

Applied Science

Advanced GCE

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

Mark Scheme for January 2013

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
All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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Annotations

Annotation	Meaning
	Tick
	Cross
	Benefit of doubt
	Error carried forward
	Example/Reference
	Ignore
	Not answered question
	Benefit of doubt not given
	Large dot (Key point attempted)
	Reject
	Contradiction
	Error in no. of significant figures
	Unclear
	Omission mark

Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
✓	separates marking points
not	answers that are not worthy of credit
reject	answers that are not worthy of credit
ignore	statements that are irrelevant
accept	answers that can be accepted
()	words that are not essential to gain credit
—	underlined words must be present in answer to score a mark
ecf	error carried forward
AW	alternative wording
ora	or reverse argument

Question		Answer	Marks	Guidance
1	(a) (i)	<p>Any one from:</p> <p>To obtain a representative sample ✓</p> <p>To check where attacks have occurred ✓</p>	1	Ignore greater variety / collect more data
	(ii)	<p>Any one from:</p> <p>(Pest) attack may occur at different stages ✓</p> <p>Different pests attack at different times ✓</p> <p>To compare, growth/results (at different stages) ✓</p>	1	Reference to pests not essential
	(iii)	<p>1. There is a danger of falling and being injured ✓</p> <p>2. Standing on the ground is safer but falling samples or cutters may cause injury ✓</p> <p>3. This may be the safest but the ground could be uneven causing the person to, fall/topple, off the steps ✓</p>	3	<p>Relative suitability of each method referenced by assessing level of type of risk.</p> <p>Ignore ladder being unstable</p>
	(iv)	Fungal diseases/attack ✓	1	
	(b) (i)	Dispersion in water - easier to control concentration / no dust (inhalation) ✓	1	Note answers must refer to dispersion in water
	(ii)	<p>Any two from:</p> <p>Has to 'hit' insects / ora ✓</p> <p>Can be washed off with rain / not long lasting ✓</p> <p>Only affects where contact is made / not full coverage ✓</p> <p>Can affect species not targeted / moved to other sites ✓</p> <p>More than one application needed ✓</p>	2	Ignore references to inedible fruit time of spreading
	(iii)	<p>Any one from:</p> <p>Is it still present in air? ✓</p> <p>How long it takes to settle ✓</p>	1	Ignore references to PPE

Question		Answer	Marks	Guidance
	(c) (i)	Any one from: Hanging them up ✓ Place, near window/on window sill/in sun ✓ Use a desiccator ✓	1	Accept use of hairdryer / radiator / vacuum Reject oven / use of Bunsen burner
	(ii)	0.21 ✓	1	Accept 0.2
	(iii)	2.5(2) g / 0.0025(2) / 2.5(2) x 10 ⁻³ kg ✓	1	ecf from(ii) units must be stated
	(iv)	1. For method 2 - any one from: (Solution) more concentrated ✓ More effective ✓ No blockages ✓	1	
		2. Advantages of method 1 - any two from: Quicker / easier ✓ Availability of paraffin / only water needed ✓ No need for hazard of paraffin ✓ Filtering / extra equipment is not needed ✓ Better spread / greater homogeneity ✓	2	Ignore safer
	(v)	(A compound used) to increase the, effectiveness/potency, / an enhancer ✓	1	Accept valid explanation Ignore references to speed

Question		Answer	Marks	Guidance
	(d)	<p>[Level 0] Candidate includes fewer than three valid points. <i>(0 marks)</i></p> <p>[Level 1] Candidate has shown some knowledge of a workable method but it may be lacking in logical order and detail. To include at least three valid points <i>(1 – 2 marks)</i></p> <p>[Level 2] Candidate gives a description of a workable method showing some organisation. To include at least five valid points. <i>(3 – 4 marks)</i></p> <p>[Level 3] Candidate gives a full description of a workable method, organised in a clear and coherent manner. To include at least seven valid points. <i>(5 – 6 marks)</i></p>	6	<p>Candidates are expected to mention the following valid points:</p> <ul style="list-style-type: none"> • wash/clean fruit • dry (the fruit) • weigh (the fruit) • clean the equipment (before use) • cut/break into pieces/separate seeds • press/crush/use of pestle & mortar/juicer • filter the juice • use of filter (paper) & funnel/muslin/sieve • repeat filtering process • measure volume of the juice • use of measuring cylinder • divide the volume of juice by the (total) mass to find the concentration. <p>Note: If juice has been weighed accept calculation mark</p>
(e)	(i)	3.7/3.8 and 5.0 (g) ✓	1	Allow 1.2 / 1.3 calculated range
	(ii)	<u>less</u> than 22.5 (g) ✓	1	Accept numerical value lower limit 15 Reject 22.5
(f)	(i)	<u>25.55</u> (cm ³) ✓	1	
	(ii)	1.80 ✓	1	Reject 1.799 / 1.8 Accept ecf

Question		Answer	Marks	Guidance
	(iii)	<i>advantage</i> Repetition ✓	1	Ignore references to time
		<i>disadvantage</i> Gives smaller figures / Less accurate (results) / (%) error will be greater ✓	1	
	(iv)	Wash with the new pomegranate juice ✓ To avoid contamination ✓	2	Ignore washing and drying
	(g)	Vitamin C has been added ✓	1	Ignore just vitamins
		Total	32	

Question		Answer	Marks	Guidance
2	(a)	Any one from: Man contained a high level of arsenic ✓ Arsenic, is a contaminant of/found in, copper ores/pyrites ✓	1	
	(b)	6 pints = $6 \times 568 / 3.4(1) / 3408$ ✓ Arsenic dose = $15 \times [6 \times 568] / 15 \times 3.41 / 15 \times 3408$ ✓	2	Accept reverse calculation
	(c)	<u>108</u> ✓	1	
	(d)	$0.0032 / 3.2 \times 10^{-3}$ (g) ✓	1	Accept 3.2 only if mg stated
	(e) (i)	700–2000 cm ³ inclusive ✓	1	
	(ii)	Any one from: How much arsenic ((III) oxide) to add ✓ Concentration of (sodium carbonate) solution ✓ Apparatus used ✓	1	Ignore risk assessment Allow 'arsenic' Ignore method / time taken for heating
	(iii)	(Fumes are) poisonous / toxic / dangerous / hazardous (from arsenic compounds) ✓	1	Ignore flammable / harmful
	(iv)	A solid formed (from two solutions) ✓	1	Accept named soluble impurity Ignore bits
	(v)	To remove soluble impurities / make sure all solution passed through ✓	1	Ignore contamination
	(vi)	28.5 (g) / 1.90×15 (g) ✓ % Yield = $\frac{\text{actual yield} \times 100}{\text{theoretical yield}}$ / = $\frac{22.8 \times 100}{28.5}$ ✓ 80 ✓	3	Correct answer = 3 marks Accept ecf
	(vii)	% (yield) lower ✓ actual yield/mass will be less as water present ✓	2	Ignore references to damp

Question		Answer	Marks	Guidance
(f)	(i)	to avoid contamination / OWTTE ✓	1	
	(ii)	solid material may contain arsenic / so only get soluble arsenic ✓	1	
	(iii)1 2	0.024 (mg dm ⁻³) ✓ Ignore / repeat / take more sample(s) / (treat as), anomalous/outlier ✓	1 1	Allow calculation without D 0.022/0.0218
	(iv)	<i>Any two from:</i> Well 1 is near to the spoil heap ✓ Well 2 is above the ore body ✓ Well 3 is closer to, ore body/arsenic source ✓	2	Ignore general reference to depth Allow Well 2 is not as close to, arsenic ore body / arsenic source / spoil heap
(g)		[Level 0] Candidate includes fewer than three valid points. (0 marks) [Level 1] Candidate shows some knowledge of a workable method but there has been little consideration of variables. To include at least three valid points. (1 – 2 marks) [Level 2] Candidate gives a description of a workable method in a logical order. To include at least five valid points. (3 – 4 marks) [Level 3] Candidate gives a full description of a workable method, using a form of writing that is appropriate to the purpose. To include at least seven valid points. (5 – 6 marks)	6	Candidates are expected to know the following valid points: <ul style="list-style-type: none"> • carry out a risk assessment / use of PPE • add contaminated water to clay /vice versa • (test) contaminated water as a control/initially <ul style="list-style-type: none"> • keep volume of contaminated water constant • add varying masses of clay or <ul style="list-style-type: none"> • keep mass of clay constant • vary volume of contaminated water <ul style="list-style-type: none"> • mention of stirring/shaking/mixing • time mentioned • filtration of mixture • temperature mentioned / need for a constant temperature • test filtered water (for arsenic content) /compare with control • repetition / mention of any extension work.

Question		Answer	Marks	Guidance
	(h)	3.77 (g) ✓ $\frac{3.77 \times 48.4}{100} / 1.82$ (g) ✓ $(\frac{1.82 \times 100}{129.4} = 1.41$ (%) ✓	3	Accept 1.82 for 2 marks Accept 1.40 / 1.410 maximum 2 marks
	(i) (i)	Advantage - any one from: Can be used for low concentrations of arsenic ✓ Safer ✓ Works with phosphates ✓ Disadvantage - any one from: Expensive ✓ Need a trained operator ✓	2	Ignore accurate / precise / more effective / reliable
	(ii)1	<u>20.9</u> (mg) ✓	1	
	2	Any two from: Inaccuracies in determination ✓ Non-uniform soil sample ✓ Soluble arsenic lost (to surroundings) ✓	2	
		Total	35	

Question			Answer	Marks	Guidance
3	(a)	(i)	68-70 (°C) ✓	1	
		(ii)	Any one from: Quicker / (more time) effective ✓ Sugars, are not decomposed/do not burn ✓ Uses less, energy/fuel ✓	1	Ignore safer / easier / more efficient
		(iii)	Any one from: Equipment ✓ Fuel ✓ Producing lower pressures ✓	1	
		(iv)	Increased/greater/larger, <u>surface area</u> ✓	1	
		(v)	Any four from: Taste / texture ✓ How much is needed / intensity ✓ Toxicity / safe / allergies ✓ Appearance / is colour acceptable ✓ Long lasting / does it, keep/store/fade ✓ Will it dissolve (in the sugary mass) ✓ Does it, react with/affect, (the sugary mass) ✓ Suitability for vegetarians etc ✓ Availability ✓	4	Ignore risks / ease of use / effectiveness /staining /smell
	(b)	(i)	Any two from: Stir ✓ Warm / heat ✓ Break into smaller pieces ✓	2	
		(ii)	Solvent below base line / base line above solvent ✓ Remove plate when solvent front is near the top of plate ✓ Dry ✓	3	

Question		Answer	Marks	Guidance
	(iii)	0.67-.0.76 ✓	1	
	(iv)	Other, dyes/substances, may have same, R _f value/result ✓	1	
	(v)	Same (fragmentation) pattern / evidence of matching ✓	1	
(c)	(i)	To condense (ethyl hexanoate/vapour) / condenser ✓	1	Reject condense, water/steam/solution/liquid Accept condenses, vapour/gas, to liquid
	(ii)	To prevent fire/ because flammable liquid/ethanol used / uses no naked flames ✓ To control the heating / maintains constant temperature ✓	2	Ignore cost effective / easier to use Accept safe if qualified Accept lower risk when qualified
	(iii)	<i>Any one from:</i> Look up the densities ✓ Test with indicator ✓ Add water to see which layer it joins ✓	1	
	(iv)	Covalent bonds ✓	1	Accept functional groups
	(v)	As a reference temperature / close to room temperature / easily kept constant ✓	1	Ignore safer
	(vi)	It is not accurate enough ✓	1	
Total			23	

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