



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE

0653/61

Paper 6 Alternative to Practical

May/June 2017

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.

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Question	Answer				Marks
1(a)	Benedict's test ;				1
1(b)	1 mark per column ;;;				3
		Benedict's test	biuret test	iodine test	
	banana	yellow/green/orange/red	blue	blue-black	
	chickpea	blue	blue	blue-black	
	egg white	blue	purple	brown	
1(c)	same volume of apple juice ; same volume / concentration of Benedict's solution / excess Benedict's ; same temperature / same time ; yellow/green = less (concentrated) / orange/red = more (concentrated) ;				max 3
1(d)	(dissolve in) ethanol ; (add) water ; cloudy / emulsion ;				3

Question	Answer	Marks
2(a)	(solution H could be) barium nitrate (or) silver nitrate ; (solution J could be) ammonia (or) sodium hydroxide ;	2
2(b)(i)	add excess copper oxide to sulfuric acid in a beaker (and stir) ; warm ; filter / filtrate is copper sulfate solution ;	3
2(b)(ii)	H is barium nitrate (solution) ; J is ammonia (solution) ;	2
2(c)	(iron(III) sulfate) gives same result / brown ppt. with both sodium hydroxide and ammonia ; so does not test/distinguish between sodium hydroxide and ammonia ; it would identify barium nitrate/ H / still gives white ppt. with H ;	3

Question	Answer	Marks
3(a)	0.36 (V) ;	1
3(b)(i)	2.00 ; 6.78 ;	2
3(b)(ii)	choice of scales and linear ($\geq \frac{1}{2}$ the grid used) ; plots correct to $\frac{1}{2}$ small square ; good best-fit straight line judgement ;	3
3(c)(i)	candidate's R value at $l = 10$ cm ;	1
3(c)(ii)	(directly) proportional (if through origin) ;	1
3(d)	reading meter scale ; observe perpendicularly / repeat / digital meter ; OR measuring the length of wire ; observe perpendicularly / repeat (for decreasing lengths of wire) ; OR wire gets hot / resistance changes ; switch off between readings ;	max 2

Question	Answer	Marks
4(a)	wear gloves / safe disposal of needle / use sterilised/clean needle/equipment ;	1
4(b)(i)	line to a red blood cell and labelled ; line to a platelet and labelled ;	2
4(b)(ii)	quality drawing more than half of box with nucleus ; irregular cell (freehand) with nucleus – 3 lobes ; two of: nucleus labelled ; cytoplasm labelled ; (cell) membrane ;	4
4(c)(i)	measurement 8(.0)/8.5/9(.0)/9.5/10(.0)mm ;	1
4(c)(ii)	measurement to the nearest 0.5 mm AND larger than (c)(i) ;	1
4(c)(iii)	magnification correctly calculated to the nearest whole number ;	1

Question	Answer	Marks
5(a)	label syringe/measuring cylinder/burette ; drawing of gas syringe/burette/up-turned measuring cylinder or graduated test-tube filled with water and in water ;	2
5(b)	6, 13.5, 28, 54.5, 65 ;	1
5(c)	2.5 AND largest volume of gas/most gas (collected in 2 minutes/same amount of time) ;	1
5(d)(i)	stop watch/clock ;	1
5(d)(ii)	pipette/burette ;	1
5(e)(i)	temperature ;	1
5(e)(ii)	reliability / to take an average / spot anomalies ;	1
5(f)	CO ₂ ; turns limewater milky ;	2

Question	Answer	Marks
6(a)	clamp/retort (stand) ;	1
6(b)	don't touch the (hot) lamp ;	1
6(c)(i)	two plots ;	1
6(c)(ii)	smooth curve (through most of the points) ; not through anomalous point / not taking into account anomalous point ;	2
6(c)(iii)	value from graph ; line / marking on graph ;	2
6(c)(iv)	as height increases temperature decreases ; non-linear / T becomes constant ;	2
6(c)(v)	no further decrease in temperature / temperature stayed the same / reached room temperature ;	1



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1(a)(i)	quality drawing using at least half the space and not feathery ; male parts – anther and filament ; female parts – stigma (and ovary) ; some petals ;	4
1(a)(ii)	<i>correctly labelled:</i> anther ; stigma ;	2
1(b)(i)	2 lines drawn edge to edge ; correct measurement of photograph $47 \text{ mm} \pm 1 \text{ mm}$ AND (sensible) flower measurement (larger than photograph) ;	2
1(b)(ii)	correct calculation ;	1
1(c)	stigma circled (on Fig.1.1) ;	1

Question	Answer	Marks
2(a)(i)	all values of V correct 7, (10), 14, 21 ;	1
2(a)(ii)	axes labelled with units ; linear scales using at least half of grid in each direction ; at least three points plotted correctly within half a small square ; best straight line or best curve ;	4
2(a)(iii)	the higher the temperature the higher the rate of the reaction ;	1
2(b)(i)	removes timing error associated with starting the stopclock and connecting apparatus / could be too fast in first minute due to powder on chips / air in measuring cylinder ;	1
2(b)(ii)	the surface area (of the chips) is reduced / reaction slowed by smaller chips ;	1
2(b)(iii)	bubble into water ; count bubbles in a certain time / time for certain number of bubbles ; OR connect delivery tube to a gas syringe ; measure volume in a certain time / time for a certain volume ; OR place reaction flask on a balance ; measure mass in a certain time / time for certain drop in mass ;	max 2

Question	Answer	Marks
3(a)(i)	51.3 (g) ;	1
3(a)(ii)	67 (cm ³) ;	1
3(a)(iii)	read to bottom of meniscus / take reading at eye level / perpendicular to scale ;	1
3(a)(iv)	1.03 ; g / cm ³ ;	2
3(b)(i)	18 (cm ³) ;	1
3(b)(ii)	$(\frac{18.1}{(b)(i)})$ 1.0 / 1.01 (g / cm ³) ; 2 or 3 significant figures ;	2
3(c)(i)	zero error on balance / test-tube touching side of cylinder ;	1
3(c)(ii)	measuring cylinder otherwise wet / contains some water when its 'dry' mass is measured ;	1

Question	Answer	Marks
4(a)	leave in the dark ; at least 24 hours ;	2
4(b)(i)	alcohol and warm (to take out chlorophyll) ; iodine (solution) ; (brown) to blue-black ;	3
4(b)(ii)	Benedicts (solution) ; heat ; red (most sugar) / orange / yellow (less) / green (little) ;	3
4(b)(iii)	no naked flame ethanol flammable / use water-bath with ethanol as ethanol flammable / goggles chemicals in eyes / don't touch hot apparatus will burn hands / heatproof gloves so don't burn hands / gloves stop chemical burns ;	1
4(c)	light AND carbon dioxide needed (for photosynthesis) ;	1

Question	Answer	Marks
5(a)(i)	solid in beaker / solution / mixture ;	1
5(a)(ii)	make sure that all the acid has reacted ;	1
5(a)(iii)	filtration ;	1
5(b)(i)	(all water gone) decomposes (to copper oxide) ;	1
5(b)(ii)	evaporate some of the water / leave to evaporate / heat / evaporate ; leave to crystallise / cool ; filter ; leave to dry / press between filter paper ;	max 3
5(c)	add barium nitrate / barium chloride AND white ppt. ;	1
5(d)	zinc oxide ; hydrochloric acid ;	2

Question	Answer	Marks
6(a)(i)	pipette / syringe ;	1
6(a)(ii)	same surface (area) / so same (rate of) evaporation ;	1
6(b)(i)	27.5 (°C) ; 14.0 (°C) ;	2
6(b)(ii)	17.8 (°C) ; 9.0 (°C) ;	2
6(c)(i)	180 (s) ;	1
6(c)(ii)	cotton wool dropped off / misread thermometer ;	1
6(d)	cotton wool almost dry / rate of evaporation slower / most alcohol evaporated / all alcohol evaporated ;	1
6(e)	reasonable sketch (left to right curve, starting high on LHS) ;	1



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1(a)	11.1 (cm ³) ; 15.8 (cm ³) ;	2
1(b)	axes labelled with units ; suitable linear scale using at least half the grid ; at least 4 points plotted $\pm$ half small square ; best-fit curve through origin ;	4
1(c)(i)	carbon dioxide ;	1
1(c)(ii)	respiration ;	1
1(d)(i)	line below original line ;	1
1(d)(ii)	volume of yeast / temperature ;	1

Question	Answer	Marks
2(a)(i)	completed apparatus with gas tight bung in one test-tube and delivery tube into other test-tube ; correct labels for delivery tube AND one chemical i.e. H or limewater ;	2
2(a)(ii)	to avoid suck back / to prevent cold limewater hitting hot solid ;	1
2(a)(iii)	H is a carbonate ;	1
2(b)	H is copper carbonate ; J is copper sulfate ; OR two copper compounds ; a carbonate and a sulfate ;	max 2
2(c)	K is copper oxide / CuO ;	1
2(d)	add barium nitrate AND white ppt. ;	1
2(e)(i)	white ppt. / colourless solution / white ppt. which disappears ;	1
2(e)(ii)	any ppt. has dissolved / no ppt. in excess ;	1

Question	Answer	Marks
3(a)(i)	7.5 (cm) ;	1
3(a)(ii)	37.5 (cm) ;	1
3(a)(iii)	40.0 and 26.7 ;	1
3(b)	<i>any 1 for 1 mark:</i> move screen slowly to and fro until sharpest focus obtained ; object / lens / screen perpendicular to bench ; object and lens same height above the bench ; carry out experiment away from other bright light sources / darkened room ;	max 1
3(c)(i)	suitable choice of scale ($\geq$ half the grid used) for x-axis ; plots correct to half a small square, at least 4 correct ; good best-fit straight line judgement ;	3
3(c)(ii)	intercept correct from candidate's graph ;	1
3(c)(iii)	correct calculation for f ; 15.0 ($\pm$ 1.0) cm ;	2

Question	Answer	Marks
4(a)	water ; oxygen ; suitable temperature ;	max 2
4(b)	light from above / all sides equally ;	1
4(c)	shoot drawn in all three dishes ; shortest shoot in A ; tallest shoot in C ;	3
4(d)	Benedict's solution ; heat ; yellow / green / orange / red ;	3
4(e)	not all grow / some die ; identify anomalies ; improve reliability ;	max 1

Question	Answer	Marks
5(a)	mention of time AND volume ; link between volume and time ;	2
5(b)(i)	<i>observations:</i> bubbles faster ; <i>measurement:</i> more gas in the same time OR less time for the same amount of gas ;	2
5(b)(ii)	repeats ; at least one more increased surface area ; 3 lots more ;	max 2
5(b)(iii)	temperature ; state of Mg ; concentration of acid ;	max 2
5(c)	hydrogen ; lighted splint AND pops ;	2

Question	Answer	Marks
6(a)	40.4 (cm) ;	1
6(b)(i)	point plotted within 1 / 2 small square and curve ; curve ignores anomalous point ;	2
6(b)(ii)	as θ increases distance increases ; increase getting less ;	2
6(c)	θ constant ; at least 4 diameters ; same material for ball bearings ; range OK e.g. 1,2,3,4, etc. ;	max 3
6(d)(i)	kinetic / movement AND kinetic / movement ;	1
6(d)(ii)	would go too far / friction of cloth greater / friction of bench too small ;	1