OCR
RECOGNISING ACHIEVEMENT

GCSE

Additional Applied Science A

General Certificate of Secondary Education

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

Mark Scheme for January 2011

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
    <u>words</u>   = 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)**		forensic scientist / forensic science officer, Forensic Science Service/FSS/Forensic Science Agency/Crime Scene Investigator/CSI; (1) environmental (protection) officer / environmental (protection) agency / environmental (protection) analyst/)/EA/EPA/ environmental health (and public protection service/officer); (1) Food Standards Agency / FSA/trading standards/public analyst; (1)	**[2]**	3 correct = 2 marks 2 or 1 correct = 1 mark **accept** scene of crime officer, SOCO **ignore** FSA, police, Law Enforcement Agency, forensics, forensic science, crime investigator, forensic officer/team **accept** (named) water company, DEFRA **ignore** Greenpeace, environmentalist, World Health Organisation, public analyst, councils **ignore** consumer protection agency, food safety agency, standard food agency, public analysis, public health
	(b)	**(i)**	ensures reliability ✓ increases sales monitors ordering reduces waste	**[1]**	**accept** any indication of correct response lose 1 mark for each additional incorrect response candidate cannot score less than zero
		(ii)	profit speed of production staff promotion reliability ✓	**[1]**	**accept** any indication of correct response lose 1 mark for each additional incorrect response candidate cannot score less than zero

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

Question			Expected Answers	Marks	Additional Guidance
3	**(a)**		blood / sample on slide; add stain or reagent (to slide / blood / sample); add / use cover / slip; all steps in correct order;	**[3]**	**context** must be correct e.g. "put staining agent onto cover slip" does not score either of the two marks 3 steps correct = 2 marks 2 steps correct = 1 mark correct order if all three steps present = 1 mark **allow** multiple responses in a single step **ignore** alternative uses for cover slip e.g. to drag across slide **do not allow** just listing the words that have been given **ignore** any reference to microscope
	(b)		multiply / times; (1) idea of (magnification) of two lenses; (1)	**[2]**	**allow** correct example of calculation for multiplication mark e.g. 10 x 20 = 200 is 1 mark **not** more than 2 lenses
			Total	**[5]**	

Question			Expected Answers	Marks	Additional Guidance
4	**(a)**		98.9 (1) 99.3 (1)	**[2]**	**accept** either way round
	(b)		systematic - consistent/calibration/zero/fixed error; (1) random - inconsistent/variable error; (1)	**[2]**	**accept** idea of errors in equipment or wrong measurement by equipment **ignore** errors in system, computer calculation, method **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
			Total	**[4]**	

Question			Expected Answers	Marks	Additional Guidance
5	**(a)**		it shows the results in different colours ☐ it has greater separating power ✓ it can produce quantitative results ✓ easier to use than paper chromatography ☐ cheaper than for paper chromatography ☐	**[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 Rf; (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 staring 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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