



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE

0653/61

Paper 6 Alternative to Practical

October/November 2016

MARK SCHEME

Maximum Mark: 60

Published

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This document consists of **6** printed pages.

Page 2	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0653	61

Question	Answers	Marks
1(a)	time <u>and</u> minutes ; observation / appearance ;	2
1(b)	iodine (molecules) move into bag / tube ; by diffusion / because they are small enough ; starch and iodine produce blue-black / darker colour ;	3
1(c)(i)	(blue-black) colour goes / fades / goes brown ;	1
1(c)(ii)	no starch left / no starch-iodine complex ;	1
1(c)(iii)	Benedict's solution ; heat ; yellow / green / orange / red ;	3
	Total:	10

Question	Answers	Marks
2(a)(i)	add sodium hydroxide (solution) / NaOH ; green ppt. ;	2
2(a)(ii)	add dilute nitric acid / HNO ₃ ; then add barium nitrate solution / Ba(NO ₃) ₂ ; white ppt. ;	3
2(b)(i)	hydrogen / H ₂ ;	1
2(b)(ii)	white ppt. ; ppt. dissolves / becomes colourless solution / soluble in excess ;	2

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0653	61

Question	Answers	Marks
2(c)(i)	displacement / redox / cation reduced / it is reduced / Fe^{2+} goes to Fe / it is replaced by Mg / it is replaced by Mg^{2+} ;	1
2(c)(ii)	exothermic ;	1
	Total:	10

Question	Answers	Marks
3(a)(i)	6.5 ;	1
3(a)(ii)	65 ;	1
3(a)(iii)	appropriate precaution (either written or shown on diagram) ; take reading at eye level / use of set square to ensure rule vertical / use of fiducial aid ;	max 1
3(b)	31. <u>0</u> ;	1
3(c)	$T = 1.55$; $T^2 = 2.4$;	2
3(d)	suitable choice of scales (more than half the grid used) ; at least 4 plots correct to $\frac{1}{2}$ small square ; good best-fit straight line with a ruler, omission of anomalous point ;	3
3(e)	yes agree (no mark) (straight) line through the origin no disagree (no mark) all points / anomaly not on the (straight) line ;	max 1
	Total:	10

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0653	61

Question	Answers					Marks
4(a)(i)	dish	Seedling height / mm			Average seedling height / mm	2
		Student 1	Student 2	Student 3		
	A	32	34 ;	30 ;	32	
	B	14	18	16	16	
	C	2	3	1	2	
4(a)(ii)	averages calculated correctly – A = 32, B = 16, C = 2 ;					1
4(b)(i)	horizontal axis labelled dish A, B and C ; linear vertical axis labelled height / mm <u>and</u> uses at least half the grid ; all bars correct height $\pm$ one half small square ;					3
4(b)(ii)	reduces effect of errors / takes account of variations / anomalies accounted for / some results may be error ;					1
4(c)	reduced it / shorter / stunted / grows more slowly ; higher concentration has a greater effect ;					2
4(d)	same specified environmental conditions, e.g. temperature, light (intensity) ;					max 1
	Total:					10

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0653	61

Question	Answers	Marks
5(a)	oxygen / O ₂ ;	1
5(b)(i)	litmus ; blue to red gas is acid AND red to blue gas is alkaline ; OR UI / full range indicator / pH indicator ; red / orange / yellow / any pH less than acid AND blue / purple / any pH greater than 7 alkali ;	2
5(b)(ii)	gas will not change the colour of red and blue litmus / UI and green or pH 7 ;	1
5(c)	diagram showing the inverted test -tube with the open end under water ; water risen into the test-tube ;	2
5(d)	gas V = ammonia / NH ₃ ; gas W = hydrogen chloride / HCl / sulfur dioxide / SO ₂ ;	2
5(e)	add limewater to test-tube and shake ; (limewater goes) white precipitate / milky ;	2
	Total:	10

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0653	61

Question	Answers	Marks
6(a)	A in series with the power source AND V in parallel ;	1
6(b)	0.65 (A) ; 1.5 (V) ;	2
6(c)	wire L = 1.5 ; wire M (= 1.5/0.65 =) 2.3 ; ohms / Ω ;	3
6(d)	minimum of 3 lengths ; minimum 10 cm range ; control ONE from material / cross-section / temperature ; graph of resistance against length ;	4
	Total:	10



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Page 2	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0653	62

Question	Answers	Marks
1(a)	3.1 ; 5.8 ;	2
1(b)	axes labelled with units ; linear scale using at least half the grid ; at least 4 plots correct $\pm$ half small square (excluding origin) ; best fit curve ;	4
1(c)(i)	steep <u>and</u> then levels off ;	1
1(c)(ii)	fast at start/slows down;	1
1(d)	glowing splint ; relights ;	2
	Total:	10

Question	Answers	Marks
2(a)(i)	copper / Cu ;	1
2(a)(ii)	23. <u>0</u> ; 38.5 ;	2
2(b)(i)	54(.0), 41.5, 30(.0), 15.5 ; ecf	1
2(b)(ii)	vertical scale linear and uses more than half of grid ; minimum of 3 points plotted correctly to within half a small square ; best straight line through origin ;	3

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0653	62

Question	Answers	Marks
2(b)(iii)	agrees as all points close to / on straight line (through origin) ;	1
2(c)(i)	exothermic ;	1
2(c)(ii)	lid / insulation around cup / more accurate thermometer / repeat with different concentrations (extra points) ;	1
	Total:	10

Question	Answers	Marks
3(a)	note the reading on either side and find mean / shown on a diagram / measure cube and mark the <u>mid point</u> ;	1
3(b)(i)	36 (.0) ;	1
3(b)(ii)	21 (.0) cm ;	1
3(b)(iii)	14 (.0) cm ;	1
3(c)(i)	84.4 g ;	1
3(c)(ii)	56 to 56.2666... ; 56 / 56.3 g (2/3 significant figures) ;	2
3(d)	any 2 centre of gravity of the rule not at the 50 cm mark ; difficulty in obtaining balance of ruler ; pivot not at right angles to edge of rule ; cube irregular ; ruler mass rounded ;	max 2
3(e)	a smaller and b greater ;	1
	Total:	10

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0653	62

Question	Answers	Marks
4(a)(i)	1.8 ;	1
4(a)(ii)	3.5 ;	1
4(b)(i)	1.7 ;	1
4(b)(ii)	8.5 (mm/hr) ;	1
4(b)(iii)	water enters bag / enters membrane ;	1
4(c)	water (in the beaker) ; Benedict's ; heat ; no change / stays blue ;	4
4(d)	level in tube drops / bag deflates / water from bag into beaker ;	1
	Total:	10

Question	Answers	Marks
5(a)(i)	ammonia / NH ₃ ;	1
5(a)(ii)	white precipitate / white solid ;	1
5(a)(iii)	add silver nitrate ; white precipitate ;	2
5(a)(iv)	blue ppt. ;	1

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0653	62

Question	Answers	Marks
5(b)(i)	measuring cylinder / pipette / burette ;	1
5(b)(ii)	UI ; red to green ;	2
5(b)(iii)	salt would be impure / salt would be coloured ;	1
5(b)(iv)	heat ;	1
	Total:	10

Question	Answers	Marks
6(a)	64 (F) ; 49 (G) ;	2
6(b)	axes labelled with units ; suitable scales chosen for axes using at least half of grid ; at least 4 points plotted $\pm \frac{1}{2}$ square for each container ; smooth curves drawn (and labelled) ;	4
6(c)(i)	G is better (no mark) because the temperature fell more rapidly / lower curve ;	1
6(c)(ii)	named non-metallic material for F , e.g. polythene / wood / plastic ; named metallic material for G , e.g. copper / metal ;	2
6(d)	value in region 21 to 40 °C ;	1
	Total:	10



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Page 2	Mark Scheme	Syllabus	Paper
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Question	Answers	Marks												
1(a)	<table border="1"> <tr> <td>Nutrient tested for</td><td>Testing solution</td><td>Heat needed? (Yes/no)</td></tr> <tr> <td>Protein</td><td>Biuret</td><td>no</td></tr> <tr> <td>Reducing sugar</td><td>Benedict's</td><td>yes</td></tr> <tr> <td>Starch</td><td>Iodine</td><td>no</td></tr> </table> 3 correct reagents = 2, 1 correct = 1;; 1 mark for heat for reducing sugar only ;	Nutrient tested for	Testing solution	Heat needed? (Yes/no)	Protein	Biuret	no	Reducing sugar	Benedict's	yes	Starch	Iodine	no	3
Nutrient tested for	Testing solution	Heat needed? (Yes/no)												
Protein	Biuret	no												
Reducing sugar	Benedict's	yes												
Starch	Iodine	no												
1(b)	<table border="1"> <tr> <td>Testing solution used</td><td>Initial colour</td><td>Colour after test</td></tr> <tr> <td>Benedict's solution</td><td>Blue</td><td>blue</td></tr> <tr> <td>biuret solution</td><td>Blue</td><td>purple/lilac</td></tr> <tr> <td>iodine</td><td>brown</td><td>brown</td></tr> </table> purple / lilac for protein ; negative colours brown and blue ;	Testing solution used	Initial colour	Colour after test	Benedict's solution	Blue	blue	biuret solution	Blue	purple/lilac	iodine	brown	brown	2
Testing solution used	Initial colour	Colour after test												
Benedict's solution	Blue	blue												
biuret solution	Blue	purple/lilac												
iodine	brown	brown												
1(c)	Benedict's: yellow / green / orange / red ; iodine: blue-black ;	2												
1(d)	same volume of juice and lemonade ; same volume of Benedict's solution ; yellow / green for small amount of reducing sugar OR orange / red for high(er) amount of reducing sugar ;	3												
	Total:	10												

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0653	63

Question	Answers	Marks
2(a)	30 ; 32 ;	2
2(b)(i)	31 ;	1
2(b)(ii)	0.032 0.019/0.018, 0.012/0.011 ;	1
2(c)(i)	linear scale for vertical axis using at least half of the grid ; all three points plotted correctly to within half a small square ; best appropriate straight line or curve <u>through the origin</u> ;	3
2(c)(ii)	as concentration increases speed increases ;	1
2(d)	0.75 and difference between them is much greater than difference between other pairs / % difference greater than other pairs / % difference greater than 10% ;	1
2(e)	(reacted chips have) smaller surface area / (already reacted chips will) react slower ;	1
	Total:	10

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0653	63

Question	Answers	Marks
3(a)(i)	correct symbol for voltmeter ; correct parallel (voltmeter) connection between X and Y ;	2
3(a)(ii)	1.9 (V) ;	1
3(a)(iii)	0.24 (A) ;	1
3(a)(iv)	7.9 ; Unit Ω / ohm ;	2
3(b)	15 (Ω) ;	1
3(c)	YES (no mark) and values of R_T and $0.5 R_S$ are close enough / difference can be attributed to experimental error ;	1
3(d)	resistors become hot / temperature affects resistance ;	1
3(e)	increases ;	1
	Total:	10

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0653	63

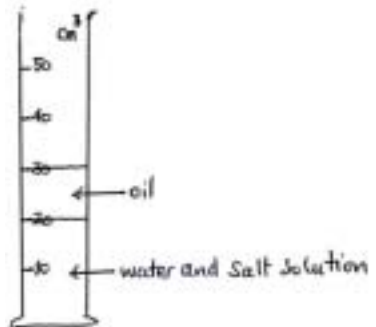
Question	Answers				Marks
4(a)	Test-tube	Initial colour	Final Colour	Change in CO2 concentration (increase / decrease / no change)	1
	A	red	purple	decrease	
	B	red	yellow	increase	
	C	red	red	(no change)	
	D	red	red	no change	
changes for A <u>and</u> B correct ; anything other than no change for D = no marks					
4(b)(i)	photosynthesis (removes CO ₂) ;				1
4(b)(ii)	respiration (produces CO ₂) ;				1
4(b)(iii)	rate of photosynthesis and respiration is matched ;				1
4(c)	control / to show no change without organisms ;				1
4(d)(i)	water bath ; between 10–40 °C ;				2
4(d)(ii)	volume of water ; number / size of tadpoles ; size of pondweed ; amount of indicator ; light intensity ; type of water ; type of pondweed ;				max 3
	Total:				10

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0653	63

Question	Answers	Marks
5(a)(i)	symbol for cell / DC power supply ; symbol for ammeter or lamp ;	2
5(a)(ii)	copper oxide / CuO ;	1
5(b)(i)	thermometer and stopper ; thermometer bulb opposite to the side-arm ;	2
5(b)(ii)	99.5 (°C) ;	1
5(b)(iii)	(0.5 less than 100) within experimental error / inaccuracy of thermometer / height above sea level ;	1
5(c)	carbon dioxide / CO ₂ ;	1
5(d)	sodium hydroxide solution / add ammonia solution ; colour of ppt. / specific example, e.g. blue ppt. = Cu ²⁺ ;	2
	Total:	10

Question	Answers	Marks
6(a)(i)	29. <u>0</u> ; 41. <u>0</u> ;	2
6(a)(ii)	eye level / bottom of meniscus ;	1
6(b)	1.2 (1.193103448275862) ; 0.8 (0.8390243902439024463) ;	2
6(c)(i)	(teat / dropping) pipette ;	1
6(c)(ii)	formula takes it into account ;	1

Page 7	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2016	0653	63

Question	Answers	Marks
6(c)(iii)	find the average / mean (of the three results for each liquid) ;	1
6(d)(i)	S and because it is less dense than water / liquid T ;	1
6(d)(ii)	oil / S on top (ecf) with one line at 20 ;  (water and salt solution or water and solution R)	1
	Total:	10