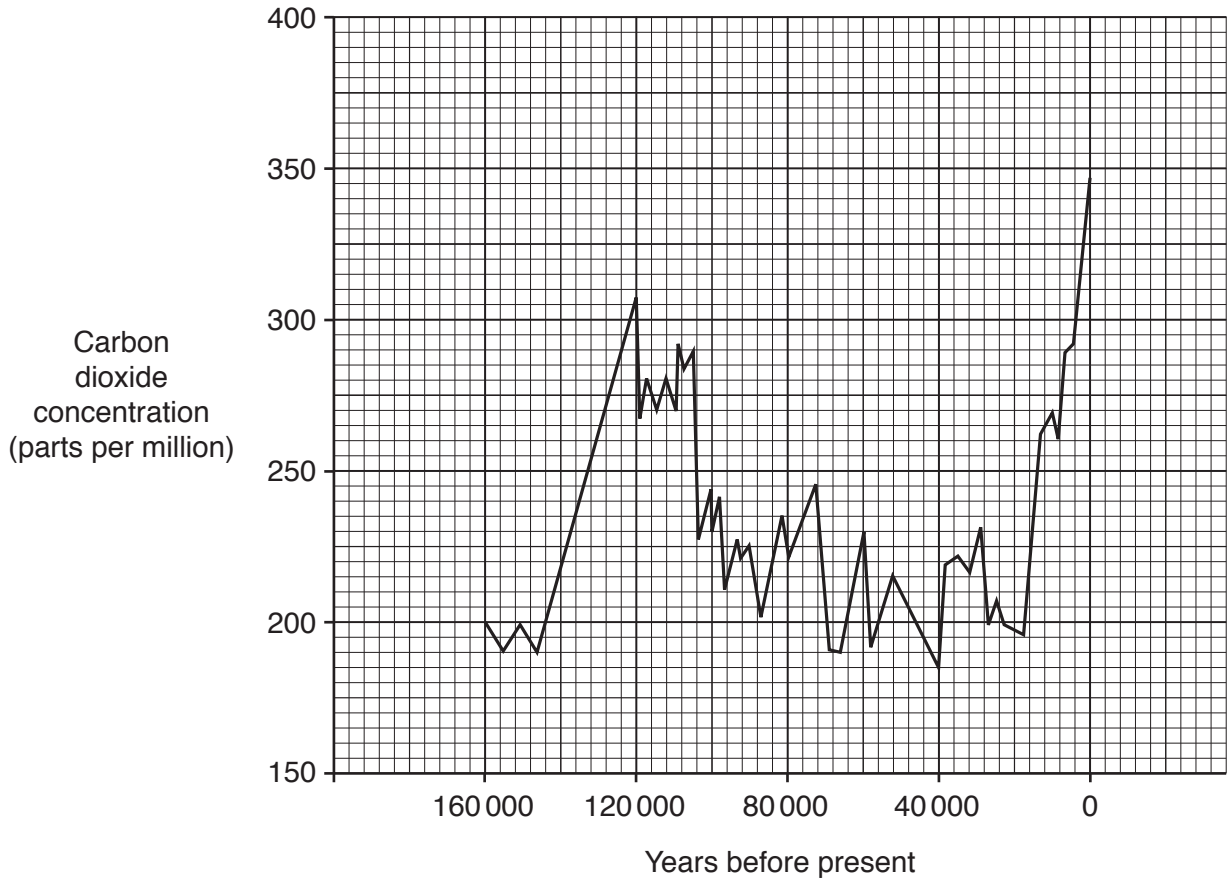
Photosynthesis ☐

Transpiration ☐

[1]

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(c) The graph shows how carbon dioxide levels in the atmosphere have changed during the last 160 000 years.



(i) Read this statement:

Carbon dioxide levels in the atmosphere are rising out of control.

What evidence is there in the graph for and against this statement?

for .....

.....

against .....

.....

[2]

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(ii) Look at the section of the graph for the last 20 000 years.

What conclusions can be made about the release of carbon dioxide into the atmosphere and also its removal from the atmosphere during the last 20 000 years?

.....

.....

.....

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

(iii) Describe how human activity has contributed to the trends in the graph and suggest how this activity could affect biodiversity.

.....

.....

.....

.....

.....

.....

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

(d) The information in the box is part of a scientific journal report.

> **Growing crops with shiny leaves could cause an annual global cooling of over 0.1 °C.**
>
> **This is almost 20% of the total global temperature increase since the Industrial Revolution.**

Most crop plants have non-shiny leaves.

A few varieties of crop plants do have shiny leaves but they do **not** all produce high yields.

Explain how scientists could use selective breeding to help reduce global temperatures.

.....

.....

.....

.....

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

END OF QUESTION PAPER

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ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

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