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Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel

International GCSE (9–1)

Centre Number | | | | | |

Candidate Number | | | | |

Tuesday 12 May 2020

Afternoon (Time: 2 hours)

Paper Reference **4BI1/1B 4SD0/1B**

Biology

Unit: 4BI1

Science (Double Award) 4SD0

Paper: 1B

You must have:
Calculator, ruler

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.*
- Show all the steps in any calculations and state the units.
- 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 ☒.

Information

- The total mark for this paper is 110.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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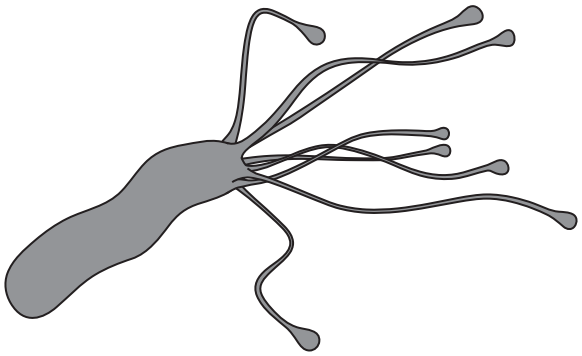
Answer ALL questions.

1 The bacterium *H. pylori* causes stomach ulcers.

(a) The diagram shows this bacterium.



(i) Which of these is found in this bacterium?

(1)

☒ **A** cellulose

☒ **B** chitin

☒ **C** cytoplasm

☒ **D** nucleus

(ii) The bacterium has evolved to release an enzyme called urease.

The action of the bacterium neutralises the acid in the stomach.

What is the pH changed to?

(1)

☒ **A** 1

☒ **B** 2

☒ **C** 7

☒ **D** 12

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(iii) Use the theory of evolution by natural selection to explain how *H. pylori* bacteria could have evolved to produce urease.

(4)

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(b) Probiotics are live microorganisms that can have health benefits when consumed.

Scientists investigate the ability of probiotics and cranberry juice to reduce the growth of *H. pylori*.

The scientists give various treatments to a group of people who have *H. pylori*.

The treatments are given daily for three weeks.

The scientists measure the mean percentage reduction of *H. pylori* for each treatment.

The table shows the scientists' results.

Treatment	Mean percentage (%) reduction in *H. pylori*
probiotics	14.9
cranberry juice	16.9
probiotics and cranberry juice	22.9
control	1.5

Give two conclusions from these results.

(2)

1 .....

2 .....

(Total for Question 1 = 8 marks)

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2 The passage describes reproduction in flowering plants.

Complete the passage by writing a suitable word in each blank space.

(8)

Flowers are organs that allow plants to carry out ..... reproduction.

The male gamete is contained within the ..... grains. These grains

are released from the ..... , which is found on top of the filament.

These grains need to land on the ..... , the female part of the flower.

Grains can be transferred by wind or by animals. These animals are often insects such as

..... or butterflies. The petals of insect-pollinated plants are often

..... and brightly coloured. After pollination, the grains

germinate and a tube grows down the ..... to reach the ovary.

In the ovary, the gametes fuse. This process is known as ..... .

(Total for Question 2 = 8 marks)

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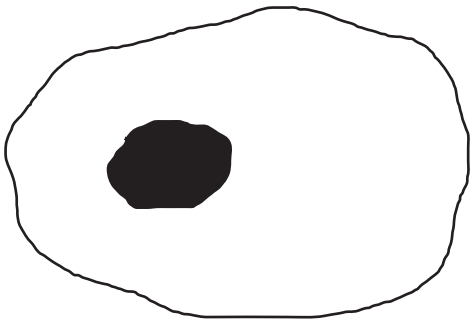
3 (a) A student uses a light microscope to look at a human cheek cell.

The student makes this drawing of the cell.



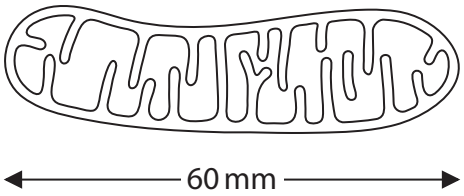
Name the organelle shown in the drawing.

(1)

.....

(b) Mitochondria are organelles that are too small to be seen using a light microscope.

The drawing shows a mitochondrion that has been magnified.



The actual length of this mitochondrion is 6 μm.

[1 μm = 0.001 mm]

Calculate the magnification of this drawing.

(2)

magnification = ...

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(c) The table gives information about mitochondria in different human cells.

Cell	Mean number of mitochondria per cell	Mean volume of cell in μm^3	Mean number of mitochondria per μm^3
heart muscle	5000	15000	
sperm	75	30	2.50
egg	600000	4000000	0.15

(i) What is the mean number of mitochondria per μm^3 in a heart muscle cell?

(1)

☒ **A** 0.33

☒ **B** 3

☒ **C** 10000

☒ **D** 75000000

(ii) Comment on the differences in the data for the sperm and for the egg.

(3)

(Total for Question 3 = 7 marks)

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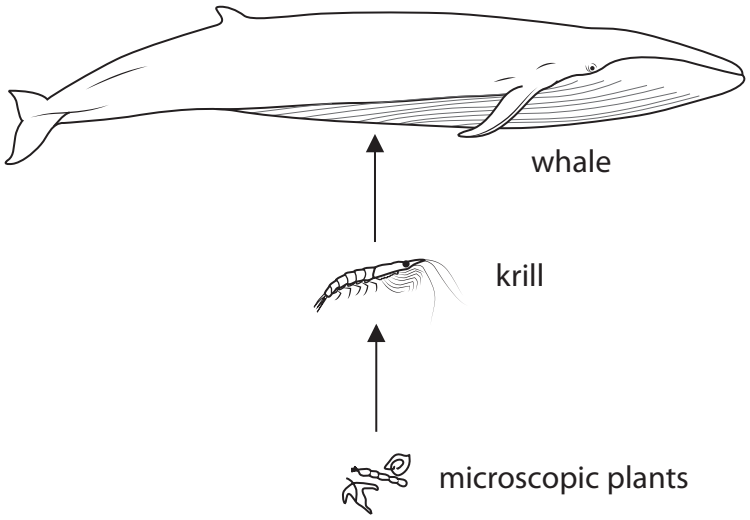
4 The diagram shows a food chain in the Antarctic ocean.



Not to scale

(a) (i) Which term describes the trophic level of the krill?

(1)

- ☒ **A** predator
- ☒ **B** prey
- ☒ **C** primary consumer
- ☒ **D** secondary consumer

(ii) Draw a labelled pyramid of biomass to represent this food chain.

(2)

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(b) The microscopic plants float in seawater, but also grow on the lower surface of ice.

The krill feed on the microscopic plants.

They remove microscopic plants from the lower surface of the ice at a rate of 1.6 cm^2 per second.

Calculate the time taken for the krill to remove microscopic plants from one square metre of ice.

Give your answer in minutes.

(2)

time taken = ... minutes

(c) A student investigates the rate that krill feeding removes microscopic plants floating in seawater.

Suggest how the student could do this investigation in a laboratory.

(4)

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(d) Krill obtain most of their food from microscopic plants growing on the lower surface of ice.

Explain how global warming could affect the whale population in the Antarctic ocean.

(4)

(Total for Question 4 = 13 marks)

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5 Plants can be genetically modified (GM) to produce insect poison.

They are modified using a bacterium called *Agrobacterium*.

This bacterium has a plasmid that contains recombinant DNA.

(a) Describe how the plasmid is modified to contain recombinant DNA.

(3)

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(b) A farmer can use either of these methods to improve his crop yield.

- grow GM plants that produce the insect poison
- grow non-GM plants and use pesticides

The farmer decides to grow the GM plants rather than using pesticides.

Discuss the decision made by the farmer.

(6)

(Total for Question 5 = 9 marks)

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6 Aerobic respiration is a process in living organisms.

(a) Which of these is the balanced chemical symbol equation for aerobic respiration?

(1)

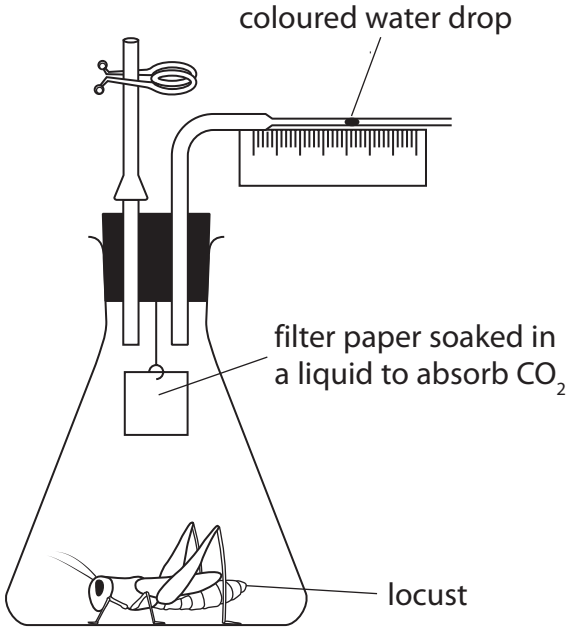
☒ **A** $C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2$

☒ **B** $C_6H_{12}O_6 \longrightarrow 2C_2H_5OH + 2CO_2$

☒ **C** $C_6H_{12}O_6 + 6CO_2 \longrightarrow 6O_2 + 6H_2O$

☒ **D** $C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O$

(b) A student uses this apparatus to investigate aerobic respiration in a locust.



(i) The coloured water drop moves during the investigation.

Explain why the coloured water drop moves during the investigation.

(2)

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(ii) The student compares the aerobic respiration of male and female locusts.

He uses three male locusts and three female locusts.

He uses locusts of the same age and the same species.

Explain three other variables that the student needs to control.

(6)

1 .....

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(c) The table shows the student's results.

	Distance moved by coloured water drop in mm	
	male	female
trial 1	5.0	5.4
trial 2	4.9	5.2
trial 3	2.0	5.2
mean	5.0	

(i) Complete the table by giving the missing mean value.

(1)

(ii) Comment on the reliability of the data in the table.

(3)

(Total for Question 6 = 13 marks)

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7 The table gives the masses of protein and lipid (fat) in the same volume of milk from a cow and from a human.

	Protein in g	Lipid in g
cow	3.3	3.9
human	1.3	4.1

(a) Describe how you would test a sample of cow's milk and a sample of human milk to show they contain different masses of protein.

(2)

(b) Some of the proteins in milk are antibodies.

Explain why antibodies in milk are useful for babies.

(2)

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(c) Give two ways that lipid in milk is used by babies.

(2)

1 .....

.....

2 .....

.....

(d) Milk is used to make yoghurt.

(i) Name the carbohydrate in milk used to make yoghurt.

(1)

.....

(ii) Name the bacteria added to milk to make yoghurt.

(1)

.....

(iii) Explain why milk needs to be heated to a high temperature at the start of the process for making yoghurt.

(2)

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(Total for Question 7 = 10 marks)

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8 Cell division can be by meiosis or by mitosis.

(a) (i) Where are cells dividing by meiosis found in a human?

(1)

- ☒ **A** kidney
- ☒ **B** penis
- ☒ **C** skin
- ☒ **D** testis

(ii) Which part of a flowering plant is usually used to demonstrate cells dividing by mitosis?

(1)

- ☒ **A** anther
- ☒ **B** cotyledon
- ☒ **C** root tip
- ☒ **D** xylem

(b) The table lists features comparing the processes of meiosis and mitosis in human cells.

Complete the table by giving the missing information.

(6)

Feature	Meiosis	Mitosis
number of chromosomes in each original cell	46	
number of daughter cells produced from each original cell		2
number of chromosomes in each daughter cell		
ploidy level of daughter cells produced		diploid
genetic differences in daughter cells	present	
type of cell produced		body cell

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(c) Cell division can cause variation in offspring.

(i) Describe other causes of variation in offspring.

(3)

(ii) Scientists investigating a drug treatment use rats that are homozygous for many genes.

Suggest the advantages of using rats that are homozygous for many genes.

(2)

(Total for Question 8 = 13 marks)

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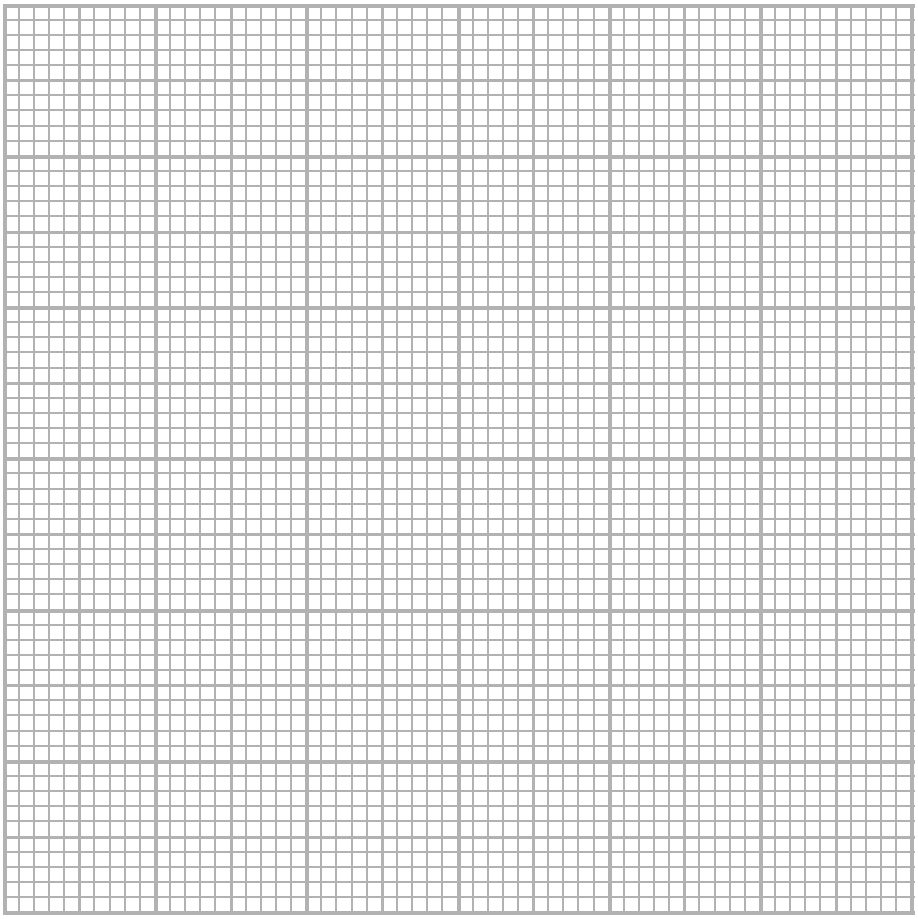
9 (a) The table shows the production of wheat and barley in the United Kingdom from 2011 to 2015.

Crop	Crop production in thousand tonnes per year				
	2011	**2012**	**2013**	**2014**	**2015**
wheat	15 300	13 200	11 900	16 600	16 100
barley	5 500	5 500	7 100	6 900	7 300

(i) Plot a line graph to show the changes in wheat and barley production from 2011 to 2015.

Use a ruler to join the points with straight lines.

(6)



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(ii) Describe the changes in the production of each crop from 2011 to 2015.

(2)

(iii) Determine which of the crops had the greatest percentage change in production from 2011 to 2015.

Show your working.

(3)

(b) A wheat field, 100 m by 100 m, can produce a total yield of 25 000 kg of carbohydrate in a year.

Calculate the mean mass, in grams, of carbohydrate produced **each day** by a square metre of the wheat field.

(2)

mean mass = ... g

(Total for Question 9 = 13 marks)

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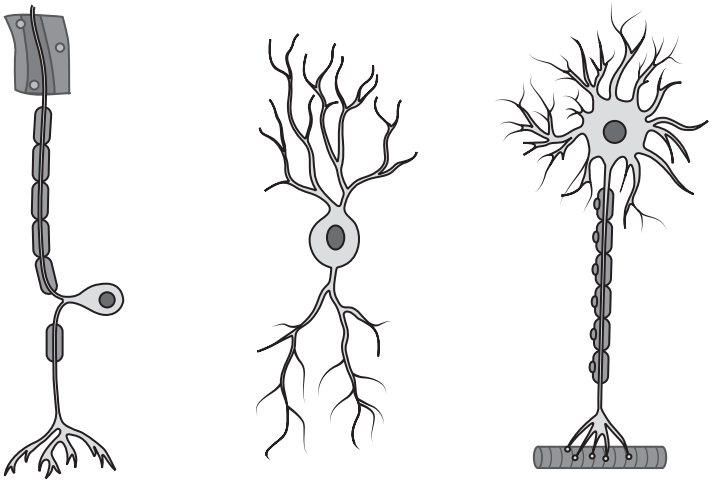
10 (a) The diagram shows three types of neurone.



A B C

(i) Give the names of these neurones.

(3)

A .....

B .....

C .....

(ii) Explain the role of these neurones in the withdrawal reflex of a finger from a hot object.

(3)

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(b) A teacher uses this method to estimate the speed of a nerve impulse.

- students stand in a circle and hold hands
- student A in the circle starts a timer and at the same time squeezes the hand of student B on his left
- when student B feels his hand being squeezed, he immediately squeezes the hand of the student on his left
- this process continues around the circle of students until student A feels his hand being squeezed and he stops the timer

(i) Explain what other measurements the teacher would need to make in order to calculate the speed of a nerve impulse.

(2)

(ii) Describe whether the teacher's method is likely to give an accurate estimate of the speed of a nerve impulse.

(2)

(Total for Question 10 = 10 marks)

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11 Some cosmetic companies claim that adding argan oil to their shampoo increases the strength of human hair.

Design an investigation to find out if argan oil shampoo does increase the strength of human hair.

Include experimental details in your answer and write in full sentences.

(6)

(Total for Question 11 = 6 marks)

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