



General Certificate of Education

Applied Science

8771/8773/8776/8779

SC14 The Healthy Body

Mark Scheme

2009 examination – January series

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Question 1

(a)(i)	Dip clinistix/dipstick into (fresh) urine Compare to colour chart to read level/colour change of paper shows positive result Ignore specific colours quoted unless clearly referring to e.g. universal indicator or litmus	(1) (AO1) (1) (AO1)	2
(ii)	To avoid false positive result/ so no additional glucose present/ valid result/more accurate/base level measured Reject <i>to find normal levels/results affected</i> if no qualification given	(1) (AO1)	1
(iii)	3.5-7.5mmol ⁻¹ (but allow any single figure within this range)	(1) (AO1)	1
(b)(i)	Carb. intake must balance against insulin Avoid sugary drinks, snacks (allow reduce sugar intake) Slow release/low GI foods preferable/high fibre foods/named examples Eat little and often Avoid long gaps between meals	(1) (AO1) (1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2)	3
(ii)	(Insulin) produced from pancreas/ β -cells In response to detected high plasma glucose/eating carbohydrate Glucose converted to glycogen/glycogenesis/EW/cells take up more glucose High blood glucose reduced (Glucagon) produced from α -cells/pancreas (NB mark for pancreas once only) In response to detected low plasma glucose Glycogen broken down to release glucose/glycogenolysis Low blood glucose increased	(1) (AO1) (1) (AO1) (1)(AO1) (1)(AO1) (1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1)	Max 6

Total Mark: 13**Question 2**

(a)(i)	13.05g but allow 16.3g (incorrect use of ratio but acceptable calculation)	(1) (AO2)	1
(b)(i)	35.8% 1 mark if calculation partly correct e.g. 6100 on bottom of % calculation or 2184 (kJ in the 1.2 litres of squash) on the top	(2) (AO2)	2
(ii)	Increased risk of obesity Increased risk of dental caries Increased risk of (type 2) diabetes (allow diabetes alone but reject if type 1 specified) Lack of other important nutrients if hunger satisfied by drink Possibility of hyperactivity/behaviour disorders Ignore references to CVD, hypertension, stroke etc: only childhood problems gain these marks	(1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2)	Max 3

(c)(i)	Pale lips/eyelids/nailbeds/low haemoglobin levels/anaemic/low hematocrit/low RBC count/low pulse oximeter reading Tiredness/lack of energy/dizzy/faint Poor growth/lack of named tissue Deficient immune system/Example	(1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2)	Max 2
(ii)	Increased fresh fruit, especially citrus To increase vitamin C intake to aid iron absorption Increase iron-rich food/named iron-rich food Ignore references to iron tablets/tonics etc.	(1) (AO2) (1) (AO2) (1) (AO2)	Max 2

Total Mark: 10**Question 3**

(a)(i)	Blood taken by needle from a vein in the arm (reject "blood test" without further explanation, also reject "injection") Liquid chromatography Urine sample taken/tested	(1) (AO1) (1) (AO1) (1) (AO1)	Max 1
(ii)	135-145 mmol litre ⁻¹ /allow single figure within this range	(1) (AO1)	1
(b)	Absorbed at (small/large)intestine/villi Dissolved in blood (plasma, but mention of cells or haemoglobin cancels this mark) Pumped by action of heart Lost in urine via kidney/description of events in kidney Lost through sweating	(1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1)	Max 4
(c)	Calculation eg 150mg per day/ 1050mg per week/ or other Water contains far less sodium than soup/very low levels But water is consumed much more often Elderly people are more prone to heart and kidney trouble/should have lower intake of sodium Probably even these levels should be avoided i.e. disagree (unqualified answer of "no" does not gain this mark but incorrect calculation and therefore argument does not cancel this mark)	(1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2)	Max 4

Total Mark: 10**Question 4**

(a)(i)	By homeostasis/homeostatically controlled blood plasma/tissue fluid	(1) (AO1)	1
(ii)	Water potential/solute concentration/named solute eg sodium/glucose concentration (not simply "moisture" or "water") Food/nutrient levels pH/acidity/alkalinity temperature (allow "heat" but not "energy") oxygen (not "air") sterile/aseptic conditions (not "clean")	(1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1) (1) (AO1)	Max 3

(b)	80 000 x 2 ¹² / answer worked out= 3276800000. One mark if exponential relationship correct (1638400000 is x2 ¹¹ allow 1 mark, 6553600000 is x2 ¹³ allow 1 mark) 2 ¹² = 4096	(2) (AO2) or (1) (AO2)	2
(c)(i)	Faulty valve flap/faulty valve tendon/valve(s)/damage due to rheumatic fever "hole in the heart"/tetralogy of Fallot/specific correctly named condition Reject "heart disease/CHD"	(1) (AO1) (1) (AO1)	2
(ii)	More energy/less tired/more active Less breathlessness/ better gas exchange No chest pain Allow longer life expectancy/better quality of life "better heart function/EW" is too simplistic so reject	(1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2)	Max 2

Total Mark: 10**Question 5**

(a)	C Highest diastolic blood pressure/ she is overweight/lowest vital capacity If an additional person is included in the answer, mark for identifying C is cancelled although reasons that support the answer can stand if correct	(1) (AO2) (1) (AO2)	2
(b)(i)	Person takes deepest possible inhalation Then exhales through spirometer (in single breath)	(1) (AO1) (1) (AO1)	2
(ii)	400 x 7 = 2800cm ³ or 2.8 litres 400 x incorrect number = 1 mark Incorrect number x 7 = 1 mark	(2) (AO2)	2
(c)	(External) intercostal muscles Contract Diaphragm contracts/moves down Volume of thorax increases/pressure inside decreases Air moves down pressure gradient	(1) (AO1) (1) (AO1) (1) (AO1) (1) (AO2) (1) (AO2)	Max 4

Total Mark: 10

Question 6

(a)(i)	All subjects same age sex, health, size, fitness, smoking habits. Any two valid factors allowed credit. (height/weight/BMI = size so do not count as separate factors)	(2) (AO3)	Max 2
(ii)	Resting pulse/blood pressure measured as baseline Exercise consistent, only duration varied Other (at least one specified) factors kept constant eg food Recovery time sufficient for pulse/bp to return to normal Sufficient repeat observations	(1) (AO3) (1) (AO3) (1) (AO3) (1) (AO3) (1) (AO3)	Max 2
(b)(i)	Graph right way up (i.e. time jogging on x axis) <i>If axes unlabelled this mark cannot be given.</i> Scales for both axes linear and appropriate Plotting correct (1 plotting error cancels this mark, no negative marks) N.B. bar chart does not gain plotting mark	(1) (AO3) (1) (AO3) (1) (AO3)	3
(ii)	Data point for 160sec circled <i>Either</i> Subject became tired/bored so did less work/stopped/anaerobiosis caused fatigue/lactic acid build up <i>Or</i> Not an anomaly as stroke volume increased to increase cardiac output so rate dropped <i>Or a different data point circled and sensible explanation given. Likely to be the result of mis-plotting</i>	(1) (AO3) (1) (AO3) (1) (AO3) (1) (AO3)	2
(iii)	Increase in exercise (not <i>time</i>) links to increase in pulse rate/ directly proportional/positive correlation "rate" is acceptable, but "breathing rate" loses this mark	(1) (AO3)	1

Total Mark: 10**Question 7**

(a)(i)	By the release of hormones	(1) (AO1)	1
(ii)	Stimulates production of Hydrochloric acid pH value of stomach falls/stomach becomes more acidic	(1) (AO2) (1) (AO2)	2
(b)(i)	Beer has lowest alcohol but highest gastrin increase Cognac has highest alcohol but zero gastrin increase Beer and champagne have different alcohol contents but the same effect on gas increase Beer has less alcohol than wine but produces more gas	(1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2)	Max 2
(ii)	As a control/ to show that simply drinking fluid had no effect/it was the alcohol causing the effect/that water has no effect Simply "to compare the other results to" or "to see the effect of water" does not gain this mark, answer needs to give the idea of proving that alcohol is causing the effect on the plasma gastrin levels.	(1) (AO2)	1

(c)	Only one distilled alcoholic drink tested so more data required before deciding Second hypothesis is supported (unqualified “yes” does not gain this mark Products of fermentation/named e.g. increase gastrin levels/ products of distillation/cognac do not increase gastrin levels	(2) (AO2) (1) (AO2) (1) (AO2)	Max 2
(d)	Helps prevent abuse of human subjects Health and safety concerns addressed objectively Investigation receives objective evaluation/other sensible ideas Ignore “goes against religious views” unless specific and relevant ethical concerns are made clear	(1) (AO2) (1) (AO2) (1) (AO2)	Max 2

Total Mark: 10

Question 8

(a)	Increase surface area/physical breakdown/crushing To enable enzymes to bind with more substrates at once/work faster/more efficient Chewing stimulates release of enzymes/amylase (reject “enzymes” without detail/explanation)	(1) (AO2) (1) (AO2) (1) (AO2)	2
(b)	Eat as little sugary food as possible (ignore “fizzy drinks” as these are often diet versions with no added sugar) Brush frequently / floss between the teeth Use antiseptic mouthwash to clean parts of brace that brush can’t reach Disclosing tablets will reveal plaque that has not been removed	(1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2)	Max 2
(c)	Milk/sardines contain calcium (necessary for dentine and enamel) Raw veg could help tooth and jaw development /help avoid orthodontics (reject “crunchy food strengthens teeth” as too unspecific) Vitamin C in fresh fruit may help avoid gum disease Sardines contain vitamin D/ aid absorption of calcium (To gain marks benefits must be stated; a random list of vitamins does not gain credit)	(1) (AO2) (1) (AO2) (1) (AO2) (1) (AO2)	Max 3

Total Mark: 7