Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel Level 1/Level 2 GCSE (9–1)

Tuesday 16 May 2023

Morning (Time: 1 hour 10 minutes)

Paper reference **1SC0/1BH**

Combined Science
PAPER 1

Higher Tier

You must have:
Ruler, calculator

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- In the questions marked with an **asterisk (*)**, marks will be awarded for your ability to structure your answer logically, showing how the points that you make are related or follow on from each other where appropriate.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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Pearson

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Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

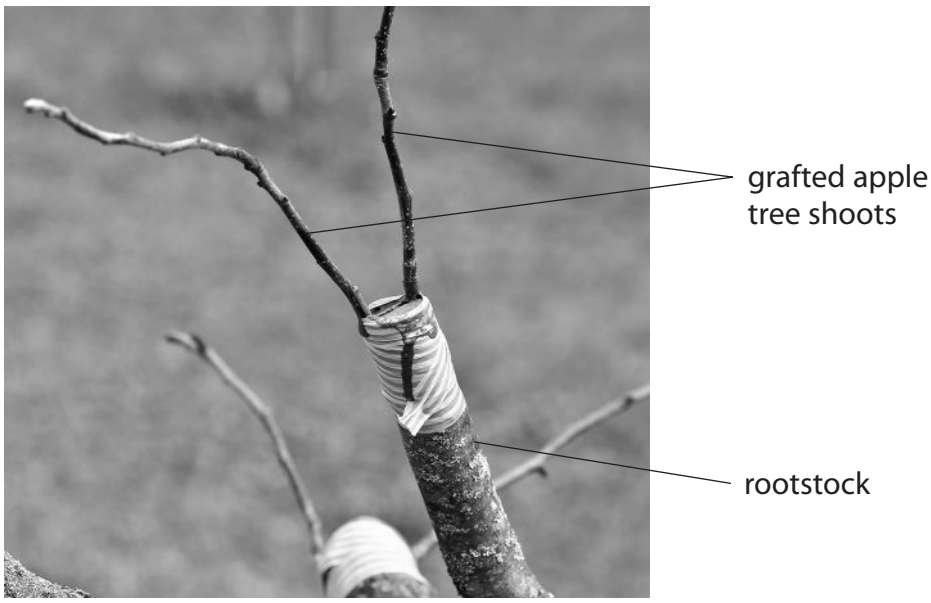
1 (a) Name the type of reproduction that produces genetically identical organisms.

(1)

.....

(b) Grafting is a technique used to grow some varieties of apple tree.

Figure 1 shows apple tree shoots grafted on to a rootstock.



(Source: © ATTILA Barsan/Shutterstock)

Figure 1

Grafting can be used to produce apple trees that are genetically identical.

Give **one** advantage and **one** disadvantage of growing genetically identical apple trees.

(2)

advantage

.....

.....

.....

disadvantage

.....

.....

.....

(c) As apples ripen, enzymes convert starch into sugars.

Devise a method to find the optimum pH of an enzyme that breaks down starch.

You may use standard laboratory equipment and the solutions listed in the box.

starch solution	enzyme solution	iodine solution
a range of pH solutions		

(4)

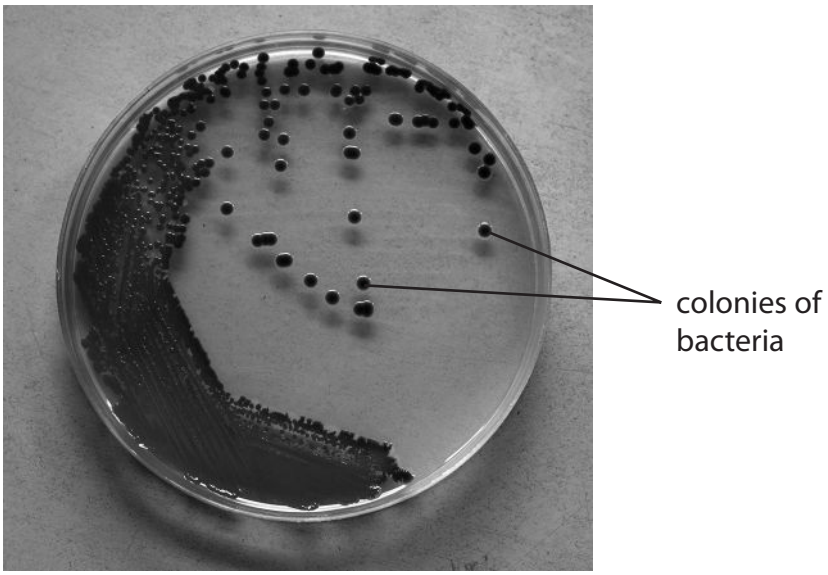
(d) The optimum pH of an enzyme is pH 6.

Explain why this enzyme would not work at pH 10.

(2)

(Total for Question 1 = 9 marks)

2 Figure 2 shows colonies of bacteria growing on an agar plate.



(Source: © Chatchouliya/Shutterstock)

Figure 2

Each colony starts as one bacterium.

Every time bacteria reproduce, the number of bacteria in each colony doubles.

(a) Calculate the number of bacteria in a colony after five hours, if each bacterium reproduces every 30 minutes.

(2)

..... bacteria

(b) Some bacteria are pathogens.

(i) State the meaning of the term pathogen.

(1)

.....

.....

(ii) Explain why antibiotics can be used to treat bacterial infections.

(2)

.....

.....

.....

.....

(iii) A rod-shaped bacterium is 0.005 mm long.

A student draws the rod-shaped bacterium.

The bacterium in the drawing is 80 mm long.

Calculate the magnification of this drawing.

(2)

magnification = ...

(Total for Question 2 = 7 marks)

3 (a) Figure 3 shows a diagram of a mouse sperm cell.

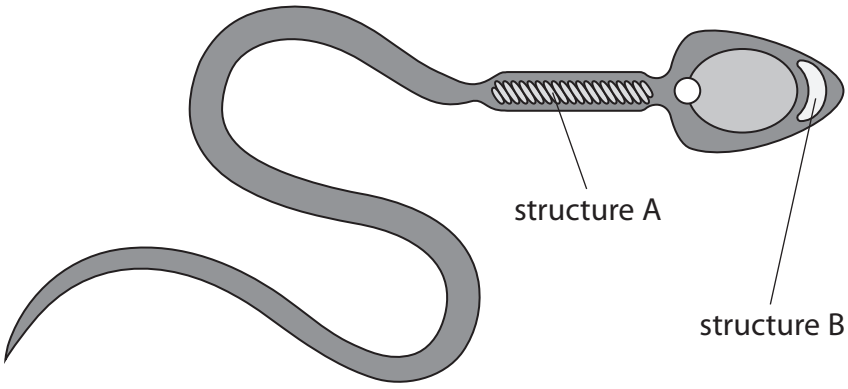


Figure 3

(i) Which row of the table shows the functions of structure A and structure B?

(1)

		function of structure A	function of structure B
☒	**A**	releases energy	contains the genetic material
☒	**B**	produces glucose	contains digestive enzymes
☒	**C**	releases energy	contains digestive enzymes
☒	**D**	produces glucose	contains the genetic material

(ii) The diploid chromosome number for a mouse is 40.

State the number of chromosomes in a mouse sperm cell.

(1)

.....

(b) After a mouse egg cell is fertilised, cell division produces a ball of genetically identical stem cells.

(i) Which is the correct order for the stages of one cell division?

(1)

- ☒ **A** metaphase → prophase → anaphase → telophase
- ☒ **B** prophase → metaphase → anaphase → telophase
- ☒ **C** anaphase → prophase → metaphase → telophase
- ☒ **D** prophase → anaphase → metaphase → telophase

(ii) The genetically identical stem cells produce the cells that develop into an embryo.

Describe how stem cells produce the cells of an embryo.

(2)

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(c) Scientific research has made many discoveries and developments allowing stem cells to be used in medical treatments.

Figure 4 shows a timeline for some of these discoveries and developments.

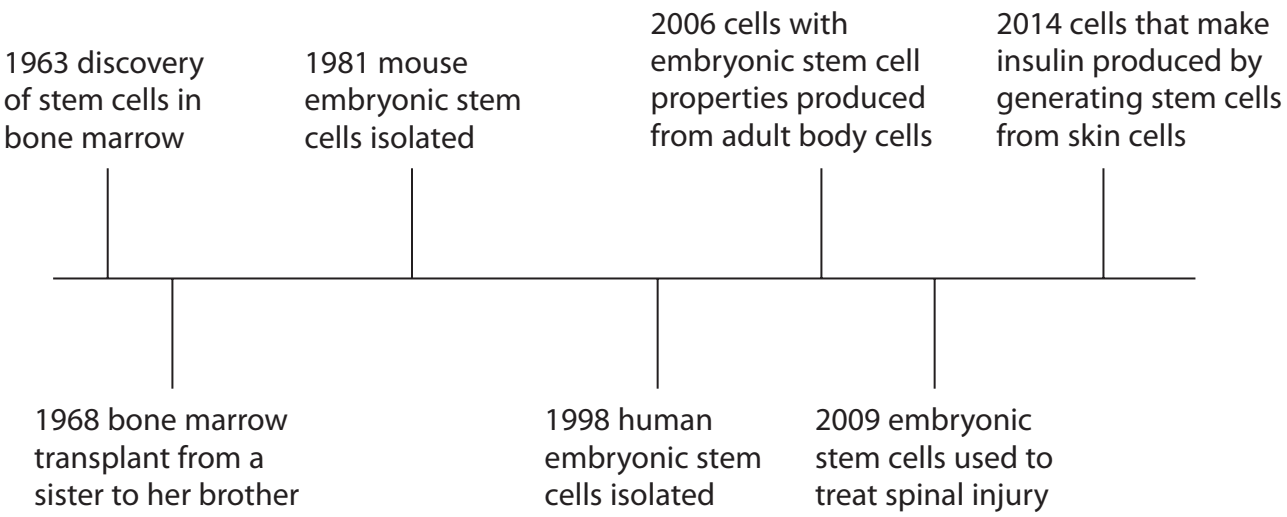

Figure 4

(i) Give **one** scientific reason why the bone marrow transplant in 1968 was from a sister to her brother.

(1)

.....

.....

(ii) Give **one** scientific reason why some people are opposed to the isolation of human embryonic stem cells.

(1)

.....

.....

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(iii) Stem cells, with the properties of embryonic stem cells, can be produced from a patient's own skin cells.

Discuss the benefits of using these stem cells to treat the patient.

(3)

(Total for Question 3 = 10 marks)

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4 (a) In the 19th century the destruction of wetland habitats caused the extinction of the bittern in the UK.

Figure 5 shows a bittern.

(Source: © Ildiko Laskay/Shutterstock)

Figure 5

Restoration of the habitats has led to the birds returning to the UK.

Male bitterns make a loud booming sound.

This allows the numbers of male bitterns to be counted.

In 1997, 11 males were counted and this increased to 221 males in 2021.

(i) Calculate the percentage increase in the number of males from 1997 to 2021.

(3)

.....%

The bitterns are difficult to see in the reeds of the wetland habitat.

(ii) Give **one** benefit of this to the bittern.

(1)

.....

.....

.....

(iii) There is some concern that the bitterns in the UK are all closely related. This could make them susceptible to extinction.

Explain, using your knowledge of natural selection, why being closely related could make the bitterns susceptible to extinction.

(3)

(b) Describe how selective breeding can be used to produce a large population of animals that are not closely related.

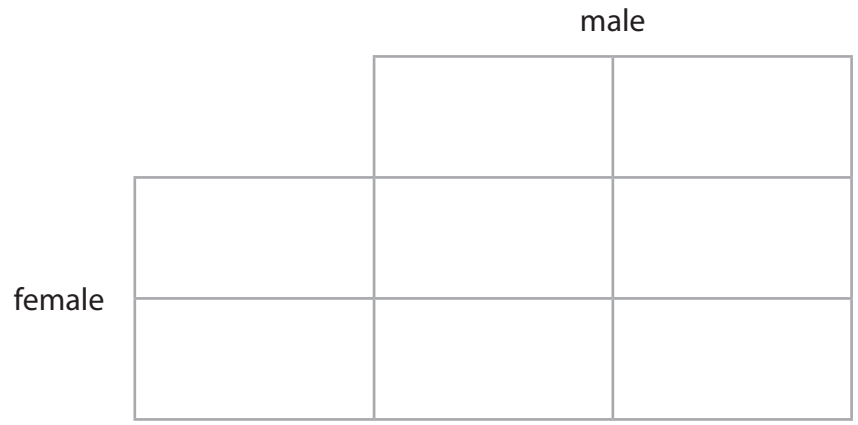
(2)

(c) Sex determination in birds is different from humans.

Males are homozygous Z and females are heterozygous ZW.

Complete the Punnett square to show how sex is determined in birds.

(2)



(Total for Question 4 = 11 marks)

5 A student investigated the movement of water in potatoes.

The student used three identical cubes of potato.

The size of a cube is shown in Figure 6.

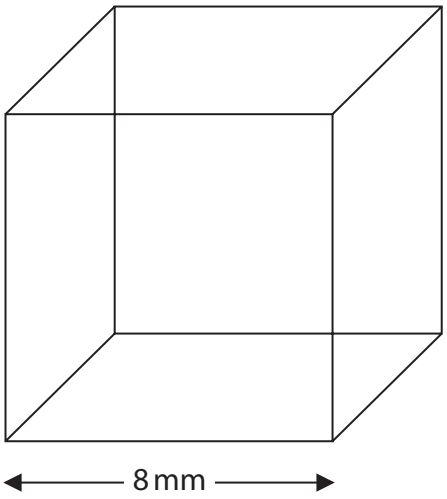


Figure 6

(a) (i) Calculate the volume of this cube.

Include the units in your answer.

(2)

.....

One cube was placed in water and each of the other two cubes were placed in solutions with different concentrations of salt.

The cubes were left for 20 minutes.

Figure 7 shows the student's results.

	starting mass in grams	final mass in grams
water	0.95	1.08
dilute salt solution	0.95	0.98
concentrated salt solution	0.94	0.88

Figure 7

(ii) Give **one** way the student could ensure the measurement of the mass of the cubes is accurate.

(1)

(iii) Explain the mass change in the cube in the concentrated salt solution.

(3)

(iv) The student wanted to find the concentration of salt solution where the potato cube did not change mass.

Describe how the student could modify this investigation to find this concentration.

(3)

(b) Explain why potato cells do not burst when placed in water.

(2)

(Total for Question 5 = 11 marks)

6 (a) A person's mass is partially influenced by the alleles they inherit from their parents.

Give **two** other factors that can influence a person's mass.

(2)

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(b) Figure 8 shows the data obtained from a patient by a doctor doing a health check.

The guidance used by the doctor is also listed in Figure 8.

measurement	data	guidance
BMI	28	18–25 healthy 26–30 overweight 30+ obese
waist : hip ratio	0.85	<0.9 healthy >0.9 abdominal obesity
alcohol units	3–4 units per day	<14 units per week
number of cigarettes smoked	0	do not smoke or vape

Figure 8

Comment on the data and the health risks to this patient.

(4)

*(c) The doctor also tested the reaction time of the patient.

Describe the structure and function of a reflex arc.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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