TOPICAL PAST PAPER QUESTIONS WORKSHEETS

Edexcel IGCSE (4BI1) Paper 2B

Exam Series: Jan 2017 – Jan 2023

Format Type A:
Answers to all questions are provided as an appendix

Introduction

Each Topical Past Paper Questions Compilation contains a comprehensive collection of hundreds of questions and corresponding answer schemes, presented in worksheet format. The questions are carefully arranged according to their respective chapters and topics, which align with the latest Edexcel International GCSE subject content. Here are the key features of these resources:

1. The workbook covers a wide range of topics, which are organized according to the latest syllabus content for Edexcel IGCSE or AS/A Level exams.

2. Each topic includes numerous questions, allowing students to practice and reinforce their understanding of key concepts and skills.

3. The questions are accompanied by detailed answer schemes, which provide clear explanations and guidance for students to improve their performance.

4. The workbook's format is user-friendly, with worksheets that are easy to read and navigate.

5. This workbook is an ideal resource for students who want to familiarize themselves with the types of questions that may appear in their exams and to develop their problem-solving and analytical skills.

Overall, Topical Past Paper Questions Workbooks are a valuable tool for students preparing for Edexcel IGCSE or AS/A level exams, providing them with the opportunity to practice and refine their knowledge and skills in a structured and comprehensive manner. To provide a clearer description of this book's specifications, here are some key details:

- Title: Edexcel IGCSE Biology (4BI1) Paper 2B Topical Past Papers

- Subtitle: Exam Practice Worksheets With Answer Scheme

- Examination board: Pearson Edexcel

- Subject code: 4BI1

- Years covered: Jan 2017 – Jan 2023

- Paper: 2B

- Number of pages: 650

- Number of questions: 147

Contents

Chapter 1

Structure and functions in living organisms

1.1 Cell structure

1. 4BI1_2B_que_20211116 Q: 7

As an embryo develops, its cells differentiate.

(a) Explain the importance of cell differentiation in the development of the growing embryo.

(2)

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(b) (i) Which of these is a feature of adult stem cells?

(1)

☒ **A** they do not divide

☒ **B** they divide by meiosis

☒ **C** they can become all cell types

☒ **D** they are found in some tissues and organs

(ii) Adult stem cells or embryonic stem cells can be used in medical treatments.

Explain why the choice between these two types of stem cells can cause issues for doctors.

(2)

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(Total for Question 7 = 5 marks)

TOTAL FOR PAPER = 70 MARKS

1.2   Biological molecules

2. 4BI1_2B_que_20220115 Q: 2

Food items can often be spoiled if saprotrophic microorganisms such as mould fungi grow on them.

(a) Describe how a saprotrophic fungus such as mould obtains its food.

<div align="right">(3)</div>

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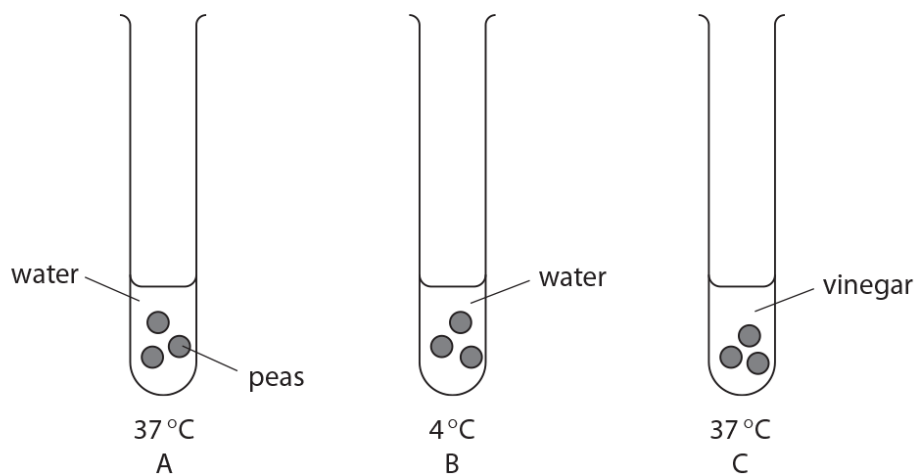(b) A student uses this method to investigate ways of preventing peas from being spoiled.

- place three peas in each of three test tubes as shown in the diagram

- cover the peas in test tube A with water and keep at 37 °C

- cover the peas in test tube B with water and keep at 4 °C

- cover the peas in test tube C with vinegar, which is a weak acid, and keep at 37 °C

- leave the peas for 24 hours

The student observes the level of cloudiness of the solution to determine how spoiled the peas have become.
The level of cloudiness can be used as a measure of fungal growth.

The table shows the student's results.

Test tube	Conditions peas are kept in	Level of cloudiness
A	water at 37 °C	very cloudy
B	water at 4 °C	slightly cloudy
C	vinegar at 37 °C	no cloudiness

(i) Suggest a problem with using the level of cloudiness of the solution to determine how spoiled the peas have become.

(1)

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(ii) Explain the appearance of the peas in water at 4 °C.

(2)

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(iii) Explain the appearance of the peas in vinegar at 37 °C.

(2)

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(Total for Question 2 = 8 marks)

3. 4BI1_2B_que_20220616 Q: 5

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 cm³ pineapple juice with 1 cm³ of pH 4 buffer

- place 1 cm³ 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.

pineapple juice and pH buffer solution

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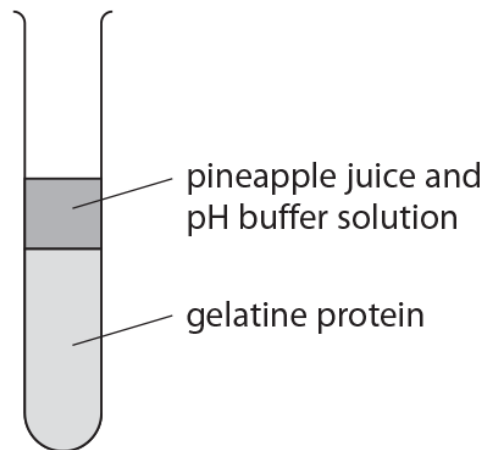
(a) The table shows the student's results for the volumes of gelatine digested at pH 4.

Tube number	Volume of gelatine digested in cm³
1	0.55
2	1.89
3	0.54
4	0.61

(i) Calculate the mean volume of gelatine digested in cm³.

Give your answer to two decimal places.

(3)

mean volume = ... cm³

(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 cm³
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 ....

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

(3)

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(c) Describe how to test for the presence of protein.

(2)

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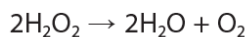
(Total for Question 5 = 11 marks)

4. 4BI1_2B_que_20210304 Q: 6

Catalase is an enzyme found in many cells.

It speeds up the breakdown of hydrogen peroxide into water and oxygen.

The equation for the reaction is

$$2H_2O_2 \rightarrow 2H_2O + O_2$$

A teacher demonstrates the effect of increasing catalase concentration on the initial rate of the reaction.

This is the teacher's method.

- cut five equal size discs from a potato, each 0.2 mm thick
- place the discs in a boiling tube with 5 cm³ of buffer solution
- add 5 cm³ of hydrogen peroxide solution to the boiling tube
- place a bung and delivery tube firmly into the boiling tube
- position the other end of the delivery tube under an inverted measuring cylinder
- start a timer as soon as the first bubble of oxygen enters the measuring cylinder
- measure the volume of oxygen produced in one minute

Repeat this method three times.
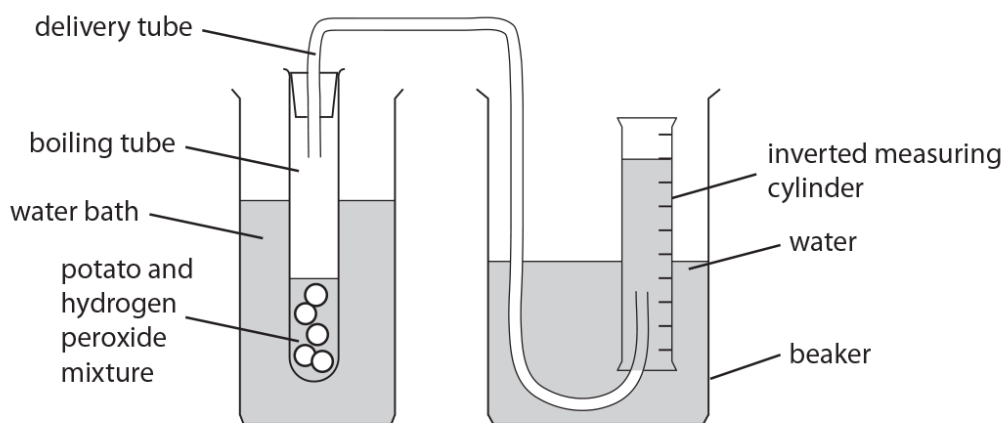
The teacher uses this method with different numbers of potato discs, making sure that other conditions are unchanged.

(a) Give the expected relationship between the named independent variable and the named dependent variable in this demonstration.

(2)

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(b) Give **two** variables that the teacher controls in this demonstration.

(2)

1 ....

2 ....

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

Enzyme concentration in number of discs	Volume of oxygen produced in one minute in cm^3				
	Reading 1	Reading 2	Reading 3	Reading 4	Mean reading
5	1.2	1.5	0.0	1.5	
10	3.5	4.5	6.0	5.5	4.9
15	6.5	7.0	7.5	8.0	7.3
20	9.0	8.5	8.0	7.5	8.3
25	15.0	11.0	11.5	12.0	12.4

(i) Calculate the mean volume of oxygen produced in one minute using 5 potato discs.

(2)

mean reading = ... cm^3

(ii) Calculate the percentage increase in mean volume of oxygen produced in one minute as the concentration of enzyme changes from 15 to 20 discs.

(2)

percentage increase = ... %

(iii) Explain the relationship between the concentration of enzyme and mean volume of oxygen produced in one minute.

(2)

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(d) Suggest why the teacher measures the volume of oxygen after the first minute of the reaction rather than after 10 minutes.

(2)

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(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 70 MARKS

5. 4BI1_2B_que_20190608 Q: 3

Bags made from starch are better for the environment than plastic bags made from fossil fuels.

Bags made from starch are decomposed by microorganisms such as soil fungi.

(a) (i)   Which of these is a feature of fungi?

(1)

☒ **A**   chloroplasts in the cytoplasm

☒ **B**   starch stored in the cytoplasm

☒ **C**   thread-like hyphae

☒ **D**   walls made of cellulose

(ii) The soil fungi release an enzyme called amylase that digests the bag.

What is the product of this digestion?

(1)

☒ **A**   amino acids

☒ **B**   fatty acids

☒ **C**   glycerol

☒ **D**   maltose

(iii) Amylase is a protein.

Describe how protein is made in a cell.

(5)

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(b) A student investigates the effect of soil pH on the decomposition of bags made from starch.

She uses this method.

- cut two small squares from a bag

- measure the mass of each small square

- place one square in a beaker of soil with a pH of 7.0

- place the other square in a beaker of soil with a pH of 9.0

- after 10 days, remove the squares and measure their mass again

The table shows the student's results.

pH of soil	Mass of square in g		Percentage loss in mass (%)
	at start	after 10 days	
7.0	2.00	1.00	50.0
9.0	2.10	0.62	

(i) Calculate the percentage loss in mass shown by the square in pH 9.0 soil.

(1)

percentage = ...

(ii) Calculate the difference between the percentage loss in mass for the two squares.

(1)

difference = ...

(iii) Explain how the student could improve her method so that she can obtain more accurate results.

(4)

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(Total for Question 3 = 13 marks)

1.3 Nutrition

6. 4BI1_2BR_que_20220616 Q: 2

A student uses this method to measure the energy value of a sample of bread.

- measure the mass of a sample of bread

- put 20 cm^3 of water in a boiling tube

- place a thermometer in the boiling tube and record the initial temperature of the water

- place the sample of bread on a mounted needle

- light the bread sample in a Bunsen flame

- quickly move the burning bread sample and place it directly under the boiling tube

- if the bread stops burning, relight the bread in the Bunsen flame

- place it back under the boiling tube

- repeat until the bread does not burn

- record the final temperature of the water in the boiling tube

thermometer

boiling tube

20 cm^3 of water

burning bread

mounted needle
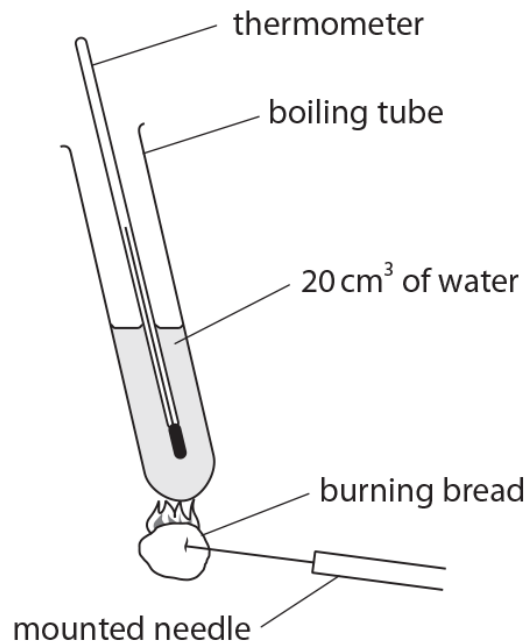
The student repeats the experiment 3 times.

The table shows some of the student's results.

Initial temperature of water in °C	Final temperature of water in °C	Increase in water temperature in °C	Energy released in J	Mass of bread sample in g	Energy released by 1 g of bread in J
20	33	13	1092	0.25	4368
20	34	14	1176	0.30	3920
21	36			0.20	

(a) To calculate the energy released from the burning bread the student uses this formula.

energy (in J) = mass of water (in g) $\times$ 4.2 $\times$ increase in temperature (in °C)

They then calculate the energy in joules released by 1 g of bread.

(i) Calculate the increase in water temperature for the third sample of bread.

(1)

temperature increase = ... °C

(ii) Calculate the energy released in joules by the third sample of bread.

[1 cm^3 of water has a mass of 1 g]

(1)

energy released = ... J

(iii) Calculate the energy released in joules by 1g of bread for the third sample of bread.

(1)

energy released by 1 g = ... J

(b) The energy value given on the packaging of the bread is 10 400 J for 1 g of bread.

Comment on why the student's method gives a different value.

(5)

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(c) Give two ways that the student could modify this apparatus to achieve an answer
nearer to the energy value given on the packaging of the bread.

(2)

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2 ....

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(Total for Question 2 = 10 marks)

7. 4BI1_2B_que_20211116 Q: 5

Obesity is caused when energy input is greater than energy output.

A student likes to eat potato crisps but is concerned about obesity.

The student has a choice of two different types of crisp to eat.

Describe an experiment the student could use to determine which type of crisp contains the least energy.

(6)

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(Total for Question 5 = 6 marks)

8. 4BI1_2B_que_20201119 Q: 4

A student investigates the effect of different colours of light on the rate of photosynthesis in a water plant.

This is the student's method.

● place a 1% sodium hydrogen carbonate solution in a boiling tube

● cut a 5 cm length of pondweed and place it in the tube

● place a lamp 10 cm from the tube containing the pondweed

● leave the pondweed for 10 minutes until it starts to produce bubbles from the cut end

● count the bubbles produced in one minute

● count the bubbles for two more one minute periods

The student repeats the experiment three more times using filters in front of the lamp that let through either red light, blue light or green light.
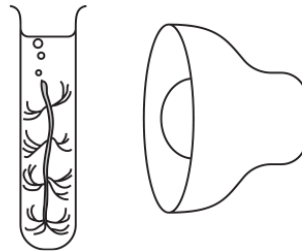
These are the student's results.

Colour of filter	Number of bubbles per minute			
	Test 1	Test 2	Test 3	Mean
no filter	47	84	80	
red	48	48	42	46
blue	55	56	50	54
green	9	8	10	9

(a) Write the balanced symbol equation for photosynthesis.

(2)

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(b) (i) Anomalous results are not included in the calculation of the mean.

Calculate the mean number of bubbles per minute for the lamp with no filter.

(2)

number = ... bubbles per minute

(ii) Explain the student's results.

(4)

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(iii) Give two abiotic variables that the student should control in her experiment.

(2)

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2 ....

(c) (i) Explain why measuring the rate of photosynthesis by counting bubbles may
         not be an accurate method to use.

(2)

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(ii) Suggest an alternative method that the student could use to measure the rate
      of photosynthesis in her experiment.

(2)

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(Total for Question 4 = 14 marks)

9. 4BI0_2B_que_20190115 Q: 4

A student investigates how the time taken to transfer burning food affects the calculation of its energy content.

He uses this apparatus to measure the energy content of popcorn.
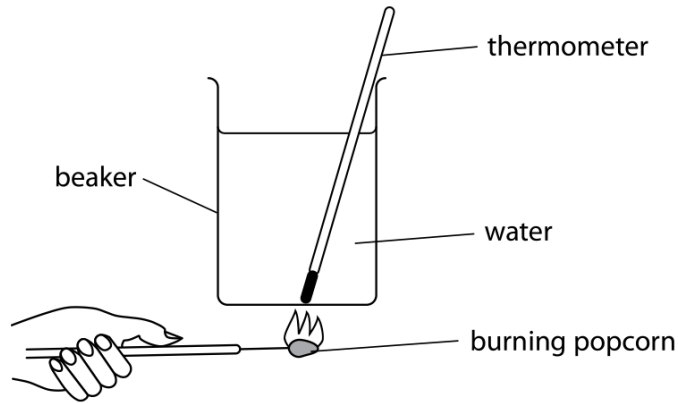
The student ignites the popcorn in a Bunsen burner flame and then transfers the burning popcorn to below the beaker of water.

For two samples, he transfers the burning popcorn quickly.

For another two samples, he transfers the burning popcorn slowly.

The table shows how the time taken to transfer the burning food affects the energy content calculated by the student.

Sample	Energy content in J per g	
	Quick transfer	**Slow transfer**
1	7255	4000
2	8400	5040

(a) (i) Give the dependent variable in this investigation.

(1)

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(ii) Explain how the student could improve the reliability of his results.

(2)

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(iii) Explain why the time taken to transfer the burning popcorn affects the energy content calculated by the student.

(2)

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(iv) Give two ways that the student could modify the apparatus to improve the accuracy of the energy content calculated.

(2)

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2 ....

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(b) The student uses this formula to calculate the energy content of the food in J per g.

$$\text{energy content} = \frac{\text{mass of} \underline{\hspace{3cm}} \text{ in g} \times \underline{\hspace{3cm}} \text{ rise in °C} \times 4.2}{\text{mass of} \underline{\hspace{3cm}} \text{ in g}}$$

The formula is incomplete.

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

(3)

(Total for Question 4 = 10 marks)

10. 4BI0_2B_que_20190115 Q: 6

Enzymes are molecules that enable chemical reactions to take place in cells.

(a) The table gives some information about different types of enzyme.

Complete the table by giving the missing information.

(4)

Type of enzyme	Example	Site of production	Optimum pH
amylase	salivary amylase		7.0
	pepsin		1.5
lipase	pancreatic lipase	pancreas	

(b) Explain why salivary amylase and pepsin have different optimum pH values.

(3)

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(Total for Question 6 = 7 marks)

TOTAL FOR PAPER = 60 MARKS

Appendix A

Answers

Question Number	Answer	Additional guidance	Mark
(a)	An explanation that makes reference to two of the following points: • (unspecialised cells) develop into specialised cells / cells with specific functions (1) • to produce tissues / organs / example of tissue or organ (1)	**Allow** examples of specific cell types e.g. muscle cells / bone cells	**2**

Question Number	Answer	Mark
(b) (i)	The only correct answer is D are found in some tissues and organs A is not correct as they can divide B is not correct as do not divide my meiosis C is not correct as cannot become all cell types	**1**

Question Number	Answer	Additional guidance	Mark
(b)(ii)	An explanation that makes reference to two of the following points:	**Allow** converse for adult cells for both MPs	
	• cells from embryos can make any cell type / many more cell types / adult stem cells can become fewer cell types (1)	**Allow** only stem cells that come from embryos are totipotent / eq	
	• ethical issues about the use of embryonic cells / eq (1)	**Allow** people object to killing embryos / embryos are potential human lives / eq **Allow** embryo cells can become tumours	**2**

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2. 4BI1_2B_rms_20220115 Q: 2

Question Number	Answer	Additional guidance	Mark
(a)	A description that makes reference to three of the following:		**3**
	• enzymes (1)		
	• (feed on) dead / decaying organisms (1)		
	• for <u>extracellular digestion</u> (1)		
	• absorb the digested food / nutrients (1)	**Accept** named nutrients **Accept** broken down food	

Question Number	Answer	Additional guidance	Mark
(b)(i)	A description that makes reference to one of the following: • judgement of cloudiness is subjective / is qualitative / not quantitative / cloudiness cannot be accurately measured / cannot be repeated by other people / eq (1)	**Accept** cloudiness is judged by eye **Accept** cannot see small differences / it is imprecise **Accept** cannot measure difference in cloudiness	**1**

Question Number	Answer	Additional guidance	Mark
(b)(ii)	An explanation that makes reference to two of: • less kinetic energy / lower collision frequency / not at optimal temperature for enzymes / eq (1) • less fungal growth / less mould / only slight fungal growth (1) • less respiration (1)	**Accept** fewer E-S complexes formed **Accept** microbes / bacteria for fungi **Accept** less decay / less spoilage / less digestion	**2**

Question Number	Answer	Additional guidance	Mark
(b)(iii)	An explanation that makes reference to two of: • enzymes denature (in acid / low pH / vinegar) (1) • active site shape changes / enzymes do not bind with substrate / eq (1) • fungal growth decreases (1)	 **Reject** enzymes denature due to **high temperature** **Accept** fungi killed / less spoilage / less decomposition / less respiration **Accept** bacteria / microbes for fungi	**2**

_____   compiled by examinent.com   _____

3. 4BI1_2B_rms_20220616 Q: 5

Question Number	Answer	Additional guidance	Mark
(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	**3**

		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.		

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

Question Number	Answer	Additional guidance	Mark
(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
(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) • <u>optimal pH</u> / <u>optimum pH</u> (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	Additional guidance	Mark
(c)	A description that makes reference to the following. • add biuret (reagent) / add biuret A and biuret B / sodium hydroxide & copper sulfate (1) • turns lilac / purple / pink / mauve / eq (1)	**Accept** correct, alternative tests e.g. ninhydrin test goes red / brown xanthoproteic test goes yellow	**2**

4. 4BI1_2B_rms_20210304 Q: 6

Question Number	Answer		Mark
(a)	An answer that makes reference to two of the following points: • increasing enzyme concentration increases the rate of oxygen production / eq (2) **one mark** for naming the enzyme concentration / number of potato discs as the independent variable <u>and </u>the oxygen production as the dependent variable (1)	**Allow** increasing catalase concentration / number of potato discs increases the amount of oxygen produced / eq (2) **Max one** for correct relationship but variables named wrongly e.g. increasing potato disc number (dependent variable) increases the volume of oxygen produced (independent variable)	**2**

Question Number	Answer	Mark
(b)	An answer that makes reference to two of the following points: • pH / volume of buffer (1) • volume of hydrogen peroxide / substrate (1) • time / duration of reaction (1) • size / volume / mass / shape / surface area of each disc (1) • temperature (1)	**2**

Question Number	Answer	Additional guidance	Mark
(c) (i)	• 4.2 ÷ 3 • 1.4 (2)	Allow **one mark** for mean using all values e.g. 4.2 ÷ 4 = 1.05 or 1.1 or 1.0	**2**

Question Number	Answer	Additional guidance	Mark
(c) (ii)	• 8.3 - 7.3 ÷ 7.3 x 100 • = 13.7 (2)	**Allow one mark** for 1(.0) or (8.3 – 7.3) **Allow one mark** for ÷ by 7.3 **Allow one mark** for 0.137 **Allow** 13.6986 / 14 for 2 marks **Allow one mark** for 13.69	**2**

Question Number	Answer	Additional guidance	Mark
(c) (iii)	An explanation that makes reference to two of the following points: • increasing enzyme concentration /number of discs increases volume of oxygen produced (1) • more active sites (1) • (increase in enzyme concentration) means more collisions / more enzyme substrate complexes / more enzymes combine with substrates / eq (1)		**2**

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5. 4BI1_2B_rms_20190608 Q: 3

Question Number	Answer	Mark
(a)(i)	The only correct answer is C thread-like hyphae *A is incorrect because fungi lack chloroplasts* *B is incorrect because fungi do not store starch* *D is incorrect because fungi walls are made of chitin*	**1**

Question Number	Answer	Mark
(a)(ii)	The only correct answer is D maltose *A is incorrect because amino acids are products of protease digestion* *B is incorrect because fatty acids are products of lipase digestion* *C is incorrect because glycerol is a product of lipase digestion*	**1**

Question Number	Answer	Mark
(a)(iii)	A description that makes reference to five of the following points: • <u>transcription</u> / <u>transcripts</u> / <u>transcribes</u> (1) • mRNA/messenger RNA **and** leaves <u>nucleus</u> / mRNA/messenger RNA **and** enters <u>cytoplasm</u> (1) • ribosomes (1) • tRNA/transfer RNA (brings) attached amino acids (1) • codons / anticodons / complementary bases (1) • <u>translation</u> / <u>translated</u> / <u>translates</u> / amino acid chain / polypeptide chain (1)	**5**

Question Number	Answer	Mark
(b)(i)	70.475 to 70.5	**1**

Question Number	Answer	Additional guidance	Mark
(b)(ii)	(70.5 − 50 =) 20.5	Allow (answer from 3(b)(i) − 50) eg: 70.4 − 50 = 20.4	**1**

Question Number	Answer	Additional guidance	Mark
(b)(iii)	An answer that makes reference to four of the following points: • same surface area / mass / thickness / area / size (1) • remove soil from square (before weighing) (1) • control <u>temperature</u> / oxygen / moisture / water (1) • (soil) same mass / same amount / same volume / same type / same soil / decomposers / bacteria / fungi (1) • repeat / use more squares / obtain average / remove anomalies (1) • increase range of pH / use different pHs / more pHs (1)	Ignore more time Mp3 Ignore light / carbon dioxide Mp4 Ignore sterile soil	**4**

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