Cambridge Assessment International Education

Cambridge IGCSE™

CO-ORDINATED SCIENCES **0654/53**

Paper 5 Practical Test **May/June 2022**

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 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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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.

Examples of how to apply the list rule
State **three** reasons…. [3]

A

1	Correct	✓	**2**
2	Correct	✓	
3	Wrong	×	

B
(4 responses)

1	Correct, Correct	✓, ✓	**3**
2	Correct	✓	
3	Wrong	ignore	

C
(4 responses)

1	Correct	✓	**2**
2	Correct, Wrong	✓, ×	
3	Correct	ignore	

D
(4 responses)

1	Correct	✓	**2**
2	Correct, CON (of 2.)	×, (discount 2)	
3	Correct	✓	

E
(4 responses)

1	Correct	✓	**3**
2	Correct	✓	
3	Correct, Wrong	✓	

F
(4 responses)

1	Correct	✓	**2**
2	Correct	✓	
3	Correct CON (of 3.)	× (discount 3)	

G
(5 responses)

1	Correct	✓	**3**
2	Correct	✓	
3	Correct Correct CON (of 4.)	✓ ignore ignore	

H
(4 responses)

1	Correct	✓	**2**
2	Correct	×	
3	CON (of 2.) Correct	(discount 2) ✓	

I
(4 responses)

1	Correct	✓	**2**
2	Correct	×	
3	Correct CON (of 2.)	✓ (discount 2)	

Question	Answer	Marks
1(a)	result for $t = 0$; full set of results; increasing volume down the table ;	**3**
1(b)	loss of gas ; put bung back on more quickly / thistle funnel / tube in boiling tube ; OR non mixing of reagents ; stir ;	**2**
1(c)(i)	axes right way round and labelled with quantity and units; suitable linear scale and plots cover at least half the grid (starting at 0,0) ; plots correct ± half small square;	**3**
1(c)(ii)	curve from their origin and of best-fit ;	**1**
1(c)(iii)	as time increases the volume increases; becomes slower / levels off ;	**2**
1(c)(iv)	hydrogen peroxide (almost) used up ;	**1**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(a)(i)</td><td>
<table>
<tr><td>food sample</td><td>final colour observed with biuret solution</td><td>final colour observed with iodine solution</td></tr>
<tr><td>celery</td><td>blue</td><td>brown / orange / yellow</td></tr>
<tr><td>potato</td><td>blue</td><td>blue-black</td></tr>
</table>
;;;;</td><td>4</td></tr>
<tr><td>2(a)(ii)</td><td>none and
does not contain protein and starch;

contains starch and
potato does not contain protein;</td><td>2</td></tr>
<tr><td>2(b)(i)</td><td>ethanol and water;</td><td>1</td></tr>
<tr><td>2(b)(ii)</td><td>white emulsion;</td><td>1</td></tr>
</table>

Question	Answer	Marks
3(a)(i)	colour for all solutions ; all colours different ;	**2**
3(a)(ii)	all pH recorded ; all pH different ;	**2**

Question	Answer	Marks
3(a)(iii)	<table><tr><td>acid</td><td>strong</td></tr><tr><td>acid</td><td>weak</td></tr><tr><td>neutral</td><td></td></tr><tr><td>alkali</td><td>weak</td></tr><tr><td>acid</td><td>weak / intermediate / medium</td></tr><tr><td>alkali</td><td>strong</td></tr></table>	**2**
3(b)(i)	time / no reaction for all ; dilute HC*l* fastest and no reaction for dilute salt solution, limewater and soap solution ; HC*l* < vinegar ;	**3**
3(b)(ii)	hydrochloric acid vinegar orange juice salt solution, soap solution, limewater ;	**1**
3(c)	as pH increases the rate of reaction decreases ; pH of 7 and above do not react ;	**2**
3(d)	limewater and white ppt ;	**1**

Question	Answer	Marks
4	**One mark from each section and any two others.** **apparatus** Bunsen burner / spirit burner ; balance ; measuring cylinder ; **method** heat water to dryness ; repeat ; **goggles** protect **eye** from **acid / burns / hot water spitting** **measurements** mass of empty container / water and container before heating ; mass of solid after heating ; **control** volume / mass of solution used ; **conclusion** calculate average to identify / exclude anomalies ; subtraction of masses ; most mass left has most dissolved ; **OR** **apparatus** measuring cylinder / gas syringe ; gas collection with apparatus to collect gas ;	**7**

Question	Answer	Marks
4	**method** add acid and collect gas given off ; repeat each solution ; **goggles** protect **eye** from **acid / burns** **measurements** volume of gas given off ; **control** volume / mass of solution used ; excess acid ; **conclusion** calculate average to identify / exclude anomalies ; most CO_2 given off has most dissolved solid ;	

Question	Answer	Marks
5(a)	40.0;	**1**
5(b)(i)	$t = 25.4 \pm 0.5$;	**1**
5(b)(ii)	$T = t / 20$ / **(b)(i)** / 20 ;	**1**
5(b)(iii)	T^2 correct / **(b)(ii)**^{2} ;	**1**
5(c)(i)	l correct ; to 3 significant figures ;	**2**
5(c)(ii)	10% calculation and matching statement ;	**1**
5(d)	t and T present ;	**1**

Question	Answer	Marks
5(e)	disagree <u>and</u> doubling **/** does not double *T ;*	**1**
5(f)(i)	rule close to pendulum when measuring length / perpendicular viewing of rule / use of a fiducial aid;	**1**
5(f)(ii)	reaction time / measurement errors less significant / measuring a longer time ;	**1**

Question	Answer	Marks
6(a)	room temperature recorded to the nearest 0.5 °C ;	**1**
6(b)(i)	θ_H value recorded ;	**1**
6(b)(ii)	θ_H value recorded and θ_H value < **(i)** ;	**1**
6(b)(iii)	full set of values recorded ;	**1**
6(c)	as *d* increases, θ decreases ;	**1**
6(d)	value in **(a)** / room temperature ;	**1**
6(e)(i)	θ_V recorded and > corresponding θ_H value at 100 mm in Table 6.1;	**1**
6(e)(ii)	correct temperature difference ;	**1**
6(f)	allow thermometer to warm up / steady reading / get the maximum reading ;	**1**