

Cambridge IGCSE™

CO-ORDINATED SCIENCES**0654/62**

Paper 6 Alternative to Practical

February/March 2024

MARK SCHEME

Maximum Mark: 60

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 February/March 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

This document consists of **9** printed pages.

PUBLISHED**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 descriptions 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)(i)	17.5 ; 20.0 ;	2
1(a)(ii)	6.5 ; 2.5 ;	2
1(b)	syringe;	1
1(c)	wear goggles to protect eyes from burns / gloves to protect hands / skin from burns ;	1
1(d)(i)	hydrogen peroxide gets used up AW ;	1
1(d)(ii)	yes and explanation using 2 pieces of data from table ;	1
1(e)	less gas collected / volume lower / results are lower ; use divided flask/boiling tube / use of ignition tube / tube on string ;	2
1(f)	identify / exclude anomalies ;	1
1(g)	glowing splint ; relights ;	2

Question	Answer	Marks
2	<p>one mark from each section and any two others</p> <p>Apparatus measuring cylinder / syringe or balance and its use ; ruler and its use;</p> <p>method growing medium, rice and each of the 3 fertilisers and leave for fixed time ;</p> <p>measurements mass/volume of fertiliser ; height of plants ;</p> <p>lots of seedlings / at least 3 seedlings ;</p> <p>variables constant same volume / concentration/mass of fertiliser ; same height of seedling at the start ; same pH / light / temperature / humidity ; stated time left to grow ; same amount of soil ; same amount of water ;</p> <p>processing and conclusion repeat / many seedlings and calculate average to identify / eliminate anomalies;</p> <p>calculate growth rate: amount grown / time / change in height/time ;</p> <p>bar chart of fertiliser against height of crop in same time / 3 graphs of time against height and gradients compared</p> <p>greatest height after fixed time (specified here or very clear) / highest bar on chart is best fertiliser ;</p>	7

Question	Answer	Marks
3(a)	to distribute (reagents) equally;	1
3(b)	7.8; 70.1 ;	2
3(c)(i)	12.82051282 and 1.426533524 ; 13 and 1.4 ;	2
3(c)(ii)	to get time without a catalyst so can compare the other solution / catalyst / ions to it ;	1
3(c)(iii)	iron(II) copper zinc sodium ;	1
3(d)	a 10% calculation; use of the 10% calculation to show that it is not a catalyst ; or a 110% or 90% calculation ; use of value to show that it is not a catalyst ; or ratio as percentage ; use value to show that it is not a catalyst ; e.g. 10 % of 75.2 = 7.52 75.2 – 7.52 = 67.68 / 73.4 + 7.52 = 80.92 and within 10% so not a catalyst ; OR 10% of 73.4 = 7.34 ; 73.4 + 7.34 = 80.74 / 75.2 – 7.34 = 67.86 and within 10% so not a catalyst ;	2
3(e)(i)	too fast to measure / instantaneous ;	1
3(e)(ii)	times will be smaller ;	1

Question	Answer	Marks															
3(e)(iii)	forgets to add copper ions / adds distilled water/zinc ions /sodium ions instead of copper ;	1															
4(a)	<table border="1"> <tr> <td>test</td> <td>copper(II) salt</td> <td>zinc salt ;</td> </tr> <tr> <td>aq ammonia few drops</td> <td>(pale) blue ppt</td> <td>white precipitate</td> </tr> <tr> <td>aq ammonia excess</td> <td>and dark blue solution ;</td> <td>and ppt dissolves / colourless solution ;</td> </tr> <tr> <td>nitric acid and barium nitrate</td> <td>no reaction and</td> <td>white precipitate and</td> </tr> <tr> <td>nitric acid and silver nitrate</td> <td>...white precipitate ;</td> <td>.... no reaction ;</td> </tr> </table>	test	copper(II) salt	zinc salt ;	aq ammonia few drops	(pale) blue ppt	white precipitate	aq ammonia excess	and dark blue solution ;	and ppt dissolves / colourless solution ;	nitric acid and barium nitrate	no reaction and	white precipitate and	nitric acid and silver nitrate	...white precipitate ; no reaction ;	5
test	copper(II) salt	zinc salt ;															
aq ammonia few drops	(pale) blue ppt	white precipitate															
aq ammonia excess	and dark blue solution ;	and ppt dissolves / colourless solution ;															
nitric acid and barium nitrate	no reaction and	white precipitate and															
nitric acid and silver nitrate	...white precipitate ; no reaction ;															
4(b)(i)	chloride ;	1															
4(b)(ii)	sulfate ;	1															
4(c)	colour can be seen easily ;	1															

Question	Answer	Marks
5(a)(i)	12.0 (cm) ;	1
5(a)(ii)	60.0 (cm) ;	1
5(b)(i)	3.0 ;	1
5(b)(ii)	image drawn inverted ; image drawn enlarged ;	2
5(c)	(as U increases) V and m both decrease ;	1

Question	Answer	Marks
5(d)(i)	axes labelled with quantity and units ; suitable linear scales and plotted points cover $\geq \frac{1}{2}$ the grid ; 5 points plotted correctly $\pm \frac{1}{2}$ small square ;	3
5(d)(ii)	best-fit line ;	1
5(e)	indication on graph of how data were obtained $\geq \frac{1}{2}$ the line between the plotted points used ; gradient calculated correctly (expect 15 ± 1) ;	2
5(f)	(easier to see as) the image has a sharp edge ;	1

Question	Answer	Marks
6(a)(i)	set-square drawn perpendicular to the bottom of the spring and lined up with the rule ;	1
6(a)(ii)	read scale at right angles/eye-level / place ruler close to spring ;	1
6(b)	46.4 (cm) ;	1
6(c)(i)	repeat to reduce effect of (random) errors ;	1
6(c)(ii)	No and doubling m does not double r with an example / ratio of r/m or m/r is not constant with 2 calculations ;	1
6(d)	150 g \pm 20 (g) / relevant calculation ;	1
6(e)	any one from wear goggles to protect eyes in case spring falls / breaks / comes loose / flies off ; place mass on base of stand to prevent it toppling to protect hitting feet / hands / eyes; steel cap / closed shoes to protect feet from loads falling ;	1