AQA

Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____
I declare this is my own work.

GCSE
COMBINED SCIENCE: TRILOGY

H

Higher Tier
Biology Paper 2H

Monday 1 June 2020 Afternoon Time allowed: 1 hour 15 minutes

Materials

For this paper you must have:
- a ruler
- a scientific calculator.

Instructions
- Use black ink or black ball-point pen.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

Information
- The maximum mark for this paper is 70.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

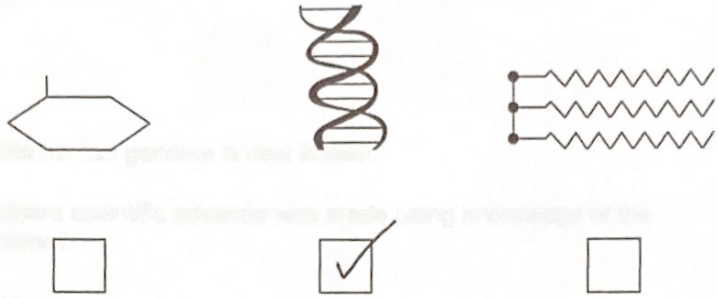
Do not write outside the box

0 1 This question is about DNA and genes.

0 1 . 1 Which diagram represents a DNA molecule?

[1 mark]

Tick (✓) **one** box.



☐ ☑ ☐

0 1 . 2 Describe the structure of a DNA molecule.

[1 mark]

2 strands that are coiled into a double helix structure

0 1 . 3 A gene is a small section of DNA on a chromosome.

Complete the sentences.

[2 marks]

A gene codes for a particular sequence of amino acids.

This sequence makes a specific protein.

Do not write outside the box

0 1 . 4 What is meant by the term genome?

[1 mark]

all of the genetic material of an organism.

0 1 . 5 The complete human genome is now known.

Which important scientific advance was made using knowledge of the human genome?

[1 mark]

Tick (✓) **one** box.

- Discovering antibiotic resistant bacteria ☐
- Finding more foods to eat from tropical forests ☐
- Tracing how aboriginal people spread across Australia ☑
- Working out when the last ice age ended ☐

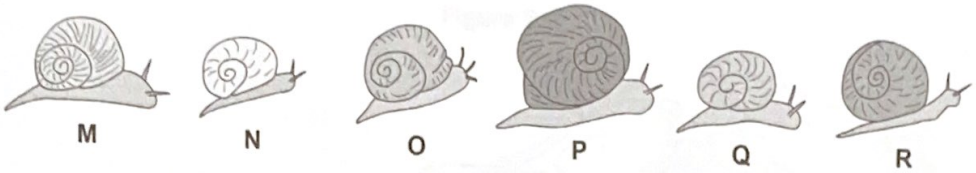
Question 1 continues on the next page

Do not write outside the box

A student found six different snails of one species in his garden.

Figure 1 shows the snails.

Figure 1



0 1 . 6 All the snails are different.

What scientific term describes differences in characteristics between individuals of a species?

[1 mark]

Variation

0 1 . 7 A change in DNA has caused snail **P** to be very different from the other five snails.

Suggest why there might be an increasing number of snails similar to snail **P** in each future generation.

[2 marks]

Snail P has a larger and potenially stronger shell so is more likely to survive and pass on genes to its offspring

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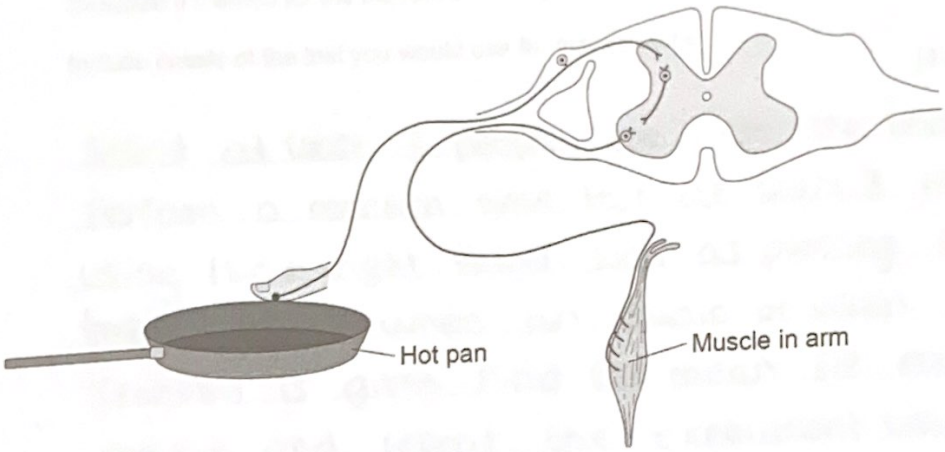
Do not write outside the box

0 2 Human reactions are a response to an external change.

0 2 . 1 Reflex actions help to protect the body against damage.

Figure 2 shows the nervous pathway for a reflex action.

Figure 2



A stimulus from the hot pan will cause the muscle in the arm to contract and move the finger away.

Describe how the stimulus from the hot pan reaches the muscle in the arm.

[4 marks]

The stimulus is detected by receptors in the fingers which initiates an electrical impulse. The impulse travels via the sensory neurones, relay neurones then motor neurones to the effector which is the arm muscles. The impulse causes the muscle to contract and the hand to be pulled away from the hot pan. Between neurones, the impulse crosses gaps/ synapses as chemical neurotransmitter.

Do not write outside the box

0 2 . 2 A student investigated whether using the right hand or the left hand had an effect on reaction time.

The student only tested right-handed people.

Describe a method for the student's investigation.

Include details of the test you would use for reaction time.

[4 marks]

Select at least 3 people, the more the better. Perform a reaction time test at least 3 times using their right hand such as pressing a ~~buzzer~~ buzzer when an audio or visual stimulus is given. Find the mean for each person and repeat the experiment using their left hands. Compare the means to find correlation between reaction time and hand used. It is important to chose participants of the same age + gender and perform the experiment at the same time of day.

Question 2 continues on the next page

Do not write outside the box

A different student carried out an investigation to see if playing tennis improved reaction time.

The student used two groups of six people.

Table 1 shows the results.

Table 1

Person	Reaction time in seconds	
	People who play tennis	People who do not play tennis
1	0.2	0.3
2	0.4	0.4
3	0.3	0.6
4	0.4	0.5
5	0.2	0.3
6	0.3	0.2
Mean	**X**	0.4

0 2 . 3 Calculate mean value **X** in **Table 1**.

[2 marks]

$\frac{0.2+0.4+0.3+0.4+0.2+0.3}{6} = \frac{1.8}{6}$

X = 0.3 seconds

0 2 . 4 What is the dependent variable in the student's investigation?

[1 mark]

reaction time

Do not write outside the box

The student concluded:

'Playing tennis improves reaction time.'

0 2 . 5 Give **one** piece of evidence which supports the conclusion.

[1 mark]

Students who play tennis had shorter mean reaction times

0 2 . 6 Give **one** piece of evidence which does **not** support the conclusion.

[1 mark]

There is a big overlap in times between the two groups

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Turn over for the next question

Do not write outside the box

0 3 There is a need to grow enough food for all the people in the world.

Growing enough food affects habitats and biodiversity.

0 3 . 1 What is meant by the term biodiversity?

[1 mark]

The variety of all the different species in an ecosystem

Peat bogs are being destroyed because peat is used by humans.

Destroying peat bogs also reduces biodiversity.

0 3 . 2 Give **one** use of peat taken from peat bogs.

[1 mark]

Used as fertiliser

0 3 . 3 Explain why the use of peat is harmful to the environment.

Do **not** refer to biodiversity in your answer.

[2 marks]

The decay of peat releases carbon dioxide into the atmosphere which is increases global warming.

Do not write outside the box

0 3 . 4 Intensive farming, where a single crop is grown on a large area of land year after year, is more cost effective for farmers.

It is efficient to use fertilisers and to burn the waste so the land is ready to use the next year.

Planting a single crop reduces biodiversity.

Suggest **two** ways that this type of farming can damage the environment.

Do **not** refer to biodiversity in your answer.

[2 marks]

1 When the crops are harvested and removed, minerals are taken from the soil

2 The fertilisers used by the farmers can pollute water in rivers and lakes.

0 3 . 5 Most of the world's production of antibiotics is used in farming.

Antibiotics are given to animals to prevent the spread of disease.

Explain how the widespread use of antibiotics in farming is a threat to human life.

[4 marks]

The antibiotics given to the animals are passed into the environment in animal sewage which can flow into rivers. This causes bacteria both on land and in water to become resistant to the antibiotics. Some of these bacteria are human pathogens and cause human diseases. Due to the antibiotic resistance of the bacteria, humans will no lager be able to be treated and cured with the antibiotic.

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Do not write outside the box

0 4 . 1 In sexual reproduction, cells divide by meiosis to form gametes.

Which **two** statements are true for cell division by meiosis?

[2 marks]

Tick (✓) **two** boxes.

- Daughter cells have two sets of chromosomes. ☐
- Four daughter cells are formed. ☑
- The daughter cells are genetically identical. ☐
- The DNA replicates twice. ☐
- The parent cell divides twice. ☑

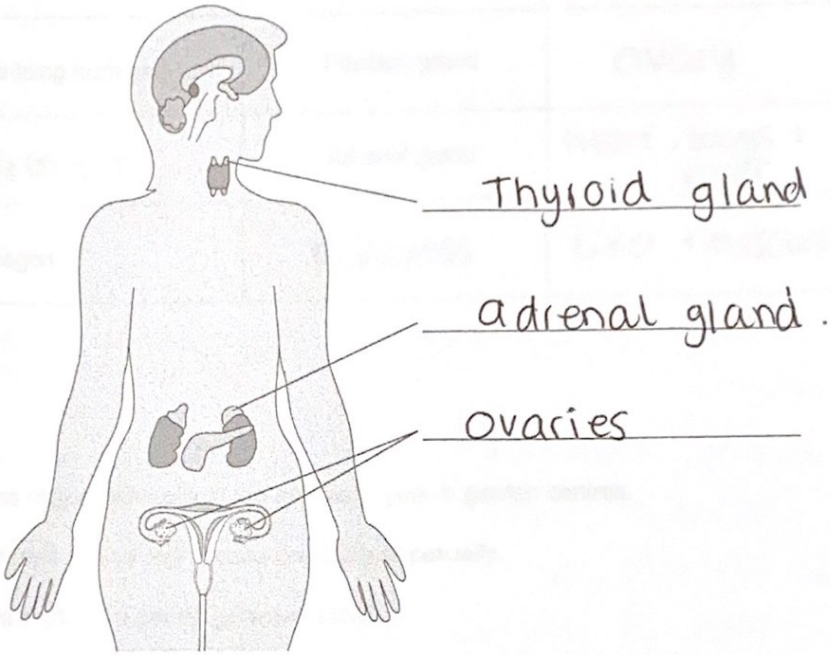
Do not write outside the box

Hormones are released from endocrine glands.

Each hormone travels in the bloodstream to a target organ.

Figure 3 shows the position of endocrine glands in a female.

Figure 3



0 4 . 2 Label the endocrine glands on **Figure 3.**

[3 marks]

Question 4 continues on the next page

Do not write outside the box

0 4 . 3 Complete **Table 2**.

[3 marks]

Table 2

Hormone	Name of gland which releases hormone	Target organ of hormone
Luteinising hormone (LH)	Pituitary gland	ovary
Adrenaline	Adrenal gland	Heart, lungs + liver
Glucagon	Pancreas	liver + muscles.

Millions of geranium plants are sold each year in garden centres.

Geraniums can be reproduced asexually or sexually.

Figure 4 shows a potted geranium plant.

Figure 4

Do not write outside the box

Garden centres usually grow new geranium plants by asexual reproduction.

0 4 . 4 Suggest **two** advantages for garden centres of growing geraniums by asexual reproduction compared with sexual reproduction.

[2 marks]

1 Only requires one parent plant

2 Will produce many genetically identical plants

0 4 . 5 Suggest **two** disadvantages for garden centres of growing geraniums by asexual reproduction compared with sexual reproduction.

[2 marks]

1 They will be genetically identical so will all be susceptible to the same diseases

2 There will be no genetic variety for new colours and other characteristics to offer customers.

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Turn over for the next question

Do not write outside the box

0 5 This question is about inheritance.

Humans have 23 pairs of chromosomes in each body cell.

One pair of chromosomes determines sex.

0 5 . 1 Complete **Figure 5**.

[2 marks]

Figure 5

		Female	
		X	X
Male	X	XX	XX
	Y	XY	XY

0 5 . 2 In some families all children are the same sex.

Give the reason why.

[1 mark]

There is a 50% chance that the sperm cell that fertilises the egg has an X chromosome and 50% that it has a Y.

Do not write outside the box

Cystic fibrosis (CF) is an inherited disorder.

0 5 . 3 A man and a woman do **not** have CF.

The man and the woman have a child who has CF.

Draw a Punnett square diagram to find the probability that their next child will have CF.

Use the symbols:

T = dominant allele

t = recessive allele

Draw a ring around the genotype of any children with CF.

[4 marks]

	T	t
T	TT	Tt
t	Tt	tt

1 out of 4 offspring = 25% or 0.25

Probability = 0.25

Question 5 continues on the next page

Do not write outside the box

Embryo screening for CF can be done by two methods.

Method 1

- The woman becomes pregnant by sexual intercourse.
- After 10 weeks of pregnancy a fine needle is inserted into the uterus.
- A sample of the fluid surrounding the embryo is taken.
- The DNA of the embryo is tested for CF.

The screening is done free by specialist hospitals for couples who are at risk of having a child with CF.

There is a small risk of miscarriage.

Method 2

- The couple use In Vitro Fertilisation (IVF) to produce a small number of embryos.
- Each embryo is tested for CF.
- One or two embryos without CF are implanted in the woman's uterus.

In 2017 the success rate for having a baby by IVF for women under 35 years was 30%

IVF is a stressful, invasive procedure.

In most UK areas the free public health service does not provide IVF for all women asking for it.

Do not write outside the box

0 5 . 4 Suggest **three** reasons for choosing **Method 1** instead of **Method 2**.

[3 marks]

1 Does not require IVF which is stressful and invasive

2 Higher chance of successful pregnancy as miscarrige risk is low compared to IVF success.

3 The test can be carried out even once the mother is pregnant.

0 5 . 5 Suggest **one** advantage of **Method 2**.

[1 mark]

Do not need to consider termination as embryos are tested before they are implanted in the womans uterus.

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Turn over for the next question

Do not write outside the box

0 6 Scientists believe that the first life on Earth was primitive anaerobic bacteria which first appeared billions of years ago.

0 6 . 1 Which domain of the three-domain classification system do these primitive anaerobic bacteria belong to?

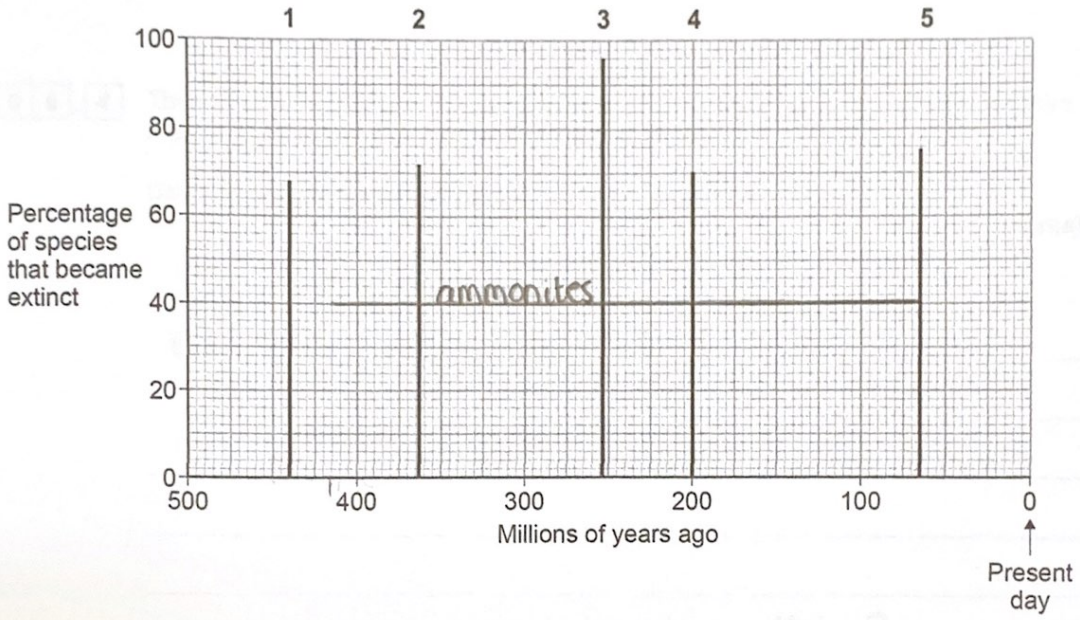
[1 mark]

archaea

Scientists have identified five periods of mass extinction since the fossil record began.

Figure 6 shows the timeline of the five mass extinction events.

Figure 6



0 6 . 2 Ammonites were organisms that first appeared in the oceans 415 million years ago.

Ammonites disappeared in the 5th mass extinction.

Draw a horizontal line on **Figure 6** to show the time period that ammonites existed on Earth.

Label the line 'ammonites'.

[1 mark]

Do not write outside the box

0 6 . 3 Another type of organism that existed in the oceans was called trilobites.

Trilobites existed from 544 million years ago until 278 million years ago.

How many more years did ammonites exist than trilobites?

[2 marks]

ammonites : 415 - 65 = 350 (million)
trilobites : 544 - 278 = 266 (million)
350 - 266 = 84 (million)

84 million years

0 6 . 4 There was an increase in the percentage of species which became extinct in the third mass extinction compared to the first mass extinction.

Calculate the percentage increase.

[3 marks]

1st mass extinction = 68
3rd mass extinction = 96

$\frac{96-68}{68} \times 100 = 41.17647$

Percentage increase = 41.2 %

7

Turn over for the next question

Do not write outside the box

0 7 Human activities affect the environment.

0 7 . 1 Describe the reasons why deforestation takes place and the effects deforestation has on the environment.

[6 marks]

Tropical rainforests are cleared for land. This land is used to raise cattle, plant rice and other crops such as coffee and grow biofuels such as palm oil. Forrests can also be chopped down to clear area for mining and collecting wood for use in building and paper. This whole process ~~releases~~ increases the amount of carbon dioxide in the atmosphere because there is less trees to take in the carbon dioxide, more respiration by microorganisms decaying the material (so releasing CO_2) and burning of the waste also releases CO_2. The build up of CO_2 leads to global warming. ~~which~~ ~~[illegible]~~. other consequences include habitat loss which lead to reduced biodiversity and soil erosion.

Do not write outside the box

Forests have been called:

'The lungs of the planet.'

0 7 . 2 Describe **one** way forests being called 'The lungs of the planet' can be considered to be a **correct** statement.

[1 mark]

Forests involve gas exchange with the atmosphere

0 7 . 3 Trees do **not** have lungs.

Describe **one** other way forests being called 'The lungs of the planet' is an **incorrect** statement.

[1 mark]

In forests carbon dioxide is used and oxygen is released but in lungs, oxygen is used and carbon dioxide is released.

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END OF QUESTIONS