Version 1.0

General Certificate of Education (A-level) Applied
June 2011

Applied Science SC14

(Specification 8771/8773/8776/8777/8779)

Unit 14: Colour Chemistry

Final

Mark Scheme

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for standardisation each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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Question 1

1ai	Nose clip/ mouthpiece; Breathe normally/ at rest/ through mouthpiece – deep breathing negates; tidal volume is height of trace/equivalent description; breathing rate is no.peaks per minute/equivalent description; } expl. of how graph is used	AO1 AO1 AO1 AO1	**2 max**
1aii	tidal volume correctly worked out from trace (0.6 - 0.7 or 1.7 – 1.75); **multiplied** by number of breaths per minute (3 breaths); allow 1 mark for either value correctly identified, but wrong calculation. Any value between 1.8 and 3.5 however derived for 2 marks	AO2 AO2	**2**
1b	contraction; of diaphragm/ muscle; increases volume of thorax; decreasing internal pressure; air enters down pressure gradient/from higher pressure outside;	AO1 AO1 AO1 AO1 AO1	**3 max**
1c	(new trace should show) higher amplitude peaks/ increased tidal volume (ignore reference to vital capacity); (new trace should show) fewer peaks per unit time/decreased rate;	AO2 AO2	**2**
1d	continue with the same diet; not do any other special training/same level of activity otherwise; not take any medication (that could affect performance); no change in other habits that may affect breathing such as smoking;	AO3 AO3 AO3 AO3	**3**

Total Mark: 12

Question 2

2a	She would have sweated more; in order to maintain constant body temperature (credit to prevent overheating/ getting too hot/heatstroke but do not credit "to keep cool"); needed to replace salt lost; salt lost in sweat; (accept sodium for salt)	AO2 AO2 AO2 AO2	**2 max**

2b	140	AO1	**1**

2c	nausea/vomiting; muscle twitch/spasms/weakness; restlessness/lethargy/fatigue; irritability; dehydration – ignore headaches - ignore	AO2 AO2 AO2 AO2	**2 max**

<table>
<tr>
<td>2d</td>
<td>
<table>
<tr><td colspan="3">The marking scheme for this part of the question includes an assessment of the Quality of Written Communication (QWC). There are no discrete marks for the assessment of written communication but QWC will be one of the criteria used to assign the answer to an appropriate level below.</td></tr>
<tr><th>Level</th><th>Mark</th><th>Descriptor
An answer will be expected to meet most of the criteria in the level descriptor.</th></tr>
<tr><td>3</td><td>4-5</td><td>Answer is full and detailed and is supported by an appropriate range of relevant points such as those given below:
- argument is well structured with minimal repetition or irrelevant points
- accurate and clear expression of ideas with only minor errors in the use of technical terms, spelling, punctuation and grammar.</td></tr>
<tr><td>2</td><td>2-3</td><td>Answer has some omissions but is generally supported by some of the relevant points below:
-the argument shows some attempt at structure and the ideas are expressed with reasonable clarity but with a few errors in the use of technical terms, spelling, punctuation and grammar.</td></tr>
<tr><td>1</td><td>0-1</td><td>Answer is largely incomplete. It may contain some valid points which are not clearly linked to an argument structure:
-unstructured answer
-errors in the use of technical terms, spelling, punctuation and grammar or lack of fluency.</td></tr>
<tr><td colspan="3">An answer that would score full marks would be:
An increase in blood sodium levels would be detected by the brain, which brings about a reduction in the release of the hormones aldosterone from the adrenal gland and angiotensin. Therefore less aldosterone travels to the kidney in the blood plasma. When the levels of aldosterone are reduced, the kidney tubules reabsorb less sodium into the body from the kidney filtrate. This results in more sodium being lost from the body via the urine, reducing the level remaining in the blood.</td></tr>
</table>
</td>
<td>AO1</td>
<td>5</td>
</tr>
</table>

Total Mark: 10

Question 3

3ai	(Pulse) oximeter	AO1	**1**
3aii	88.2 (%) to 91.8 (%) (reversed); allow 1 mark for working out 2% of 90 / 1.8% / one in range correct; allow 1 mark for 88-92	AO2	**2**
3bi	Less (energy would be released); allow 'very little' or wtte	AO2	**1**
3bii	No/less ATP produced; Due to glycolysis; Krebs requires oxygen; Oxidative phosphorylation requires oxygen (allow any alternative wording of oxidative phosphorylation); Krebs cycle produces ATP; Oxidative phosphorylation produces more ATP; More anaerobic/ less aerobic respiration;	AO2 AO2 AO2 AO2 AO2 AO2 AO2	**3 max**
3c	Level of oxygen in the blood would be reduced/appropriate figure suggested e.g. less than 90%; accept 'less' Surface area is reduced by emphysema; Less diffusion takes place	AO2 AO2 AO2	**3**

Total Mark: 10

Question 4

4a	Direct correlation/link/the greater the lack of regular brushing, the greater the likelihood of tooth decay; More plaque if don't brush;	AO1 AO1	**1**
4b	Lack of dental hygiene leaves food/ sugar/ bacteria in the mouth; Produces plaque; Breakdown of food/ sugar/ plaque; Bacteria causes breakdown of food/ sugar/ plaque; Produces acid; Acid destroys tooth enamel;	AO1 AO1 AO1 AO1 AO1 AO1	**4 max**
4ci	67.5%; partially correct answer gains 1 mark, e.g. 20000/36000 identification of one figure correctly and put into calculation gains 1 mark	AO2	**2**
4cii	Some children may have had teeth extracted elsewhere than in hospital eg at their dentist; Number of children does not necessarily mean number of teeth, more children could be having fewer teeth extracted; 1997 could have been an unusually low year for unknown reason; Not enough data for year-on-year results to show a trend; Any other intelligent and plausible comment acceptable;	AO3 AO3 AO3 AO3 AO3	**2 max**
4d	Regular flossing (between teeth); Brushing gums; Brush where teeth meet gums; Mouthwash;	AO1 AO1 AO1 AO1	**1**

Total Mark: 10

Question 5

5ai	villi/villus (any phonetic spelling ok)	AO1	**1**

5aii	normal has longer/larger villi **or** coeliac has smaller; normal has more villi **or** coeliac has fewer; further apart on normal;	AO2 AO2 AO2	**2 max**

5aiii	(reduced villi have) smaller surface area; less diffusion can take place; into the blood;	AO2	**2 max**

5b	two groups, one with CD and one without / control group; matched for gender/age/ethnic background/socio-economic background/other suitable suggestion that would reduce confounding variables; compare incidence of past rotavirus infection in the 2 groups; same number in each group; large number in each group; method of identifying infection;	AO3 AO3 AO3 AO3 AO3 AO3	**3 max**

Total Mark: 8

Question 6

6ai	sample of blood; test strip (allow specific example e.g. clinistix); digital cholesterol meter; ignore chromatography; allow dipstick;	AO1 AO1 AO1	**2 max**

6aii	Value or range given within range 4.0-6.5 (mmol l^{-1}) credit other values if correct for specified unit	AO1	**1**

6b	reduced risk of heart attack; reduced risk of atheroma/blocked blood vessels/aneurism; reduced blood pressure; reduced risk of stroke; **ignore** reduced obesity/weight loss/healthier	AO2 AO2 AO2 AO2	**2 max**

6ci	£45625	AO2	**1**

6cii	£1140000	AO2	**1**

6ciii	eating spread is nicer than taking tablets/similar appropriate quality of life argument; spread reduces supervision needed for drug administration so saves nursing time for more important tasks; undiagnosed patients would not receive drugs but would benefit from spread; easier to continue with spread at home as a lifestyle choice than to self-medicate (Allow any reasonable suggestions) Allow 'would help every patient' Allow 'reduces cost so money can be spent on other things' Allow 'reduces cost because...' Ignore unspecified refs. to cost	AO2 AO2 AO2 AO2	**2 max**

6d	reduce intake of saturated fats; increase intake of fresh fruit/vegetables; increase intake of soluble fibre eg in oats; increase in vitamin B12; reducing calories if overweight (conversely increase calories if underweight);	AO2 AO2 AO2 AO2 AO2	**1 max**

Total Mark: 10

Question 7

7a	accept value between 30% and 50% 5 a day;	AO1 AO1	**1 max**

	with regard to fruit intake, the conclusion seems valid; no mention made of other aspects of healthy diet e.g. fat; (therefore) cannot reach a conclusion;	AO2 AO2	**4 max**
7b	Two marks max from: however no indication of sample size; no indication of ages; time of year; eg;	 AO3 AO3 AO3 AO3	

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	An answer that would score full marks would be: Children of this age are growing rapidly and therefore require a good source of protein in their diet. This can be obtained from lean meat, eggs, fish, milk or plant sources such as beans and lentils. The youngest children in this age group should drink whole milk but the oldest can change to half-fat or skimmed milk in order to reduce their intake of fat. Milk is also an important source of calcium which ensures the development of strong bones and teeth. Regular intake of oily fish will provide omega3 and omega6 fatty acids, as well as vitamin D. Vitamin D is required in order to incorporate calcium into bone. Children of this age also need iron found in red meat and dark-green leafy vegetables such as spinach to ensure that they produce enough red blood cells. They should obtain their energy mainly from complex carbohydrates with a low glycaemic index, rather than fat. Salt and sugar should only be added to food in very small amounts.		

Total Mark: 10

Question 8

8ai	to ensure insulin dose is correct/ any correct reference to insulin; blood sugar levels out of normal range cause serious illness (allow 'fatal') / to avoid hyperglycaemia or hypoglycaemia;	AO1 AO1	**2**

8aii	Dipstick into (fresh) urine sample/ wtte; Glucose/digital meter using small drop of blood;	AO1 AO1	**1 max**

8b	reduce/eliminate (simple) sugars/sugary foods/named sugary foods/foods with high GI; increase intake of complex carbohydrates/named starchy food/food with low GI; increase intake of fruit and vegetables; increase fibre intake; avoid alcohol; eat regularly Ignore refs. to fats	AO2 AO2 AO2 AO2 AO2 AO2	**3 max**

8c	insulin (named in correct context); released when blood glucose levels rise; (insulin) converts glucose to glycogen; (insulin) lowers (blood) glucose; glucagon (named in correct context); released when blood glucose levels fall; (glucagon) causes glycogen to be broken down; (glucagon) increases (blood) glucose levels; Broken down glycogen releases glucose; Maximum 3 marks if don't include both hormones	AO1 AO1 AO1 AO1 AO1 AO1 AO1 AO1 AO1	**4 max**

Total Mark: 10

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