



COMBINED SCIENCE

0653/61

Paper 6 Alternative to Practical

October/November 2019

MARK SCHEME

Maximum Mark: 40

Published

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PUBLISHED**Generic Marking Principles**

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GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

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- 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
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GENERIC MARKING PRINCIPLE 4:

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GENERIC MARKING PRINCIPLE 6:

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Question	Answer	Marks
1(a)(i)	7.5 / 8(%) ;	1
1(a)(ii)	A 35 and B 20 ; C 120 ; D > 300 ;	3
1(a)(iii)	B at top / D at bottom ; correct order B A C D ;	2
1(a)(iv)	as a control / to find out what happens with only water / to find out what happens with no pepsin / to show that pepsin has an effect / to show that pepsin acts as a catalyst ;	1
1(a)(v)	to maintain constant temperature / to maintain optimum temperature for enzymes / to keep at 40 °C ;	1
1(b)	two or more additional values of percentage or volume ; at least one value less than 15% / less than 2 cm ³ ;	2
1(c)	biuret ; lilac / purple / violet / mauve ; blue ;	3

Question	Answer	Marks
2(a)(i)	E acid and F alkali / base ;	1
2(a)(ii)	delivery tube into container of limewater and delivery tube under surface ;	1
2(a)(iii)	hydrogen ;	1
2(a)(iv)	sulfate ;	1
2(a)(v)	sulfuric acid ;	1
2(b)	ammonia / sodium hydroxide ;	1
2(c)	copper(II) and (ammonia =) blue ppt and dark blue solution or (sodium hydroxide =) pale blue ppt ;	1

Question	Answer	Marks
3	<i>one mark from each section and then any other 3 marks from:</i> 1. apparatus (allow from a <u>labelled</u> diagram) sea water in a suitable container and use of heating device / Bunsen burner ; measuring cylinder ; filter funnel and filter paper (may be from a diagram if the funnel clearly contains a filter paper) ; weighing scales ; 2. method filter to remove insoluble particles (before heating) ; heat / leave so that (all) water evaporates ; repeat for same type of seawater ; wear goggles when heating / wear goggles to prevent solution or salt from going into eyes / wear gloves so salt water does not touch skin / take precaution against hot apparatus e.g. use tongs, wait for apparatus to cool before touching ; 3. measurements and control idea of weighing empty evaporating basin / container ; same amount of water used / quotes volume of water used / measures volume or mass of water used ; measure mass / weigh salts after evaporation ; 4. processing and use of results calculate average mass of salts for each type of sea-water (if measurements repeated) ; calculate percentage mass or mass of salts in fixed volume of water ; compare <u>mass</u> of salts (if same volume used) / states that a larger <u>mass</u> has more dissolved salts ;	7

Question	Answer	Marks
4(a)(i)	78.0 (°C) ;	1
4(a)(ii)	°C ;	1
4(a)(iii)	65.5 (°C) ;	1
4(a)(iv)	reading thermometer perpendicular to the scale / thermometer bulb in centre of liquid / continuous stirring ;	1
4(b)(i)	axes correct way round and axes correctly labelled 'temperature (of water)' and 'time / min' ; suitable linear scale so plots occupy at least half of grid ; five points correctly plotted for either line $\pm \frac{1}{2}$ small square ;	3
4(b)(ii)	smooth best-fit line drawn ; both lines clearly and correctly labelled ;	2
4(c)(i)	(similarity) temperature decreases (with time) (in both experiments) ; (difference) temperature decreases faster in cup without lid ora ;	2
4(c)(ii)	3.5 minutes shown on graph ; candidate's value ± 0.5 (°C) (with a lid) ;	2



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Question	Answer	Marks
1(a)(i)	8.5 ;	1
1(a)(ii)	1.5 ;	1
1(a)(iii)	2.0 ;	1
1(b)	average calculated ; outlier excluded (ave = 0.5) ;	2
1(c)	A has more vitamin C / A is more concentrated (than B) ora ;	1
1(d)(i)	correct calculation (0.0025 or 0.003) ; answer to appropriate significant figures (1 or 2) ;	2
1(d)(ii)	burette / syringe / graduated pipette ;	1
1(e)	enlarged circle (greater than 5 cm diameter) ; continuous line around outside and 9–11 segments ; pith and centre shown ;	3
1(f)	biuret ;	1

Question	Answer	Marks
2(a)(i)	test tube and bung and delivery tube above solid and 1 label ; delivery tube into container without bung, under the level of the limewater (with label on limewater) ;	2
2(a)(ii)	carbon dioxide / CO ₂ ;	1
2(a)(iii)	carbonate ;	1
2(b)	copper (ion) / Cu ²⁺ ;	1
2(c)	F (copper) oxide ; G (copper) sulfate ;	2

Question	Answer	Marks
3	<i>one mark from each section and then any other 3 marks from:</i> 1. apparatus flask / test-tube / boiling-tube and heating apparatus, e.g. Bunsen burner ; (gas) syringe / measuring cylinder to collect gas / burette / weighing scale ; measuring cylinder to measure fizzy drink ; 2. method and safety drink in a container with delivery tube into gas syringe or upturned container in water ; heat / leave (until no more gas is given off) / shake (until no more gas is given off) ; wear goggles when heating / wear goggles to prevent (hot) fizzy drink from going into eyes / take precaution against hot apparatus, e.g. tongs, wait for apparatus to cool before touching, use heat gloves to protect against burning ; repeat for same type of fizzy drink ; 3. measurements and control same amount of drink used / quotes volume of drink used / measures volume or mass of drink used ; measure <u>volume</u> of CO₂ evolved / measure <u>mass</u> lost ; to constant volume of gas / to constant mass ; 4. processing and use of results calculate average amount of CO₂ evolved for each type of drink (if measurements repeated) ; compare volume/mass of CO₂ / largest volume collected has most CO₂ / smallest volume collected has least CO₂ / largest loss in mass has most CO₂ / smallest loss in mass has least CO₂ ;	7

Question	Answer	Marks
4(a)(i)	5(.0) (cm) ;	1
4(a)(ii)	50. <u>0</u> (cm) ;	1
4(b)(i)	14.18 ; 14.16 ;	2
4(b)(ii)	14.17 ;	1
4(b)(iii)	correct calculation of T and T^2 (1.417 and 2.01) ;	1
4(c)(i)	(time for complete swing is when bob crosses ...) retort stand upright / line drawn on card / any sensible description that shows attempt to time from a point in swing to same point in swing ;	1
4(c)(ii)	reaction time of humans / human error in timing / one oscillation is too short to time accurately / difficult to start/stop at exactly the right time ; reduced percentage uncertainty / uncertainty spread over more oscillations / uncertainty less significant over more oscillations ;	2
4(d)(i)	axes right way round with linear scale so that plots occupy at least half of grid, starting from 0 ; correct plots to $\pm \frac{1}{2}$ small square ;	2
4(d)(ii)	appropriate best-fit <u>straight</u> line based on plots ;	1
4(e)	T^2 is (directly) proportional to L ;	1



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1(a)(i)	(so that) <u>all</u> surface area in contact with solution / <u>all</u> potato tissue is in contact with (sugar) solution / <u>all</u> potato tissue affected / to allow comparison between tubes ;	1
1(a)(ii)	55 and 52 ± 1 ;	1
1(a)(iii)	–5 and –8 ;	1
1(a)(iv)	–6.5 ;	1
1(a)(v)	18% ;	1
1(b)(i)	(increased in length as) <u>water</u> entered potato / more sugar in potato / lower concentration of water in the potato ;	1
1(b)(ii)	same concentration of sugar / water in potato and solution ;	1
1(c)(i)	$0.1 < \text{value} < 0.3$;	1
1(c)(ii)	<i>any three from:</i> temperature ; type of potato ; same potato ; diameter of potato ; volume of solution ; (initial) length ; time ;	3
1(d)	add iodine ; (positive) blue-black / black and (negative) brown ;	2

Question	Answer	Marks
2(a)(i)	lighted splint and pops ;	1
2(a)(ii)	G sodium hydroxide / NaOH and E sodium / Na ;	1
2(a)(iii)	calcium / Ca ²⁺ / copper / Cu ²⁺ / Iron(III) / Fe ³⁺ / zinc / Zn ²⁺ ;	1
2(b)(i)	one sealed container containing reaction mixture and delivery tube ; tube enters solution H in a an open container ;	2
2(b)(ii)	limewater ;	1
2(b)(iii)	calcium ;	1

Question	Answer	Marks
3	<i>one mark from each section and then any other 3 marks from:</i> 1. apparatus gas collection: measuring cylinder to collect gas / burette / (gas) syringe / balance (to measure change in mass) ; measuring cylinder (to measure volume of hydrogen peroxide) ; timer / stopwatch ; 2. method reactants in a container with delivery tube into gas syringe or upturned container in water ; measure amounts of gas and take readings of time ; use same amounts of hydrogen peroxide <u>and</u> oxide(s) ; wear goggles to prevent hydrogen peroxide or oxides from harming / entering eyes ; repeat (for the same oxide) ; 3. measurements and control measure <u>volume</u> hydrogen peroxide / specific amount / same <u>concentration</u> hydrogen peroxide ; same <u>mass</u> oxide (catalyst) ; measure volume / mass of gas given off in fixed time / measure time to collect fixed volume / mass of gas ; 4. processing and use of results calculate average from repeated readings ; same volume least time is best catalyst / same volume most time is worst catalyst or same time largest volume collected is best catalyst / same time smallest volume collected is worst catalyst ; describe how to calculate a rate, e.g. cm^3/s or $1/t$;	7

Question	Answer	Marks
4(a)	<u>0.30</u> ;	1
4(b)	0.77 / 0.767 ; answer to 2 decimal places ;	2
4(c)(i)	axes correct way round and axes correctly labelled with units ; suitable linear scale so plots occupy at least half of grid ; five points correctly plotted to $\pm \frac{1}{2}$ small square ;	3
4(c)(ii)	smooth curve with single, unbroken line through or near to all points ;	1
4(d)	as distance increases less force is required ora ; non-linear relationship / bigger change in force at small distances ora ;	2
4(e)(i)	<i>any two from:</i> B has most appropriate resolution for the readings / divisions are suitable for the readings ; B covers the range of the readings / has a larger (maximum) value than the readings / high enough for the readings / goes to 5 N ; A has big gaps (between divisions) / each division in A is 2.0 N / difference between readings too big / scale is too large ; C cannot measure (some of) values (in the table) / C cannot measure above 1 N / C does not measure high enough ;	2
4(e)(ii)	line at 1.8 N marked on newton meter B in Fig. 4.3 ;	1
4(f)	difficult to read newton meter (while door is moving) / difficult to ensure newton meter is pulled horizontally / at right angles / difficulty in pulling newton meter smoothly / meter reading varies ;	1