Cambridge Assessment International Education

Specimen Paper Answers
Paper 4: Alternative to Practical

Cambridge O Level Biology

5090

For examination from 2023

Version 1

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Introduction

The main aim of this booklet is to exemplify standards for those teaching Cambridge O Level Biology 5090, and to show examples of very good answers.

In this booklet, we have provided answers for all questions with examiner comments. These exercises require candidates to answer questions on experimental skills and candidates are awarded maximum of 40 marks for this paper and the mark scheme provides the answers required to gain the marks.

Each question and answer is followed by an examiner comment on the candidate's answer. Additionally, the examiner has set out a number of common mistakes that occur when candidates answer the questions. In this way, it is possible to understand what candidates have done to gain their marks and how they could improve their answers and avoid errors.

The mark schemes for the Specimen Papers are available to download from the School Support Hub at **www.cambridgeinternational.org./support**

2023 Specimen Paper 4 Mark Scheme

Past exam resources and other teaching and learning resources are available on the School Support Hub www.cambridgeinternational.org/support

Assessment at a glance

The syllabus for Cambridge O Level Biology 5090 is available at www.cambridgeinternational.org

All candidates take three papers. Candidates will be eligible for grades A* to E.

Paper 1: Multiple Choice		And	Paper 2: Theory	
1 hour			1 hour 45 minutes	
40 Marks	30%		80 Marks	50%
40 four-option multiple-choice questions			Short-answer and structured questions	
Externally assessed			Externally assessed	

Practical assessment

Paper 3: Practical Test		Or	Paper 4: Alternative to Practical	
1 hour 30 minutes			1 hour	
40 Marks	20%		40 Marks	20%
Questions will be based on the experimental skills in Section 4			Questions will be based on the experimental skills in Section 4	
Externally assessed			Externally assessed	

Question 1

Question 1(a)

1 Glucose is a reducing sugar. Benedict's solution is used to test for the presence of a reducing sugar.

(a) Describe how you would use Benedict's solution to test for a reducing sugar in some fruit juice.

Include a suitable safety precaution in your answer.

Take some fruit juice and add an equal volume of Benedict's solution. ✓ Place the test-tube containing the mixture in a hot water bath ✓ to heat it safely. ✓

[3]

Mark awarded = 3 out of 3

Examiner comment

Three marks scored. The first for adding Benedict's solution to the fruit juice. The second for heating the mixture and the third for use of a safety feature as asked for – a water-bath.

Common mistakes

Omitting heating

Question 1(b)(i)

Some students were given a 1.0% solution of glucose and some distilled water.
They diluted the glucose solution to produce five solutions of different concentrations.

The students tested each of the solutions they had prepared with Benedict's solution.
The concentrations of the solutions and the results of their tests are shown in Table 1.1.

Table 1.1

glucose solution concentration (%)	result of Benedict's test
0.0 (distilled water)	*Blue* ✓
0.1	slightly green
0.2	green
0.3	yellow
0.4	orange
0.5	red

(b) (i) The students also decided to test the distilled water with Benedict's solution.

Write the result of this test in Table 1.1. [1]

Mark awarded = 1 out of 1

Examiner comment

The candidate is correct.

Common mistakes

As a result is asked for, answers such as 'no change' or 'negative' are not acceptable.

Question 1(b)(ii)

(ii) Explain why the students tested the distilled water.

To see the colour produced by Benedict's when no glucose was present. ✓

..... [1]

Mark awarded = 1 out of 1

Examiner comment

The candidate is correct.

Common mistakes

'As a control' or 'to show that the water contains no glucose' are insufficient answers to gain the mark.

Question 1(c)

(c) The students compared the colour of their solutions after the same length of time.

State **three other** variables that the students should have controlled to make their results comparable.

1 *same volume of glucose solution in each test-tube ✓*

2 *same volume of Benedict's solution added to each test-tube ✓*

3 *all test-tubes heated to same temperature ✓*

[3]

Mark awarded = 3 out of 3

Examiner comment

The candidate is correct.

Question 1(d)(i)

The students were then provided with a glucose solution **X** of unknown concentration. They repeated the Benedict's test in exactly the same way. They decided that the result was a yellowish-orange colour.

(d) (i) Using the results in Table 1.1, suggest what you can conclude about the % concentration of glucose in solution **X**. Explain how you reached this conclusion.

conclusion *0.35% ✓*

explanation *...the colour of X is between the colours produced by 0.3% and 0.4%.✓*

[2]

Mark awarded = 2 out of 2

Examiner comment

Two marks scored. The first for a value between 0.3% and 0.4% and the second for observing the colour was intermediate to the colours of 0.3% and 0.4%.

Question 1(d)(ii)

(ii) The students found it difficult to decide the exact colour of solution **X** after testing it with Benedict's solution.

Suggest a reason for this difficulty and a method which could be used to improve their confidence in deciding the colour.

difficulty *Actually describing colours is difficult, specially when there is not much difference between them.* ✓

improvement *using a colour chart of known concentrations to compare the results with.* ✓

[2]

Mark awarded = 2 out of 2

Examiner comment

Two marks scored. The first for identifying a genuine difficulty and the second for providing a valid means of overcoming the difficulty.

Another difficulty that could be identified is that different people see the same colour differently. This could be overcome by the same person recording all the colours.

Question 1(e)

(e) Describe how the students could use a 1.0% glucose solution to produce 5 cm^3 of a 0.5% glucose solution.

They should take 2.5cm^3 of the 1.0% glucose solution ✓ *and add 2.5cm^3 of water.* ✓

[2]

Mark awarded = 2 out of 2

Examiner comment

Two marks scored. The first for using 2.5cm^3 of 1.0% glucose solution and the second for diluting it with the same volume of water (to give 5cm^3 of 0.5% glucose solution).

Also scoring both marks would be equal volumes of 1.0% glucose solution and water being mixed and a 5cm^3 sample of the resulting 0.5% glucose solution being taken.

Question 1(f)

(f) After the students had tested the glucose solutions with the Benedict's solution, they noticed that a solid had collected at the bottom of the test-tubes.

They decided that finding the mass of any solid formed was another way of measuring the concentration of glucose in the solution.

Suggest how the students could separate any solid from a solution and obtain its mass.

The solution should be filtered through filter paper and the solid collected. ✓ This should then be dried and its mass measured. ✓

[2]

Mark awarded = 2 out of 2

Examiner comment

Two marks scored. The first for a good technique for collecting the solid and the second for drying it and measuring its mass.

Common mistakes

Not drying the solid which means that the mass measured also includes water.

Total mark awarded = 16 out of 16

Question 2

Question 2(a)

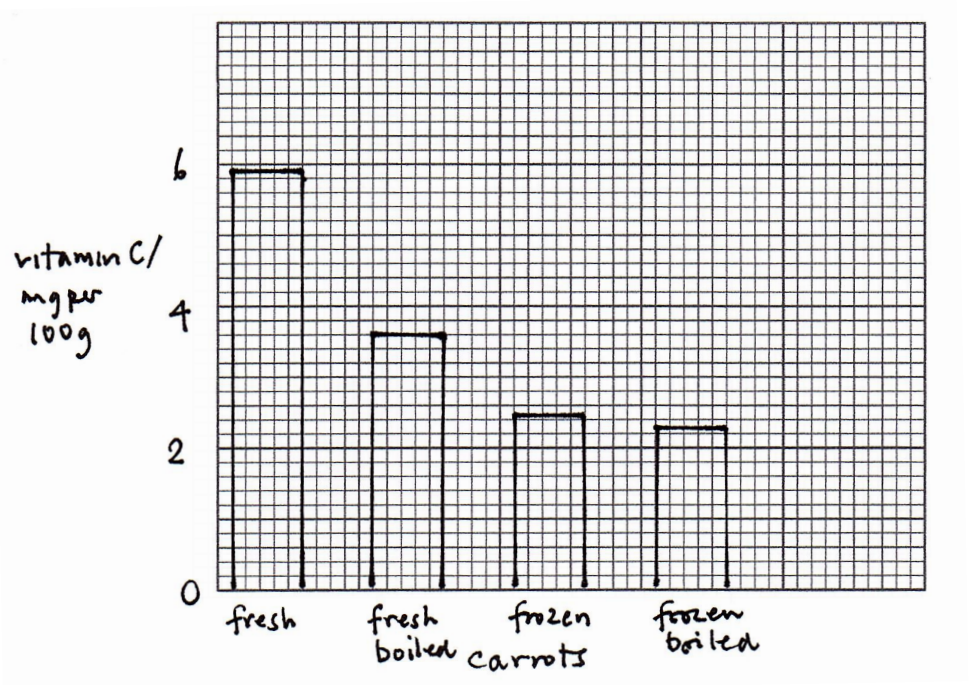
2 Carrots are a food containing vitamin C. They can be frozen to be preserved and stored.

Some students measured the vitamin C content of fresh and frozen carrots. They then boiled the carrots in water and measured the vitamin C content again. Their results are shown in Table 2.1.

Table 2.1

carrots	vitamin C / mg per 100 g
fresh	5.9
fresh, boiled	3.6
frozen	2.5
frozen, boiled	2.3

(a) Construct a bar chart of the data in Table 2.1 on the grid.



[4]

Mark awarded = 4 out of 4

Examiner comment

Four marks scored. The first for the axes being fully labelled with the physical quantity and also with the appropriate unit on the y axis. The second for the scale for vitamin C content being linear, including a value at the origin and using over half of the grid. The third for the data values being correctly plotted and the fourth for the bars being ruled, narrow, of equal width and not touching.

Vitamin C content would be acceptable on x axis with horizontal bars drawn.

Common mistakes

- Not fully labelling the axes e.g. omitting carrots
- Bars touching
- Omitting the value at the origin of the vitamin C/mg per 100g axis.

Question 2(b)(i)

(b) (i) State which boiled carrots contained the most vitamin C.

Fresh ✓ [1]

Mark awarded = 1 out of 1

Examiner comment

The candidate is correct.

Question 2(b)(ii)

(ii) Suggest **two** conclusions the students could reach from these results.

1 boiling reduces vitamin C content ✓

2 freezing reduces vitamin C content ✓

[2]

Mark awarded = 2 out of 2

Examiner comment

Both marks scored for interpreting the data given. Answers e.g. fresh carrots contain more vitamin C than boiled or frozen carrots would score both marks as well.

Question 2(c)

(c) Carrots can be cooked by heating them in an oven or by boiling them in water.

You want to investigate the effect of these two cooking methods on the vitamin C content of the cooked carrots.

Describe how you would do this investigation.

There is a simple test that can be used to measure vitamin C content. You do not need to know this test. Refer to **the vitamin C test** in your answer.

I would do the vitamin C test on some fresh carrot to measure its content. ✓ I would then take two samples of the same mass ✓ from that carrot. ✓ One sample I would boil in water at 100°C and the other sample I would cook in an oven ✓ at the same temperature. ✓ I would then carry out the vitamin C test on both samples and determine their vitamin C contents and compare them. ✓

[6]

Mark awarded = 6 out of 6

Examiner comment

Six marks scored. The first for measuring the vitamin C content of a fresh carrot. The second for taking samples from the same carrot. The third for ensuring those samples were of the same mass. The fourth for using both cooking methods under investigation. The fifth for using the same temperature in both and the sixth for re-testing both samples for their vitamin C content after cooking.

Cooking the samples for the same length of time and repeating the whole procedure to see if similar results were obtained would also score marks, but there are only 6 marks available here.

Total mark awarded = 13 out of 13

Question 3

Question 3(a)

3 The potato is a plant that can store starch grains in its cells. Fig. 3.1 shows some of these starch grains as seen under a microscope.

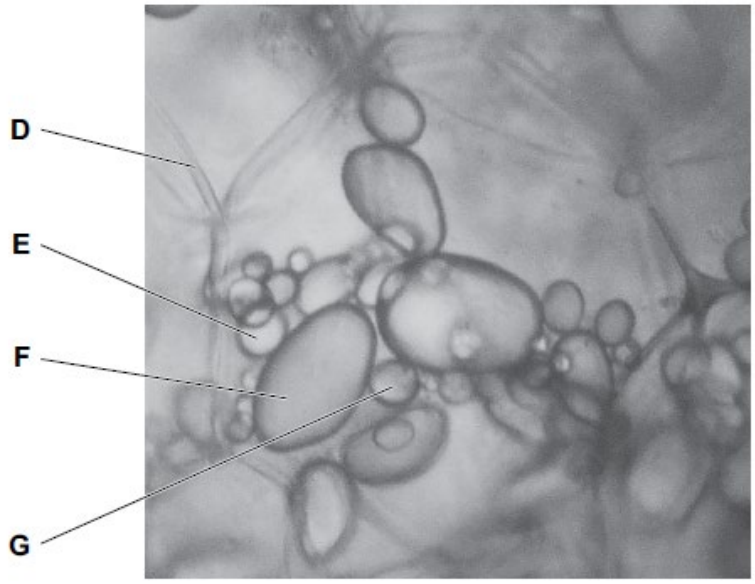


Fig. 3.1

(a) Identify the structure labelled **D**.

Cell wall ✓ [1]

Mark awarded = 1 out of 1

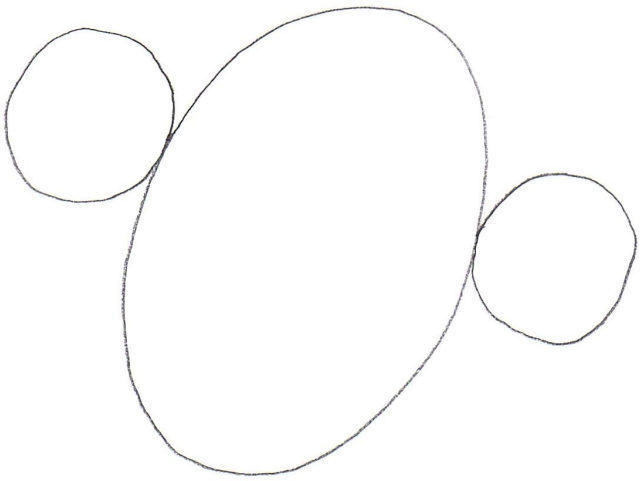
Examiner comment

The candidate is correct.

Question 3(b)

(b) Draw the starch grains labelled **E**, **F** and **G** as they appear in Fig. 3.1.

Grain **F** should be at least 60 mm long.



[3]

Mark awarded = 3 out of 3

Examiner comment

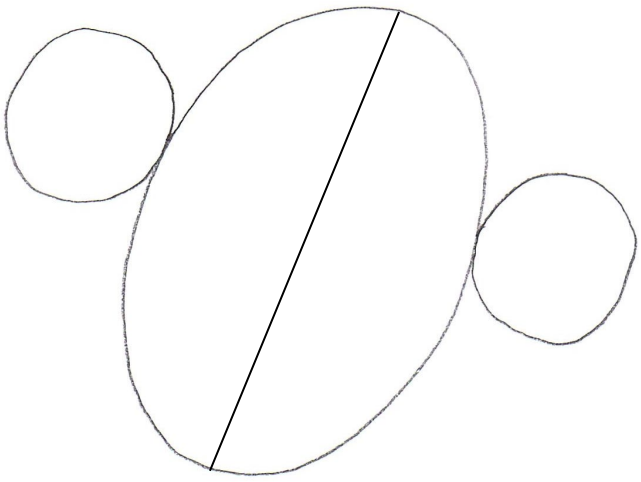
Three marks scored. The first for the outline of grain F being cleanly drawn, with a continuous line with no overlapping at 'joins', and with no shading anywhere. The second for grain F being more than 60mm long as asked for and the three grains touching 'as they appear in Fig. 3.1'. The third for the positioning of the three cells and their proportions being shown well.

As the outlines of the grains in Fig. 3.2 are thick, double lines may be drawn. Only the outer line would be assessed.

Common mistakes

- Making three separate drawings of the grains and so not drawing them 'as they appear in Fig. 3.1'
- Drawing of grain F being less than 60mm long.

Question 3(c)(i)



(c) (i) On your drawing, draw a line to indicate the maximum length of grain **F**.

Measure this length and record it.

.....65 ✓mm [2]

Mark awarded = 2 out of 2

Examiner comment

Two marks scored. The first for a correctly drawn line and the second for an accurate measurement.

Common mistakes

- Drawing and then measuring a line longer than the actual drawn grain F
- Confusing 'length' and 'width'

Question 3(c)(ii)

(ii) The actual length of grain **F** is 0.03 mm. Calculate the magnification of your drawing to the nearest whole number.

Space for working

65/0.03 = 2166.67 ✓

magnification × .....2167 ✓..... [2]

Mark awarded = 2 out of 2

Examiner comment

Two marks scored. The first for the use of the correct expression i.e. measurement in 3(c)(i) divided by the given actual measurement, 0.03. The second for the resulting magnification being correctly expressed to the nearest whole number, as asked for, and with no units.

Common mistakes

0.03/65

Question 3(d)

(d) Describe how to prepare a slide of potato tissue to observe starch grains as clearly as possible under a microscope.

Scrape some potato tissue on to a microscope slide. ✓ Add iodine solution ✓ to stain ✓ the starch grains. Put a cover slip on, avoiding air bubbles forming. Then place the slide on the stage of the microscope and observe it under low power.

[3]

Mark awarded = 3 out of 3

Examiner comment

Three marks scored. The first for a description of how the starch grains would be obtained and used. The second for use of a stain and the third for the naming of a suitable stain.

Use of a cover slip and preventing/removing air bubbles would also score here, but there are only three marks available.

Total mark awarded = 11 out of 11

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