



**General Certificate of Secondary Education
June 2011**

Human Health and Physiology 44151H

(Specification 4415)

**Unit 1: Topics in Human Health and Physiology
(Higher)**

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.

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Question	Answers	Extra information	Mark
1(a)	A lens		1
	B pupil		1
	C iris		1
	D cornea		1
1(b)	<ul style="list-style-type: none"> • Ciliary muscles / X contract • Suspensory ligaments / Y slacken 	Do not accept 'they'	1
		Do not accept 'they'	1
	<ul style="list-style-type: none"> • (allowing) lens become more spherical / rounder / more convex / fatter / shorter focal length 	Allow relaxed / not stretched Do not accept flatter	1
1(c)(i)	Reference to (puff) of air / air blown into eye		1
1(c)(ii)	Diabetes / high <u>blood</u> pressure / glaucoma	Do not accept stress / retinitis	1
1(c)(iii)	<p>Any two of</p> <ul style="list-style-type: none"> • (Small blood) vessels damaged / burst • in retina • Vision blurred / not in focus • Pressure on optic nerve <p>OR</p> <ul style="list-style-type: none"> • Shape of eyeball changed • So objects no longer in focus / blurred / short sight / long sight 	<p>Ignore effects on receptor / rods / cones</p> <p>Ignore blindness</p> <p>Ignore changes to shape of lens</p>	2
Total			11

Question	Answers	Extra information	Mark
2(a)(i)	37.8 gains two marks	Accept 37.77 / 37.78 Ignore rounding error if correct answer shown in working Ignore units If incorrect answer allow 1 mark for $85/(1.5 \times 1.5)$ or $85 / 2.25$	2
2(a)(ii)	Obese	Accept ECF from part (i)	1
2(b)	Reduce calorie / joule / energy / food intake / fat / sugar / carbohydrate Increase fruit / vegetables / eat five portions of fruit or vegetables	Ignore references to protein / salt If neither mark gained allow one mark for balanced diet. Ignore healthy diet / eat less junk food Ignore references to change of lifestyle / exercise	1 1
2(c)	Anorexia	allow bulimia ignore kwashikor and vitamin / mineral deficiencies	1

2(d)(i)	<i>Marks awarded for this answer will be influenced by the quality of written communication.</i>	
	The answer is coherent and in a logical sequence. It contains a range of appropriate or relevant specialist terms used accurately. There is a clear scientific description of the link between diet and heart attacks including at least 4 points.	4
	The answer has some structure and use of specialist terms has been attempted, but not always accurately. There is a scientific description of the link between diet and heart attacks including at least 2 points.	2-3
	The answer is poorly constructed with an absence of specialist terms or their use demonstrates a lack of understanding of their meaning. There is a brief description of the link between diet and heart attacks, which has little clarity and detail.	1
	No relevant content.	0
	<p>Examples of scientific ideas that may contribute to a candidate's response:</p> <ul style="list-style-type: none"> • High level of fat / cholesterol in diet • Fat in diet saturated • Leads to high blood cholesterol / LDL • Fatty deposits on arteries / atheroma. • Narrowing of blood vessels restricts flow of blood • Blood clots may block blood supply • Heart (muscle) does not receive enough oxygen • Heart muscle dies • High salt intake • Increases blood pressure due to high salt / atheroma • Which damages blood vessels <p style="margin-left: 200px;">Do not accept HDL for this point</p> <p style="margin-left: 200px;">Allow blood vessels</p> <p style="margin-left: 200px;">Ignore veins</p> <p style="margin-left: 200px;">Allow fat / cholesterol blocks blood vessels</p>	

2(d)(ii)	Any one of <ul style="list-style-type: none">• (Plan) exercises (for patient)• Advise lifestyle change• Advise relaxation technique / stress reduction	Ignore massage Ignore breathing exercises Ignore references to diet Ignore drugs	1
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Total			11
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Question	Answers	Extra information	Mark
3(a)	Any 2 of <ul style="list-style-type: none"> • Higher number of cases in men • Cases rise to peak at 65 • Cases rise then fall with age • Cases very low / zero under 20 or up to 19 	Accept answers in range 65-74 for either men or women	2 max
3(b)	Any one from e.g. need to know about <ul style="list-style-type: none"> • budgeting • number of (cancer) doctors / nurses • beds / equipment / drugs / treatment / resources 	Ignore number of patients Ignore statistics Ignore research / prevention	1
3(c)(i)	e.g. X-ray / (body) scan / MRI / CAT / ultrasound / biopsy	Ignore breathing tests Ignore screening	1
3(c)(ii)	Radiographer (all techniques except biopsy) or <u>cytologist</u> / <u>oncologist</u> if biopsy given in (c)(i) or <u>ultrasound</u> technician if ultrasound given in (i)	Award mark only if linked to part (i) Allow radiologist Ignore cancer specialist Ignore doctor / nurse / surgeon / technician Ignore endoscopy	1
3(d)	Any 2 of <ul style="list-style-type: none"> • Surgery / remove lung or tumour • Radiotherapy / radiation • Chemo(therapy) / drugs • Cyberknife 	Ignore transplant Ignore radiology Ignore medicine / tablets	2 max
Total			7

Question	Answers	Extra Information	Mark
4(a)	Use of needles / pins	Answer must relate to 'how'	1
	At specific points in body / points related to disease / acupuncture sites	Allow in skin / at pressure points / nerves / receptors / painful area Ignore 'to restore harmony' Ignore to relieve pressure / stress/ symptoms	1
4(b)(i)	Any 2 of <ul style="list-style-type: none"> • gender • age • duration of treatment / for three weeks • treatment given daily • mean length of time patients had suffered from urticaria • all had urticaria which did not respond to treatment 	Ignore control group / two groups Ignore number of people Do not accept Y axis label (dependent variable) i.e. mean length of urticaria symptoms in hours	2 max
4(b)(ii)	Length of time of symptoms / duration of urticaria attacks		1
4(c)	Psychological / placebo effect owtte	Ignore control treatment successful	1
4(d)	Would show if some people did not respond to treatment	Accept might show up anomalies OWTTE Ignore more accurate / reliable / valid Ignore mean is just an average Ignore shows range	1

4(e)	<ul style="list-style-type: none">• worth trying• treatment effective / reduces symptoms / mean times decreases <p>OR significant difference between two groups</p> <p>OR length of attacks might continue to get shorter</p> <p>OR but probably only reduce duration of attacks / not certain to work / does not cure</p>		1 1
Total			9

Question	Answers	Extra information	Mark
5(a)	Acid conditions	Allow mucus	1
	In vagina / cervix	Allow uterus / womb Ignore references to white blood cells / antibodies	1
5(b)(i)	Division uncontrolled / divides rapidly / divides continuously	Accept reproduction or multiplication if qualified by rapid / uncontrolled / continuous Ignore growth	1
5(b)(ii)	May enter blood stream / lymph	Allow blood vessel formation within organ / angiogenesis	1
	(then) form cancers in other parts of the body / form secondary cancers	Ignore spread / invade within organ	1
5(c)(i)	Rises then falls		1
	Peak at 290 / at age 30-34	Allow answers within range 30-34 inclusive	1
5(c)(ii)	62.5 gains 2 marks	Allow 62 or 63 for 2 marks Ignore rounding if 62.5 shown in working. If answer incorrect allow one mark for (incorrect number of cases) X 5	2
5(c)(iii)	Any 2 of <ul style="list-style-type: none"> • (Most) unlikely to be sexually active / to have had intercourse • None / few of this age group with disease / infected / exposed to virus • So greatest chance of success / more effective / done before it is too late / won't get late in life 	Ignore won't get disease	2 max

5(d)	Fear of side effects / new vaccine so not enough known about effects	Ignore religion / ethics	1
	Fear it might encourage promiscuity / encourage girls to have sex / encourage girls to think sex is safe		1
Total			13

Question	Answers	Extra information	Mark
6(a)	A trachea	Accept windpipe	1
	B alveoli		1
6(b)	X / intercostal muscles contract / pull ribs upwards and/or outwards	2 marks for anatomical changes Ignore intercostals move up Ignore ribs move up unless qualified by moved by intercostals	1
	Y / diaphragm contract / diaphragm flattens	Allow diaphragm flattened / moves downwards	1
	Thorax / chest volume increased	2 marks for effects of anatomical changes	1
	Thorax / chest pressure decreased		1
6(c)(i)	Make sure airways / mouth clear or check that no vomit	Ignore pulse Ignore check that patient not breathing	1
6(c)(ii)	<ul style="list-style-type: none"> • Ensure supply of oxygen • to brain <p>OR</p> <ul style="list-style-type: none"> • Carbon dioxide in (paramedic's) breath • Will stimulate breathing 	Allow oxygen supply to any part of body Accept prevent brain damage Ignore damage to heart Allow this point only if linked to carbon dioxide	2
6(d)(i)	High proportion / percentage of carbon dioxide in air / X	Ignore to get rid of carbon dioxide	1
	Stimulates / increases breathing rate or stimulates / detected by pH receptors or makes blood acidic		1

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6(d)(ii)	No carbon dioxide in air / Z	Ignore body has enough oxygen	1
	Carbon dioxide / pH receptors not stimulated or blood pH not acidic		1
Total			13

Question	Answers	Extra information	Mark
7(a)(i)	<p>Look for well constructed argument linking insulin and glucose levels</p> <p>Any three from</p> <ul style="list-style-type: none"> • Rise in blood glucose stimulates insulin production / detected by pancreas • Insulin stimulates glucose uptake by body cells / liver • Insulin stimulates formation of glycogen • Blood glucose concentration falls 	<p>Do not accept this point if detected by brain</p> <p>Ignore two descriptions if no cause and effect</p> <p>Allow insulin converts glucose to glycogen or allow glycogen stored in liver / muscles / body cells</p>	3 max
7(a)(ii)	<p>Fall in blood glucose concentration</p> <p>Reduces insulin production</p>		<p>1</p> <p>1</p>
7(b)	<p>Look for well constructed argument linking insulin and glucose levels with activity</p> <p>Any three of</p> <ul style="list-style-type: none"> • Blood sugar level more constant / large insulin dose causes large drop in blood glucose • Can adjust insulin level / gets insulin when she needs it • To cope with activity level / prevent high blood sugar • Can take in high carbohydrate for activity • Can eat when convenient 		3 max
Total			8

Question	Answers	Extra information	Mark
8(a)(i)	Any 2 of <ul style="list-style-type: none"> • Calcium is structural component of bones and / or teeth • Vitamin D aids calcium absorption • Low calcium results in greater risk of tooth decay / rickets / weaker bones 	Allow needed for <u>growth</u> of bones / teeth Accept osteoporosis Accept need for strong bones Ignore brittle bones Accept reference to muscle contraction / blood clotting	2 max
8(a)(ii)	Reduced oxygen uptake / reduced carbon dioxide gas output / gas exchange not as effective (Resulting in) breathlessness / harder to breathe OR More susceptible to infection / causes coughing / affects cilia	Ignore reduced lung capacity	1 1
8(a)(iii)	(Pancreatic) enzymes / named enzyme unable to enter gut Impaired food digestion / named food digestion	Do not accept unable to enter liver / stomach Ignore references to bile / insulin	1 1
8(b)	(Mutation) affects structure of enzyme / protein or different protein made Enzyme / protein unable to carry out function or (enzyme) reactions slower or different chemical reactions	Ignore protein / enzyme not made Ignore reactions affected Accept enzyme / protein faulty	1 1

<p>8(c)</p>	<p>If one child has cystic fibrosis, both parents must be carriers</p> <table border="1"> <tr> <td></td> <td>C</td> <td>c</td> </tr> <tr> <td>C</td> <td>CC</td> <td><u>Cc</u></td> </tr> <tr> <td>c</td> <td><u>Cc</u></td> <td>cc</td> </tr> </table> <p>Stated or shown on genetic diagram:</p> <ul style="list-style-type: none"> • Parental genotypes / correct alleles in gametes • Correct combination of alleles in offspring • <u>Carriers</u> identified 		C	c	C	CC	<u>Cc</u>	c	<u>Cc</u>	cc	<p>Allow use of different letters for dominant and recessive alleles so long as upper case for dominant and lower cases for recessive.</p> <p>Ignore sex chromosomes, but most sex linked explanations will receive no marks if no allele on Y chromosome</p> <p>If 'line drawing' rather than punnett square, then carriers genotypes must be correctly derived to gain credit</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>
	C	c										
C	CC	<u>Cc</u>										
c	<u>Cc</u>	cc										
<p>8(d)(i)</p>	<p>May involve abortion / death of some embryos /damage to embryos</p> <p>Moral / ethical / religious issues</p>	<p>Ignore 'playing God' / interfering with nature</p>	<p>1</p> <p>1</p>									
<p>8(d)(ii)</p>	<p>Any two from</p> <ul style="list-style-type: none"> • Baby will have genetic material from non-parent / baby biologically related to only one parent / both want to be biological parents • Concern about characteristics • Still chance of child having cystic fibrosis • Emotional issues e.g. child discovering donor parent 	<p>Ignore moral / ethical / religious issues</p>	<p>2</p>									

8(e)	Use enzymes to 'cut out' normal allele	Allow gene	1
	Splice allele into virus		1
	Use e.g. aerosol / get patient to breathe in (modified) virus / virus inserts gene into patient's cells	Ignore direct insertion of gene / allele into body cells	1
		If no other marks gained allow one mark for insertion of normal gene / allele into bacterium / plasmid	
Total			19

Question	Answers	Extra information	Mark
9(a)(i)	Pacemaker	Accept sino atrial node / SAN Do not accept AVN	1
9(a)(ii)	(Artificial / electrical) pacemaker	Allow stop then restart heart Ignore drugs Ignore heart machine	1
9(b)	(Growing) stem cells To produce heart valves	Allow to grow heart Ignore artificial heart / transplant Accept other research method	1 1
9(c)(i)	Any two from e.g. for artificial heart <ul style="list-style-type: none"> • Only two chambers / no atria or ventricles • right and left sides contract alternately • 'diaphragms' move up and down whereas ventricles squeeze from sides 	Allow diaphragm / hydraulic fluid moves blood (rather than muscle) If no other marks gained, allow one mark for use of motor / need for power supply	2 max

9(c)(ii)	Marks awarded for this answer will be influenced by the quality of written communication.	
	The answer is coherent and in a logical sequence. It contains a range of appropriate or relevant specialist terms used accurately. There is a clear scientific evaluation of treatment with the artificial heart with at least 4 points.	5/4
	The answer has some structure and the use of specialist terms has been attempted, but not always accurately. There is at least an attempt to evaluate treatment with the artificial heart with at least 2 points.	3/2
	The answer is poorly constructed with an absence of specialist terms or their use demonstrates a lack of understanding of their meaning. The answer is limited to either advantages or disadvantages of treatment with the artificial heart	1
	No relevant content.	0
	Examples of scientific points that may contribute to a candidate's response:	
	Advantages of artificial heart e.g. <ul style="list-style-type: none"> • Unlimited supply of artificial hearts / shorter waiting time • No need for tissue typing • No need for immunosuppressant drugs / no risk of rejection Disadvantages of artificial heart e.g. <ul style="list-style-type: none"> • Risk of power failure • Risk of mechanical failure • High cost • Not available until 2013 <p style="margin-left: 150px;">Ignore references to infection / blood clotting / wires</p> <p style="margin-left: 150px;">Ignore ethics / morals / religion</p>	
Total		11

Question	Answers	Extra information	Mark
<p>10(a)(i)</p>	<p>2 of e.g.</p> <ul style="list-style-type: none"> • Breast milk contains <u>all</u> the nutrients a baby needs / right amount of nutrients or named nutrients • It contains antibodies / helps immunity / gives passive immunity • It can help to protect babies from chest infections / ear infections / allergies, • Breastfed babies go on to have healthier blood pressure as children • Breastfed babies are less likely to become obese adults • Sterile 	<p>Ignore infection unqualified</p> <p>Ignore availability / healthier / natural</p> <p>Ignore bonding</p>	<p>2 max</p>
<p>10(a)(ii)</p>	<p>2 of e.g.</p> <ul style="list-style-type: none"> • Breast milk is free • It is always at the right temperature / time saving / saves sterilizing bottles • Mothers who breastfeed reduce their risk of developing pre-menopausal breast cancer / ovarian cancer / fractures from osteoporosis. • Breastfeeding helps the uterus return more quickly to its pre-pregnancy size • Encourages bonding 	<p>Ignore cheap / cheaper</p> <p>Ignore release / delivery of placenta</p> <p>Ignore gets rid of surplus milk</p>	<p>2 max</p>

10(b)(i)	Stimulates oestrogen production or stimulates egg / follicle maturation	Ignore egg growth / development / release Accept follicle development / growth	1
10(b)(ii)	Any one from <ul style="list-style-type: none"> • Stimulates LH production • Inhibits FSH production • Stimulates build up / repair of uterine lining • Stimulates development of secondary sexual characteristics / named 	Allow thickens uterus lining / wall Ignore ovulation / egg release	1
10(b)(iii)	Stimulates egg release or stimulates development of corpus luteum		1
10(b)(iv)	Stimulates build-up / repair / maintenance of uterine lining	Allow thickens uterus lining / wall	1
10(c)	Any 3 from <ul style="list-style-type: none"> • FSH production inhibited • By hormone(s) / named hormone(s) • Produced by placenta • No eggs mature 	Ignore LH Accept no eggs released Ignore no eggs produced / grow Accept mucus plug in cervix	3 max

10(d)	Records (average of) large number of readings / 20 000 readings		1
	More reliable / more accurate / more precise	Ignore references to armpit / tongue	1
10(e)	Look for link between data from both graphs	Ignore reliability / accuracy / precision	
	Temperature rise on day 13 is just after / coincides with LH peak	Allow temperature rise coincides with egg release	1
	LH stimulates egg release		1
	Indicates intercourse at this time has higher chance of successful fertilisation	If no other marks obtained allow one mark for tells woman when she is ovulating / releasing egg / most fertile	1
10(f)	Any two from <ul style="list-style-type: none"> • Device only indicates that egg release is likely to have occurred • Intercourse on day(s) before this / just after this could result in pregnancy • Reference to longevity of sperm 	Allow only indicates likelihood of pregnancy / woman can become pregnant at any time in the month / temperature varies throughout the month	2 max
Total			18

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