OCR
RECOGNISING ACHIEVEMENT

GCE

Applied Science

Advanced GCE

Unit **G628:** Sampling, Testing and Processing

Mark Scheme for June 2011

Oxford Cambridge and RSA Examinations

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Question			Expected Answers	Marks	Additional Guidance
1	a		Any **two** from See if it can be grown here ✓ Has better flavour/taste than 'home' varieties ✓ More resistant to pests ✓ Produces higher / better yield ✓ Increased apple production ✓	2	**ignore** better variety **ignore** more jobs
	b		**Contact** Acts directly on sprayed 'infected' areas / outer surface / outside of plant ✓ Areas not reached by the spray are not affected / product can be washed off / contains toxic compounds / may affect consumer/ may enter water system✓ **Systemic** Absorbs (by roots) / penetrates into the plant ✓ May be retained in the plant / to be used at correct time / may affect consumer / may enter water system ✓	1 1 1 1	**ignore** eutrophication **accept** may be present in the fruit
	c	i	Risk assessment / check hazards / use PPE ✓	1	
	c	ii	The percentage of copper in the soil will vary / for comparison / uneven spraying ✓	1	**ignore** wide range of results **ignore** reliable / accurate / valid
	c	iii	Cause of change / rain / re-spraying on copper / fungicide concentration ✓ Effect of change / dilution ✓	1 1	**ignore** washed away **ignore** no change **ignore** 'weather' / environmental factors / unqualified **ignore** temperature
	d		So that only one variable will be **affecting the results** / AW ✓	1	**ignore** 'fair test' **ignore** compare
	e	i	Change the temperature / use a different carrier gas / use a different column ✓	1	**reject** change the conditions **ignore** references to solvent **accept** change in pressure / rate of flow
	e	ii	12 ✓	1	

Question			Expected Answers	Marks	Additional Guidance
	e	iii	Ethyl butanoate and butyl ethanoate ✓	1	The names of both compounds are needed for the mark
	e	iv	Any **two** from Reference of position of B & C with respect to A or D/G ✓ Both have a smaller retention time than compound **G** / ethyl hexanoate ✓ Therefore a lower relative molecular mass ✓	2	Some comparison is necessary
	f	i	Under the same conditions / constant / room temperature ✓	1	**accept** air type container / cool place / dry place / level of low light **accept** refrigerator
	f	ii	Any **two** from Date ✓ Apple variety ✓ Sample number / which apple ✓ Time since removal from storage ✓ Analyst's name ✓	2	**ignore** time only **ignore** length of time of storage

Question			Expected Answers	Marks	Additional Guidance
	f	iii	To prevent contamination ✓	1	**accept** impurities **ignore** bacteria
	f	iv	Full use has not been made of graph paper ✓ The **y axis** should be spread out more to show the variations more clearly / AW ✓	2	**accept** all points plotted too close together **ignore** no heading
	g		A method that needs to cut / destroy / damage the apple ✓	1	
	h	i	To obtain an average / mean / representative / (more) reliable result ✓	1	**ignore** accurate **accept** valid
	h	ii	11.1 ✓	1	
	h	iii	The apple was less/not ripe / a different variety ✓	1	**accept** brand **accept** different storage times/ages
	h	iv	Any **three** from Some of the infrared (energy) is **absorbed** (by the sample) ✓ Different bonds vibrate differently ✓ Different **bonds** absorb infrared energy of a particular frequency ✓ Making the (covalent) bonds vibrate more ✓ The energy that is not absorbed is detected (and compared to the infrared energy at the start) ✓	3	

Question			Expected Answers	Marks	Additional Guidance
	i		**[0 marks]** Candidate does not include more than one valid point. **[1-3 marks]** Candidate gives a **description** that shows some knowledge of experimental technique but not necessarily in a logical order. For 1 mark candidates should include two valid points. For 2 marks candidates should include at least three valid points. For 3 marks candidates should include at least four valid points. **[4-6 marks]** Candidate gives a **description** of a workable experiment in a logical and ordered way but in less detail. For 4 marks candidates should include at least five valid points. For 5 marks candidates should include at least six valid points. For 6 marks candidates should include at least seven valid points. **[7-10 marks]** Candidate gives a **full description** of a workable experiment in a logical and well ordered way. For 7 marks candidates should include at least eight valid points. For 8 marks candidates should include at least nine valid points. For 9 marks candidates should include at least ten valid points. For 10 marks candidates should include at least eleven valid points.	10	**valid points:** • complete a risk assessment • **cut** an apple into slices (of equal size) • (prepare a) Vitamin C solution(s) of known strength • place one slice as a control • place slice(s) into a Vitamin C solution/add Vitamin C drop wise for a known time period • remove slice from the Vitamin C solution (and place on a paper towel) • start timing using suitable timer • record observations (at known time intervals) • take the time at which the apple slice starts to turn brown / compare against a colour chart • suitable method of recording result / results table • repeat with different concentrations /number of drops (of Vitamin C) • process results **accept** use of lemon/orange juice **accept** use of photographs **ignore** PPE
			Total	**39**	

Question			Expected Answers	Marks	Additional Guidance
2	a	i	Wear (plastic) gloves / (face) mask ✓ As mercury (and its compounds) are toxic / poisonous ✓	2	**ignore** eye protection **ignore** harmful / dangerous
	a	ii	In **separate**/(different) container**s** ✓	1	
	a	iii	Any **four** from Date / time of collection ✓ Location✓ Health and safety label ✓ Number of sample / name of contents / collector✓ Storage instructions/ temperature of storage✓	2	2 marks for **four** correct answers 1 mark for **two or three** correct answers 0 mark for **one** correct answer **ignore** mass/quantity
	a	iv 1 iv 2	Concentration (of mercury) increases✓ Up to 5cm depth ✓ AVP ✓ Look it up in science books / journals / previous work / ask an 'expert' / analyse soil samples away from the mine ✓	2 1	
	b	i	The mercury percentage /amount might decrease ✓ As the total mass increases (because of the water present) ✓ OR The mercury percentage / amount might increase ✓ As the water may be contaminated with mercury ✓	2	a valid explanation is required to obtain the first mark
	b	ii	To make the samples homogeneous / same size ✓	1	
	b	iii	Correct rearrangement of the equation $\frac{0.270 \times 8.00}{0.360}$ / $\frac{A_1 \times [Hg]_2}{A_2}$ ✓ 6.00 (μg dm^{-3}) ✓	2	**accept** 6 (μg dm^{-3})
	b	iv	600 (μg dm^{-3}) ✓	1	**allow** ecf (answer biii x 100)
	b	v	Correct conversion μg / g (x 10^{-6})✓ 0.012 ✓	2	**allow** ecf ($\frac{\text{answer biv x } \mathbf{10^{-6}} \text{ x100}}{5}$) **reject** ecf answer without appropriate conversion

Question			Expected Answers	Marks	Additional Guidance
	b	**vi**	Any **two** from Easy / quick ✓ (Very) accurate ✓ Less hazardous ✓ Very sensitive / only small samples needed✓	**2**	**ignore** reliable **ignore** precise
	c	**i**	To remove impurities / contamination ✓	**1**	**accept** clean **accept** tap may contain impurities
	c	**ii**	To ensure that the material was completely dry / all water removed✓	**1**	
	c	**iii**	0.0045 (g) ✓	**1**	
	c	**iv**	$\frac{3.38 \times 10^{-7} \times 100}{0.0045}$ ✓ 0.0075 (1) ✓	**2**	**allow** ecf from c iii **reject** inverted fraction
	d	**i**	3.8-3.9 (km s^{-1}) inclusive ✓	**1**	
	d	**ii**	5.2 ±0.1 (km s^{-1}) inclusive ✓ Assumption – it continues as a straight line graph of the **same slope** / **gradient** / carries on at same rate✓	**1** **1**	
	e	**i**	h increases ✓ as ρ and g remain constant ✓	**1** **1**	
	e	**ii**	984.8 (cm) ✓	**1**	**accept** 984.7 / 984.76 / 985 (cm) **reject** 984 (cm)
	f	**i**	(Very) sensitive / quick to use / accurate / easy to make up / easy to use ✓	**1**	**ignore** no better / safer test to use **ignore** effective / more reliable
	f	**ii**	(Addition of ammonia from the water) affect/interferes with results / would produce erroneous result ✓	**1**	**accept** Nessler's solution would react with it **ignore** accurate **ignore** just contamination
	f	**iii**	(Sufficiently) accurate / has graduation mark✓	**1**	**ignore** precise
	f	**iv**	Shaken ✓ To achieve homogeneity / uniform concentration / same throughout / **fully** mixed ✓	**2**	**reject** stir **ignore** just mix
			Total	**34**	

Question			Expected Answers	Marks	Additional Guidance
3	a	i	**[0 marks]** Candidate does **not** include more than one valid point. **[1 – 2 marks]** Candidate is able to give the name of at least one piece of equipment and describe at least one stage of the procedure. There is minimal structure and there may be problems with the presentation. **[3 – 4 marks]** Candidate is able to give the name and purpose of at least two pieces of equipment used and describes at least two stages of the procedure. The instructions are organised and easy to follow. **[5 – 7 marks]** Candidate is able to give the names and sizes of suitable equipment and describe at least three stages in the procedure on a **large scale**. Detailed, easy to follow instructions suitable for use by the farming families. **Candidates describing small scale procedures can only gain a maximum of 4 marks.**	7	**valid points** **Production of juice from the stalks** • Cutting / mincing / shredding / pounding (of stalks) • Use of mangle / roller-mill / pestle mortar / food processor • Collection of juice in suitable container / buckets • **Small scale** pestle mortar / food processor **Filtering of the juice into a pan** • Use of cloth / muslin / netting/ (fine) sieve / colander • **Small scale** filter paper/funnel **Description of a vessel used for heating** • Use of a preserving pan / metal bucket / cauldron • Suitable size of vessel described capacity of 25 dm^3 or larger • **Small scale** large flask / 500cm^3 **Suitable method of heating a large volume described** • An open fire / electrical heating / gas heating • **Small scale** Bunsen burner/ hot plate **Suitable method of impurity removal** • A large ladle / spoon / scoop / sieve • **Small scale** scoop / spoon /sieve **Description of bottling** • Use of a jug / funnel • **Small scale glass** funnel **Use of personal protective equipment** • Apron / old clothing / gloves • **Small scale** use of normal laboratory PPE **ignore** crush **ignore** plastic bucket **accept** large as a size

Question			Expected Answers	Marks	Additional Guidance
	a	**ii**	Increased / more boiling / heat for longer ✓	**1**	**accept** re-heat **reject** add more sugar
	b	**i**	4 (dm^3) ✓	**1**	
	b	**ii**	A – to separate (the alcohol and water) ✓ B – to condense (the alcohol vapour) / vapour to liquid ✓	**1** **1**	**accept** fractionating column **accept** condenser/ condensation **reject** condense steam / water
	c		Any **two** from Stable to heat / light / storage ✓ How much is needed / concentration necessary / intensity of colour ✓ Not affected by other components in the sweet ✓ Will affect taste ✓ Availability (of colouring agent) ✓ Water soluble ✓	**2**	**reject** answers that refer to the toxicity / safety of the colouring agent **ignore** cost
	d	**i**	D √ The R_f value is $\frac{3.0}{5.0}$ = 0.6, which is one of the values in the table ✓	**1** **1**	
	d	**ii**	Try another solvent / two way chromatography ✓	**1**	
	d	**iii**	(Relative) molecular mass / M_r ✓	**1**	
			Total	**17**	

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