



**General Certificate of Secondary Education
June 2013**

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.

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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Mark scheme instructions for examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

- 2.1** In a list of acceptable answers where more than one mark is available ‘any **two** from’ is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.
- 2.2** A bold **and** is used to indicate that both parts of the answer are required to award the mark.
- 2.3** Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that ‘right + wrong = wrong’.

Each error / contradiction negates each correct response. So, if the number of error / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (often prefaced by ‘Ignore’ in the mark scheme) are not penalised.

3.2 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column or by each stage of a longer calculation.

3.3 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.4 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.5 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.6 Brackets

(.....) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.7 Ignore / Insufficient / Do not allow

Ignore or insufficient is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

Question	Answers	Extra information	Mark
1(a)	Osteopath / chiropractor	Allow phonetic spellings	1
1(b)	Any two from: <ul style="list-style-type: none"> • Spine / body shorter • Spine / body curved / hunch back • Bones fragile / weaker / brittle / less dense / less supportive 		2 max
1(c)(i)	Calcium	Allow phosphate	1
1(c)(ii)	Any two from: <ul style="list-style-type: none"> • Milk • Cheese • Yoghurt • Pulses / named • Soya beans / tofu • Sardines / pilchards / whitebait • Cabbage / kale / broccoli / okra • Nuts • Sesame seeds 	Allow dairy to max 1 mark if no other mark awarded eg peas / beans / lentils	2 max
1(d)	Any two from: eg <ul style="list-style-type: none"> • Severity of condition / different levels • Cost of drug • Side effect / allergic reaction • Other medical condition / may interact with other medicine • Age • Availability • Only works for some types of <u>osteoporosis</u> 	Ignore needs more testing	2 max
Total			8

Question	Answers	Extra information	Mark
2(a)	(Uterus / womb) contracts	Allow contractions	1
	Cervix / neck of womb dilates or widens		1
	Baby pushed out (through vagina)	Allow baby is born Ignore extra details Ignore reference to third stage	1
2(b)(i)	Placenta		1
2(b)(ii)	Supply oxygen / food / named example of food / antibodies / water	Allow exchange of substances for 1 mark Accept: barrier to maternal blood or a specified substance protection against high BP of mother <u>production</u> of hormones	1
	Remove waste / CO ₂ / urea		1
2(c)	Harmful effect on fetal nervous system	Ignore addiction	1
	Harmful effect on fetal growth / structure eg facial features / birth defects / premature birth / stillborn / miscarriage	If no other mark, allow FAS / fetal alcohol syndrome	1
2(d)(i)	'The percentage of mothers who drank alcohol before pregnancy did not change with age' box ticked.		1

2(d)(ii)	Percentage who drink increases with age	Eg it increases by 18% = 2 marks	1
	Quantitative statement eg larger increase between age groups as age increases / overall increase of 18%		1
2(d)(iii)	<p>Sensible suggestion eg more stressed at older age / more chance of addiction at higher age</p> <p>or Educational reason – eg aware of consequences</p> <p>or Less likely to be served alcohol when young</p> <p>or More chance of addiction / habit with age</p> <p>or More confident / blasé with age</p> <p>or Older women can afford alcohol</p>	Assume answer refers to older women unless otherwise stated	1
Total			12

Question	Answers	Extra information	Mark
3(a)(i)	5051	Correct answer gains 2 marks If answer incorrect, allow 1 mark for evidence of (872 + 1751 + 1241 + 1187) or 1 mark for 5051 in the working, followed by incorrect answer	2
3(a)(ii)	Any two from: <ul style="list-style-type: none"> • Failure to use condoms / having unprotected sex • More frequent sexual activity • Greater number of sexual partners 	Do not allow no contraception Ignore lack of awareness / lack of education	2 max
3(b)(i)	Any two from: <ul style="list-style-type: none"> • Overuse of antibiotics • Non-resistant strain killed / resistant strain survives • Less competition between non-resistant and resistant strains / resistant strain reproduces / resistant strain passes on resistance <u>gene</u> 		2 max
3(b)(ii)	B Largest clear zone / largest diameter / most bacteria killed	Allow 37	1 1
Total			8

Question	Answers	Extra information	Mark
4(a)	If (large doses of) a substance cause a symptom / illness		1
	Small doses will cure symptom / illness		1
4(b)(i)	Any two from: <ul style="list-style-type: none"> • All patients had arthritis • All patients had taken conventional treatment <u>before trial</u> • No patients took conventional treatment (during trial) • Trial length 		2 max
4(b)(ii)	Plain water / solution without homeopathic solution / dummy pill / placebo	Ignore false drug	1
4(c)(i)	Treatment ineffective / not very effective	Allow only negative statements	1
4(c)(ii)	Placebo effect / psychological effect	Allow they believed it had worked Allow fulfilment of expectation	1
4(c)(iii)	In <u>pain</u> (since treatment not effective)		1
Total			8

Question	Answers	Extra information	Mark
5(a)	A salivary gland	A Accept saliva gland / sublingual gland	1
	B stomach		1
	C pancreas	C Allow pancrease, accept pancreatic gland	1
	D <u>small</u> intestine / ileum / duodenum	D Do not allow large intestine	1
5(b)(i)	Liver		1
5(b)(ii)	Neutralisation / to give correct pH		1
	Emulsification (of fats) / described re. droplet formation	Do not allow breakdown of molecules	1
5(c)(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. The method will allow valid results to be collected and includes standardised volumes & measurement of time to clear (= quantitative). At least 3 temperatures are used.		6/5
	The answer has some structure and the use of specialist terms has been attempted, but not always accurately. The method will allow some results to be collected – eg time to clear but volumes not standardised / or qualitative measure of clearing. Only 2 temperatures are used.		4/3
	The answer is poorly constructed with an absence of specialist terms or their use demonstrates a lack of understanding of their meaning. The method described is weak but shows some understanding of the sequence of an investigation.		2/1
	No relevant content.		0
	Examples of scientific points that may contribute to a student's response: <ul style="list-style-type: none"> • Equal volumes / amounts of trypsin • Equal volumes / amounts of milk powder solution • Range of temperatures • Maintained by water bath • Temperature equilibration of solutions before mixing • Time to clear solution recorded for each temperature • Repetition at each temperature 		

Question	Answers	Extra information	Mark
5(c)(ii)	Graph to show: Reduction in time taken with increase in temperature followed by increase in time taken with increase in temperature		1
5(c)(iii)	Increase in temperature increases rate of reaction	Allow more collisions	1
	Until temperature high enough to denature enzyme / to change shape of enzyme	Allow lack of fit between enzyme and substrate	1
5(d)(i)	No / smaller villi or villi flatter	Assume it = coeliac disease Allow descriptions of villi – eg projections Allow it is flat(ter) Allow thicker lining / thicker epithelium Ignore smaller surface area	1
5(d)(ii)	Decreased absorption (of food) in intestine / nutrients in faeces		1
	Since reduced surface area / reduced diffusion	Allow if reduced S.A. given in 5(d)(i) If no other marks obtained allow 1 mark for poor nutrition	1
Total			19

Question	Answers	Extra information	Mark									
6(a)	A red (blood) cell	A Allow red corpuscle / erythrocyte	1									
	B platelet	B Allow thrombocyte	1									
	C (blood) plasma		1									
6(b)(i)	D cytoplasm		1									
	E (cell) membrane / cell surface membrane	E Allow plasma membrane	1									
	F nucleus	F Must be phonetic (do not allow neclus / nucus etc) Ignore DNA	1									
6(b)(ii)	Any two from: <ul style="list-style-type: none"> • Ability to move / cytoplasm flows • Ability to change shape / can form pseudopodia • Can detect stimulus 	Do not allow change shape if cell wall mentioned Ignore size Ignore references to nucleus	2 max									
6(c)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td></td> <td>✓ &/or ✓</td> <td></td> </tr> <tr> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>✓</td> <td></td> <td></td> </tr> </tbody> </table>		✓ &/or ✓				✓	✓			Top row: allow second <u>&</u> / <u>or</u> third box All three rows correct for 2 marks Two or one row correct for 1 mark	2
	✓ &/or ✓											
		✓										
✓												
6(d)(i)	W O X AB Y B Z A	All four correct for 3 marks Three or two correct for 2 marks One correct for 1 mark	3 max									
6(d)(ii)	<u>Red cells</u> have <u>antigens</u>		1									
	Which interact with <u>antibodies</u>	Ignore location of antibodies	1									
Total			15									

Question	Answers	Extra information	Mark
7(a)	<p>Observed <u>large</u> number of people</p> <p>Correlated incidence of lung cancer and amount of smoking</p> <p>Used data about incidence of lung cancer in <u>non-smokers</u> as 'control'</p>	<p>Eg relate number of cases / deaths to no. cigarettes smoked / number of years smoking / number of people smoking</p> <p>Allow compared smokers and <u>non-smokers</u></p>	<p>1</p> <p>1</p> <p>1</p>
7(b)(i)	<p>Higher <u>death</u> rate for males or <u>Death</u> rate increases with age more for men than for women</p> <p><u>Death</u> rate for females begins to fall at highest age group / 85+ / women's rises then falls</p>	<p>If no other marks, allow 1 mark for general point – eg men go up more than women</p> <p>For full marks, must refer to deaths at least once</p>	2 max
7(b)(ii)	<p>Any two from:</p> <ul style="list-style-type: none"> • Women smoke fewer cigarettes (per day) than men / men smoke more / more men smoke • Women started smoking later in life than men / men smoking for longer / more women stopped smoking • Men smoke higher-tar cigarettes 	<p>Allow women succumb to other diseases such as breast cancer</p> <p>Allow more men work in named industry – eg asbestos / mining</p>	2 max

Question	Answers	Extra information	Mark
7(c)	<p>Any two pros from:</p> <ul style="list-style-type: none"> • Benefits of up to £2.1 billion a year • Lives saved • Reduced NHS expenditure • Fewer fires • Lower cleaning costs • Lower employment costs • Reduces passive smoking / asthma • Less likely to smoke if have to go outdoors to do it • If fewer adults smoking, fewer children likely to smoke <p>Any two cons from:</p> <ul style="list-style-type: none"> • Restriction on personal freedom • Loss of business by eg restaurants / pubs • People take (outdoor) smoking breaks • Loss of tax • Loss of stress relief <p>Conclusion</p> <ul style="list-style-type: none"> • Financial / health benefits outweigh personal freedom issues 	<p>Only award conclusion mark if at least one pro and one con</p> <p>Allow converse in favour of personal freedom</p>	<p>3 max</p> <p>1</p>
Total		11	

Question	Answers	Extra information	Mark
8(a)(i)	Thermoregulatory	Allow hypothalamus	1
8(a)(ii)	Hypothalamus / (lower) mid-brain	Do not allow hypothalamus if already given in 8(a)(i)	1
8(a)(iii)	Skin		1
	Thermoregulatory centre (itself) / hypothalamus		1
8(b)(i)	When core temperature rises, B / artery / arterioles dilate	Do not accept: capillaries / vessels move closer / further away from surface	1
	Increasing flow of blood through A / capillaries / close to surface / to skin or Decreasing flow of blood through A / capillaries / close to surface / to skin	Allow max 3 marks if A and B identification is inverted	1
	(If blood near surface) increased heat loss or (If blood away from surface) decreased heat loss		1
	When core temperature falls, B / arteries / arterioles constrict		1
8(b)(ii)	(When core temperature rises) C / sweat gland produces sweat		1
	Sweat <u>evaporates</u>		1
	<u>Evaporation</u> uses heat (from body) / cools body / cools skin / cools blood		1

Question	Answers	Extra information	Mark
8(c)(i)	Increase in <u>temperature</u> increases heat index / how hot the body feels	OR , if no other marks, allow 1 mark for the higher the humidity and the higher the temperature → the more dangerous	1
	Increase in humidity increases heat index / how hot the body feels		1
8(c)(ii)	The more humid the less sweat will <u>evaporate</u>		1
	<u>Therefore</u> less cooling / less heat escapes		1
8(d)	<u>Heat</u> production by <u>muscles</u> / <u>muscles</u> get warm(er)	Ignore reference to energy	1
	(Via) <u>respiration</u>		1
8(e)	Cancer cells divide rapidly / cancer grows rapidly		1
	Therefore high rate of respiration / metabolism		1
Total			19

Question	Answers	Extra information	Mark									
9(a)(i)	A 46 / 23 pairs	Allow A divided by 2	1									
	B 23		1									
	C 46 / 23 pairs		1									
9(a)(ii)	Zygote		1									
9(a)(iii)	D meiosis	Allow meiosis	1									
	E mitosis		1									
9(b)(i)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td>T</td> <td>t</td> </tr> <tr> <td>T</td> <td>TT</td> <td>Tt</td> </tr> <tr> <td>t</td> <td>Tt</td> <td>tt</td> </tr> </table> <p>gametes T and t T and t</p> <p>F1 genotypes correctly <u>derived</u></p> <p>Thalassaemia genotype identified</p>		T	t	T	TT	Tt	t	Tt	tt	<p>Accept use of any letter so long as upper and lower case distinguishable</p> <p>Ignore X and Y</p>	1 1 1
	T	t										
T	TT	Tt										
t	Tt	tt										
9(b)(ii)	<p>Reply $0.5 / \frac{1}{2} / 50\%$ / evens chance of child having thalassaemia</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td>T</td> <td>t</td> </tr> <tr> <td>t</td> <td>Tt</td> <td>tt</td> </tr> <tr> <td>t</td> <td>Tt</td> <td>tt</td> </tr> </table> <p>gametes T and t t and t</p> <p>F1 genotypes correctly <u>derived</u></p> <p>Thalassaemia genotypes correctly identified</p>		T	t	t	Tt	tt	t	Tt	tt	<p>Accept 1:1 / 1 in 2 / 2 in 4 / 50:50</p> <p>Do not accept 1:2 / 50/50</p>	1 1 1
	T	t										
t	Tt	tt										
t	Tt	tt										
Total			13									

Question	Answers	Extra information	Mark
10(a)	Tied off pancreatic ducts of healthy dogs Enzyme-producing cells withered Extract made from remaining cells When extract injected into diabetic dogs they recovered	Allow from pancreas of healthy dog Allow injected insulin → recovery	1 1 1 1
10(b)	Permanently damaged healthy dogs / healthy dogs killed / dogs suffer But preferable to experimenting on humans / experiments on humans not permitted / are unethical End result has saved many lives / has controlled diabetes in many people– so experiments justified	Ignore dogs cannot give consent Allow helped many people	1 1 1
Total		7	