

Applied Science

Advanced GCE **G628**

Sampling, Testing and Processing

Mark Scheme for June 2010

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Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

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Question		Gd	Expected Answers	Marks	Additional Guidance
1	a	C/D E/U	<i>any two from:</i> Cost ✓ Effect on, pods/tree/ecosystem/environment/birds/animals ✓ Effect on beneficial insects ✓ Health and safety considerations / effect on humans ✓ Effectiveness / long lasting effect ✓ Availability ✓ Method of application/time for spreading AVP ✓	2	Accept effect on taste of product
	b	E/U E/U	<i>any two from:</i> To see if they were, ripe/mature/suitable for harvesting (picking) ✓ To check if, diseased/healthy ✓ To check if damaged ✓	2	Reject quality Reject size Reject contaminated Ignore taste
	c	C/D	Use of long handled pole with knife attached / use of, steps/ladder/cherry picker, / shake the tree ✓	1	
	d	i	E/U 500 ✓	1	
		ii	C/D 500 (kg) ✓	1	
	e	i	E/U So that the results can be compared / obtain a representative sample ✓	1	Ignore fair test /homogeneous
		ii	E/U Ask the, grower/scientist, / use data or science books / use electronic means / internet ✓	1	

Question			Gd	Expected Answers	Marks	Additional Guidance
1	e	iii	C/D C/D	any two from: Temperature ✓ Humidity / dryness / moisture ✓ Keep them all under the same conditions ✓ Labelling ✓ Store away from, vermin/insects, / sealed container ✓	2	Ignore refrigeration Ignore light Ignore reference to time
		iv	E/U	To clean / to remove, dirt/insects/traces of pesticide, ✓	1	Accept bacteria Not kill bacteria Accept impurities Not contamination
		v	E/U	To prevent, (cross) contamination/spreading of, disease/micro-organisms ✓	1	Accept nothing transferred
		vi	E/U	They would turn brown ✓	1	Reject any reference to pods
		vii	C/D	4125 g / 4.125 kg ✓	1	The relevant correct unit is essential
		viii	E/U	To report to others / as a help in any modifications / for a comparison / to use in further analysis ✓	1	Accept references to cocoa fat
		ix	C/D	Quicker / no calculations required / less likely to make a mistake / clearer or easier to understand ✓	1	Ignore more reliable Ignore range Accept trends and patterns
		x	A/B	Reject sample (beans dried too long) / re-start with different sample ✓	1	
	f		C/D C/D	any two from Sort the beans by size ✓ Mentions the need to adjust, temperature/time ✓ Correctly specifies the direction of, temperature/time, change ✓	2	Reject 'sort' without qualification Accept heat
	g		A/B C/D	Peaks 1 and 2 decrease in size ✓ Peak 3 increases in size ✓	2	Reject all peaks the same size

Question			Gd	Expected Answers	Marks	Additional Guidance
1	h	i	A/B	The chocolate will be a solid at 25 °C ✓	1	
		ii	A/B	Viscosity varies with temperature ✓	1	Accept thickness / runniness / ability to flow
		iii	E/U	So that the results can be <u>compared</u> ✓	1	Reject accurate / reliable
	i	i	C/D	So that all the chocolate was at the same temperature of the water bath/expansion was complete ✓	1	Ignore constant /correct temperature
		ii	E/U	Make sure that it is clean / wash it ✓	1	Accept sterilise
		iii	A/B A/B	<i>graph shows:</i> The sugar line is steeper than the chocolate line ✓ <u>Two straight</u> lines ascending from the same temperature ✓	2	

Question		Gd	Expected Answers	Marks	Additional Guidance
1	j	A/B A/B C/D C/D E/U E/U E/U	<p>[Level 1] Candidate gives a full description of a workable experiment in a logical sequence with a correct conclusion. To include at least six valid stages. Using a form of writing that is appropriate to purpose</p> <p style="text-align: right;">(6 - 7 marks)</p>	7	<p><i>Candidates are expected to know the following stages:</i></p> <ul style="list-style-type: none"> • carry out a risk assessment • keep the chocolate at the same temperature during the experiment • temperature range ensures chocolate solid
			<p>[Level 2] Candidate gives a description of a workable experiment in a logical order. To include at least four valid stages. A conclusion may have been provided.</p> <p style="text-align: right;">(4 - 5 marks)</p> <p>[Level 3] Candidate has shown some knowledge of experimental technique but not necessarily in a logical order. To include at least two valid stages. There may be no conclusion or an incorrect conclusion</p> <p style="text-align: right;">(1 - 3 marks)</p> <p><i>N.B. The number of ticks on the script will not always directly equate with the numbers of marks given.</i></p>		<table border="1" style="width: 100%;"> <tr> <td style="width: 50%;"> <p>Method 1</p> <ul style="list-style-type: none"> • place the point of the rod so that it rests on the chocolate surface • place the mass on top of the rod • balance it for a known number of seconds so that the rod penetrates the chocolate • measure the horizontal width of the indentation / depth of penetration • repeat at this temp • repeat at different temperatures </td> <td style="width: 50%;"> <p>Method 2</p> <ul style="list-style-type: none"> • place the rod at a known height above the chocolate • release/drop the rod on to the chocolate • ensure vertical fall/ use of tube • measure the horizontal width of the indentation / depth of penetration • repeat at this temp • repeat at different temperatures </td> </tr> </table> <p>conclusion correctly relates depth of penetration to the hardness of the chocolate</p>
<p>Method 1</p> <ul style="list-style-type: none"> • place the point of the rod so that it rests on the chocolate surface • place the mass on top of the rod • balance it for a known number of seconds so that the rod penetrates the chocolate • measure the horizontal width of the indentation / depth of penetration • repeat at this temp • repeat at different temperatures 	<p>Method 2</p> <ul style="list-style-type: none"> • place the rod at a known height above the chocolate • release/drop the rod on to the chocolate • ensure vertical fall/ use of tube • measure the horizontal width of the indentation / depth of penetration • repeat at this temp • repeat at different temperatures 				
	k	A/B A/B C/D	<p>any three from:</p> <p>Cola contains more caffeine than plain chocolate ✓</p> <p>105 mg of theobromine has the (stimulant) effect of 105÷10 mg of caffeine ✓</p> <p>In total, cola has a greater effect ✓</p> <p>Can of cola increases heart rate more than 25 g plain chocolate as contains more caffeine ✓</p>	3	Need comparison – not just state data
			Total	39	

Question			Gd	Expected Answers	Marks	Additional Guidance
2	a	i	E/U E/U	Reference to danger of being in water e.g. fast-flowing/deep/polluted/contaminated/drowning ✓ Reference to falling on, slippery rocks/uneven ground, ✓	2	Reject reference to wildlife
		ii	A/B A/B	Heavier/more dense, particles will be deposited first ✓ The 'tin ore' will be diluted by other sediments as distance from the mine increases ✓	2	
		iii	A/B C/D	Spread out the grit on absorbent paper ✓ Remove the grit with tweezers ✓	2	Method carried out by stream
		iv	C/D	0.75 (%) ✓	1	
		v	E/U	Less danger of breakage / glass is heavier ✓	1	
		vi	E/U E/U	<i>any two from:</i> Date ✓ Place of collection ✓ Time of collection ✓ What the jar contains / sample name or number ✓ Mass/amount, of sample ✓ Suitable hazard warning label ✓	2	
	b	i	E/U	Toxic / harmful (tin oxide/arsenic oxide)✓	1	
		ii	C/D	(Wash with more water) until it is no longer blue ✓	1	Reject clear solution / water
		iii	C/D C/D	<i>any two from:</i> Furnace temperature needed is high ✓ The equipment is not available ✓ dangerous/toxic/harmful, vapours / tin produced as a liquid ✓	2	Accept suitable ventilation system

Question		Gd	Expected Answers	Marks	Additional Guidance
2	c		A/B A/B Total mass of tin in the cans is $1 \times 10^8 \times 0.40 \text{ g} / 4 \times 10^7 \text{ g} / 0.40 \times 30 \div 100 \text{ g} \checkmark$ 12 tonnes / 12000 kg / $1.2 \times 10^7 \text{ g} \checkmark$	2	The answer must have the correct relevant unit to gain both marks
	d	i	E/U Repeat the measurement / ignore it \checkmark	1	Reject 'anomaly' / 'outlier' without qualification
		ii	A/B A/B C/D Length of pipe is 0.90 m \checkmark Velocity = frequency x 2 x length \checkmark 315 (m s^{-1}) \checkmark	3	Accept ecf
	e	i	C/D E/U E/U <i>any three from:</i> Accuracy \checkmark Easy to use \checkmark Quick in operation \checkmark Effective \checkmark Safe to use / temperature considerations \checkmark Uses available, materials/equipment \checkmark	3	Ignore cost Ignore reliable Ignore feasible Time needs qualifying
		ii	A/B C/D The mass of zinc is very small \checkmark This small mass could lead to significant errors in weighing \checkmark	2	Reject percentage of zinc
		iii	C/D C/D Choose a method that does not damage the coin / uses a minimal amount for analysis \checkmark Gives accurate results for very small samples \checkmark	2	Ignore effective / safe
	f		C/D C/D The concentration, diminishes/reduces, away from the coast \checkmark Most of the TBT is on the surface / TBT less as depth increases \checkmark	2	
			Total	29	

Question		Gd	Expected Answers	Marks	Additional Guidance
3	a		C/D <i>any one from:</i> The pressure is too high / dangerous ✓ Cannot generate this pressure in the laboratory ✓ Toxicity / unavailability of starting materials ✓	1	Ignore cost
	b	i	E/U Takes a shorter time ✓	1	
		ii	C/D <i>any two from:</i> E/U Lower temperature used / safer ✓ No, other/waste, products ✓ Bigger yield ✓	2	
		iii	E/U (fractional) Distillation ✓	1	Accept a description of distillation /evaporation of lower bp liquid Ignore reference to apparatus
		iv	E/U The relative molecular mass / M_r is 44 ✓	1	
		v	A/B Compare the fragmentation pattern with that of ethanal / refer to the computer library of mass spectra ✓	1	
		vi	A/B See if any bonds present only in ethanoic acid are present in the sample of compound T ✓	1	
	c	i	A/B Bigger surface area for reaction between alcohol and, air/oxygen ✓	1	Need explanation Not just 'surface area'

Question			Gd	Expected Answers	Marks	Additional Guidance
3	c	ii	A/B A/B C/D C/D E/U E/U E/U	<p>[Level 1] Candidate gives a full description of a workable experiment to include calibration organised in a clear and coherent manner. To include at least seven valid stages. <i>(6 - 7 marks)</i></p> <p>[Level 2] Candidate gives a description of a workable experiment showing some organisation. To include at least four valid stages. <i>(4 - 5 marks)</i></p> <p>[Level 3] Candidate has shown some knowledge of experimental technique but description may be lacking in logical order and detail. To include at least two valid stages. <i>(1 - 3 marks)</i></p> <p><i>N.B. The number of ticks on the script will not always directly equate with the numbers of marks given.</i></p>	7	<p><i>valid stages may include:</i></p> <ul style="list-style-type: none"> • put sand into the test tube (and cork) • pour water into measuring cylinder • volume of water in excess of 150cm³ • float tube in cylinder of water • adjust amount of sand • mark the water level on the tube (using the marker pen) • replace the water in cylinder with the salt solution • float tube in salt water and mark level on the tube (using the marker pen) <p>calibration</p> <ul style="list-style-type: none"> • remove the tube and mark a scale from 1.00 to 1.10 g cm⁻³
		iii	E/U	Risk assessment ✓	1	
		iv	E/U	1.44 (g) ✓	1	Not 1.4
		v	E/U	5.76 (g) ✓	1	Accept ecf /numerical & sig fig x 4
	d	i	E/U E/U	<p>any two from:</p> <p>Use of PPE ✓</p> <p>Use a fume cupboard ✓</p> <p>No naked flames ✓</p>	2	
		ii	C/D	Method shows no naked flames / use of water bath / use of electric hotplate ✓	1	Diagram essential
				Total	22	

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