



# Cambridge IGCSE™

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CO-ORDINATED SCIENCES

0654/63

Paper 6 Alternative to Practical

May/June 2022

MARK SCHEME

Maximum Mark: 60

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**Published**

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2022 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

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This document consists of **11** printed pages.

**Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

**GENERIC MARKING PRINCIPLE 1:**

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

**GENERIC MARKING PRINCIPLE 2:**

Marks awarded are always **whole marks** (not half marks, or other fractions).

**GENERIC MARKING PRINCIPLE 3:**

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

**GENERIC MARKING PRINCIPLE 4:**

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

**GENERIC MARKING PRINCIPLE 5:**

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

**GENERIC MARKING PRINCIPLE 6:**

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

**Science-Specific Marking Principles**

- 1 Examiners should consider the context and scientific use of any keywords when awarding marks. Although keywords may be present, marks should not be awarded if the keywords are used incorrectly.
- 2 The examiner should not choose between contradictory statements given in the same question part, and credit should not be awarded for any correct statement that is contradicted within the same question part. Wrong science that is irrelevant to the question should be ignored.
- 3 Although spellings do not have to be correct, spellings of syllabus terms must allow for clear and unambiguous separation from other syllabus terms with which they may be confused (e.g. ethane / ethene, glucagon / glycogen, refraction / reflection).
- 4 The error carried forward (ecf) principle should be applied, where appropriate. If an incorrect answer is subsequently used in a scientifically correct way, the candidate should be awarded these subsequent marking points. Further guidance will be included in the mark scheme where necessary and any exceptions to this general principle will be noted.
- 5 'List rule' guidance  
For questions that require *n* responses (e.g. State **two** reasons ...):
  - The response should be read as continuous prose, even when numbered answer spaces are provided.
  - Any response marked *ignore* in the mark scheme should not count towards *n*.
  - Incorrect responses should not be awarded credit but will still count towards *n*.
  - Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should **not** be awarded for any responses that are contradicted within the rest of the response. Where two responses contradict one another, this should be treated as a single incorrect response.
  - Non-contradictory responses after the first *n* responses may be ignored even if they include incorrect science.

**6** Calculation specific guidance

Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'.

For questions in which the number of significant figures required is not stated, credit should be awarded for correct answers when rounded by the examiner to the number of significant figures given in the mark scheme. This may not apply to measured values.

For answers given in standard form (e.g.  $a \times 10^n$ ) in which the convention of restricting the value of the coefficient ( $a$ ) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme.

Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

**7** Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

Question	Answer	Marks
1(a)	syringe ;	1
1(b)	goggles to protect eyes / goggle to stop burns ; gloves to protect hands / gloves to stop burns ;  <b>max 1</b>	1
1(c)	18.0;	1
1(d)(i)	axes right way round and labelled with units; suitable linear scale points covering at least half the grid; plots correct $\pm \frac{1}{2}$ small square;	3
1(d)(ii)	curve from their origin and of best-fit ;	1
1(d)(iii)	as time increases volume increases ;  until volume becomes constant / no more gas given off ;	2
1(d)(iv)	hydrogen peroxide used up ;	1
1(e)	volume / concentration of peroxide ; volume of celery puree / catalase ; temperature ; pH ; batch / type of celery (puree) ;  <b>max 1</b>	1
1(f)	identifies anomalies ;	1
1(g)	glowing (splint) ; relights ;	2

Question	Answer				Marks
2(a)	food sample	Benedict's	biuret	iodine solution	3
	celery	orange / red / yellow / green	blue	brown / yellow / orange	
	potato	blue	blue	blue-black	
2(b)	celery contains reducing sugar; potato contains starch; neither contain protein;				3

Question	Answer	Marks
3(a)(i)	red yellow / <b>light</b> orange / yellow green pale green orange dark green / dark greeny blue / green blue orange / yellow purple ;;	2

Question	Answer	Marks														
3(a)(ii)	<table border="1"> <tr> <td data-bbox="349 213 1137 277">acid</td> <td data-bbox="1137 213 1921 277">strong</td> </tr> <tr> <td data-bbox="349 277 1137 341">acid</td> <td data-bbox="1137 277 1921 341">weak</td> </tr> <tr> <td data-bbox="349 341 1137 405">neutral</td> <td data-bbox="1137 341 1921 405">-</td> </tr> <tr> <td data-bbox="349 405 1137 469">acid</td> <td data-bbox="1137 405 1921 469">strong/intermediate/medium</td> </tr> <tr> <td data-bbox="349 469 1137 533">alkali</td> <td data-bbox="1137 469 1921 533">weak</td> </tr> <tr> <td data-bbox="349 533 1137 596">acid</td> <td data-bbox="1137 533 1921 596">weak/intermediate</td> </tr> <tr> <td data-bbox="349 596 1137 660">alkali</td> <td data-bbox="1137 596 1921 660">strong</td> </tr> </table>	acid	strong	acid	weak	neutral	-	acid	strong/intermediate/medium	alkali	weak	acid	weak/intermediate	alkali	strong	<b>2</b>
acid	strong															
acid	weak															
neutral	-															
acid	strong/intermediate/medium															
alkali	weak															
acid	weak/intermediate															
alkali	strong															
3(a)(iii)	orange juice is yellow / orange / colour masks colour of indicator ;	<b>1</b>														
3(a)(iv)	soap solution and doesn't burn skin / pH 9 / weak alkali ;	<b>1</b>														
3(b)(i)	both times in the correct place any format ; 145 ; 29 ;	<b>3</b>														
3(b)(ii)	dilute hydrochloric acid lemon juice vinegar orange juice salt solution, soap solution, sodium hydroxide solution ;	<b>1</b>														
3(c)	as pH increases the rate of reaction decreases ora ;  pH of 7 and above do not react ;	<b>2</b>														
3(d)	limewater <b>and</b> white ppt ;	<b>1</b>														

Question	Answer	Marks
4	<p><b>One mark from each section and any two others.</b></p> <p><b>apparatus</b> Bunsen burner / spirit burner ; balance ; measuring cylinder ;</p> <p><b>method</b> heat water to dryness ;</p> <p>repeat ; <b>goggles</b> protect <b>eye</b> from <b>acid / burns / hot water spitting</b></p>	7

Question	Answer	Marks
4	<p><b>measurements</b>  <u>mass</u> of empty container / water and container before heating ;  <u>mass</u> of solid after heating ;</p> <p><b>control</b>            volume / mass of solution used ;</p> <p><b>conclusion</b>            calculate average to identify / exclude anomalies ;            subtraction of masses ;            most mass left has most dissolved ;</p> <p><b>OR</b></p> <p><b>apparatus</b>            measuring cylinder / gas syringe ;            gas collection with apparatus to collect gas ;</p> <p><b>method</b>            add acid and collect gas given off ;            repeat each solution ;</p> <p><b>goggles</b> protect <b>eye</b> from <b>acid / burns</b></p> <p><b>measurements</b>  <u>volume</u> of gas given off ;</p> <p><b>control</b>            volume / mass of solution used ;            excess acid ;</p> <p><b>conclusion</b>            calculate average to identify / exclude anomalies ;            most CO<sub>2</sub> given off has most dissolved solid ;</p>	

Question	Answer	Marks
5(a)(i)	8.0 ;	1
5(a)(ii)	$40(.0) / (a)(i) \times 5$ ;	1
5(b)(i)	25.4333; 3 sf ;	2
5(b)(ii)	1.27(s) ;	1
5(b)(iii)	1.61 ;	1
5(c)(i)	40.25 ;	1
5(c)(ii)	10% of 40 is 4 / 10% of 40.3 is 4.03 <b>and</b> yes within 10% ;	1
5(d)	disagree <u>and</u> doubling / does not double $T$ ;	1
5(e)	to avoid parallax / line-of-sight errors ;	1

Question	Answer	Marks
6(a)	24.0 ;	1
6(b)(i)	correct $d$ values recorded (10) 20, 40, 60, 80, 100 ;	1
6(b)(ii)	mm and °C ;	1
6(b)(iii)	allow thermometer to cool down / reach steady reading / to get to minimum temperature ;	1
6(c)(i)	as $d$ increases, $\theta$ decreases ;	1
6(c)(ii)	decrease in temperature = $82-49 / 33$ ; $33/90 = 0.37$ ;	2

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
6(d)	24(°C) / room temperature ;	<b>1</b>
6(e)	3.5(°C) ;	<b>1</b>
6(f)	don't touch / gloves <b>and</b> hot lamp / burn skin / hand ;	<b>1</b>