



**Cambridge Assessment International Education**  
Cambridge International General Certificate of Secondary Education (9–1)

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**CO-ORDINATED SCIENCES (9–1)**

**0973/61**

Paper 6 Alternative to Practical

**May/June 2019**

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.

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This document consists of **9** 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.

Question	Answer	Marks
1(a)(i)	time and minutes ;	<b>1</b>
1(a)(ii)	50.5 ; 46.0 ;	<b>2</b>
1(b)(i)	axes labelled including units ; sensible linear scale and uses at least half the space ;	<b>2</b>
1(b)(ii)	at least 4 correct plots $\pm$ half small square for each line ; two smooth curves of best fit correctly labelled ;	<b>2</b>
1(c)(i)	32.5 and 34(.0) ;	<b>1</b>
1(c)(ii)	greater loss of heat in small test-tube because steeper graph ;	<b>1</b>
1(c)(iii)	(yes), because small test-tube / baby has greater heat loss / loses heat faster / greater temperature loss (same time) ;	<b>1</b>

Question	Answer	Marks
2	<p>To gain 7 marks at least one mark needed from each section and any two others</p> <p><b>alkali</b> named alkali e.g. sodium hydroxide / potassium hydroxide / limewater / ammonia / ammonium hydroxide ;</p> <p><b>apparatus and method</b> measuring cylinder / pipette / burette / syringe <b>and</b> thermometer ; suitable vessel for reaction <b>and</b> lid / lagging/polystyrene cup ; repeat all three (several times) ;</p> <p><b>readings</b> initial temperature ; highest / final temperature ;</p> <p><b>control</b> same volumes / amount of acids / alkali ; same concentrations of acids / alkali ; same starting temperature ;</p> <p><b>use of results</b> calculate rise in temperature for each acid and compare / higher T (rise) means more heat given out ;</p>	<b>max 7</b>

Question	Answer	Marks
3(a)	correct distance marked ;	<b>1</b>
3(b)(i)	25.53(333...) (s) ; 25.5 / answer given to 3 s.f. ;	<b>2</b>
3(b)(ii)	1.28(s) ;	<b>1</b>
3(b)(iii)	1.6(384.....) ;	<b>1</b>
3(c)	9.64(355...) / 9.63(41...) ;	<b>1</b>
3(d)	9.75(308642) / 9.7 ;	<b>1</b>
3(e)	agree, value(s) close enough ; <b>or</b> disagree, difference too large ;	<b>1</b>
3(f)	reaction time errors less significant / larger length, measurement errors less significant / swings more slowly ;	<b>1</b>

Question	Answer	Marks
4(a)	clear and continuous outline ; larger than half the box ; detail in centre ;	<b>3</b>
4(b)(i)	39 ;	<b>1</b>
4(b)(ii)	correct measurement ;	<b>1</b>
4(b)(iii)	correct calculation ;	<b>1</b>
4(c)(i)	Benedict's ; green / yellow / orange / red ;	<b>2</b>
4(c)(iii)	goggles because of heat / chemicals in eye ; water bath so contents not ejected from tube ; cut away from body as knife sharp ; gloves because hot solution / apparatus ; tongs because apparatus hot ;	<b>max 1</b>
4(c)(iv)	volume ; amount of Benedict's ; concentration of Benedict's ; concentration of fruit ; amount of fruit ; temperature ; time left ;	<b>max 1</b>

Question	Answer	Marks
5(a)(i)	both give white ppt. / both give same result ;	1
5(a)(ii)	add dilute nitric acid (first ) / add dilute nitric acid (before barium nitrate) ; carbonate will bubble with nitric acid / acid removes carbonate / carbonate will not give ppt. with barium nitrate after acid added first ;	2
5(a)(iii)	gas bubbled through <b>limewater</b> ; white ppt. / milky ;	2
5(b)(i)	to avoid introducing other ions / to avoid contamination ;	1
5(b)(ii)	no ppt / remains (colourless) solution / colourless solution / remains colourless ;	1
5(b)(iii)	test 2 ammonium / $\text{NH}_4^+$ ; test 3 not chloride / not $\text{Cl}^-$ ; test 4 sulfate / $\text{SO}_4^{2-}$ ;	3
5(b)(iv)	acid / nitric acid ; white ppt. could be due to carbonate ;	2
5(b)(v)	heating ammonia solution would give ammonia anyway ;	1

Question	Answer	Marks
6(a)	$l_1 = 35 \text{ mm}$ ;	<b>1</b>
6(b)(i)	$e = 60 \text{ mm}$ ;	<b>1</b>
6(b)(ii)	$k = 0.05 \text{ (N/mm)}$ ;	<b>1</b>
6(c)	<i>any two from</i> place the ruler close to the spring ; view perpendicularly / view at eye level ; clamp rule vertically ; use a set-square / other fiducial aid ;	<b>max 2</b>
6(d)	$m = 225 \text{ g}$ ;	<b>1</b>
6(e)	2.5 ;	<b>1</b>
6(f)(i)	24 (cm <sup>3</sup> ) ;	<b>1</b>
6(f)(ii)	65 (g) ;	<b>1</b>
6(f)(iii)	2.7 (g/cm <sup>3</sup> ) ;	<b>1</b>
6(f)(iv)	use a digital balance / scale / use balance ; thinner pointer on the balance ; use callipers to determine volume of block ;	<b>1</b>