

GCE

Applied Science

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

Advanced GCE

Mark Scheme for June 2018

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

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.

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Question			Answer	Mark	Guidance
1	(a)	(i)	Hard hat – rock falls Goggles / eye protection – flying splinters of rock Gloves – sharp edges Steel capped boots – rocks breaking and falling Dust / face mask – prevent inhaling dust	1 1	Accept – any implication of small pieces of rock from hammering Needs to be a reason not just H and S
1	(a)	(ii)	Any TWO from Date or time / location / collector / name (of fossil) / hazard warning / storage instructions / fragile, handle with care	2	
1	(a)	(iii)	Size / scale Location of collection Alternative view Colour Labelling of fossil / name Mass Type of rock in which found	1 1	
1	(a)	(iv)	Collect a different fossil to see if this typical of the Upper Chalk Research (on the internet) Collect from another outcrop in the Upper Chalk for comparison	1	
1	(b)		(Gradually) seep through / filter through / gradually permeate	1	
1	(c)	(i)	Clean (and dry)	1	Accept – washed / sterilised
1	(c)	(ii)	To remove insoluble material, that might affect the results	1 1	Accept – an implication of insoluble
1	(c)	(iii)	[0 marks] Candidate does not include any of the valid steps. [1-2 marks] Candidate includes at least one basic step and shows some outline understanding of the task. [3-4 marks] Candidate includes at least four valid steps and shows a reasonable level of understanding with some attempt at a logical order. [5 marks] Candidate includes at least seven valid steps and shows a clear understanding of the order of steps	6	<i>Valid steps</i> • Use of a measuring cylinder / beaker • To measure out a stated quantity / volume of stream water • Place the water in an evaporating basin / beaker / crucible (of suitable size) • Weigh the evaporating basin etc. (with or without the water) • Use of a watch glass

Question			Answer	Mark	Guidance
			needed. Heating to constant mass is omitted [6 marks] Candidate includes most of the valid steps including the need to heat to constant mass.		<ul style="list-style-type: none"> • Heat basin until all water has gone / dry • Slowly / gently • Allow the basin to cool • Weigh the basin (and contents) • Heat (gently) again to constant mass • Find the concentration of soluble material
1	(c)	(iv) I	Have the table in sample number order (rather than ascending order of mass)	1	Accept 'bar chart / graph'
1	(c)	(iv) II	Any TWO from Too high a volume of water initially used Incorrect weighing at the end Sample not completely dry / not heated for long enough / not completely evaporated Incorrect filtering / contamination of sample Arithmetical error Not heated for long enough	1 1	
1	(c)	(iv) III	255 (mg dm ⁻³)	1	
1	(c)	(iv) IV	No. of grams = 255/1000 = 0.255 1000 dm ³ in 1 m ³ Mean value = 255 g m ⁻³	1 1	One mark for obtaining 0.255 / 255000 Accept ecf from III
1	(d)		Use of a water bath / electric heater / hotplate	1	Accept 'reflux' Do not accept 'use of a Bunsen burner / naked flame'
1	(e)		Any TWO from Larger / 100 cm ³ burette / smaller water sample / more concentrated soap solution	2	Accept 'stronger soap solution'
1	(f)	(i)	The type of soap is not specified Does not have a control	1	
1	(f)	(ii)	Boiling the water before (treating it with the soap)	1	

Question			Answer	Mark	Guidance
1	(g)	(i)	Hardness is caused by the hydrogencarbonate (ion), sample B has a lower value than the other two / dry residue comes mainly from hardness, sample has a lower value	1	A comparison is important here
1	(g)	(ii)	Areas where farming occurs have higher nitrate levels	1	
1	(h)		A process of evaporation and condensation (in another part of the apparatus)	1	
1	(i)	 more lower	1	
1	(j)		From the graph 22.50 cm ³ of aq sodium hydroxide corresponds to 1.55 g of calcium sulfate (1) Solubility = $\frac{1.55 \times 100}{750} = 0.207 \text{ g / 100 cm}^3$ (1)(1) (1.50 gives 0.200 cm ³ , and 1.60 gives 0.213 cm ³)	3	Accept a range of 1.50 to 1.60 inclusive for the mass of CaSO ₄ . There is one mark for obtaining 1.55 g and two marks for giving the correct answer to 3 significant figures. A value of 0.2 or 0.21 g would get a total of two marks
Total				35	

Question			Answer	Mark	Guidance
2	(a)	(i)	By the use of science books / the internet / ask an expert to look at leaves/acorns/bark	1	Accept 'by comparison of leaves / acorns / bark'
2	(a)	(ii) I	26.(0) m	1	Accept any value between 25.98 and 26.0 m
2	(a)	(ii) II	The height of the observer / trunk needs to be considered	1	
2	(a)	(ii) III	The further away from the tree, the smaller the angle,	1	More difficult to see the actual top of the tree
2	(b)		Caterpillar hairs cause skin irritation / asthma style symptoms (when inhaled) / covered in poisonous hairs	1	Accept answers based on the toxicity of the pesticide being used
2	(c)		Advantage – may not need a second spraying Disadvantage – (broad spectrum), will affect more beneficial insects / non-specific	2	Accept for an advantage 'It kills on contact / instantly / so its quick' Accept for disadvantage 'hazardous to humans'
2	(d)	(i)	0.5 – 0.6 (mg) inclusive	1	
2	(d)	(ii)	0.00331	2	If answer correct but sf incorrect 1 mark Significant figure mark applies only to correct numbers
2	(e)		[0 marks] Candidate does not include any of the valid steps. [1-2 marks] Candidate includes at least two basic steps and shows some outline understanding of the task [3-4 marks] Candidate includes at least four valid steps and shows a reasonable level of understanding with some attempt at a logical order. [5 marks] Candidate includes at least six valid steps and shows a clear understanding of the order of steps needed. The hard shell has been removed but the final powdering step has been omitted. [6 marks] Candidate includes most of the valid steps including the final step to obtain fine acorn flour.	6	<i>Valid steps</i> <ul style="list-style-type: none"> • Remove cup • Remove the (hard) shell • Cut the acorn 'meat' into small pieces / use of a pestle and mortar • (Place in a suitable vessel and) run water over the pieces / leave to soak in water / use warm or boiling water • Until the water is no longer brown / repeat leaching step • Filter / sieve • Using a cloth / filter paper • Allow the material to dry • Powder in a pestle and mortar
2	(f)	(i)	It does not state the mass of the oak galls needed	1	Accept 'how many'
2	(f)	(ii)	Risk assessment	1	
2	(f)	(iii)	34.8 / 35 (g)	1	
2	(f)	(iv)	Take a known volume of the iron-containing solution and add twice the volume of water (1) Stir / mix well (1)	2	

Question			Answer	Mark	Guidance
2	(f)	(v)	No reaction with oxygen / air can occur	1	Accept 'No oxygen entering.....'
2	(f)	(vi) I	If there is no iron present, there is no colour and no absorption	1	
2	(f)	(vi)II	This is the colour where the absorption is the greatest	1	Accept 'others colours are blocked'
2	(f)	(vii)	Any THREE from Use the same paper / material Compare over a set time interval Expose to the same amount of light Ink of the same age used Same amount / concentration of ink used Temperature considerations Humidity	3	
2	(f)	(viii)	Not long lasting There are not enough oak galls Slow production rate Difficult process of manufacture Environmental considerations	2	
2	(g)	(i)	Size / same of ball Direction of the grain / Wood is end on / sideways on Age of wood Density Moisture content of the wood Storage of the wood Which part of the tree	2	Do not accept 'thickness'
2	(g)	(ii)	305.7 (N)	1	Accept 305 – 306 inclusive
2	(g)	(iii)	Jarrah is much harder /stronger (than the other two woods) Jarrah may not rot (so easily) durable / lasts longer split so easily does not have to be 'weather' treated needs replacing less often / last longer	2	
			Total	34	

Question			Answer	Mark	Guidance
3	(a)		<i>In vivo</i> testing on the body <i>In vitro</i> testing in the laboratory	1	
3	(b)	(i)	To see if the composition varied from batch to batch / representative sample	1	Do not accept average
3	(b)	(ii)	To see if the product changes	1	
3	(b)	(iii)	Gave accurate results / reliable results / reproducible results	1	Accept most appropriate
3	(b)	(iv) increases decreases	1	
3	(b)	(v)	Either 340nm or 300nm	1	
3	(c)		80 (cm ³)	1	
3	(d)	(i)	Area is 16cm ² Mass of sunscreen needed = 16 x 2 = 32(mg)	1	
3	(d)	(ii)	$\frac{32 \times 100}{40}$ (1) 80mg (1)	2	Accept ecf on (d) (i)
3	(e)		Any TWO from Porosity Colour Stretchiness Wetness How often washed Type of laundry treatment Past exposure to UV radiation Thickness Numbers of layers Coverage of skin	2	
3	(f)	(i)	Sunscreen Q Good protection in UVA, less protection in UVB (1) Sunscreen S Good protection in both UVA and in UVB (1)	2	Accept answers in terms of appropriate wavelengths
3	(f)	(ii)	Increase the concentration of active ingredients K (and M)	1	
3	(g)	(i)	Otherwise the starting spot would all dissolve in the solvent	1	
3	(g)	(ii)	0.77 / 0.78 / 0.8	1	Do not accept 0.7

Question			Answer	Mark	Guidance
3	(g)	(iii)	Other compounds could have the same R_f factor	1	
3	(h)		Compound B has a (relative) molecular mass of 228	1	
3	(i)		Particular (covalent) bonds	1	
3	(j)		Tested on people (to see if there are any H and S concerns)	1	
			Total	21	

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