Pearson Edexcel

International GCSE

Biology (9–1) (Modular)

Sample Assessment Materials

Pearson Edexcel International GCSE in Biology (Modular) (4XBI1)

First teaching September 2024
First examination June 2025
First certification August 2025

Issue 1

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Introduction

The Pearson Edexcel International GCSE (9-1) in Biology (Modular) (4XBI1) is designed for use in schools and colleges. It is part of a suite of International GCSE modular qualifications offered by Pearson.

These sample assessment materials have been developed to support this qualification and will be used as the benchmark to develop the assessment students will take.

The sample assessment materials in this document are derived from the existing Edexcel International GCSE (9-1) in Biology qualification, which is linear in design.

Both linear and modular routes are designed to provide the same level of demand overall while offering candidates a choice of assessment options. In the modular qualification, candidates are able to sit and resit individual units in different series.

Note: Within International GCSE (9-1) in Biology (Modular), assessments are referred to as units. This is to support the modular nature of the qualification as each individual assessment is entered for as a separate unit.

General marking guidance

- All candidates must receive the same treatment. Examiners must mark the last candidate in exactly the same way as they mark the first.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than be penalised for omissions.
- Examiners should mark according to the mark scheme – not according to their perception of where the grade boundaries may lie.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification/indicative content will not be exhaustive. However, different examples of responses will be provided at standardisation.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, a senior examiner must be consulted before a mark is given.
- Crossed-out work should be marked **unless** the candidate has replaced it with an alternative response.

Subject specific marking guidance

Symbols and terms used in the mark scheme:

- Round brackets ( ): words inside round brackets are to aid understanding of the marking point but are not required to award the point
- Curly brackets { }: indicate the beginning and end of a list of alternatives (separated by obliques) where necessary, to avoid confusion
- Oblique /: words or phrases separated by an oblique are alternatives to each other and either answer should receive full credit
- ecf: indicates error carried forward which means that a wrong answer given in an early part of a question is used correctly in a later part of a question.

You will not see 'owtte' (or words to that effect). Alternative correct wording should be credited in every answer unless the mark scheme has specified otherwise.

The Additional Guidance column is used for extra guidance to clarify any points in the mark scheme. It may be used to indicate:

- what will not be accepted for that marking point, in which case the phrase 'do not accept' will appear alongside the relevant marking point
- it might have examples of possible acceptable answers which will be adjacent to that marking point.

Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | | | | | |

Candidate Number | | | | |

Pearson Edexcel International GCSE (9–1)

Sample assessment material for first teaching 2024

Time 1 hour 40 minutes

Paper reference **4WBI1/1B**

Biology (Modular)
UNIT 1

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 unit is 90.
- 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.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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S 8 1 5 4 3 A 0 1 2 4

Pearson

Answer ALL questions.

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 Biologists classify organisms into different groups. One group of organisms is fungi.

Complete the passage about fungi by writing a suitable word or words in each blank space.

(4)

Fungi do not carry out photosynthesis. Their body is usually organised into a mycelium made from thread-like structures called ..... .

Fungal cell walls are made of ..... .

Fungi feed by extracellular secretion of ..... onto food material and absorption of the organic products. This is known as ..... nutrition.

(Total for Question 1 = 4 marks)

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2 (a) All living organisms share characteristics.

(i) State **two** characteristics that all living organisms share.

(2)

1 .....

.....

2 .....

.....

(ii) Some organisms are pathogens.

Which of these organisms can cause a bacterial disease in humans?

(1)

☒ **A** *Amoeba*

☒ **B** *Lactobacillus bulgaricus*

☒ **C** *Mucor*

☒ **D** *Pneumococcus*

(b) Give **three** differences between the structure of viruses and bacteria.

(3)

1 .....

.....

2 .....

.....

3 .....

.....

(Total for Question 2 = 6 marks)

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3 A meal contains different food components.

(a) The table lists some of the components in the meal.

Complete the table by giving the function of each component.

One has been done for you.

(4)

Component	Function of component
vitamin A	
vitamin C	
vitamin D	bone growth
iron	
dietary fibre	

(b) The meal also contains proteins and lipids.

The chemical elements found in proteins are carbon, hydrogen, oxygen and nitrogen.

State which **one** of these elements is not found in lipids.

(1)

.....

(Total for Question 3 = 5 marks)

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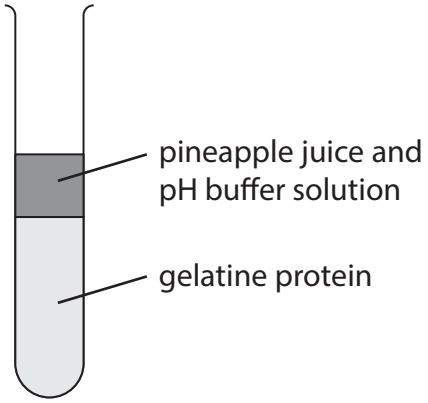
4 Pineapple juice contains a protease called bromelain.

A student uses this method to investigate the digestion of solid gelatine protein by bromelain.

- place solid gelatine protein into a test tube up to a height of 5 cm
- mix 5 cm^3 pineapple juice with 1 cm^3 of pH 4 buffer
- place 1 cm^3 of the pineapple juice and buffer solution on top of the gelatine
- leave for one hour in a water bath set to 37 °C
- measure the height of the solid gelatine and use it to calculate the volume of gelatine that has been digested.

Repeat the method three more times.

The diagram shows part of the student's method.



(a) The table shows the student's results for the volumes of gelatine digested at pH 4.

Tube number	Volume of gelatine digested in cm^3
1	0.55
2	1.89
3	0.54
4	0.16

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(i) Calculate the mean volume of gelatine digested in cm^3.

Give your answer to **two** decimal places.

(3)

mean volume = ... cm^3

(ii) State what substances are produced when the gelatine protein is digested.

(1)

.....

(b) The student repeats the investigation with different pH buffers.

The table shows their results.

pH	Mean volume of gelatine digested in cm^3
3	0.32
5	0.98
7	0.51
9	0.33
11	0.01

(i) Give **two** variables the student should control.

(2)

1 .....

2 .....

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(ii) Explain the effect of changing the pH on the mean volume of gelatine digested.

(3)

(Total for Question 4 = 9 marks)

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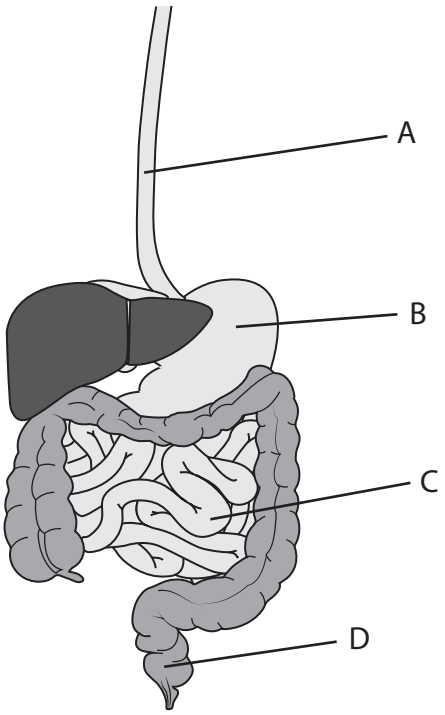
5 (a) The diagram shows part of the human digestive system.



(i) In which of these parts is hydrochloric acid produced?

(1)

- ☒ **A**
- ☒ **B**
- ☒ **C**
- ☒ **D**

(ii) In which of these parts are faeces stored?

(1)

- ☒ **A**
- ☒ **B**
- ☒ **C**
- ☒ **D**

(iii) Which of these parts is the small intestine?

(1)

- ☒ **A**
- ☒ **B**
- ☒ **C**
- ☒ **D**

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(b) The liver produces bile.

Explain the role of bile in digestion.

(3)

(Total for Question 5 = 6 marks)

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6 Plants use their leaves during photosynthesis.

(a) Explain how the structure of a leaf is adapted for gas exchange.

(4)

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(b) A student observes that the leaves on different ivy plants seem to be different sizes depending on the amount of sunlight the plants receive.

Design an investigation to test whether the amount of sunlight received by ivy plants affects the size of their leaves.

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

(6)

(Total for Question 6 = 10 marks)

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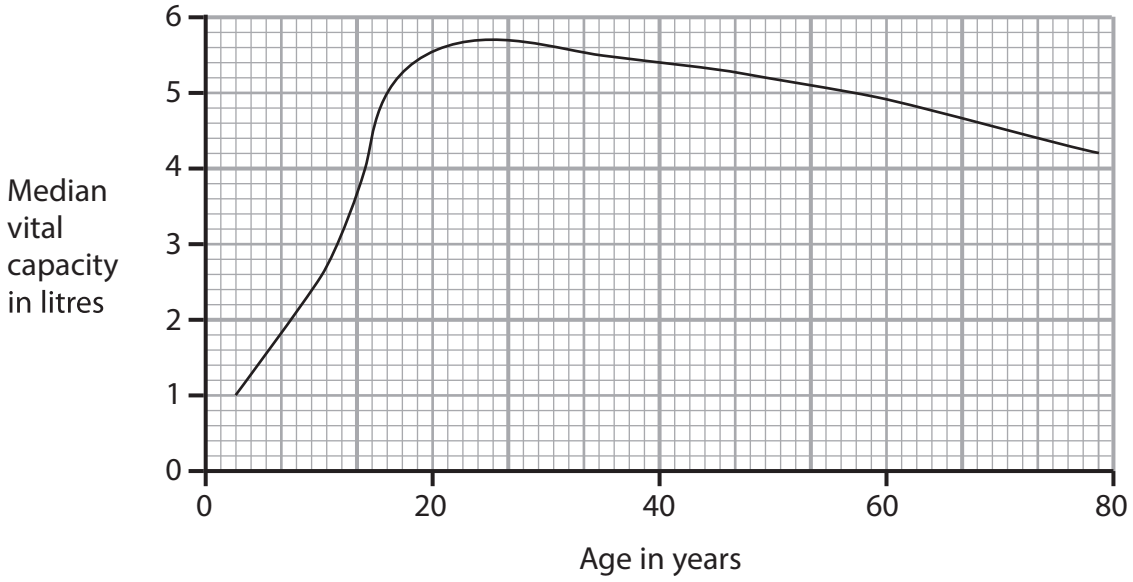
7 (a) Vital capacity is the maximum volume of air that a person can force out of their lungs in one breath.

The graph shows the relationship between vital capacity and age for a large number of people.



The vital capacity plotted is the median value for each age.

(i) Determine the percentage change in median vital capacity from age 20 to age 80.

(2)

percentage change = ... %

(ii) Explain why the median is used rather than the mean.

(2)

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.....

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(iii) Explain why vital capacity changes with age.

(2)

(iv) Age is not the only variable that can change vital capacity.

Give **two** other variables that can affect a person's vital capacity.

(2)

1 .....

.....

2 .....

.....

(b) Describe a method you could use to demonstrate the effect of exercise on breathing rate in students.

(3)

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(Total for Question 7 = 11 marks)

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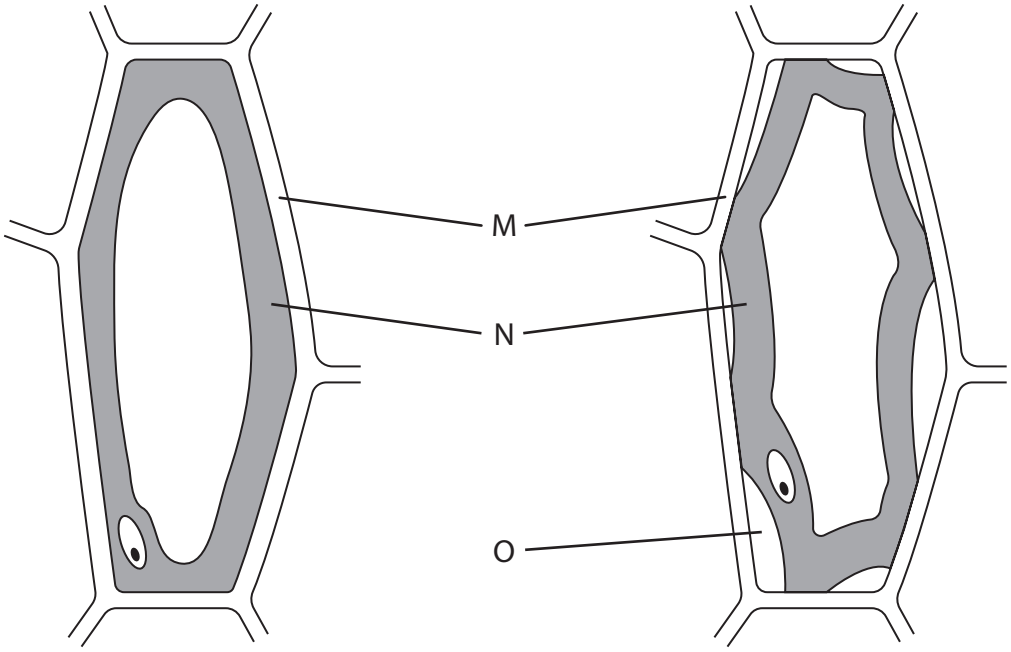
8 The diagram shows a plant cell in distilled water and a plant cell in a concentrated solution of sodium chloride.



Cell in distilled water

Cell in concentrated solution of sodium chloride

(a) (i) Which structure is labelled M?

(1)

- ☒ **A** cell membrane
- ☒ **B** cell wall
- ☒ **C** nucleus
- ☒ **D** vacuole

(ii) Which structure is labelled N?

(1)

- ☒ **A** cell membrane
- ☒ **B** cell wall
- ☒ **C** cytoplasm
- ☒ **D** vacuole

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(b) (i) Give the name of the liquid found in the gap labelled O in the cell in the concentrated solution of sodium chloride.

(1)

(ii) Explain the differences in the appearance of the cell in distilled water and the cell in the concentrated solution of sodium chloride.

(4)

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(c) Describe an experiment you could do to show how different concentrations of sodium chloride solution affect the appearance of plant cells.

(4)

(Total for Question 8 = 11 marks)

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9 An electronic cigarette (e-cigarette) has been developed.

Instead of burning tobacco, e-cigarettes heat a liquid that contains nicotine and flavourings to produce a vapour that is inhaled.

Scientists carried out an investigation to see how the smoking habits of people changed between 2011 and 2016.

Each year they determined the percentage of people who used e-cigarettes and the percentage of people who smoked normal cigarettes during the year.

The results are shown in the table.

	Percentage of people	
Year	**using e-cigarettes**	**smoking normal cigarettes**
2011	1.5	15.8
2012	2.8	14.0
2013	4.5	12.7
2014	13.4	9.5
2015	16.0	9.3
2016	11.3	8.0

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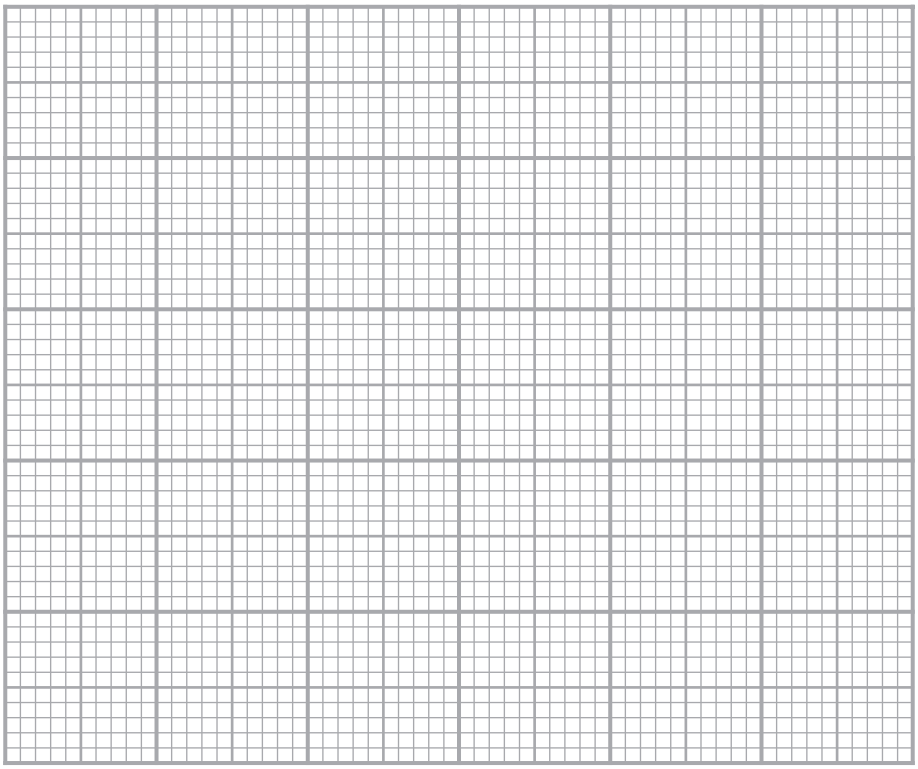
(a) Plot a line graph to show how the percentage of people who used ecigarettes and the percentage of people who smoked normal cigarettes changed between 2011 and 2016.

Join the points with straight lines.

(6)



(b) Describe the changes in the percentages of people smoking cigarettes and using e-cigarettes between 2011 and 2016.

(2)

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(c) The scientists interviewed 60 000 people each year during the period of the investigation.

Calculate the change in the number of people who were smoking normal cigarettes from 2011 to 2016.

(2)

number of people = ...

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(d) Some people consider e-cigarettes as a less harmful alternative to smoking normal cigarettes.

(i) Explain why using ecigarettes may be thought to be less harmful than smoking normal cigarettes.

(4)

(ii) Suggest why many doctors are concerned about the use of e-cigarettes.

(2)

(Total for Question 9 = 16 marks)

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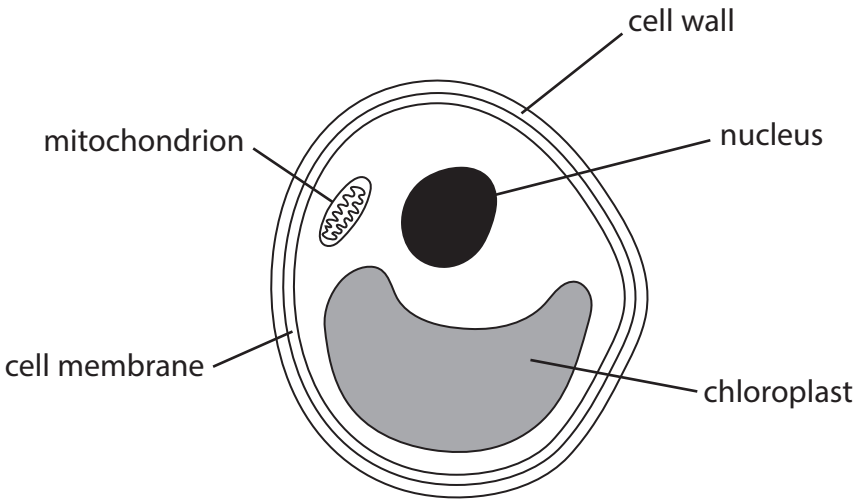
10 The diagram shows a single-celled organism called *Chlorella* that lives in fresh water.

Chlorella has a chloroplast and can photosynthesise.



(a) (i) Which of these groups of organisms contains *Chlorella*?

(1)

- ☒ **A** animals
- ☒ **B** bacteria
- ☒ **C** plants
- ☒ **D** protoctists

(ii) Which of these labelled structures would also be present in an animal cell?

(1)

- ☒ **A** cell membrane and chloroplast
- ☒ **B** cell membrane and mitochondrion
- ☒ **C** cell wall and chloroplast
- ☒ **D** cell wall and mitochondrion

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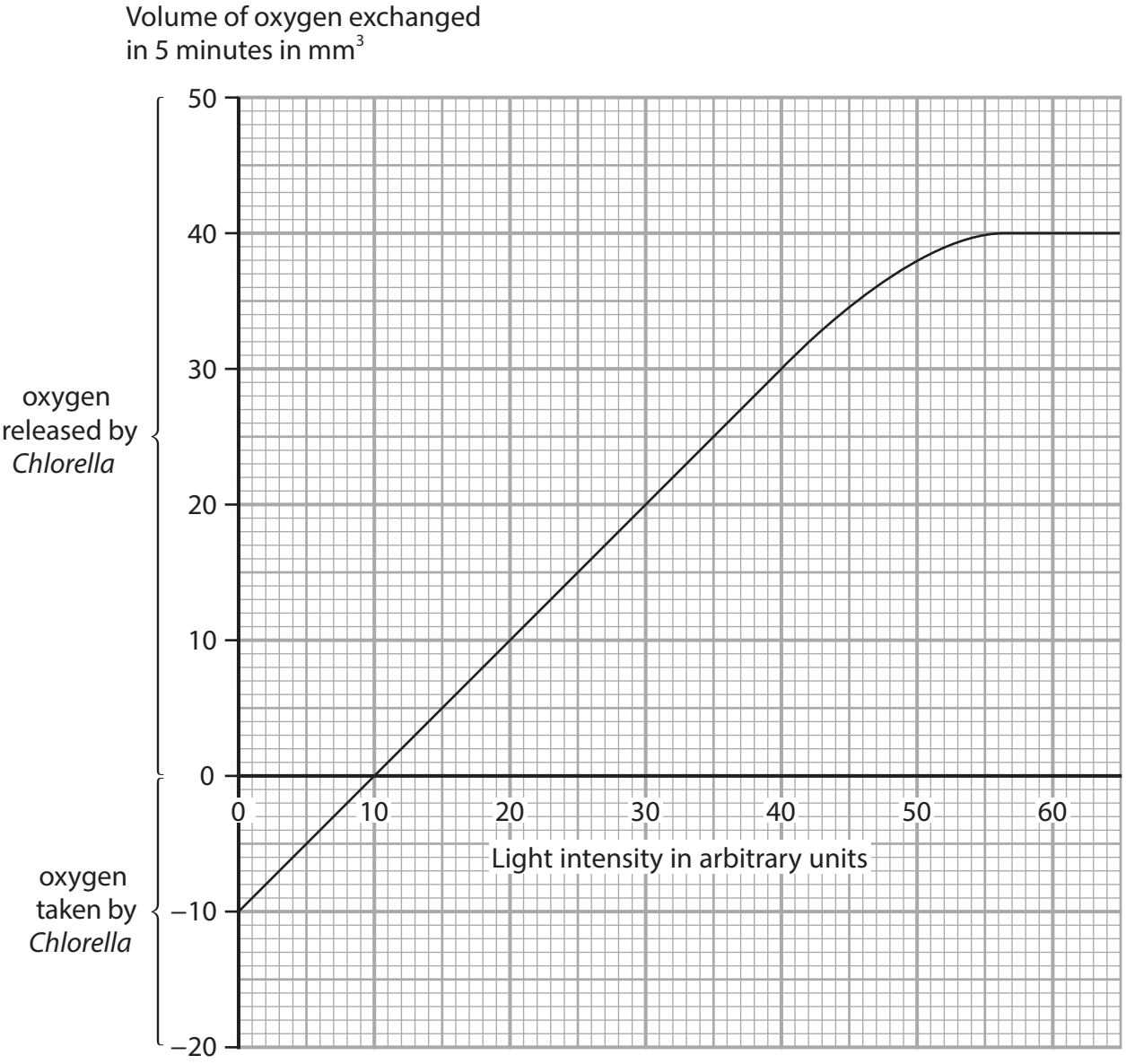
(b) The graph shows the effect of light intensity on gas exchange by *Chlorella*.



(i) Explain why *Chlorella* takes in oxygen at light intensities below 10 arbitrary units.

(2)

.....

.....

.....

.....

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(ii) Explain the changes in the volume of oxygen released as the light intensity increases from 10 arbitrary units.

(3)

(iii) The volume of oxygen released by *Chlorella* is the difference between the oxygen produced by photosynthesis and the oxygen taken in.

Use the graph to calculate the volume of oxygen produced in five minutes by photosynthesis at a light intensity of 50 arbitrary units.

(2)

volume of oxygen = ... mm^3

(c) Describe how hydrogen-carbonate indicator could be used to investigate the effect of light intensity on carbon dioxide exchange by *Chlorella*.

(3)

(Total for Question 10 = 12 marks)

TOTAL FOR UNIT = 90 MARKS

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Biology Unit 1 (Modular)
Mark Scheme

Question Number	Answer	Mark
1	• hyphae (1) • chitin (1) • enzymes (1) • saprotrophic / saprophytic (1)	**4**

Question Number	Answer	Mark
2(a)(i)	An answer that makes reference to two of the following: • (require) nutrition / food / eq (1) • respire /eq (1) • excrete (waste) /eq (1) • respond to surroundings / sensitivity / eq (1) • move /eq (1) • control their internal conditions / homeostasis /eq (1) • reproduce /eq (1) • grow / develop /eq (1)	**2**

Question Number	Answer	Mark
2(a)(ii)	The only correct answer is **D** *Pneumococcus* *A is not the answer as Amoeba does not cause bacterial disease in humans* *B is not the answer as Lactobacillus bulgaricus does not cause bacterial disease in humans* *C is not the answer as Mucor does not cause bacterial disease in humans*	**1**

Question Number	Answer	Additional guidance	Mark
2(b)	An answer that makes reference to three of the following: Virus • smaller / eq (1) • protein coat (1) • no cell wall (1) • no cell membrane / eq (1) • no cytoplasm / organelles / ribosomes / no vacuole / eq (1) • no plasmids (1) • no flagella (1)	**Mark first 3 answers** allow converse ignore nucleus mitochondria Golgi ignore chloroplasts loop or circles of DNA	**3**

Question Number	Answer	Mark
3(a)		**4**

Component	**Function of Component**
vitamin A	Vision/sight/sight in dim light/immune system/disease resistance/skin
vitamin C	Skin/tissue/connective tissue/prevent scurvy/wound healing/ immune system / disease resistance
vitamin D	(bone growth)
iron	Haemoglobin/red blood cells
dietary Fibre	Peristaisis/food movement/reduce risk of bowel cancer/ reduce constipation

Question Number	Answer	Mark
3(b)	Nitrogen/N	**1**

Question Number	Answer	Additional guidance	Mark
4(a)(i)	0.57 (3)	0.57 gains all **three marks** **Accept** 0.90 for **two marks** OR **Accept** 0.56 or 0.56(66666….7) or 0.56 recurring for **two marks** **Accept** 0.9 or 0.8975 or 1.7 or ÷3 for **one mark** *Example calculation (not mark points):* *(0.55 + 0.54 + 0.61) = 1.7* *÷ 3* *to two dp* Correct answer with no working gains all three marks.	**3**

Question Number	Answer	Additional guidance	Mark
4(a)(ii)	• amino acids / peptides (1)	**Accept** polypeptide	**1**

Question Number	Answer	Additional guidance	Mark
4(b)(i)	An answer that makes reference to two of the following. • temperature (1) • height / volume / mass / concentration of gelatine / protein/ eq (1) • volume / concentration, of, enzyme / bromelain / pineapple juice / eq (1) • volume of buffer (1) • time (in incubator) (1) • surface area of gelatine / SA:vol ratio / width of tube (1)	**Ignore** amount **Accept** gel for gelatine **Ignore** type / source of protein **Ignore** type / source of juice	**2**

Question Number	Answer	Additional guidance	Mark
4(b)(ii)	An explanation that makes reference to three of the following. • volume digested increases up to (pH) 5 then decreases (above 5) / volume digested decreases above and below 5 / eq (1) • optimal pH / optimum pH (1) • (away from optimal pH / 5) enzyme denatures / (active site) shape changes / eq (1) • substrate no longer binds / fits / shape not complementary to substrate (1)	**Accept** rate increases up to 5 then decreases **Accept** denatures at high pH / low pH **Accept** E/S complexes do not form	**3**

Question Number	Answer	Mark
5(a)(i)	The only correct answer is **B** *A is not correct as it does not produce hydrochloric acid* *C is not correct as it does not produce hydrochloric acid* *D is not correct as it does not produce hydrochloric acid*	**1**

Question Number	Answer	Mark
5(a)(ii)	The only correct answer is **D** *A is not correct as it does not store faeces* *B is not correct as it does not store faeces* *C is not correct as it does not store faeces*	**1**

Question Number	Answer	Mark
5(a)(iii)	The only correct answer is **C** *A is not correct as it is not the small intestine* *B is not correct as it is not the small intestine* *D is not correct as it is not the small intestine*	**1**

Question Number	Answer	Mark
5(b)	An explanation that makes reference to three of the following points: • neutralises acid / eq (1) • optimal pH for enzymes / lipase eq (1) • emulsifies lipid / eq (1) • breaks down (large droplets) into small droplets / eq (1) • increases surface area for enzyme action /eq (1)	**3**

Question Number	Answer	Mark
6(a)	An explanation that makes reference to four of the following points: • waxy cuticle to prevent evaporation of water / eq (1) • air spaces / spongy cells / gaps/eq (1) • to allow diffusion of CO_2 / eq (1) • stomata (1) • allow entry of CO_2 / exit of O_2 / eq (1) • moist to allow gases to dissolve/ eq (1)	**4**

Question Number	Answer	Additional Guidance	Mark
6(b)	An answer that makes reference to six of the following: • C – (plant ivy in) shaded and unshaded area / different exposure to light / eq (1) • O – same species / type / age / starting size of leaf / same plant / eq (1) • R – repeat with multiple leaves / repeat / eq (1) • M1 – measure length / width / height / surface area / eq (of leaves) (1) • M2 – grow ivy for same stated time (1) • S1 - temperature / pests / humidity / plant density / carbon dioxide / weather / time of year / wind / eq (1) • S2 – same water / minerals / soil /nutrients / fertiliser / pH / eq (1)	**Allow** different light intensities / distances of lamp **Allow** groups **Ignore** size of leaves **Allow** measure size with a ruler / in mm / eq **Allow** volume Minimum time of one day	**6**

Question Number	Answer	Additional guidance	Mark
7(a)(i)	5.5 – 4.2 ((5.5 – 4.2) / 5.5) x 100 = 24%	Full marks for correct answer Accept 23.6%	**2**

Question Number	Answer	Additional guidance	Mark
7(a)(ii)	An explanation that makes reference to two of the following points: • median used as each age has wide / high range (1) • not (influenced by) affected by extreme values / less affected by anomalies / eq (1) • data is skewed /eq (1)	Allow converse for mean	**2**

Question Number	Answer	Mark
7(a)(iii)	An explanation that makes reference to two of the following: • (increases) (up to 20 years) as body / size / mass / chest cavity / lungs / muscle increases / grows / develops / eq (1) • no / little change (from 20) no further growth / stop growing / eq (1) • (decreases) (from 25 years) as <u>diaphragm</u> / <u>intercostal</u> muscle weaker / lungs less elastic / less recoil / eq (1)	**2**

Question Number	Answer	Additional guidance	Mark
7(a)(iv)	An answer that makes reference to two of the following: • smoking (1) • lung disease / infection / condition / asthma/ bronchitis / emphysema / eq (1) • fitness / how active you are / eq (1) • body size/ height / mass / genetics /eq (1) • sex /eq (1) • altitude at which you live / eq (1) • pregnancy (1) • pollution / eq(1)	ignore illness / health	**2**

Question Number	Answer	Additional guidance	Mark
7(b)	A description that makes reference to three of the following: • count number of breaths per minute / number of breaths in stated time (at rest) / eq (1) • breathing rate count per minute / number of breaths in stated time after / during exercise /eq (1) • repeat / using more participants /use group/ eq (1) • control age / sex / fitness of subjects / amount / period of exercise / eq (1)	allow use spirometer at rest for mp 1 use spirometer after exercise for mp 2 allow running increasing distances or durations of exercise for mp 1 and mp 2 if measure heart rate can score mp 3 and 4 only	**3**

Question Number	Answer	Mark
8(a)(i)	The only correct answer is **B** M is the cell wall. *A is not the answer as M is not the cell membrane* *C is not the answer as M is not the nucleus* *D is not the answer as M is not the vacuole*	**1**

Question Number	Answer	Mark
8(a)(ii)	The only correct answer is C N is the cytoplasm. *A is not the answer as N is not the cell membrane* *B is not the answer as N is not the cell wall* *D is not the answer as N is not the vacuole*	**1**

Question Number	Answer	Mark
8(b)(i)	• sodium chloride (solution) / salt solution / bathing solution / eq (1)	**1**

Question Number	Answer	Additional guidance	Mark
8(b)(ii)	An explanation that makes reference to four of the following in distilled water • water enters cell / eq(1) • by osmosis (1) • from dilute solution to more concentrated solution / from high(er) water potential to low(er) water potential / water / outside has a higher water potential / eq (1) • cytoplasm pushed against cell membrane/ cell wall / eq (1) • cell is turgid / (1)	allow converse for cell in salt solution water exits allow as salt soln / outside has lower water potential allow **high conc of water to low conc of water** cytoplasm /cell membrane shrinks away cell plasmolysed / flaccid	**4**

Question Number	Answer	Additional guidance	Mark
8(c)	A description that makes reference to four of the following: • (immerse) onion epidermis /rhubarb epidermis / named suitable plant tissues / leaf epidermis / eq (1) • same volume of solutions / stated volume of solutions /eq (1) • <u>at least two</u> different concentrations of salt solution / eq (1) • leave cells for stated time / same time / eq (1) • (observe / draw / photograph under) <u>microscope</u> / eq (1)	allow 'layer of onion' 'onion skin cells' 'rhubarb stem' *Cladophora* / / toadflax /eq not just leaf not just water and salt solution if describe potato discs expt can score mp 2 3 4 so 3 max	**4**

Question Number	Answer	Additional guidance	Mark
9(a)	An answer that makes reference to the following points: • S scales linear and at least half axis (1) • A1 Axes 'correct way round' (1) • L lines straight and joining each point (1) • A2 labelled 'year' and 'percentage of students' (1) • P points accurately plotted (1) • K key or lines labelled for cigarettes and vaping (1)	bar chart lose L only **Do not allow** L if extrapolated Points plotted within one small square	**6**

Question Number	Answer	Mark
9(b)	A description that makes reference to two from the following points: • e-cigarette use increased (from 2011) **up to 2015** then decreased / decreased in 2016 (1) • smoking normal cigarettes decreases (from 2011 to 2016) (1) • at start e-cigarettes lower than smoking / significantly low / at end e-cigarette use higher than smoking / significantly high (1)	**2**

Question Number	Answer	Additional guidance	Mark
9(c)	• 15.8 - 8 = 7.8 • 7.8 ÷ 100 × 60 000 = 4680 (2) OR • 15.8 / 100 x 60 000 = 9480 • 8.0 /100 x 60 000 = 4800 • 9480 – 4800 = • 4680 (2)	**Allow** 1 mark for 7.8 or 0.078 Award full marks for correct numerical answer without working	**2**

Question Number	Answer	Additional guidance	Mark
9(d)(i)	An explanation that makes reference to four of the following points: • less tar (1) • fewer carcinogens / less risk of cancer (1) • less risk of emphysema / lung disease / damage to alveoli / chronic bronchitis / damage to cilia / eq (1) • less carbon monoxide (1) • less risk of heart disease / strokes (1) • less risk of addiction / can control nicotine levels (1)	**Allow** converse for normal cigarettes for all MPs	**4**

Question Number	Answer	Mark
9(d)(ii)	An answer that makes reference to two of the following points: • non-smokers may start using e-cigarettes (1) • e-cigarettes may lead to taking up smoking (1) • e-cigarettes are addictive as they contain nicotine (1) • nicotine can increase risk of blood clots / increase blood pressure (1) • e-cigarettes may also be harmful / damage lungs / risks not yet known (1)	**2**

Question Number	Answer	Mark
10 (a)(i)	The only correct answer is **D** (protoctists) *A is incorrect as the animals do not have chloroplasts* *B is incorrect as bacteria do not have nuclei* *C is incorrect as plants are multicellular*	**1**

Question Number	Answer	Mark
10 (a)(ii)	The only correct answer is **B** (cell membrane and mitochondrion) *A is incorrect as animal cells do not have chloroplasts* *C is incorrect as animal cells do not have chloroplasts* *D is incorrect as animal cells do not have cell walls*	**1**

Question Number	Answer	Additional guidance	Mark
10 (b)(i)	An explanation that makes reference to two of the following. • low / less / no light (1) • photosynthesis is slower than respiration / photosynthesis is less than respiration / respiration is faster than photosynthesis / eq (1) • more oxygen taken in than released / more oxygen used than produced / there is a net movement of oxygen in / eq (1)	**Accept** dark **Accept** no photosynthesis but respiration occurs **Ignore** respiration gets faster **Accept** less oxygen released than taken in	**2**

Question Number	Answer	Additional guidance	Mark
10 (b)(ii)	An explanation that makes reference to three of the following. • at 10 (au) respiration (rate) and photosynthesis (rate) are equal / at the compensation point respiration and photosynthesis are equal (1) • rate of photosynthesis increases (as light intensity increases) (1) • photosynthesis rate is greater than respiration rate (1) • levels off / eq, because another factor / temperature / carbon dioxide is limiting (1)	**Accept** converse **Accept** levels off as light is no longer limiting **Accept** at (value between 45 (a.u.) and 55(a.u.) / 40 mm^3) another factor / temperature / carbon dioxide is limiting)	**3**

Question Number	Answer	Additional guidance	Mark
10(b)(iii)	two marks for 48 (2)	**one mark** for correct reading of 38 (1) OR **one mark** for +10 (1)	**2**

Question Number	Answer	Additional guidance	Mark
10(c)	A description that makes reference to three of the following: • move lamp different distances / eq (1) • place same mass / number / volume / concentration *Chlorella* / algae, in (hydrogen-carbonate indicator) (1) • same volume / concentration of indicator / same temperature / leave for same or stated time / same starting colour of indicator / use a control tube (with no *Chlorella*) (1) • (indicator turns) yellow with low light / covered tube / **and** red / purple with high light / uncovered tube (1)	**Accept** other correct methods e.g. cover with cloths / foil / change bulb power / use of variable resistor **Ignore** place in dark and light unqualified **Ignore** amount **Accept** place bung in / seal tubes **Accept** yellow with increase in carbon dioxide / and red / purple with decrease of carbon dioxide Accept correct references to photosynthesis and respiration	**3**

Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International GCSE (9–1)

Sample assessment material for first teaching 2024

Time 1 hour 40 minutes

Paper reference **4WBI2/1B**

Biology (Modular)
UNIT 2

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 unit is 90.
- 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.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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Pearson

Answer ALL questions.

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 Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

Making Enough Blood for the World

A blood transfusion is the transfer of blood from a donor into a patient. Blood transfusions are routine medical procedures that save the lives of millions of people every year.

(Source: beerkoff/Shutterstock)

The first successful blood transfusions were performed in the early twentieth century after scientists discovered that there are four main blood groups, A, B, AB and O. The blood groups are due to the presence of proteins, called antigens, on the surface of red blood cells. There are two main protein antigens called A and B. If a patient is given blood with antigens different to their own cells, their immune system will make antibodies against that antigen. The antigens present on the surface of red blood cells for each blood group are shown in the table.

Blood group	Antigens present
A	A
B	B
AB	A and B
O	Neither A nor B

Currently, blood transfusions are carried out with blood that has been donated by healthy people. The World Health Organisation calculates that there are 118.5 million blood donations collected globally every year. Of these donations, 40% are collected from a small group of highincome countries. This means that there is a shortage of blood in many countries so the hunt is on to find an alternative.

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Scientists have found a way to make artificial red blood cells. They made spheres of cell membranes filled with haemoglobin. These artificial cells are then suspended in sodium chloride solution. These artificial red blood cells have no proteins on their surface. Another way of making red blood cells is being developed in the United Kingdom. A research team has used stem cells to produce red blood cells with blood group O. The red blood cells produced are then suspended in sodium chloride solution.

Both methods produce large quantities of safe red blood cells. There may be other advantages as well, artificial blood would always have the same concentration of solutes and will not clot when stored. Critics have pointed out that the artificial blood will only transport oxygen and that blood has many more functions.

(a) Name the type of cell that produces antibodies. (Lines 8 and 9)

(1)

.....

(b) Human blood groups are controlled by three alleles, I^A, I^B and I^O.

The I^A and I^B alleles are codominant and the I^O allele is recessive.

(i) State what is meant by the term **codominant**.

(1)

.....

.....

.....

(ii) Two parents have genotypes of I^AI^O and I^BI^O.

Which of these are all the possible blood groups of their children?

(1)

☒ **A** A and B

☒ **B** A, B and O

☒ **C** AB and O

☒ **D** A, B, AB and O

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(c) Calculate the number of blood donations collected per year from the high-income countries. (Lines 14 and 15)

Give your answer in standard form.

(2)

number = ...

(d) Some scientists have suggested that spherical artificial red blood cells transport oxygen less efficiently than normal human red blood cells.

Explain why the shape of the artificial red blood cells reduces the efficiency of oxygen transport compared to normal human red blood cells. (Lines 18 and 19)

(3)

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(e) Suggest why artificial blood does not clot when stored. (Lines 26 and 27)

(1)

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(f) Suggest why the scientists made red blood cells with blood group O.
(Lines 22 and 23)

(2)

(g) Blood is filtered in the kidney by the process of ultrafiltration.

Describe the process of ultrafiltration.

(3)

(Total for Question 1 = 14 marks)

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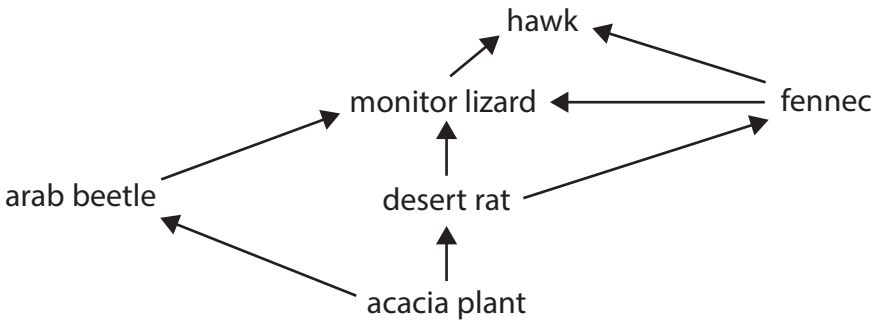
2 The diagram shows part of a food web for a desert community.



(a) (i) How many organisms in this food web are secondary consumers?

(1)

- ☒ **A** 2
- ☒ **B** 3
- ☒ **C** 4
- ☒ **D** 5

(ii) Draw the longest food chain in this food web.

(1)

(iii) Explain why most of the energy in the producers is not transferred to the hawk.

(3)

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(b) The photograph shows a fennec fox.

(Source: anolis01.123rf.com/PAL)

Fennec foxes live in the Sahara Desert, which is very hot. They have very large ears and a thin body.

Explain how the body shape of the fennec fox has evolved by natural selection.

(4)

(Total for Question 2 = 9 marks)

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3 A group of students compares the distribution of plant species in two fields using this method.

- use random sampling
- use a 0.5 m × 0.5 m quadrat
- count the number of each species in a quadrat

Repeat this method for five quadrats in each field.

The tables show the students' results.

	Field A						
	Number of plants in each quadrat						Number of plants per m^2
Species	**first**	**second**	**third**	**fourth**	**fifth**	**mean**	
dandelion	7	0	6	3	4	4	16
buttercup	2	1	0	3	2	2	6
violet	1	0	2	1	2	1	5
heather	2	3	1	2	1	2	7

	Field B						
	Number of plants in each quadrat						Number of plants per m^2
Species	**first**	**second**	**third**	**fourth**	**fifth**	**mean**	
dandelion	7	3	2	1	2		
buttercup	0	0	0	0	0	0	0
violet	0	0	0	1	0	0	0
heather	0	0	0	0	0	0	0

(a) Describe how the students would obtain random samples from each field.

(2)

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(b) (i) Calculate the mean number of dandelions per quadrat in field B.

(1)

mean number = ...

(ii) Calculate the number of dandelions per m^2 in field B.

(1)

number of dandelions per m^2 = ...

(c) Describe the differences in species distribution in field A and field B.

(2)

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(d) A teacher suggests that there are no buttercups in field B because of poor water drainage from the field.

Describe what further experiment the students could do to investigate this suggestion.

(3)

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(Total for Question 3 = 9 marks)

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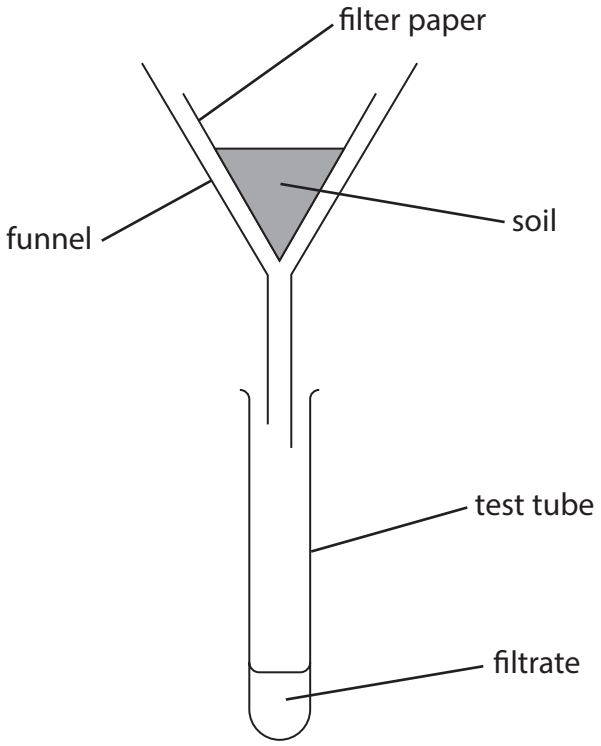
4 A student uses this method to investigate the nitrogen cycle.

- take two samples of soil, each of mass 100 g
- sterilise one sample of soil by heating at 100 °C for one hour
- place the sterilised and unsterilised samples into separate filter funnels
- pour 25 cm^3 of water through each soil sample and collect the filtrate in a test tube
- test each filtrate for nitrates
- pour water through each soil sample for 5 minutes
- pour another 25 cm^3 of water through each soil sample and collect the filtrate in a test tube
- test each filtrate for nitrates
- add 1 cm^3 of a solution of ammonium salts to each soil and leave for three days
- pour 25 cm^3 of water through each soil sample again and collect the filtrate in a test tube
- test each filtrate for nitrates

The diagram shows the student's apparatus.



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The table shows the student's results.

Soil sample	Result of test for nitrates		
	At start of investigation	After water has passed through for five minutes	Three days after adding ammonium salts
unsterilised	present	absent	present
sterilised	present	absent	absent

(a) Give the independent variable in the investigation.

(1)

.....

(b) (i) Suggest why the student poured water through the soil samples for five minutes before adding the ammonium salts.

(2)

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(ii) Comment on the results of the nitrate tests on the two soil samples three days after adding ammonium salts.

(4)

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(Total for Question 4 = 7 marks)

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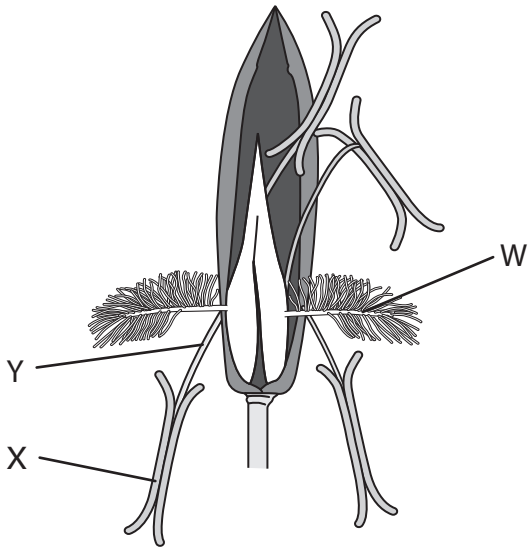
5 The diagram shows a wind-pollinated flower with some structures labelled W, X and Y.



(a) (i) Describe how structures W, X and Y are adapted for wind pollination.

(3)

(ii) Structures W, X and Y are adapted for wind pollination.

Give **two** other differences between wind-pollinated flowers and insect-pollinated flowers.

(2)

1

2

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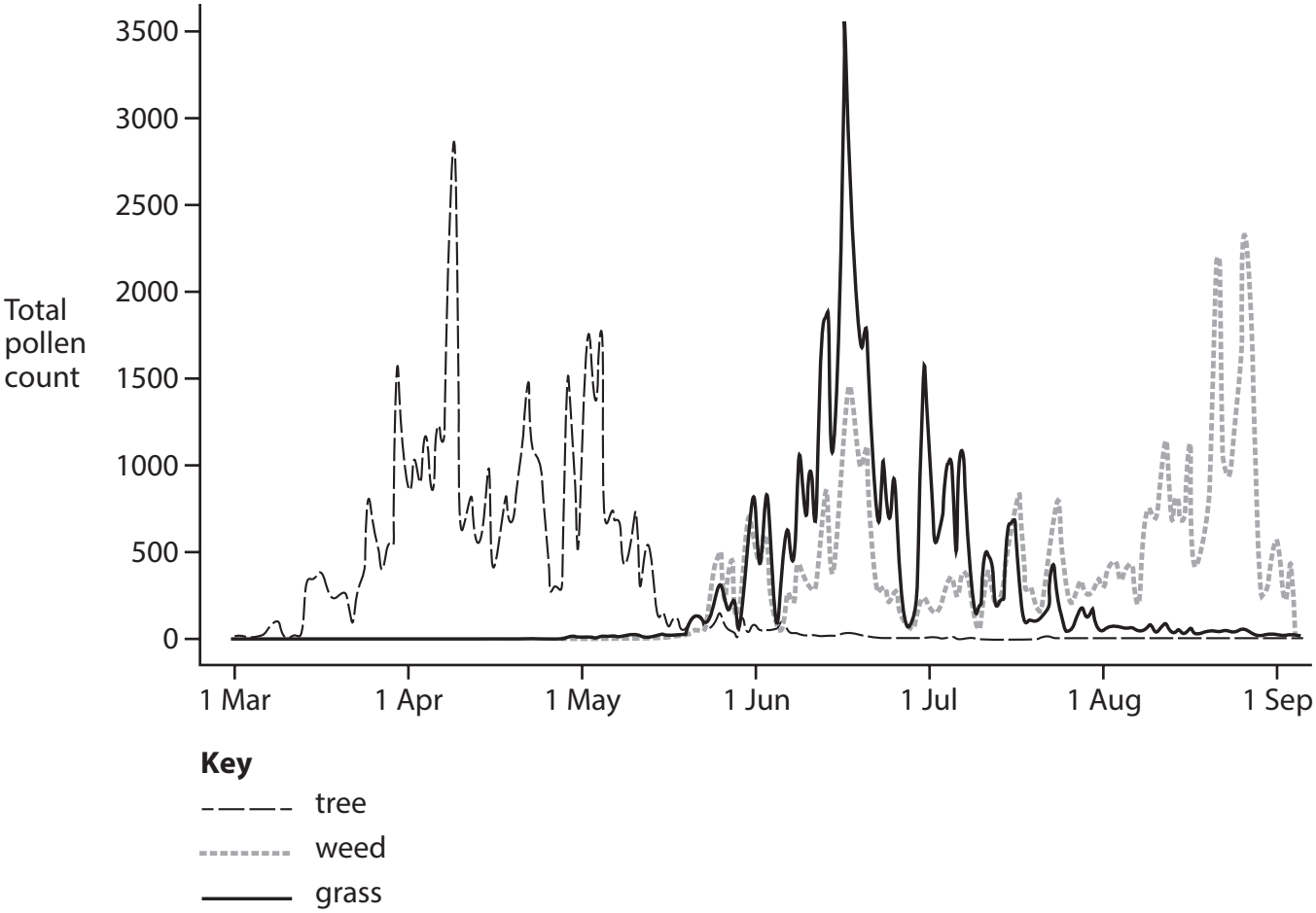
(b) Wind-pollinated flowers often cause an allergic response in people. This is known as hay fever.

Most people in the United Kingdom who get hay fever have the symptoms from April to September.

The graph shows the changes in total pollen count for three different plant types from March to September during one year in the United Kingdom.



As part of an investigation into pollen allergy, five people keep a diary of their hay fever symptoms. They do this for the same year as the pollen count.

The table gives their results.

Person	Months with severe symptoms	Months with mild symptoms	Months with no symptoms
A	April and May	March and June	July to September
B	June and July	March to May, August	none
C	April to September	March	none
D	none	none	all
E	June to September	March to May	none

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Using the data in the table and the information from the graph, discuss the likely causes of the allergic responses in each person.

(5)

(Total for Question 5 = 10 marks)

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6 The photograph shows a variety of chicken called a silkie chicken.

(Source: © yves lanceau/nature picture library/science photo library)

Silkie chickens have feathers that have a fluffy appearance.

Feather structure is controlled by a single gene.

The allele for producing silkie feathers (f) is recessive to the allele for producing normal feathers (F).

(a) (i) State what is meant by the term **gene**.

(1)

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.....

(ii) Give the possible genotypes of a chicken with normal feathers.

(1)

.....

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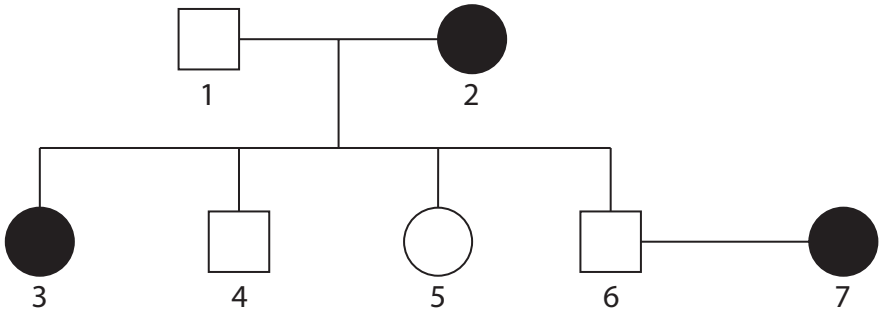
(b) A scientist investigates the inheritance of feather types in chickens.

The diagram shows a family pedigree for some chickens.



Key

- male with normal feathers
- male with silkie feathers
- female with normal feathers
- female with silkie feathers

(i) How many chickens in the family pedigree are heterozygous?

(1)

- ☒ **A** 0
- ☒ **B** 3
- ☒ **C** 4
- ☒ **D** 5

(ii) Use a genetic diagram to determine the probability of one of the offspring of individual 6 and individual 7 being a chicken with silkie feathers.

(4)

probability = ...

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(iii) The scientist observes that the chickens have either normal feathers or silkie feathers.

However, the chickens have a wide range of different heights.

Explain why there is a wider range of variation in height than in feather type.

(3)

(Total for Question 6 = 10 marks)

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7 Some people cannot make the proteins needed for blood clotting.

Cloning is used to produce large numbers of transgenic mammals.

These transgenic mammals can make the human blood-clotting proteins. The human blood-clotting proteins can then be removed from the mammals' milk and injected into people who cannot make proteins.

(a) (i) Explain why these mammals are described as transgenic.

(2)

(ii) Which enzyme is used to cut DNA to make a recombinant plasmid?

(1)

- ☒ **A** amylase
- ☒ **B** ligase
- ☒ **C** lipase
- ☒ **D** restriction

(b) Describe how a mammal is cloned.

(6)

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(Total for Question 7 = 9 marks)

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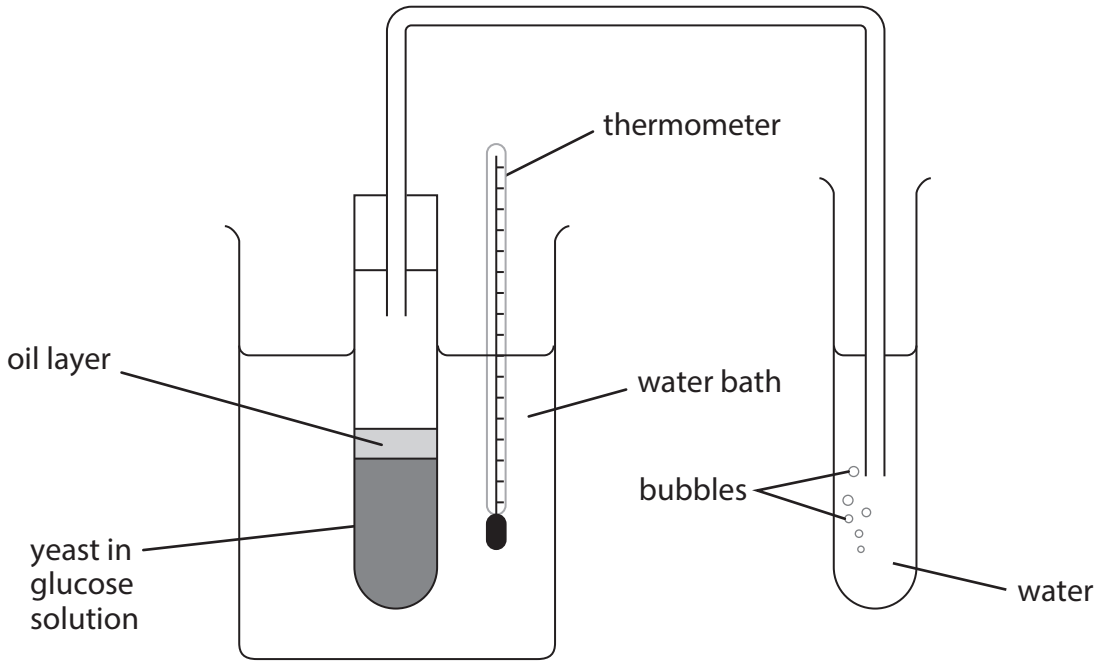
8 A student uses this apparatus to investigate the effect of temperature on the rate of anaerobic respiration by yeast.



(a) The oil layer prevents the entry of air into the glucose solution.

Explain why this is necessary.

(2)

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(b) The student varies the temperature of the water bath between 15 °C and 60 °C.

The student leaves the test tube of yeast and glucose in the water baths for five minutes before starting to count the bubbles.

They measure the rate of respiration by counting the number of carbon dioxide bubbles produced per minute.

The table shows the results.

	Number of bubbles produced in one minute				
Temperture / °C	**trial 1**	**trial 2**	**trail 3**	**trial 4**	**trial mean**
15	6	7	5	5	6
20	7	8	7	9	8
35	10	12	11	14	
45	12	15	14	16	14
60	3	2	1	2	2

(i) Explain why the student waits five minutes before they begin counting bubbles.

(2)

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(ii) Calculate the mean number of bubbles produced in one minute at 35 °C.

(2)

mean number of bubbles in one minute = ...

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(iii) Explain the change in the rate of bubble production by yeast as the temperature increases from 15 °C to 45 °C.

(3)

(c) Describe **one** way that the student could make the results more accurate.

(2)

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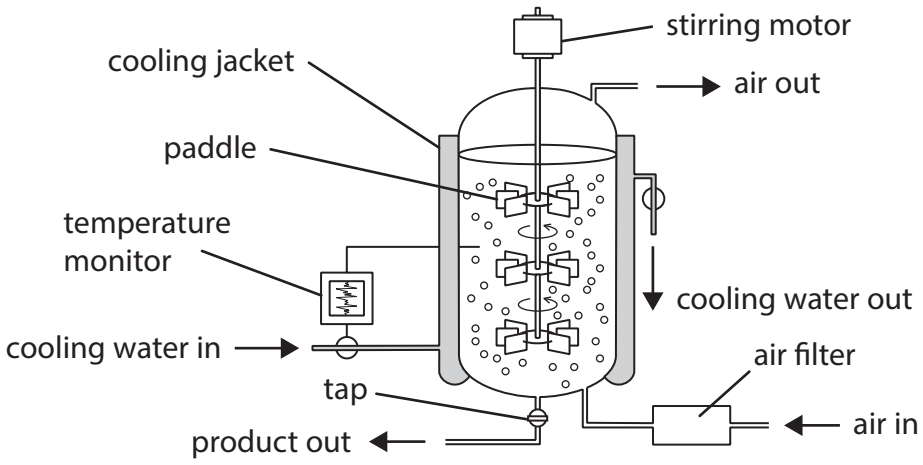
(d) The diagram shows an industrial fermenter that can be used to grow large quantities of genetically modified yeast.



Explain the function of the temperature monitor and cooling jacket.

(2)

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(Total for Question 8 = 13 marks)

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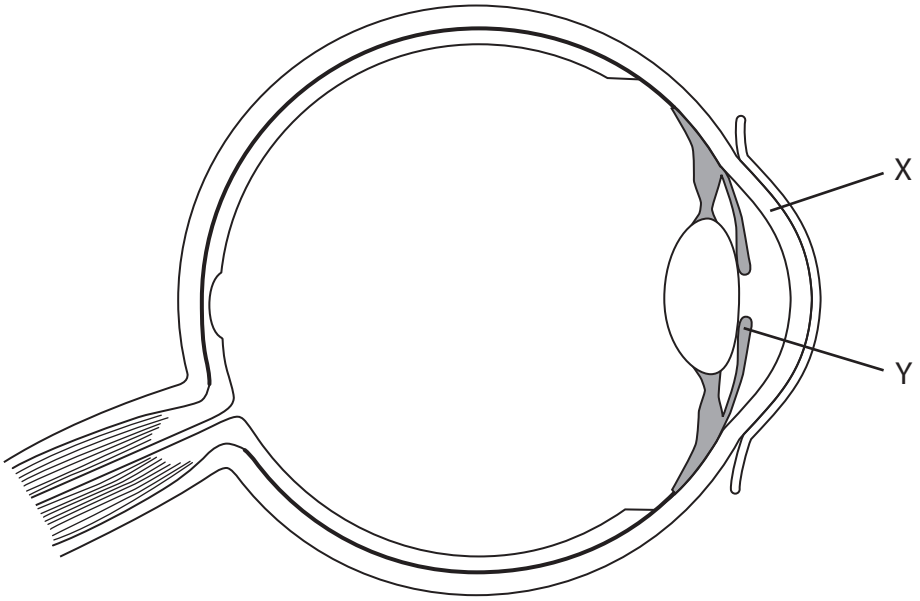
9 (a) The diagram shows the structure of a human eye.



(i) Which of these is the structure labelled X?

(1)

☒ **A** conjunctiva

☒ **B** cornea

☒ **C** lens

☒ **D** retina

(ii) When looking at a close object, which row of the table shows the state of the ciliary muscles and suspensory ligaments?

(1)

	Ciliary muscles	Suspensory ligaments
☒ **A**	contracted	loose
☒ **B**	contracted	tight
☒ **C**	relaxed	loose
☒ **D**	relaxed	tight

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(iii) Explain how structure Y controls the light entering the eye when someone walks into a dark room.

(2)

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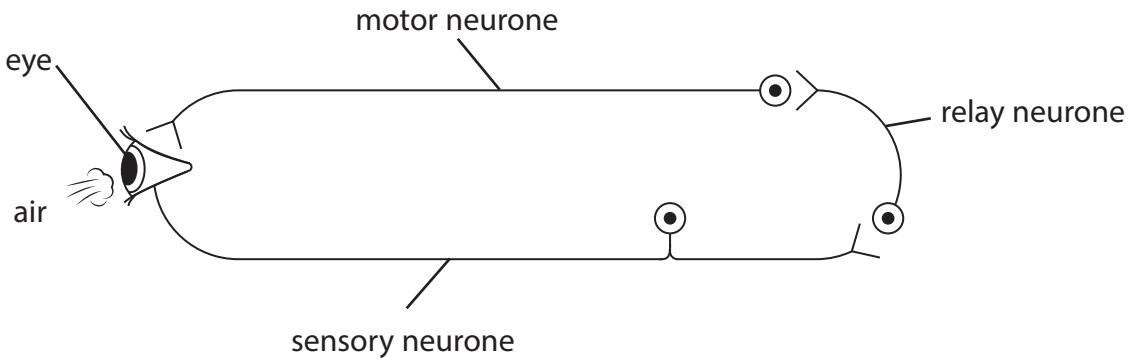
(b) Multiple sclerosis is a condition that can slow down the speed at which electrical impulses travel along neurones.

The time taken for the blink reflex to occur can be used to help diagnose if someone has multiple sclerosis.

The blink reflex causes the eyelid to close.

Air is blown on to the eye and the time taken for the eyelid to close is recorded.

The diagram shows the reflex pathway.



The speed the impulse moves along the reflex arc consisting of all three neurones in a person without multiple sclerosis is 77 metres per second.

The time taken for the blink reflex to occur in a person with multiple sclerosis is 0.0050 s.

The total length of the neurones in the reflex arc for the person with multiple sclerosis is 25 cm.

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(i) Calculate the difference between the speed of impulse for the person with multiple sclerosis and for the person without multiple sclerosis, in metres per second.

(3)

difference in speed = ... m/s

(ii) The speed of an impulse along the axon of the motor neurone for someone without multiple sclerosis is 120 metres per second.

Suggest why the speed of the impulse calculated along all three neurones is less than the speed of the impulse along only the motor neurone.

(2)

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(Total for Question 9 = 9 marks)

TOTAL FOR UNIT = 90 MARKS

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Biology Unit 2 (Modular)
Mark Scheme

Question Number	Answer	Additional guidance	Mark
1(a)	lymphocytes / eq	**Ignore** white blood cells **Reject** phagocytes	**1**

Question Number	Answer	Additional guidance	Mark
1(b)(i)	An answer that makes reference to one of the following: • both alleles expressed (1) • both alleles affect the phenotype (1) • both alleles show their characteristics / traits (1)	**Accept** both alleles work together / both alleles work together to form a third phenotype / phenotype depends upon both alleles	**1**

Question Number	Answer	Mark
1(b)(ii)	The only correct answer is **D** (A, B, AB and O) *A is incorrect as the cross could also produce AB and O* *B is incorrect as the cross could produce also AB and O* *C is incorrect as the cross could also produce A, and B*	**1**

Question Number	Answer	Additional guidance	Mark
1(c)	$4.7(4) \times 10^{7}$ (2)	**one mark** for 47400000 **or** 47.4 million **or** 47 million **or** other incorrect standard forms using 47(4) **Correct answer gains all marks**	**2**

Question Number	Answer	Additional guidance	Mark
1(d)	An explanation that makes reference to three of the following: • artificial cells are not (bi)concave / red blood cells are (bi)concave (1) • artificial cells have smaller SA(:vol ratio) / red blood cells have larger SA (:vol ratio) (1) • artificial cells absorb / bind / release less oxygen / red blood cells absorb bind more oxygen / release more oxygen / eq (1) • artificial cells do not pass through capillaries easily / eq / red blood cells pass through capillaries more easily / eq (1)	**Accept** artificial cells carry less oxygen / red blood cells carry **more** oxygen **Accept** artificial cells have slower diffusion (of oxygen) / red blood cells have faster diffusion (of oxygen)	**3**

Question Number	Answer	Additional guidance	Mark
1(e)	An explanation that makes reference to the following: • no platelets (1)	**Allow** no fibrinogen	**1**

Question Number	Answer	Additional guidance	Mark
1(f)	An answer that makes reference to two of the following: • (there are) no antigens (present) / eq (1) • so antibodies will not be produced / no rejection / no immune response / eq (1) • any recipient / more people can receive blood group O (1)	**Accept** no surface proteins **Accept** blood group A/ B / AB can receive the blood / O is the universal donor	**2**

Question number	Answer	Additional guidance	Mark
1(g)	A description that makes reference to three of: • high blood pressure (1) • forces substances out of Bowman's capsule (1) • into the glomerulus (1) • small molecules pass through / large molecules can not pass through (1)	**Accept** renal capsule **Accept** named molecules, e.g. protein	**3**

Question Number	Answer	Mark
2(a)(i)	The only correct answer is **A** - 2 *B is incorrect as there are not 3 secondary consumers* *C is incorrect as there are not 4 secondary consumers* *D is incorrect as there are not 5 secondary consumers*	**1**

Question Number	Answer	Mark
2(a)(ii)	Acacia / plant → (desert) rat → fennec / fox → monitor / lizard → hawk (1)	**1**

Question Number	Answer	Additional guidance	Mark
2(a)(iii)	An explanation that makes reference to three of the following: • (energy is lost due to) indigestible parts / faeces / not absorbed / eq (1) • (energy is lost due to) excretion / metabolic waste / urine / eq (1) • (energy is lost due to) organisms/ parts of organisms that are not consumed /eq (1) • (energy is released) in respiration / by heat loss / in active transport / due to metabolism (1) • (energy is lost due to) movement (1)	**Accept** some organisms / food not eaten Accept loss to death / decay	**3**

Question Number	Answer	Mark
2(b)	An explanation that makes reference to four of the following: • mutation / genetic variation (1) • (the fox has / ears have) large surface area to lose heat / keep body cool (1) • (which) enables survival (1) • breeding occurs / (fox) produces offspring (1) • passes on alleles / genes (for ear shape) (to next generation) (1)	**4**

Question Number	Answer	Additional guidance	Mark
3(a)	A description that makes reference to two of the following points: • use random number tables / computer / eq (1) • to generate coordinates in field / place tape measures along edge of field / eq (1)	**Allow** grid area / split area into squares (1)	**2**

Question Number	Answer	Mark
3(b)(i)	3 (1)	**1**

Question Number	Answer	Additional guidance	Mark
3(b)(ii)	12 (1)	**ECF** from 3(b)(i)	**1**

Question Number	Answer	Additional guidance	Mark
3(c)	A description that makes reference to two of the following points: • more plants / named plants in field A / more plants per quadrat / more of each species (1) • more species in field A (1) • more species evenness in field A (1) / even distributions	**Allow** converse for all mark points **Allow** A has 39 plants, B has only 16 **Allow** A has 4 species, B has only 2 **Allow** only dandelions (and 1 violet) in B / all species present in A	**2**

Question Number	Answer	Additional guidance	Mark
3(d)	A description that makes reference to three of the following points: **EITHER METHOD 1** • measure water content of soil / field / eq (1) • take repeated samples (1) • along a transect / at random locations (1) • count buttercups / compare number of buttercups to water content of soil (1) **OR METHOD 2** • plant buttercups in one field / pots with poor drainage and one with good drainage / eq (1) • • repeat (1) • control temperature / minerals / light / rainfall / water added / eq (1) • count number of buttercups (1)	Mark either of the two methods **Allow** calculate mean water content **Allow** plant in high soil water and low soil water	**3**

Question Number	Answer	Mark
4(a)	An answer that makes reference to one of the following. • sterilised / unsterilised / eq (1) • presence of bacteria / absence of bacteria / eq (1) • heated / unheated soil / eq (1) • soil sample / soil used (1)	**1**

Question Number	Answer	Additional guidance	Mark
4(b)(i)	An answer that makes reference to two of the following. • remove / dissolve / wash away nitrate present / get rid of nitrates / eq (1) • (so any) nitrate made must have been from the ammonium salt / are due to ammonium salts / eq (1) • so a fair comparison is made / so the test is valid / so the test is fair (1)	**Accept** make sure no nitrate present **Accept** to see if the nitrates come from the ammonia **Ignore** accurate / reliable	**2**

Question Number	Answer	Additional guidance	Mark
4(b)(ii)	An answer that makes reference to four of the following. • nitrates present in unsterilised soil (1) • nitrates produced /made from ammonium / ammonia (1) • nitrifying bacteria / nitrification (1) • ammonium is converted into nitrite / nitrite is converted into nitrate (1) • nitrates not present in sterilised soil because there are no bacteria / bacteria were dead / killed / removed (1)	Ammonium to nitrite to nitrate = **2 marks** (mp2 and mp4)	**4**

Question Number	Answer	Mark
5(a)(i)	A description that makes reference to the following: • W or stigma / feathery / large surface area / W stigma outside flower / exposed (to catch pollen)/eq (1) • X or anther outside flower/ exposed (to disperse pollen) / eq (1) • Y or filament long / hinged / not rigid / can move (to disperse pollen)/eq(1)	**3**

Question Number	Answer	Additional guidance	Mark
5(a)(ii)	An answer that refers to two of the following • smaller / dull / green flowers /petals / no petals / eq (1) • no nectar/ nectary (1) • no scent / eq (1) • smaller / lighter / smooth pollen grains / more pollen produced (1)	allow converse for insect pollinated larger/ coloured /eq nectar/nectary scent larger / sticky / have hooks pollen grains/ less pollen produced	**2**

Question Number	Answer	additional guidance	Mark
5(b)	An answer that makes reference to five the following: • link between pollen number and symptoms /eq (1) • Person A allergic to tree pollen (only) / eq (1) • Person B allergic to (mainly) grass pollen / eq (1) • • Person B some / mild allergy to tree and weed / eq (1) • Person C allergic to all pollen / tree and grass and weed/eq (1) • Person D no pollen allergy / eq (1) • Person E allergic to (mainly) grass and weed/ eq (1) • Person E some / mild allergy to tree / eq (1) • no species level data / eq (1) • only one year / eq (1)	allow hay fever/ allergic response/ for allergy	**5**

Question Number	Answer	Additional guidance	Mark
6(a)(i)	• section / length / part / eq, of DNA / chromosome, that codes for a protein / polypeptide (1)	**Ignore** strand	**1**

Question Number	Answer	Additional guidance	Mark
6(a)(ii)	FF <u>and</u> Ff	**Allow** FF and fF **Allow** FF, Ff, and fF **Allow** alternative letters	**1**

Question Number	Answer	Mark
6(b)(i)	The only correct answer is **C** - 4 *A is not correct as 1, 4, 5 and 6 must be heterozygous* *B is not correct as 2, 3 and 7 must be homozygous* *D because only 2, 3 and 7 are not heterozygous*	**1**

Question Number	Answer	Additional guidance	Mark
6(b)(ii)	An answer that makes reference to: • parental genotypes of Ff and ff (1) • gametes as F + f <u>and</u> f (+ f) (1) • correct F_1 genotypes (Ff, ff) in correct ratio (1) • 0.5 / 50% / ½ (1)	MP1-3 from Punnet square **Allow** ecf **ONLY** for MPs 2 and 3 with incorrect parental genotypes **Allow** different letters	**4**

Question Number	Answer	Additional guidance	Mark
6(b)(iii)	An explanation that makes reference to three from: • feather is discontinuous / categoric / height is continuous / eq (1) • height is <u>polygenic</u> (1) • height depends on the combination of many/ several, genes / not just one gene / eq (1) • height may have environmental effects (1) • feather structure is due to one gene / monogenic (1) • height depends on sex (1)	**Allow** named factors e.g. nutrition	**3**

Question Number	Answer	Mark
7(a)(i)	An explanation that makes reference to the following points: • (have been given) genetic material/ gene/ allele/ DNA/ genetically alter (1) • From human/ different species (1)	**2**

Question number	Answer	Mark
7(a)(ii)	The only correct answer is **D** (restriction enzyme) *A is incorrect as amylase digests starch* *B is incorrect as ligase attaches DNA* *C is incorrect as lipase digests lipids*	**1**

Question Number	Answer	Additional guidance	Mark
7(b)	An answer that makes reference to six of the following points: • use enucleated egg/ empty egg/ remove nucleus from egg/ eq (1) • nucleus from body cell/ diploid nucleus (placed into empty egg)/ fuse adult cell with empty egg (1) • use of electricity/ shock (1) • cell division/ mitosis (1) • embryo (1) • uterus/ womb (1) • surrogate mother (1)	Ignore DNA	**6**

Question number	Answer	Mark
8(a)	An explanation that makes reference to: • prevents entry of oxygen (1) • to prevent aerobic respiration (1)	**2**

Question number	Answer	Mark
8(b)(i)	An explanation that makes reference to: • to reach temperature of water bath / eq (1) • so that bubbling rate / respiration rate becomes constant / eq (1)	**2**

Question number	Answer	Additional guidance	Mark
8(b)(ii)	• Addition of readings: 10 + 12 + 11 + 14 = 47 • Division by 4 = 12 (2)	**Allow** one mark for 47 or division by 4 Award full marks for correct numerical answer without working	**2**

Question number	Answer Additional guidance	Mark
8(b)(iii)	An explanation that makes reference to three of the following: • faster rate of respiration (1) • more kinetic energy (1) • more collisions between substrate and enzyme (1) • more E/S complexes form (1)	**3**

Question number	Answer Additional guidance	Mark
8(c)	A description that makes reference to: • measure volume of gas (1) • using syringe / inverted measuring cylinder / burette / eq (1)	**2**

Question number	Answer	Additional guidance	Mark
8(d)	An explanation that makes reference to two of the following: • checks / monitor, temperature and lets (cooling) water in / open valve / water is pumped around / eq (1) • lowers temperature / removes heat / prevents over heating / stops temperature getting too high (1) • maintain optimal temperature / optimum temperature (1) • stop enzymes denaturing / stops enzyme shape changing / eq (1)	Ignore cools it down alone	**2**

Question Number	Answer	Mark
9(a)(i)	The only correct answer is **B** – cornea *A is incorrect as X is not the conjunctive* *C is incorrect as X is not the lens* *D is incorrect as X is not the retina*	**1**

Question Number	Answer	Mark
9(a)(ii)	The only correct answer **A** – contracted loose *B is incorrect as the ligaments would be loose* *C in incorrect as the muscles would be contracted* *D in incorrect as the muscles would be contracted*	**1**

Question Number	Answer	Additional guidance	Mark
9(a)(iii)	An explanation that makes reference to two of the following: • pupil widens / dilates / gets bigger (1) • radial muscles contract (1) • circular muscles relax (1)	**Ignore** it / Y	**2**

Question Number	Answer	Additional guidance	Mark
9(b)(i)	27 m/s (3)	**One Mark:** 2.5 ÷ 0.005 or 25 ÷ 0.005 or 0.25 (m) or 5000 **Two marks:** 50 (m/s) **Award full marks for correct answer**	**3**

Question Number	Answer	Additional guidance	Mark
9(b)(ii)	An explanation that makes reference to two of the following: • (more) synapses are present / eq (1) • which transmit by (chemical) diffusion (1) • of neurotransmitters (1)	**A** gaps / clefts present	**2**

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