Cambridge Assessment International Education

Cambridge IGCSE™ (9–1)

CO-ORDINATED SCIENCES (9–1) **0973/51**

Paper 5 Practical Test **May/June 2023**

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 2023 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.

Acronyms and shorthand in the mark scheme

Acronym / shorthand	**Explanation**
Brackets ( )	Words not explicitly needed in an answer, however if a contradictory word / phrase / unit to that in the brackets is seen the mark is not awarded.
Underlining	The underlined word (or a synonym) must be present for the mark to be scored. If the word is a technical scientific term, the word must be there.
/ or **OR**	Alternative answers any one of which gains the credit for that mark.
owtte	Or words to that effect.
ORA	Or reverse argument.
AW	Alternative wording
AVP	Alternative valid point

Question	Answer	Marks
1(a)(i)	result for 2 minutes for A or B ;	**1**
1(a)(ii)	full set of results for A, increasing ; full set of results for B ; results for A > B ;	**3**
1(b)(i)	(prevent contamination with) no **enzyme** in B ;	**1**
1(b)(ii)	to make sure enzyme is in maximum contact with apple ;	**1**
1(b)(iii)	shows comparison without **enzyme** ;	**1**
1(c)	**more juice** produced (with enzyme) / fast**er** production of **juice** ;	**1**
1(d)(i)	axes right way round and labelled with quantity and units ; sensible linear scale and plots cover at least half the grid ; plots correct ± half small square ;	**3**
1(d)(ii)	best-fit curve that goes through the origin ;	**1**
1(d)(iii)	graph marked at 5 mins ; correct reading from graph ;	**2**

Question	Answer	Marks
2(a)(i)	green / yellow / orange / red ; blue ;	**2**
2(a)(ii)	contains reducing sugar ; does not contain protein ;	**2**
2(b)	water and ethanol ; white emulsion ;	**2**

Question	Answer	Marks
3(a)(i)	time recorded for experiment 1 ;	**1**
3(a)(ii)	time recorded within 10 seconds of experiment 1 ;	**1**
3(a)(iii)	calculation of 10% ; comment including use of the 10% value ;	**2**
3(a)(iv)	avoid contamination ;	**1**
3(a)(v)	iodine ;	**1**
3(b)	all times recorded ; all in seconds and to the nearest second ; sodium chloride similar to distilled water ; Fe^{2+} and Fe^{3+} and Cu^{2+} all smaller ;	**4**

Question	Answer	Marks
3(c)(i)	expect iron(II) chloride, iron(III) chloride and copper chloride ; reaction takes less time / shortest **time and** some data seen to show this ;	**2**
3(c)(ii)	as a control / to find out if the additional solution turns **blue-black** ;	**1**

Question	Answer	Marks
4	**One mark from each section and any two others** **Collecting gas method** **apparatus** (gas) syringe / upturned mc or burette in water for collecting oxygen gas ; timer / stop-watch / stop-clock ; balance ; **method** powder into hydrogen peroxide in container and collect gas (and airtight) diagram or described well ; do each mass more than once ; use minimum 5 different masses / amounts of manganese(IV) oxide ; goggles / gloves protect eyes / hands / skin against hydrogen peroxide / MnO_2 ; **measurements** **volume** of gas ; **time** for fixed volume / time fixed for a volume ; **mass** of manganese(IV) oxide ; **control variables** volume / amount hydrogen peroxide / concentration hydrogen peroxide ; temperature ; surface area of manganese(IV) oxide ; **processing and conclusion** plot graph of mass of manganese(IV) oxide against volume of oxygen in fixed time/ time for fixed volume of oxygen gas **or** against rate ; straight line through origin proportional / straight line linear or as one increases other increases etc ; look to see if increasing mass increases / decreases / doesn't change amount gas in fixed time / time for fixed volume of gas ;	**7**

Question	Answer	Marks
4	**One mark from each section and any two others** **Timing reaction to stop method** **apparatus** timer / stop-watch / stop-clock ; balance ; **method** powder into hydrogen peroxide in container until bubbles stop ; do each mass / amount of manganese dioxide more than once ; use minimum 5 different masses / amounts of manganese(IV) oxide ; goggles / gloves protect eyes / hands / skin against hydrogen peroxide / MnO_2 ; **measurements** **time** for end of reaction / bubbles stop ; **mass** of manganese(IV) oxide ; **control variables** volume / amount hydrogen peroxide / concentration hydrogen peroxide ; temperature ; surface area of manganese(IV) oxide ; **processing and conclusion** plot graph of mass of manganese(IV) oxide against time ; straight line through origin proportional / straight line linear or as one increases other increases etc ; look to see if increasing mass increases / decreases / doesn't change amount gas in fixed time / time for fixed volume of gas ;	**7**

Question	Answer	Marks
4	**One mark from each section and any two others** **Mass decrease method** **apparatus** timer / stop-watch / stop-clock ; balance ; **method** powder into hydrogen peroxide in container on balance ; do each mass more than once ; use minimum 5 different masses / amounts of manganese(IV) oxide ; goggles / gloves protect eyes / hands / skin against hydrogen peroxide / MnO_2 ; **measurements** **mass** of reaction vessel and contents at start and end / at a fixed time ; **time** of reaction / time for fixed mass decrease ; **mass** of manganese(IV) oxide ; **control variables** volume / amount hydrogen peroxide / concentration hydrogen peroxide ; temperature ; surface area of manganese(IV) oxide ; **processing and conclusion** plot graph of mass of manganese(IV) oxide against loss in mass ; straight line through origin proportional / straight line linear or as one increases other increases etc ; look to see if increasing mass increases / decreases / doesn't change time for mass to decrease ;	**7**

Question	Answer	Marks
5(a)(i)	readings of top and bottom of spring present ; both to the nearest millimetre ;	**2**
5(a)(ii)	subtraction correct ;	**1**
5(a)(iii)	l_0 clearly marked on Fig. 5.1 ;	**1**
5(b)	all values of l recorded in the table ; values increasing ;	**2**
5(c)	*any **two** from:* view reading at eye level / perpendicular to rule ; place rule close to / parallel to the spring ; use of a fiducial aid e.g., set-square ;	**2**
5(d)	(expect NO) and doubling *L* does not double *l* (or similar)/the ratio l/L is not constant ;	**1**
5(e)	sensible prediction of *L* that give a spring length of $3l_0$;	**1**

Question	Answer	Marks
6(a)(i)	*T* value recorded at *t* = 0 ;	**1**
6(a)(ii)	*T* column complete ; temperatures decreasing ; evidence of temperatures to 0.5 °C ;	**3**
6(b)	to allow the maximum temperature of the water to be reached/to allow liquid in thermometer to expand ;	**1**
6(c)(i)	correct calculation ; answer given to 2 significant figures ;	**2**
6(c)(ii)	correct calculation ;	**1**
6(d)	the rate of cooling decreases as the temperature decreases / as the liquid cools ;	**1**
6(e)	*any **one** from:* thicker beaker / plastic beaker ; lagging around beaker / insulation ; lid on beaker / cover top of beaker ; lower **initial (**hot water) temperature ; higher **room** temperature ; more water ;	**1**