

Additional Applied Science A

General Certificate of Secondary Education

Unit **A325/02**: Scientific Detection (Higher Tier)

Mark Scheme for January 2011

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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.

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- 1 Abbreviations, annotations and conventions used in the detailed mark scheme:
- / = alternative and acceptable answers for the same marking point
 - (1) = separates marking points
 - not/reject** = answers which are not worthy of credit
 - ignore** = statements which are irrelevant - applies to neutral answers
 - allow/accept** = answers that can be accepted
 - (words) = words which are not essential to gain credit
 - words = underlined words must be present in answer to score a mark
 - ecf = error carried forward
 - AW/owtte = alternative wording
 - ORA = or reverse argument

Eg mark scheme shows 'work done in lifting / (change in) gravitational potential energy' (1)

work done = 0 marks

work done lifting = 1 mark

change in potential energy = 0 marks

gravitational potential energy = 1 mark

Question		Expected Answers	Marks	Additional Guidance
1	(a)	<p>forensic scientist / forensic science officer, Forensic Science Service/FSS/Forensic Science Agency/Crime Scene Investigator/CSI; (1)</p> <p>environmental (protection) officer / environmental (protection) agency / environmental (protection) analyst)/EA/EPA/ environmental health (and public protection service/officer); (1)</p> <p>Food Standards Agency / FSA/trading standards/public analyst; (1)</p>	[2]	<p>3 correct = 2 marks 2 or 1 correct = 1 mark</p> <p>accept scene of crime officer, SOCO ignore FSA, police, Law Enforcement Agency, forensics, forensic science, crime investigator, forensic officer/team</p> <p>accept (named) water company, DEFRA ignore Greenpeace, environmentalist, World Health Organisation, public analyst, councils</p> <p>ignore consumer protection agency, food safety agency, standard food agency, public analysis, public health</p>
	(b)	(i)	[1]	<p>accept any indication of correct response</p> <p>lose 1 mark for each additional incorrect response</p> <p>candidate cannot score less than zero</p>
		(ii)	[1]	<p>accept any indication of correct response</p> <p>lose 1 mark for each additional incorrect response</p> <p>candidate cannot score less than zero</p>

Question			Expected Answers	Marks	Additional Guidance
		(iii)	to act as an incentive to work harder <input type="checkbox"/> to check the quality of their work <input checked="" type="checkbox"/> to get extra qualifications <input type="checkbox"/> check the equipment is working properly <input type="checkbox"/>	[1]	accept any indication of correct response lose 1 mark for each additional incorrect response candidate cannot score less than zero
			Total	[5]	

Question		Expected Answers	Marks	Additional Guidance	
2	(a)	<p>any 3 from:</p> <p>condition of road/dry road; (1)</p> <p>skid marks/ tyre marks/marks on the road; (1)</p> <p>(clear) visibility/ daytime/on a bend/trees; (1)</p> <p>two cars/number of cars/both cars/registration plates/make of cars/colour of cars/damage to cars; (1)</p> <p>position of cars/angle of cars/distance between cars/direction of cars/(wrong) side of road; (1)</p>	[3]	<p>ignore reference to police cars or policemen</p> <p>ignore things which cannot be seen in the image e.g. drivers, tyre tread, time of crash, damage to road</p> <p>ignore ways of recording the scene e.g. photos, sketches</p> <p>ignore vague statements e.g. smashed cars, damage, location, weather conditions, the road</p> <p>accept interpretations about the road surface from the image e.g. ice/snow/wet/spillage e.g. water/paint/petrol</p>	
	(b)	(i)	<p>10 x 6; (1)</p> <p>60; (1)</p>	[2]	<p>accept 9.9 to 10.1</p> <p>60 = 2 marks</p> <p>accept 59.4 or 60.6</p> <p>allow ecf from measurement for 2nd marking point e.g. 15 X 6 = 90 for 1 mark</p> <p>allow correct use of mm or m</p>
		(ii)	<p>200 x 9; (1)</p> <p>1800; (1)</p>	[2]	1800 alone = 2 marks
		(iii)	<p>errors in measurements/length and width; (1)</p> <p>are multiplied together; (1)</p>	[2]	<p>not error in measurement if measurement of area implied</p> <p>allow mistakes in measurements</p> <p>ignore wrong/incorrect measurements</p> <p>accept percentage errors in measurements</p> <p>not multiplication may lead to arithmetical errors</p> <p>accept addition if percentage errors</p>
Total			[9]		

Question		Expected Answers	Marks	Additional Guidance
3	(a)	<p>blood / sample on slide; add stain or reagent (to slide / blood / sample); add / use cover / slip; all steps in correct order;</p>	[3]	<p>context must be correct e.g. “put staining agent onto cover slip” does not score either of the two marks</p> <p>3 steps correct = 2 marks 2 steps correct = 1 mark correct order if all three steps present = 1 mark</p> <p>allow multiple responses in a single step</p> <p>ignore alternative uses for cover slip e.g. to drag across slide</p> <p>do not allow just listing the words that have been given</p> <p>ignore any reference to microscope</p>
	(b)	<p>multiply / times; (1) idea of (magnification) of two lenses; (1)</p>	[2]	<p>allow correct example of calculation for multiplication mark e.g. $10 \times 20 = 200$ is 1 mark not more than 2 lenses</p>
Total			[5]	
4	(a)	<p>98.9 (1) 99.3 (1)</p>	[2]	accept either way round
	(b)	<p>systematic - consistent/calibration/zero/fixed error; (1)</p> <p>random - inconsistent/variable error; (1)</p>	[2]	<p>accept idea of errors in equipment or wrong measurement by equipment ignore errors in system, computer calculation, method</p> <p>accept idea of errors by scientist, inaccurate readings, variable measurements, unpredictable/unexpected errors ignore scientist does it incorrectly or makes a mistake, no reason for error</p>
Total			[4]	

Question		Expected Answers	Marks	Additional Guidance
5	(a)	it shows the results in different colours <input type="checkbox"/> it has greater separating power <input checked="" type="checkbox"/> it can produce quantitative results <input checked="" type="checkbox"/> easier to use than paper chromatography <input type="checkbox"/> cheaper than for paper chromatography <input type="checkbox"/>	[2]	accept any indication of correct response lose 1 mark for each additional incorrect response candidate cannot score less than zero
	(b)	any 2 from: (output) graph AND colour; (1) (mobile phase/sample) gas AND liquid / solution; (1) (stationary phase) liquid AND paper; (1) retention time AND R _f ; (1) gas quantitative AND paper not; (1) gas more /paper less expensive; (1) gas more /paper less sensitive; (1) gas more /paper less separating power; (1)	[2]	must be a comparison not thin layer instead of paper
		Total	[4]	

Question		Expected Answers	Marks	Additional Guidance
6	(a)	qualitative -litmus/pregnancy test; semi-quantitative -universal indicator/clinistix; quantitative – colorimeter/titration;	[3]	accept other appropriate medical/agricultural tests
	(b)	(i) Y = absorbance and X = concentration (g/dm^3); (1) scales correct starting at 0; (1) all plots correct; (2)	[4]	not multiplied scales (e.g. 0-100) but allow plotting marks if no scale or no labels or non linear scale cannot score for plotting points all plots correct (less than 1 small square error) = 2 marks lose 1 of the 2 marks for each incorrect plot
		(ii) through origin and all but outliers AND ring around 6.8-8.0; (1)	[1]	accept line of best fit through origin and appropriate outlier if points plotted incorrectly More than 1 outlier ringed = 0 marks
		(iii) 0.74-0.76 AND g / dm^3 ; (1)	[1]	both required for the mark accept appropriate value from graph (tolerance of half a small square) graphs with non linear scales cannot score
		Total	[9]	
		Paper Total	[36]	

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