

AQA Style

GCSE

COMBINED SCIENCE: TRILOGY

Higher Tier

Biology Paper 2

H

Time allowed: 1 hour 15 minutes

Materials

- A ruler
- A pen and pencil
- A calculator

Instructions

- Answer all the questions using a black pen.
- Answer the questions in the space available and cross out any work you do not want to be marked.
- In any calculations make sure you show your working out.
- The marks for each question are shown in brackets.
- The maximum mark for the paper is 70.
- You must make your work as neat as possible and use good English in your answers.
- You should make sure you leave time to check your answers.

Question	Mark
1	
2	
3	
4	
5	
6	
7	
Total	

Name _____

Date _____

0 1

Haemochromatosis is an inherited condition that causes an accumulation of excess iron in the body.

Haemochromatosis is caused by a recessive allele.

0 1 . 1

What is an allele?

[1 mark]

0 1 . 2

When does a recessive allele control the development of a characteristic?

[1 mark]

0 1 . 3

A man with haemochromatosis wants to have a child with a heterozygous woman.

Complete **Figure 1** to determine the probability of the child having haemochromatosis.

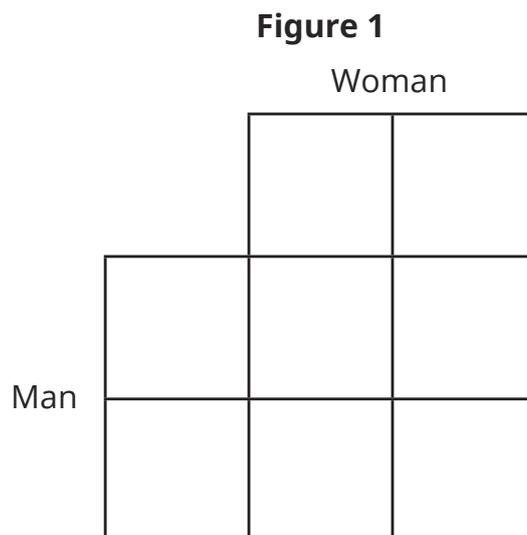
Circle any children who would have haemochromatosis.

Use the following symbols to represent the alleles:

H = dominant allele

h = recessive allele

[4 marks]



probability of a child having haemochromatosis = _____

01.4

Doctors can screen embryos for haemochromatosis. Two methods of embryo screening are shown in **Table 1**.

Table 1

Preimplantation Genetic Diagnosis (PGD)	Chorionic Villus Sampling (CVS)
Egg and sperm cells are collected from the couple and used for IVF. The embryos will be tested for haemochromatosis at 3 days old. Only the healthy embryos will be implanted into the woman.	The couple would conceive naturally. Ten weeks into the pregnancy, a sample of blood would be taken from the placenta and tested for haemochromatosis.
It costs the NHS between £8000 and £12 500.	It costs the NHS around £500.
Affected embryos are discarded. Extra unaffected embryos can be frozen for later use.	If the embryo has the disorder parents can choose whether to terminate the pregnancy or allow it to continue.
There is a 15% chance of a false-positive result, which would result in destroying a healthy embryo.	There is a 1% chance of a false-positive result, which may result in aborting a healthy embryo.
	The procedure has a 1% risk of causing a miscarriage.

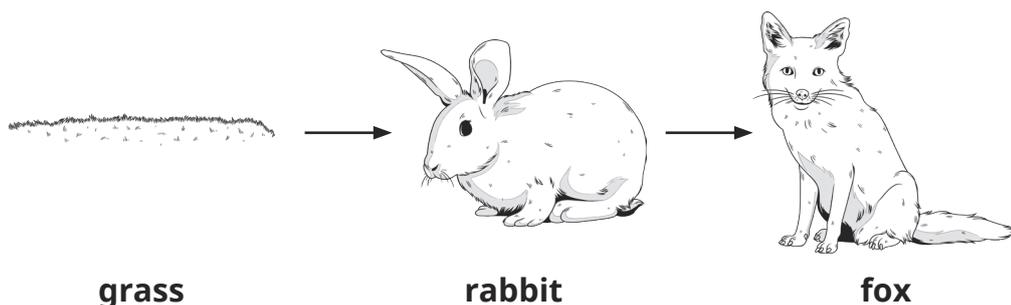
Evaluate the **benefits** of the two methods of embryo screening.

[4 marks]

0 2 . 2

The hillside is the habitat for a population of rabbits. **Figure 3** shows a food chain for the hillside.

Figure 3



Name the producer in **Figure 3**.

[1 mark]

0 2 . 3

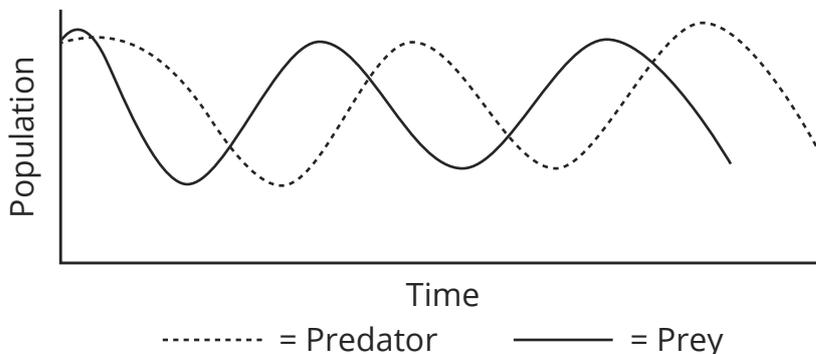
What is the role of a producer in a food chain?

[1 mark]

0 2 . 4

The numbers of rabbits and foxes rise and fall in cycles, as shown in **Figure 4**.

Figure 4



Explain why the population numbers rise and fall over time.

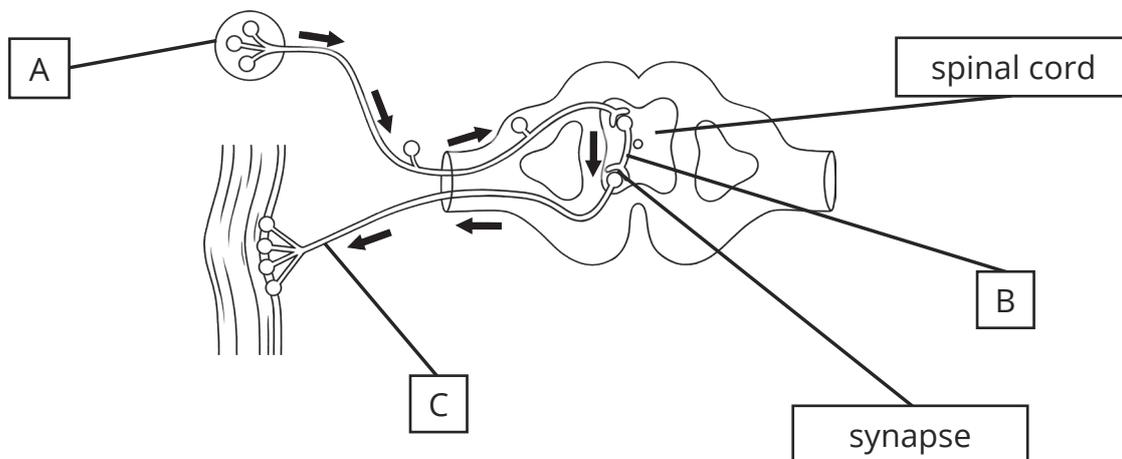
[4 marks]

0 3

The nervous system enables humans to react to their surroundings and coordinate their behaviour.

Figure 5 shows a reflex arc.

Figure 5



0 3 . 1

Some parts of the reflex arc have been labelled on **Figure 5**.

Name structures **A**, **B** and **C**.

[3 marks]

A _____
 B _____
 C _____

0 3 . 2

Describe what happens when an impulse arrives at a synapse.

[2 marks]

0 3 . 3

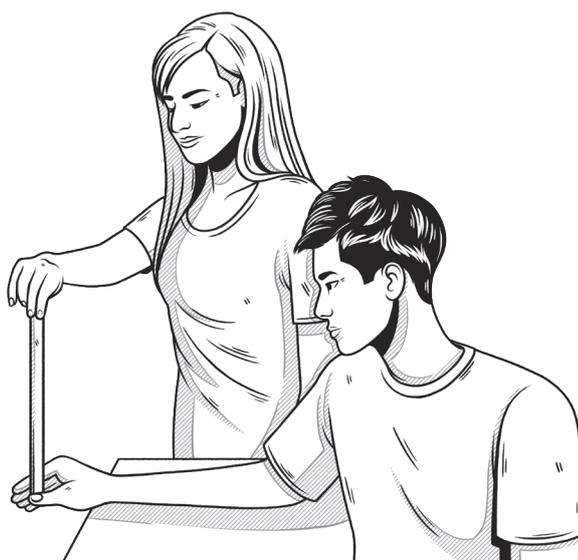
Explain why reflex actions are important.

[2 marks]

03.4 Some students investigated the effect of caffeine on reaction times. They used the following method.

- Student 1 sits on the chair and places their arm on the table so that their hand is hanging over the edge.
- Student 2 places a ruler vertically between Student 1's thumb and first finger, with the 0cm mark level with the top of the thumb as shown in **Figure 6**.
- Student 2 drops the ruler with no warning.
- Student 1 catches the ruler as quickly as possible.
- The students record how many centimetres the ruler falls before student 1 catches it.
- The students repeat the experiment four more times.
- Student 1 drinks a caffeine drink.
- 15 minutes later, the students repeat the experiment.

Figure 6



Question 3 continues on the next page.

Table 2 shows the students' results.

Table 2

	Drop Distance (cm)					Mean
	Repeat 1	Repeat 2	Repeat 3	Repeat 4	Repeat 5	
Before Caffeine	21	18	20	16	20	19
After Caffeine	14	11	13	10	12	

Calculate the mean drop distance after caffeine.

[1 mark]

mean = _____ cm

03.5

Describe what the results show about the effect of caffeine on reaction times.

[1 mark]

03.6

Suggest **two** improvements that the students could make to their method.

[2 marks]

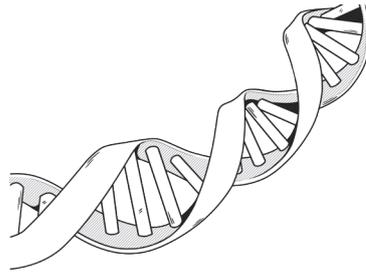
1. _____

2. _____

0 4

Figure 7 shows a section of DNA.

Figure 7



0 4 . 1

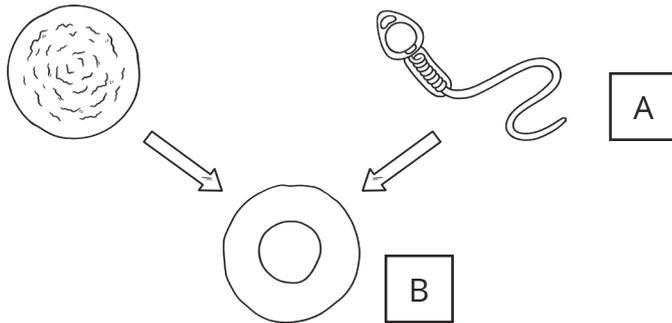
Name the part of the cell where you would find chromosomes.

[1 mark]

0 4 . 2

Figure 8 shows how a male gamete and a female gamete join together during sexual reproduction.

Figure 8



Name the process shown in **Figure 8**.

[1 mark]

0 4 . 3

Write down the number of chromosomes found in cell **A** and cell **B**.

[2 marks]

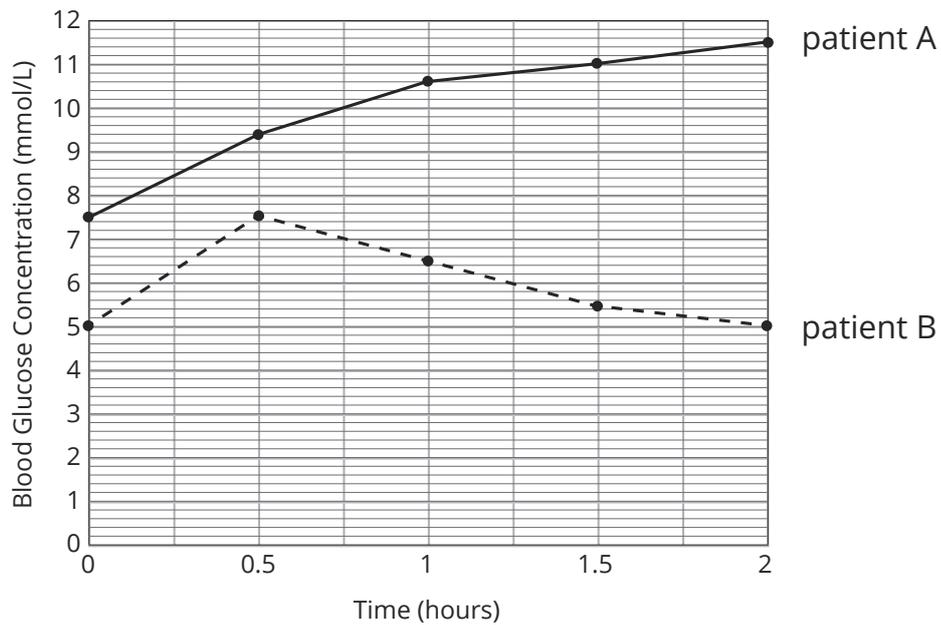
cell **A** _____

cell **B** _____

05

Two patients were given a glucose solution to drink. **Figure 10** shows how their blood glucose concentration changed after they drank the glucose solution.

Figure 10



05.1

Write down the maximum blood glucose concentration of patient **A**.

[1 mark]

_____ mmol/L

05.2

Write down the time taken for the blood glucose concentration of patient **B** to reach its maximum level.

[1 mark]

_____ hours

05.3

Patient **A** has Type 1 diabetes.

Name the hormone that patient **A** does not produce enough of.

[1 mark]

0 5 . 4 Patient **B** does **not** have Type 1 diabetes.

Explain what happens when the blood glucose concentration in patient **B** falls too low.

[2 marks]

0 5 . 5 Another patient, patient C, has Type 2 diabetes.

Compare the two types of diabetes.

You should include:

- what causes each type of diabetes
- how each type should be treated

[4 marks]

0 5 . 6 The levels of hormones that control blood glucose concentration are part of a negative feedback cycle.

Name **one** other hormone that is controlled by negative feedback.

[1 mark]

06

Vitamin A deficiency is common in developing countries where diets contain rice as their largest food source. Golden rice is a crop that can help to prevent vitamin A deficiency. Golden rice is genetically engineered to produce a substance called beta-carotene, which is converted to vitamin A in the body.

One of the genes inserted into the golden rice comes from a daffodil plant.

06.1

Describe how scientists can transfer the gene from a daffodil plant to rice plants.

[4 marks]

06.2

Before the golden rice project was started, Vitamin A deficiency was responsible for 1-2 million deaths and around 500 000 cases of irreversible blindness a year.

Suggest **two** reasons why some people had objections to the genetic engineering of golden rice.

[2 marks]

1.

2.

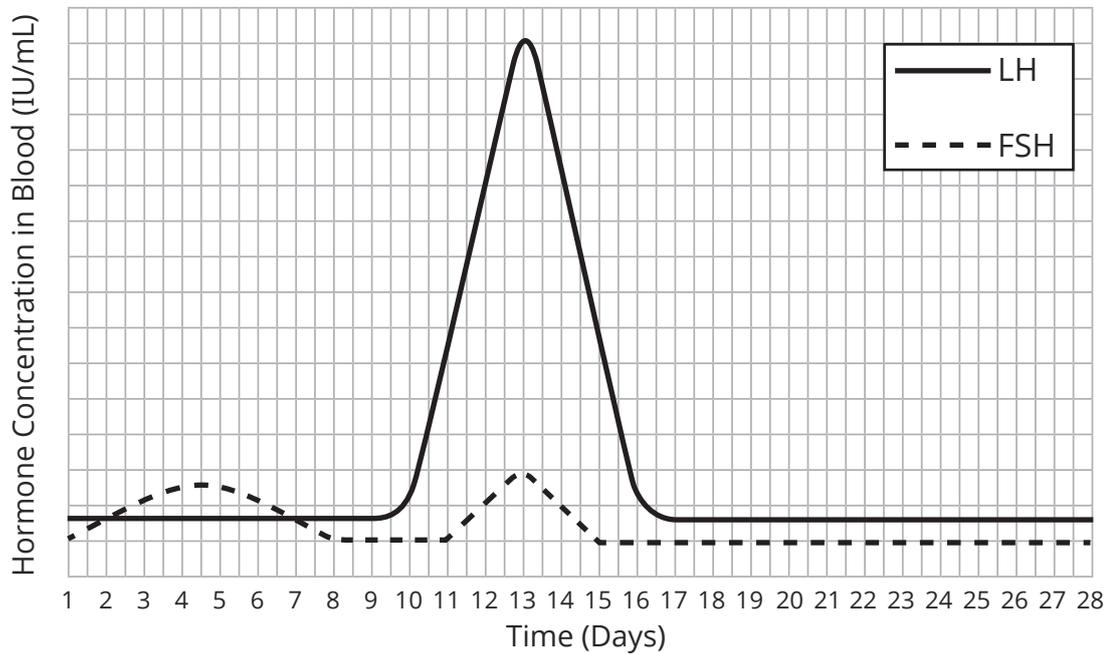
6

07

The female menstrual cycle is controlled by several hormones.

Figure 11 shows the levels of the hormones LH and FSH in the blood during the menstrual cycle of woman A.

Figure 11



07.1

Describe the roles of FSH and LH in the menstrual cycle.

[2 marks]

07.2

Write down the day on which woman A ovulated.

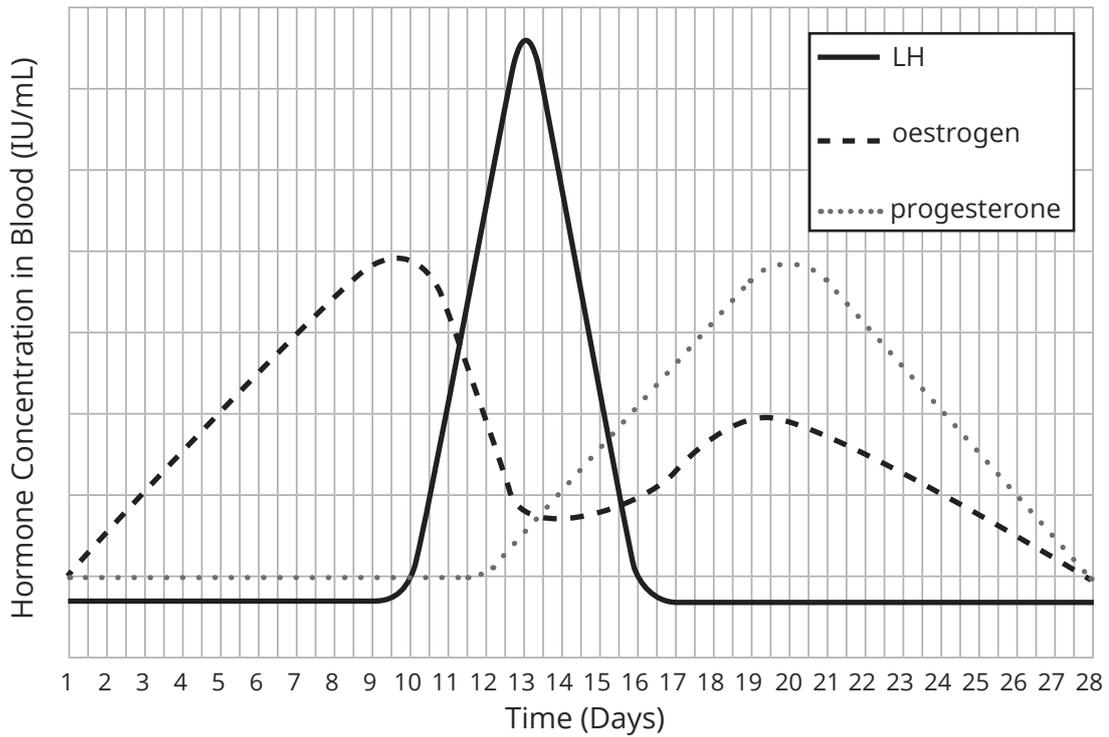
[1 mark]

day _____

07.3

Figure 12 shows the levels of LH, progesterone and oestrogen in the blood during the menstrual cycle.

Figure 12



Use the information in **Figure 12** to explain how the release of LH is controlled.

[2 marks]

07.4

Menstruation occurs when oestrogen and progesterone are both at their lowest levels.

Explain why.

[2 marks]

- 07.5 The hormones LH and FSH are given to a patient in the first stage of in vitro fertilisation (IVF).

Describe the remaining steps that a patient undergoing IVF would go through.

[4 marks]

- 07.6 Give **one** reason why a couple who are struggling with infertility may choose **not** to undergo IVF.

[1 mark]

12

END OF QUESTIONS