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General Certificate of Education (A-level) Applied
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Applied Science SC14

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

Unit 14: The Healthy Body

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 students' 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 students' 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.

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Question	Part	Sub-part	Marking guidance		Mark	Comment
1	a	i	(Cells of the) islets of Langerhans/pancreas/α cells; / High glucagon because - e.g. stimulated by low glucose; Glycogen is stored in the liver and muscles; Glycogen must be converted to glucose; Low glucagon because - Meal contains glucose; Glucose levels are high Correct ref to insulin.	AO1	3 max	
1	a	ii	Low glucose →secretion of glucagon →glucose levels increase; Glucagon increases →glucose levels rise →glucagon decreases; One compensation mark for clear understanding that a change from the set level initiates a mechanism to return it to the set level.	AO1	2	Allow 1 max for correct ref to insulin rather than glucagon
1	b		Cells of the islets of Langerhans/pancreas/α cells	AO2	1	
1	c		Glucose is used in respiration / as an energy source/ in metabolism; Allow glucose is excreted in urine; Glucose is converted to glycogen in cells.	AO2	2 max	
1	d		Line from 80mg increasing but keeping below line for a diabetic, finishing at 80mg at 3 hours;	AO3	1	

1	e	i	Fast acting insulin reduces blood glucose from breakfast; Slow acting insulin reduces blood glucose from other meals / before the evening meal / eliminates the need to inject at lunch / works throughout the day;	AO2	2	'next injection' insufficient without timescale

1	e	ii	Glucagon working/active/released; The glycogen has been converted to glucose; glycogenolysis; Insulin injected before breakfast causes cells to take up glucose too slowly for levels to get too low (to be dangerous); Person not active enough for much glucose to be used up in respiration. (ignore references to eating a large breakfast)	AO2	3 max	

2	a	i	At QRS / R when ventricles contract; pressure then increases as ventricles contract (after approx S/ 0.15 seconds / at QRS / at R);	AO2	2	R – heart – has to be ventricle

2	a	ii	(whole) Heart relaxed / filling with blood / diastole / not contracting.	AO2	1	Allow at rest

2	b	i	0.2 <u>seconds</u>; (when pressure in the ventricle exceeds the aorta or converse argument) (allow 0.18 – 0.22 <u>seconds</u>).	AO1	1	Allow explanation without time Allow explanations stating between S + T

2	b	ii	Line below that of the left ventricle; Line tracks the shape of the left ventricle (timings must match closely)	AO1	2	

3	a	i	(Pulse) oximeter	AO1	1	

3	a	ii	95%	AO1	1	

3	b		Same start point at 37°C; Line tracks below 37°C line; Line finishes below 37°C line at 14k pa.	AO1	2	All 3 for 2 marks 2 from 3, 1 mark

3	c		pH decreases / carbonic acid produced / raised activity; Chemoreceptors detect (a fall in pH / higher acidity); Impulses sent to medulla/brain; Increased rate of impulses; To respiratory muscles/diaphragm/intercostals.	AO1	3 max	Accept: Increased breathing rate / Breathe out excess CO_2;

3	d		Smaller number of alveoli; Larger air spaces per alveolus (bigger alveoli insufficient); Thicker walls / increased diffusion distance (accept converse for normal cells).	AO1	2 max	Allow <u>individual</u> alveoli having a larger S.A. on healthy tissue. Accept ref to lack of bronchiole inemphysema

3	e		Less surface area of alveoli; Diffusion of gases / gas exchange reduced / less oxygen enters blood; Less respiration; Less energy for muscles.	AO2	2 max	

4	a		(ignore references to digestion in the mouth) Amylase digests starch; to maltose; Amylase comes from the pancreas; Maltase digests maltose. Maltose to glucose; Any references to hydrolysis/bond breaking.	AO1	3 max	Ignore starch to glucose as given in stem

4	b		Less surface area (for diffusion); Fewer <u>micro</u>villi; Less absorption of molecules/nutrients; Breakdown of energy stores fat To supply energy for essential processes/growth/repair.	AO2	3 max	Allow breakdown of protein; - Reject food as insufficient for molecules

5	a		As a control; To observe the effect of lactase.	AO3	2	Ignore placebo

5	b		Same age; Similar health profile / all healthy/ same degree of colic OWTTE Size/measurement / mass similar; Equal gestation; Same sex;	AO3	3 max	Ignore same diet

5	c		Body weight differs between individuals; more accurate/better comparison; (to adjust fluid to body weight).	AO3	2	

5	d		Group A/Lactase decreases colic / reduces duration of colic / reduces symptoms; Distilled water has no/little effect on colic; Lactase needed for lactose digestion.	AO3	3	

5	e		Absorption in the gut varies; Enzymes are proteins/are digested/absorbed/denatured in the gut; (So there is) no variation in absorption time.	AO3	2 max	

5	f		(Informed) Volunteers must receive full information/ Risks / potential harm; consent; Independent evaluation to prevent abuse of subjects; Subjects not coerced/forced to participate / right to withdraw Religious views/ethical views of researchers/subjects must be respected / confidentiality; Reject unqualified statements about it being against religion.	AO2	2 max	Told risk Religion must be respected.

6	a		A good answer would read: There is reduced flow to the heart muscle due to the blockage to the ventricle muscle. This means that the heart muscle cells receive less oxygen and glucose. Respiration becomes more inefficient and does not supply the ATP necessary for heart contraction to allow normal activity. Physical activity has to stop as the heart experiences fatigue and the patient experiences chest pain.	AO1	5	

6	b	i	Higher than normal	AO2	1	

6	b	ii	Normal level 4.0 – 6.5 mmol/litre; Allow any figure within range.	AO1	1	Must be a range

6	c		Increased risk of (type ll) diabetes; Increased risk of hypertension/high blood pressure; Increased risk of osteoarthritis/painful joints; Decreased life expectancy; Increased risk of strokes; Less able to exercise	AO2	3 max	

6	d		Increased water levels; Lower water potential; Increased blood vol; Increased heart rate; Heart has to beat faster to supply O2; Increase BP	AO2	2 max	
7	a	i	CO_2	AO1	1	
7	a	ii	Mitochondrion/mitochondria/mitochondrial matrix;	AO1	1	
7	b		38	AO2	1	
7	c	i	Final hydrogen/ electron acceptor/gains electrons; Produces water.	AO1	2	Ignore unqualified respiration equations
7	c	ii	2	AO1	1	
8	a		A good answer would be: Kidneys need to conserve water, as water is lost during the process of sweating. A raised temperature during exercise causes sweating which in turn lowers the blood volume. Osmoreceptors in the hypothalamus detect this fall and release the hormone ADH from the pituitary gland. The ADH acts on the collecting ducts of the kidney, making them more permeable to water. Water is reabsorbed into the blood stream rather than being lost as urine.	AO2	5	
8	b		Pale lips/eyelids/nails; Tiredness/lack of energy/lethargy/dizzy/faint; Poor growth; Deficient immune system.	AO1	2 max	

8	c		(ignore references to iron tablets) Increase iron rich food/named iron rich food e.g. spinach or liver/red meat/cereals (fortified) Increased fresh fruit/citrus fruit/fruit juice	AO1	2	

8	d		Body/skin produces vit d; Using sunlight / UV	AO2	2	Ignore sun / heat