



Cambridge IGCSE™

COMBINED SCIENCE

0653/51

Paper 5 Practical Test

May/June 2023

MARK SCHEME

Maximum Mark: 40

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.

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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 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	<u>'List rule' guidance</u> For questions that require <i>n</i> responses (e.g. State two reasons ...): • The response should be read as continuous prose, even when numbered answer spaces are provided. • Any response marked <i>ignore</i> in the mark scheme should not count towards <i>n</i>. • Incorrect responses should not be awarded credit but will still count towards <i>n</i>. • 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 <i>n</i> 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)	volume of iodine solution remaining result recorded for 1.00 % ;	1
1(a)(ii)	all results recorded for volume of iodine solution remaining ; values to nearest 0.1 cm ³ ; lower volume of iodine remaining with higher vitamin C concentration ;	3
1(a)(iii)	correct calculations for volume of iodine solution added ;	1
1(a)(iv)	y axis: (volume of) iodine solution added / cm ³ and x axis: percentage concentration of vitamin C / concentration of vitamin C / % ; linear scale, plotted points so that points occupy at least half of the grid ; points plotted correctly, $\pm$ half a small square ;	3
1(a)(v)	line of best-fit drawn ;	1
1(a)(vi)	both values recorded (in cm ³) ;	1
1(a)(vii)	correct estimate from graph ;	1
1(b)(i)	to identify / check for, anomalous results / errors ;	1
1(b)(ii)	do experiments with more values of vitamin C concentration / use smaller intervals of concentration ;	1

Question	Answer	Marks
2(a)	residue: solid + colour matches to supervisor ; filtrate: colourless solution ;	2
2(b)	to dissolve (all of) the salt ;	1
2(c)(i)	lilac ;	1
2(c)(ii)	potassium / K^+ / K ;	1
2(d)(i)	white ppt. ;	1
2(d)(ii)	sulfate / SO_4^{2-} ;	1

Question	Answer	Marks
3	<i>One marking point from each section and any three others (if one section is missing max 6 etc.):</i> 1 Apparatus balance ; thermometer ; 2 Brief description of method and safety precautions add different masses of salt to cetyl alcohol ; use at least five different masses of salt ; place test-tube into hot water until mixture melts then allow mixture to cool (until it turns solid) ; wearing safety goggles to keep (cetyl) alcohol / hot water out of eyes / keep alcohol away from Bunsen flame / take precautions against injury with hot apparatus, e.g. test-tube holder ; 3 Measurements and control variables measure the masses of salt / states values for the masses of salt ; measure the temperature when mixture turns (back to) solid ; use the same / constant / quoted mass of cetyl alcohol ; 4 Process results to draw a conclusion repeat for each mass of salt and calculate an average ; plot graph of melting point against mass of salt added ;	7

Question	Answer	Marks
4(a)(i)	V_L in range 2.0 to 3.5 (V) ;	1
4(a)(ii)	I_L in range 0.20 to 0.30 (A) ;	1
4(a)(iii)	correct calculation of R_L seen ;	1
4(b)(i)	voltmeter shown connected in parallel across lamps L and M ;	1
4(b)(ii)	V_S and I_S present and units included ;	1
4(b)(iii)	$R_L < R_S < 1.8 \times R_L$;	1
4(c)(i)	voltmeter and lamps shown in parallel ; ammeter in common part of circuit ;	2
4(c)(ii)	V_P and I_P present and $I_P > 0.30$ (A) ;	1
4(c)(iii)	R_P correct and to two significant figures ;	1

Question	Answer	Marks
4(d)	so that the, lamp / wires / circuit does not overheat / to conserve, energy / battery ;	1
4(e)	(expect no because) combined resistance / R_s is (much) less than twice resistance of, L/R_L (or reverse argument) ; calculation to support statement / values outside the limits of experimental accuracy ;	2



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Question	Answer	Marks
1(a)	size – greater than half available space ; quality – continuous smooth outer line with no shading ; detail – seeds and pentagon / hexagon shape ;	3
1(b)(i)	diameter of okra 15–30 <u>mm</u> ;	1
1(b)(ii)	(okra) not circular / irregular shape / AW ;	1
1(b)(iii)	correct diameter for drawing in mm ;	1
1(b)(iv)	correct calculation for magnification ;	1

Question	Answer	Marks
2	<i>One marking point from each section and any two others (if one section is missing max 6 etc).</i> 1 Apparatus syringe / measuring cylinder <u>and</u> stop-watch / stop-clock ; thermometer ; water-bath ; 2 Brief description of method and safety precautions mix starch and amylase and start timer (immediately) ; remove samples from mixture at set time intervals and test with iodine ; use different temperatures ; use at least 5 different temperatures ; to stop reaction mixture / iodine / starch / amylase, from entering eye wear goggles / hot apparatus so, do not touch / use tongs / test-tube holder ; 3 Measurements measure time taken when sample, stays brown colour with iodine solution / not blue-black ; detail of measurement of temperature of water-bath, e.g. set thermostat / measure water temperature in beaker ; measure volume / cm³ of amylase or volume / cm³ of starch ; 4 Control variables use same volume / concentration, starch ; use same volume / concentration, amylase ; 5 Process results to draw a conclusion repeat at the same temperature and take averages ; plot graph of <u>time (to break down starch) against temperature (of mixture)</u> ;	7

Question	Answer	Marks
3(a)(i)	both values to same and at least 1 decimal place ; mass of test tube and solid H being higher than mass of empty test-tube ;	2
3(a)(ii)	(on heating) turns yellow ;	1
3(a)(iii)	mass that is greater than empty test-tube but less than with solid H ;	1
3(a)(iv)	(on cooling) goes white ;	1
3(a)(v)	correct mass of solid H ;	1
3(a)(vi)	correct mass of solid after heating ;	1
3(a)(vii)	gas produced (which escapes) ;	1
3(a)(viii)	correct percentage loss of mass ; correct rounding to two sig. figs. + working shown ;	2
3(a)(ix)	to ensure complete, reaction / decomposition ;	1
3(a)(x)	blue flame is hotter / reaches a higher temperature OR / yellow flame causes black (carbon / soot) to form on tube ;	1
3(b)	bubbles / fizzes / effervesces / solid disappears / colourless solution ;	1

Question	Answer	Marks
4(a)(i)	values shown for u and v in first row that add up to 95.0 cm ;	1
4(a)(ii)	all u and v values present to the nearest mm ; u values ascending, v values descending ;	2
4(a)(iii)	five values in final column correctly calculated ;	1
4(a)(iv)	cm ² ;	1
4(b)(i)	axes labelled: y-axis: uv / cm^2 and x-axis: D / cm ; suitable linear scale, plotted points fill more than 50% of available space ; points plotted correctly to $\pm \frac{1}{2}$ a small square ;	3
4(b)(ii)	(straight) line of best fit and reasonable spread of points above and below the line ;	1
4(c)	evidence of gradient calculation read-offs seen (on graph) AND read-offs use at least half the candidate's drawn line ; correct value from their graph (expect F in range 14–16 cm) ;	2
4(d)(i)	the straight line is a way of taking an average OR anomalous results can be seen / identified ;	1
4(d)(ii)	move lens (slowly) back and forwards (through focus) to find sharpest image ;	1