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

Time allowed: 1 hour 15 minutes

Materials

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

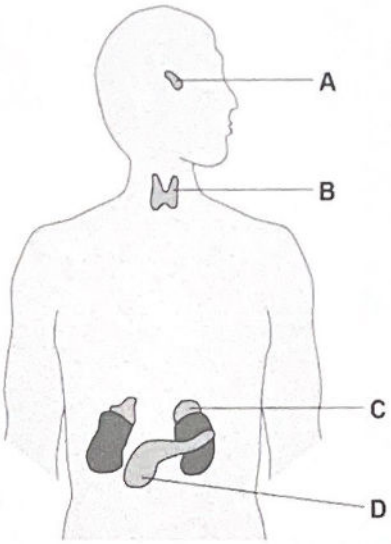
Instructions
- Use black ink or black ball-point pen.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question 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	
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.

0 1 **Figure 1** shows glands in the human body.

Figure 1



0 1 . 1 Which organ system includes the glands shown in **Figure 1**?

[1 mark]

Endocrine system

0 1 . 2 Which gland produces insulin?

[1 mark]

Tick (✓) **one** box.

A ☐ B ☐ C ☐ D ☑

pancreas

0 1 . 3 Which gland produces hormones that stimulate the other glands to produce hormones?

[1 mark]

Tick (✓) **one** box.

A ☑ B ☐ C ☐ D ☐

pituatry gland also known as the master gland

0 1 . 4 How do hormones travel from one gland to another gland?

[1 mark]

Hormones are released into the blood stream, so travel in the blood to the target organ through blood vessels.

0 1 . 5 Name **two** glands involved in human reproduction.

Do **not** refer to glands shown on **Figure 1** in your answer.

[2 marks]

1 testes (male gland)

2 ovaries (female gland)

0 1 . 6 Ovulation test kits can help women know when they are most fertile.

Ovulation test kits detect the increase in the hormone that stimulates ovulation.

Which hormone is detected by ovulation test kits?

[1 mark]

Tick (✓) **one** box.

Follicle stimulating hormone (FSH)	
Luteinising hormone (LH)	✓
Oestrogen	
Progesterone	

LH release causes ovulation, so when LH gets released in large quantities ovulation is about to occur.

0 1 . 7 A new contraceptive drug for men is being tested.

The drug:

- is given in one injection
- stops sperm being able to fertilise eggs
- is effective for up to 13 years.

Evaluate the use of the new drug compared with existing contraceptive methods.

[6 marks]

An advantage of the new drug can be that it lasts longer than other methods such as condoms, IUDs, diaphragms. However, they dont last for ever like sterilisation. This offers an option for men that no other form of contraception does. A further advantage is that one time application last 13 years, so its not like something that can be forgotten like a pill.

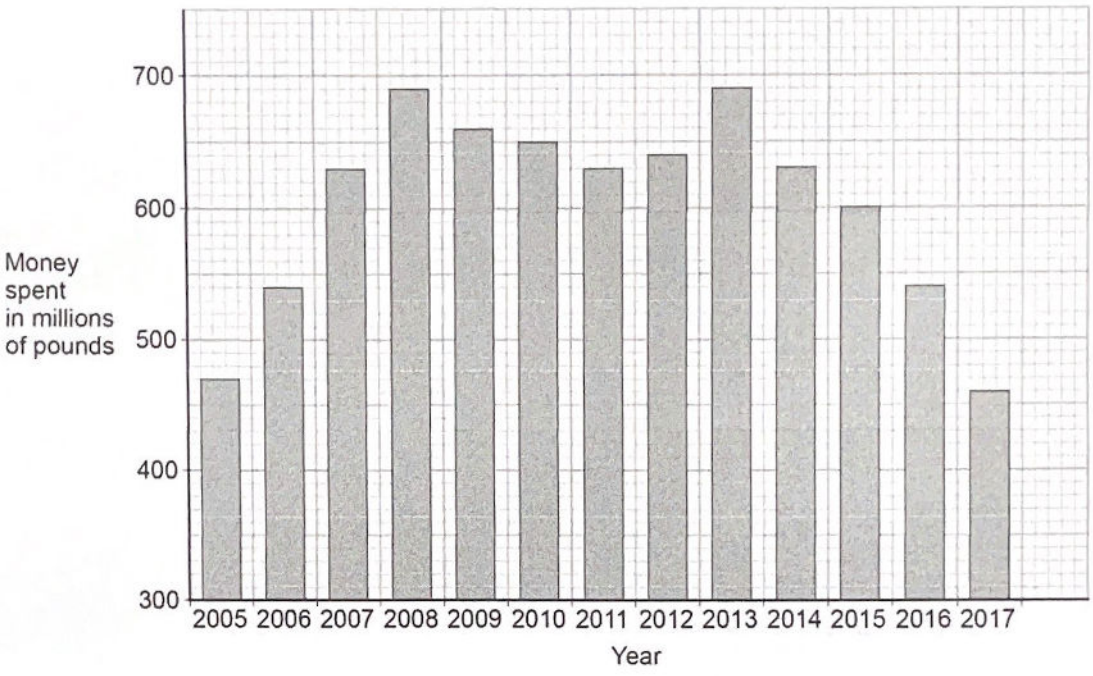
This can however also be a disadvantage, as once injected the man can't change his mind about it for maybe 13 years. It can be up to 13 years, not necessarily, hence it might be not fully effective towards the end. In addition, as its experimental its effectiveness on humans and potential sideeffects may make it ~~his~~ a risk. Not to mention its not protecting the individual from STDs like condoms for instance would.

In conclusion the negatives outweigh the positives currently making alternative methods more ~~effective~~ reasonable.

13

0 2 **Figure 2** shows the money spent on conserving biodiversity in the UK by the government.

Figure 2



0 2 . 1 Describe the trends in the money spent on conserving biodiversity from 2005 to 2011.

Use data from **Figure 2** in your answer.

[2 marks]

Increase every year between 2005 to 2008 from 470 to 690 millions of pounds. However, between 2008 and 2011 it decreases every year. So that, it decreases from 690 to 630 million pounds by 2011.

0 2 . 2 Calculate the percentage decrease in the money spent on conserving biodiversity from 2013 to 2017.

Use the equation:

$$\text{percentage decrease} = \frac{\text{change in money spent from 2013 to 2017}}{\text{money spent in 2013}} \times 100$$

Give your answer to 2 significant figures.

[3 marks]

percentage decrease = $\frac{690 - 460}{690} \times 100 = 33.33\%$

2 s/f ⇒ 33%

Percentage decrease (2 significant figures) = 33 %

0 2 . 3 Conservation of peat bogs can help maintain biodiversity.

Give **two** uses of peat taken from peat bogs.

[2 marks]

1 Peat containing compost used as soil in gardening

2 burning peat has been and still is used as a source of fuel.

Question 2 continues on the next page

Do not wr
outside t
box

0 2 . 4 Describe **two** ways to **increase** biodiversity in the UK.

Do **not** refer to money spent or to peat in your answer.

[2 marks]

1 Planting more trees offers more habitats for wildlife, giving them it a better chance of survival

2 Breeding programs for endangered species and releasing them back into the wild. This can boost wild populations.

9

0 3 A fossil was found in rocks. The rocks were formed from mud.

The fossil is of the fungus *Ourasphaira giraldae*,
genus species

0 3 . 1 What is the genus of the fungus?

[1 mark]

Ourasphaira

0 3 . 2 Why was the mud important during the formation of the fossil?

[1 mark]

Tick (✓) **one** box.

- The fungus completely decayed in the mud. ☐ With the lack of oxygen the fungus
- The mud stopped oxygen reaching the fungus. ☑ ✓ didn't break down, as organisms
- There was water in the mud around the fungus. ☐ decaying matter require oxygen

Question 3 continues on the next page

The estimated age of the fossil is in the range from 8.9×10^8 years old to 1.1×10^9 years old.

0 3 . 3 Calculate the size of the range of the estimated age of the fossil.

[1 mark]

~~8.9×10^8~~ $1.1 \times 10^9 - 8.9 \times 10^8 = 210000000$

$210000000 = 2.1 \times 10^8$

Size of range = 2.1×10^8 years

0 3 . 4 Humans did **not** exist when the fungus was alive.

Suggest **one** other reason why an accurate estimation of when this species of fungus existed is not known.

[1 mark]

Our dating methods may not be accurate / precise enough to pinpoint the exact time.

OR

Fossils of the fungus have been destroyed by geological activity or not found yet by people.

Carl Woese developed the three-domain system of classification.

0 3 . 5 Fungi are **not** in the domain Archaea.

Which domain are fungi classified in?

[1 mark]

eukaryota (as fungi are eukaryotic)

Do not write outside the box

0 3 . 6 Which **two** characteristics are features of organisms in the domain Archaea?

[2 marks]

Tick (✓) **two** boxes.

Can only survive in light	
Can survive in extreme environments	✓
Cells contain chloroplasts	
Cells do not have a cell wall	
Cytoplasm contains DNA	✓

0 3 . 7 Carl Linnaeus lived in the 1700s.

Carl Linnaeus classified living things into groups depending on their appearance.

Give **three** types of evidence that are used **now** to classify living things.

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

[3 marks]

1 Comparing differences and similarities with biochemical pathways and processes

2 Better light microscopes allow for study of internal structures of the cells.

3 DNA / genetic analysis enable to compare the genome of species with another.

10

Turn over for the next question

0 4 **Figure 3** shows one species of bird on a bird feeder.

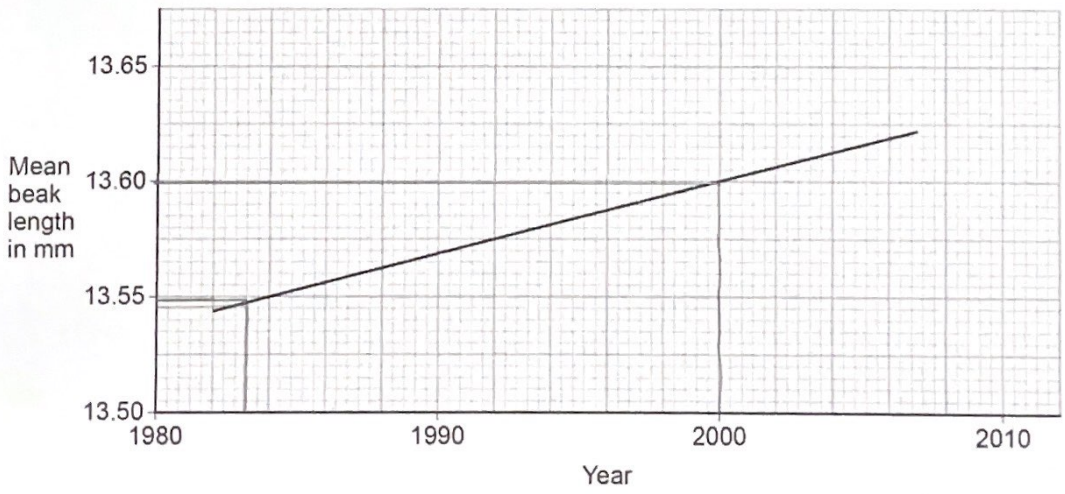
Figure 3

The birds use their beaks to reach nuts inside the bird feeder.

Figure 4 shows the mean beak length of this species of bird in the UK.

This species of bird often visits bird feeders.

Figure 4



0 4 . 1 Determine the rate of change in beak length from 1984 to 2000.

Use **Figure 4**.

[3 marks]

1984 to 2000 = 16 years

1984 = 13.55mm

2000 = 13.60mm

13.60 - 13.55 = 0.05mm

rate of change = $\frac{\text{change in beak length}}{\text{length of time}}$

rate of change = $\frac{0.05\text{mm}}{16\text{ years}} = 3.125 \times 10^{-3}\text{ mm/year}$

Rate of change = 3.125×10^{-3} mm/year

0 4 . 2 Explain the process of evolution that could cause the trend in **Figure 4**.

[6 marks]

There is natural variation in populations for their beak length. This is due to genes coding for the length and mutations to this gene happen over time inducing variation.

Individuals with longer beaks have a survival advantage. This may be as they can reach nuts and food from the feeder easier thanks to the longer beak. This allows them to access more food, grow stronger and produce more offspring. They will pass on their 'long beak' allele to their offspring, who will also have this advantage. Over time and generations there be more longer beak birds, with natural selection favouring longer and longer beaks.

0 4 . 3 Birds of this species:

- live for about 3 years
- produce up to 24 eggs every year.

Explain why evolution is easier to study in this species of bird than in humans.

[3 marks]

The birds have a significantly shorter life cycle. They reproduce much earlier on and in much larger numbers than humans. As evolution happens over several generations the birds are easier to study it on as you can fit many generations of birds within the same time as ~~the~~ a single generation for humans.

0 4 . 4 Birds of this species are found in different parts of the world.

Describe evidence that would show two individual birds are the same species.

[3 marks]

Birds of the same species should have a very similar phenotype (expressed traits) and genotype (~~genes they allele~~ genes they ~~carrie~~ carrie in their genome). If ~~they~~ two individuals were breed with each other from the two populations they would be able to produce fertile offspring.

15

0 5 Caffeine is a drug that decreases reaction time.

A group of sixteen students investigated the effect of caffeine on reaction time.

The students were all 15-year-old girls.

The group was divided into 8 pairs of students.

This is the method used.

1. Student **A** starts two stopwatches at the same time.
2. Student **A** then gives one of the stopwatches to Student **B**.
3. Student **A** says "stop" at the same time as stopping her stopwatch. Student **B** stops her stopwatch as quickly as possible after Student **A** says "stop".
4. The difference in time shown on the two stopwatches is recorded. This is the reaction time of Student **B**.
5. Student **B** drinks a caffeinated drink.
6. The students wait 15 minutes and then repeat steps 1 to 4.

0 5 . 1 Suggest **one** control variable the students should have used in the investigation.

Do **not** refer to age or sex in your answer.

[1 mark]

Students should not have consumed any ~~caffeine~~ caffeine other then as part of the experiment that day.

0 5 . 2 Suggest **two** sources of random error when using this method to measure a person's reaction time.

[2 marks]

1 They might not have started both stop watches exactly at the same time at the start.

2 Student A may have a reaction time as well, in which she says 'stop' but is to still stop her watch as well, This may not be fully simultaneous.

Question 5 continues on the next page

Table 1 shows the results.

Table 1

Student pair	Decrease in reaction time after drinking the caffeinated drink in seconds
1	0.039
2	0.021
3	0.027
4	0.041
5	0.022
6	0.036
7	0.024
8	0.097

0 5 . 3 Why can a mode **not** be determined for the data in **Table 1**?

[1 mark]

Mode is most common value, but no value appears more than once in the table.

0 5 . 4 The students decided the result from pair **8** was anomalous.

The students calculated that the mean decrease in reaction time was 0.030 seconds.

Describe how the students calculated the mean decrease in reaction time.

[1 mark]

add up all other 7 values and then divide that sum by 7.

$$\frac{0.039+0.021+0.027+0.041+0.022+0.036+0.024}{7} =$$

0 5 . 5 Caffeine causes the release of adrenaline.

Adrenaline affects heart rate.

Explain how the effect of adrenaline on heart rate might cause reaction time to decrease.

[4 marks]

Adrenalin will increase heart rate, therefore increasing the rate of blood flow to the brain and muscles. This increase blood flow supplies an increased amount of oxygen and glucose to these tissue which they can use to respire rapidly. The release of energy from respiration allows muscles to contract faster leading to a faster reaction time.

Question 5 continues on the next page

Adenosine is a different chemical made by the body.

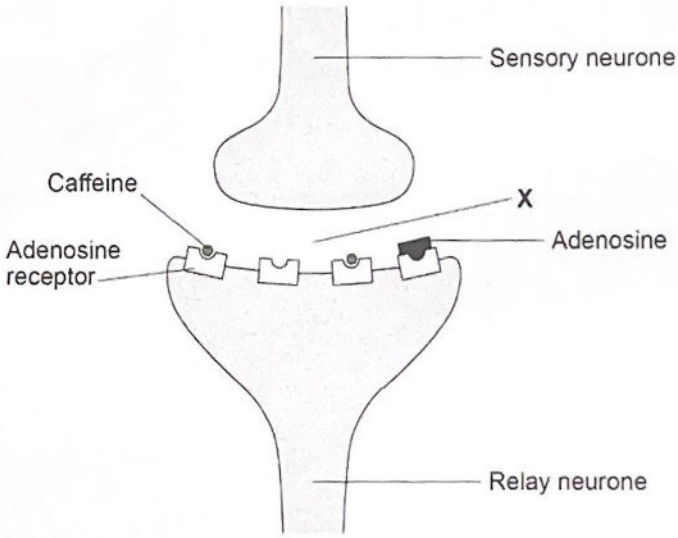
Adenosine binds to receptors on relay neurones.

Adenosine decreases the number of impulses in relay neurones.

Figure 5 shows how caffeine binds to adenosine receptors on a relay neurone.

When caffeine binds to adenosine receptors it blocks the receptor so adenosine cannot bind.

Figure 5



0 5 . 6 Label **X** shows the gap between the sensory neurone and the relay neurone.

What is the name of the gap labelled **X**?

[1 mark]

Synapse

0 5 . 7 Suggest why reaction time decreases when caffeine binds to adenosine receptors.

[2 marks]

Fewer adenosine molecules can bind to the receptors on the relay neurone. Therefore generating more impulses in the relay neurone as less bound adenosine can decrease the impulse less.

12

Turn over for the next question

0 6 This question is about genetic disorders.

0 6 . 1 Some people are heterozygous for a genetic disorder.

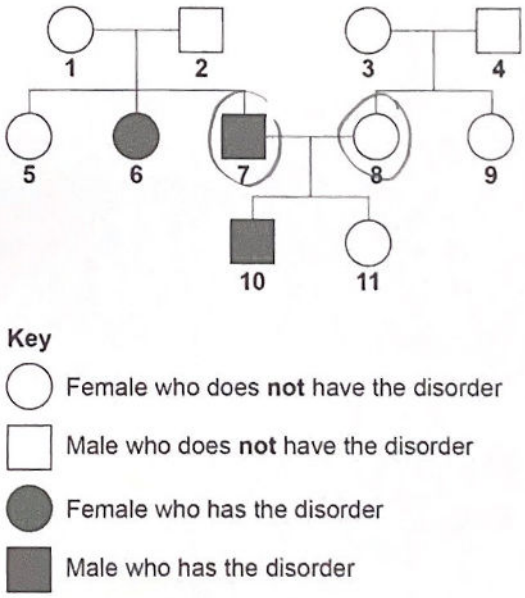
Define the term 'heterozygous'.

[1 mark]

The individual has different alleles for the same gene.

0 6 . 2 **Figure 6** shows the inheritance of a genetic disorder in a family.

Figure 6



Person **7** and person **8** plan to have another child.

Determine the probability that the child will be a **male** who has the disorder.

You should:

- draw a Punnett square diagram
- identify the genotype of person **7** and the genotype of person **8**
- identify the phenotype of each offspring genotype
- use the symbols:

H = dominant allele

h = recessive allele

Genotypes:

Person 7 : hh

Person 8 : Hh

[6 marks]

Person 7 \ Person 8	H	h
h	Hh	hh
h	Hh	hh

Offspring genotype

50% - Hh

50% - hh

Hh - doesn't have disorder

hh - does have disorder

Probability

50% = 0.5 = $\frac{1}{2}$ for disabolity

Probabilty of male = 0.5

So probability of male with disorder = 0.5 × 0.5 =

Probability of having a male child with the disorder = 0.25

Question 6 continues on the next page

0 6 . 3 Polydactyly is a different inherited disorder.

Two parents do **not** have any alleles for polydactyly in their ordinary body cells.

These parents produced a child with polydactyly.

Explain how polydactyly suddenly occurred in this family.

[4 marks]

If neither parents carry genes for it, it must have arrisen from random mutation to sex cells. This mutation at meiosis created a change in the gene, leading to the differential expression of that gene. Genes are translated into amino acid sequences, which are folded into proteins. If, there has been a change to the gene, that may result in a difference in the amino acid sequence. This could mean ~~a different~~ the protein at the end is disfunctional unable to carry out its function.

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END OF QUESTIONS