



General Certificate of Secondary Education
2023–2024

Centre Number

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Candidate Number

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Single Award Science: Biology

Unit 1

Higher Tier



[GSA12]

GSA12

FRIDAY 17 MAY 2024, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer the questions in the spaces provided.

Do not write outside the boxed area on each page or on blank pages.

Complete in black ink only. **Do not write with a gel pen.**

Answer **all nine** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 60.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question **3(a)**.



- 1 (a) The photograph below shows an insulin pump being used by a person with diabetes. An insulin pump is a small electronic device that continually releases small doses of insulin into the body.



- (i) What is the function of insulin in the body?

_____ [1]

- (ii) Suggest **one** advantage of using the insulin pump instead of injections to supply insulin to a person with diabetes.

_____ [1]



In Northern Ireland approximately **8000** people have Type 1 diabetes and **1500** of these people use insulin pumps.

- (iii) Calculate the percentage of people living with Type 1 diabetes in Northern Ireland who use insulin pumps.

(Show your working out.)

_____ % [2]

- (b) Insulin is a hormone. Give **two** features of a hormone.

1. _____

2. _____ [2]



2 Protecting fish stocks is one way humans can have a positive effect on biodiversity.

(a) What is meant by the term **biodiversity**?

_____ [1]

(b) Overfishing results in so many fish being removed from an area that some species of fish are at risk of dying out.

(i) Suggest **one** reason why modern fishing methods have led to overfishing.

_____ [1]

(ii) Give **two** measures that can be taken to prevent overfishing and protect fish stocks.

1. _____
2. _____ [2]



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Your answer should include:

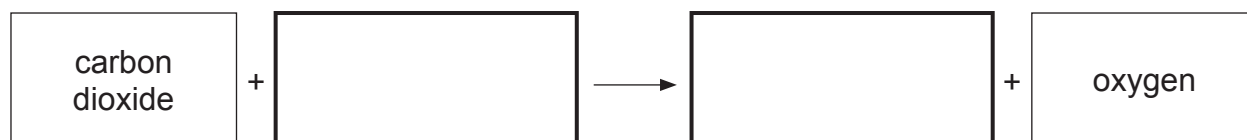
- In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

[6]

(b) Photosynthesis takes place in plants.

(i) Complete the word equation below for photosynthesis.



[2]

(ii) Name the structure in plant cells where photosynthesis takes place.

_____ [1]

(iii) Complete the sentence below about photosynthesis.

Photosynthesis takes in and uses energy, this means it can be described
as an _____ reaction. [1]

[Turn over



4 Bacteria which are resistant to a number of antibiotics are called superbugs.

The statements below give the stages that take place in the development of a superbug, but they are **not** in the correct order.

- A when antibiotics are taken the resistant bacteria survive
- B resistant and non-resistant bacteria are present in the body
- C the next generation of bacteria are all resistant to the antibiotic
- D the resistant bacteria reproduce

(a) Use the letters **A**, **B**, **C** and **D** to place these statements in the correct order.

_____ [2]

(b) MRSA is a superbug. One of the measures which can be used to control the spread of MRSA is to isolate patients when they come into hospital.

(i) Suggest **one** reason why this method is not widely used in hospitals.

_____ [1]

(ii) Give **one** other measure used to control the spread of MRSA in hospitals.

_____ [1]



- 5 In a patient who suffers from heart disease, special cells lining the blood vessels of the heart are damaged. This damage can reduce blood flow to the heart.

Stem cells can be used to replace damaged cells and increase blood flow in the blood vessels.

Scientists have developed a new technology that can produce a larger quantity of stem cells in a shorter period of time compared to previous methods.

- (a) What is a **stem cell**?

[2]

Use the information above and your knowledge to answer the following questions.

- (b) (i) Give **one** advantage, to scientists, of producing stem cells using this new technology.

[1]

- (ii) Suggest how this use of stem cells could increase respiration in heart muscle cells.

[2]

Diabetes has been linked to an increased risk of heart disease.

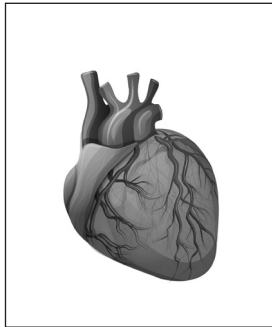
- (c) Give **one** lifestyle factor linked to an increased risk of heart disease.

[1]

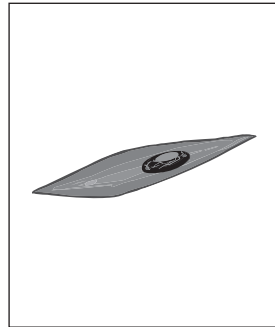
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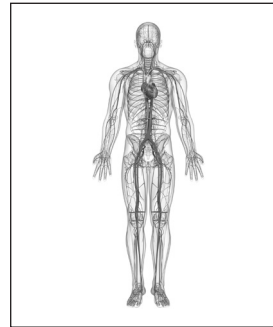
The diagrams below show levels of organisation in multi-celled organisms, but they are **not** in the correct order.



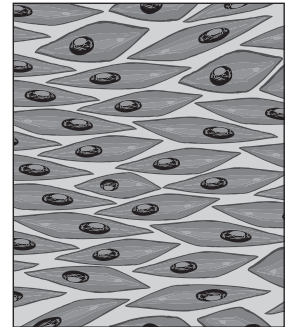
W



X



Y



Z

(d) Place the letters **W**, **X**, **Y** and **Z** in the correct order to show the levels of organisation. Start with the lowest level of organisation.

[2]



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- 6 (a) Two students investigated the effect of exercise on their heart rate. Heart rate is measured in beats per minute (bpm). They recorded their heart rate at rest and then every minute for five minutes during exercise.

The table below shows their results.

Time /min	Heart rate/bpm	
	Student 1	Student 2
0	70	75
1	80	100
2	89	110
3	95	120
4	100	125
5	100	135

- (i) Describe **two** differences between the effect of exercise on the heart rate of **Student 1** and **Student 2**.

1. _____

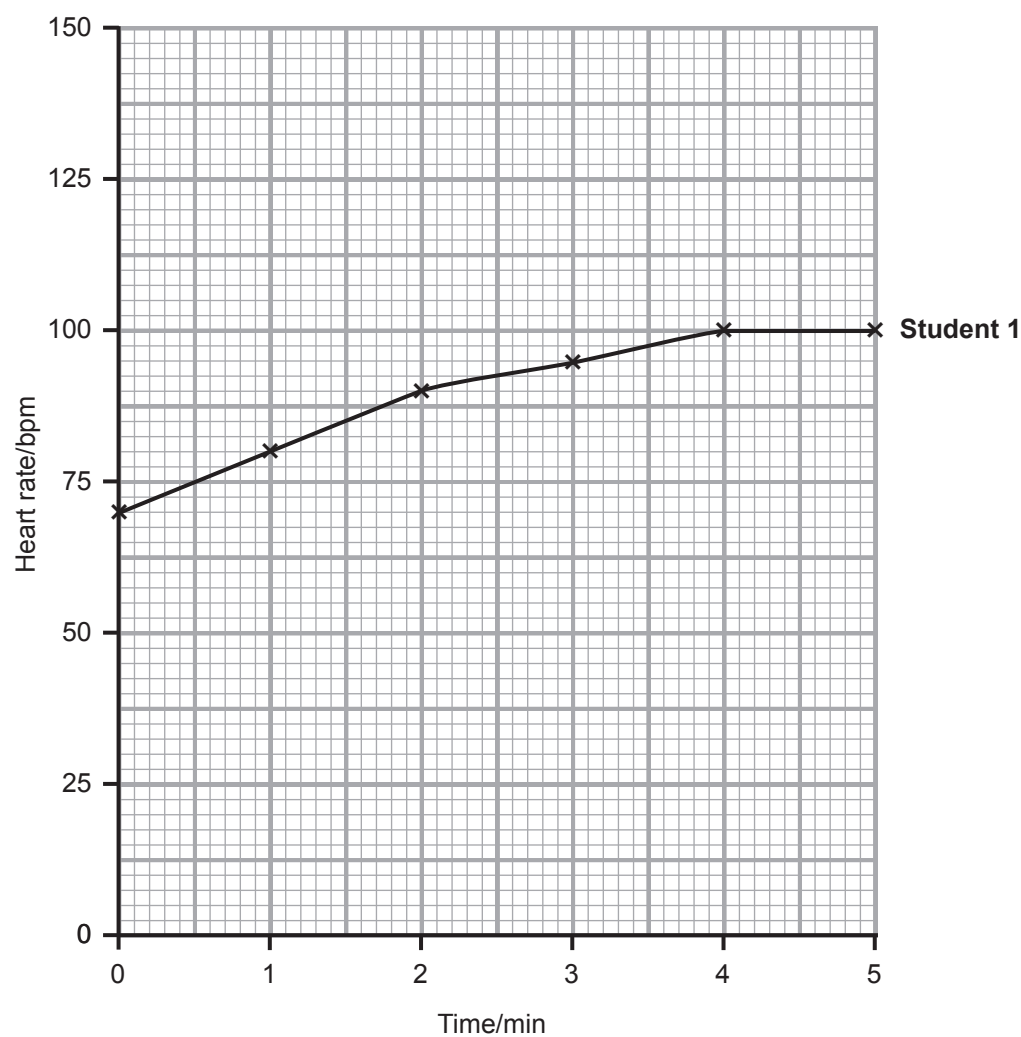
2. _____

[2]



The results for **Student 1** are shown on the graph below.

- (ii) On the same grid, plot and draw a line graph to show the results for **Student 2**.



[3]

[Turn over



After 5 minutes of exercise the heart rate of **Student 2** was 135 bpm. As she rested, her heart rate slowed at a rate of 5 bpm.

(iii) Calculate how long it will take for her heart rate to return to resting rate (75 bpm).

(Show your working out.)

_____ min [2]

(b) Give **two** ways regular exercise benefits the heart.

1. _____

2. _____

_____ [2]



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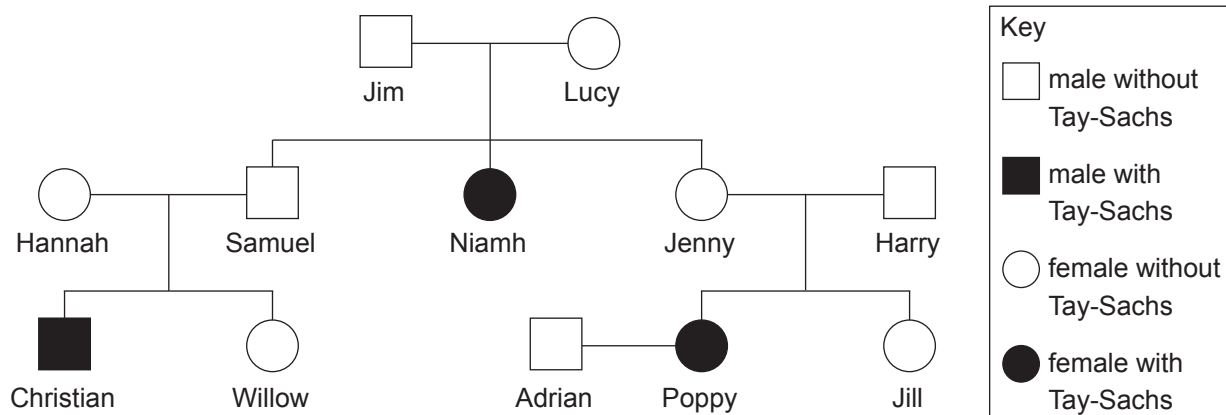
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- 7 (a) Tay-Sachs is a rare inherited condition. It is caused by a recessive allele.

The pedigree diagram below shows how this condition is passed through a family.



- (i) How many children do Lucy and Jim have?

_____ [1]

Through genetic screening Adrian found out that his genotype was homozygous dominant for this condition.

The allele for Tay-Sachs condition (**t**) is recessive to the normal allele (**T**).

- (ii) Complete the Punnett square below to show the possible genotypes of the children of Adrian and Poppy.

	Poppy	
Adrian		

[2]



(iii) What is the percentage probability of Adrian and Poppy having a child who does **not** have Tay-Sachs?

_____ % [1]

(b) What is meant by the term **phenotype**?

_____ [1]

[Turn over



- 8 A student carried out an investigation into the reaction times of males and females using their dominant and non-dominant hands.

Their results are shown in the table below.

Gender	Reaction times/ms	
	Dominant hand	Non-dominant hand
Male	250	250
Female	225	292

- (a) What type of variation is shown by hand dominance?

_____ [1]

- (b) Give **two** conclusions that can be made from these results.

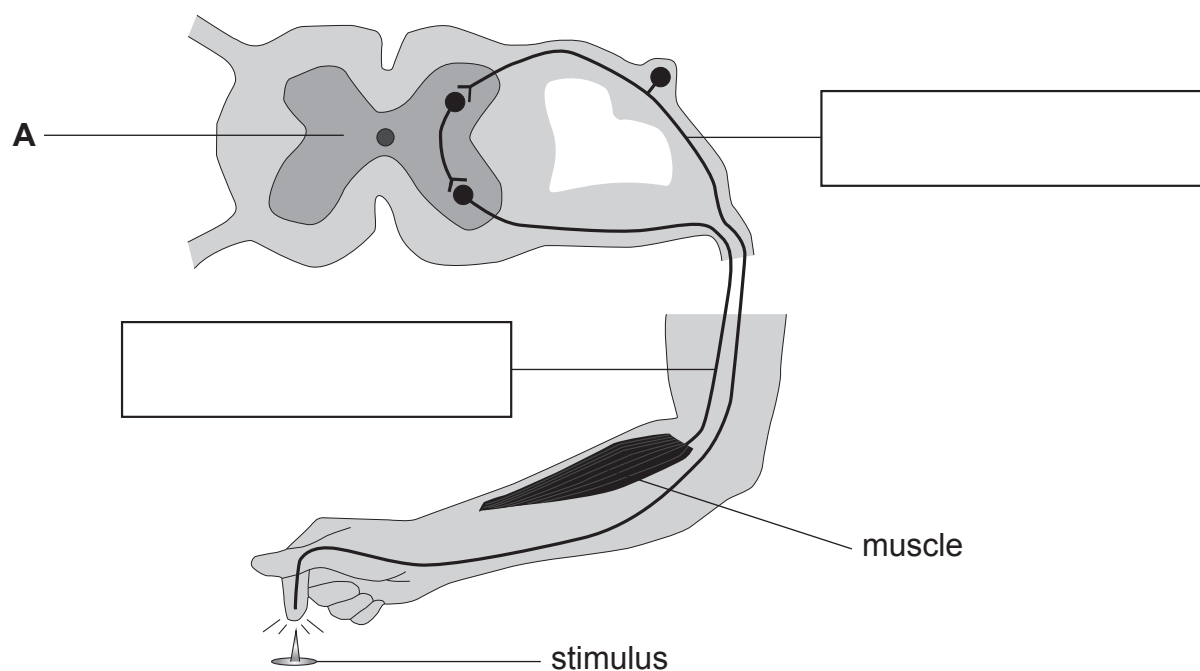
1. _____

2. _____

_____ [2]



- (c) A reflex arc is the nerve pathway involved in a reflex action.
The diagram below shows a reflex arc.



- (i) Complete the diagram above by writing the names of the **two** neurones in the boxes. [2]

- (ii) What term is used to describe the muscle in a reflex arc?

_____ [1]

- (iii) Name the part of the central nervous system labelled **A** in the diagram.

_____ [1]

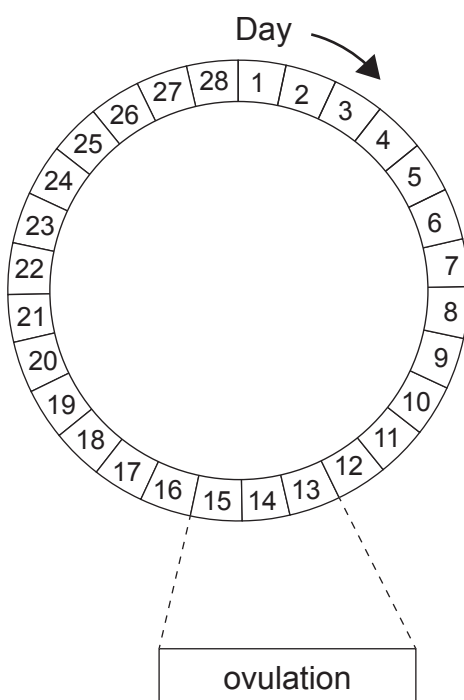
- (iv) What name is given to the gap between two neurones?

_____ [1]

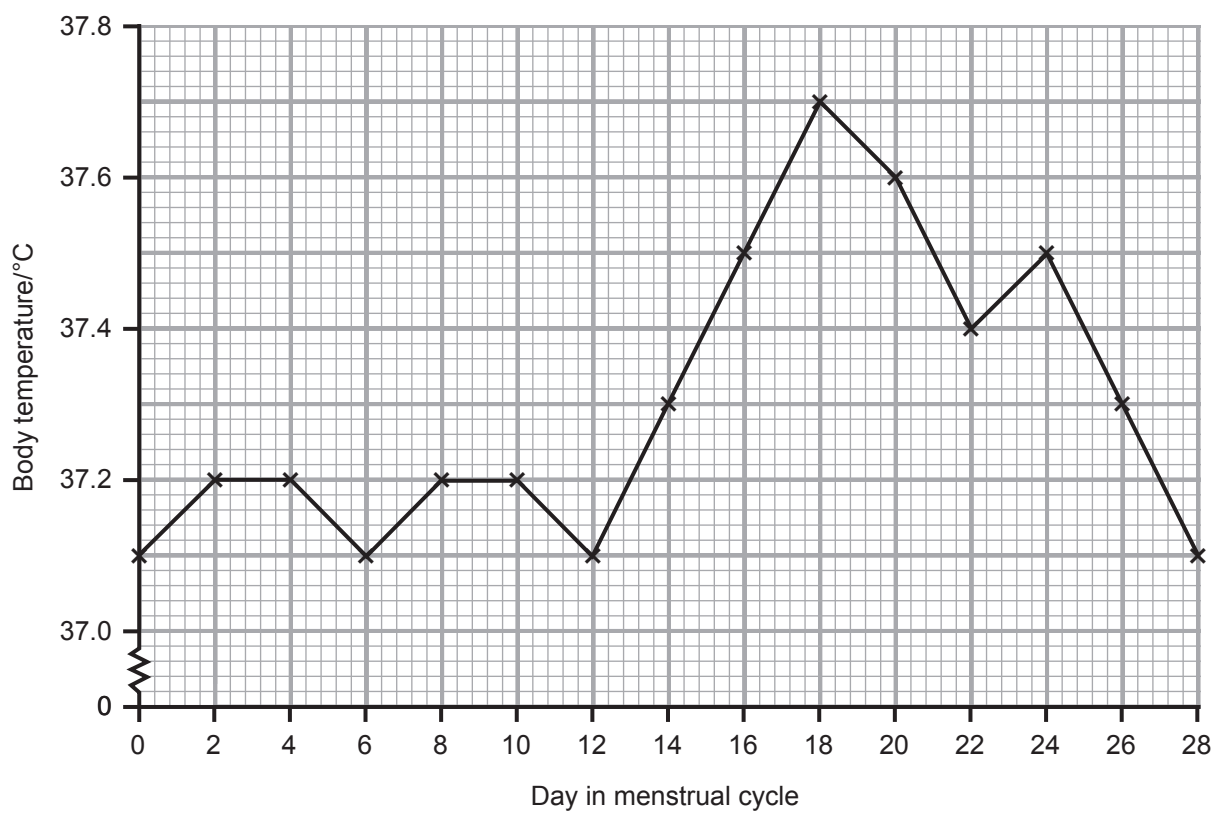
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9 The diagram below shows a menstrual cycle.



The graph below shows the change in body temperature during the menstrual cycle.



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Use this information and your knowledge to answer the following questions.

- (a) Give the range of body temperatures during ovulation.

_____ to _____ °C [1]

- (b) The hormone progesterone causes the peak in body temperature after ovulation.

- (i) Calculate the difference between the lowest and highest body temperature during this menstrual cycle.

_____ °C [1]

- (ii) Give **one** other function of progesterone in the menstrual cycle.

_____ [1]

- (c) Describe the changes that would happen in the **uterus lining** from:

day 1 to day 5. _____

day 6 to day 12. _____

_____ [2]

- (d) Name **one** type of contraceptive that changes a woman's hormone levels.

_____ [1]

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