



**General Certificate of Secondary Education
June 2013**

Human Health and Physiology 44151F

(Specification 4415)

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

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

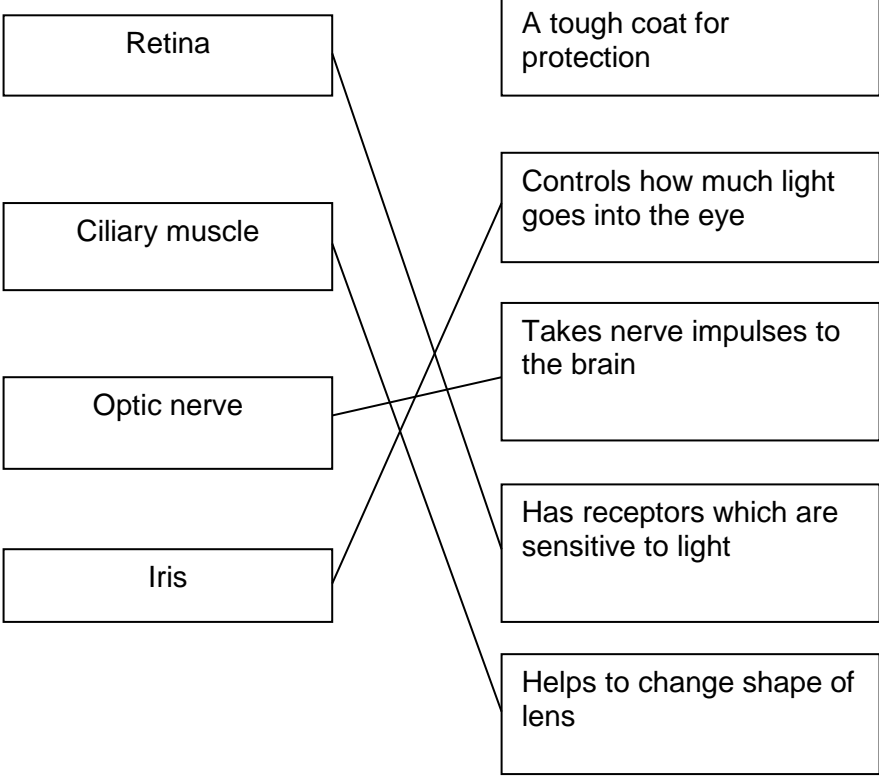
(.....) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

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)	A (Cell) membrane		1
	B Cytoplasm		1
	C Nucleus		1
1(b)(i)	Testis		1
1(b)(ii)	Tail		1
1(b)(iii)	23		1
1(b)(iv)	Testosterone		1
Total			7

Question	Answers	Extra information	Mark
2(a)	Optometrist		1
2(b)	 <p>Retina</p> <p>Ciliary muscle</p> <p>Optic nerve</p> <p>Iris</p> <p>A tough coat for protection</p> <p>Controls how much light goes into the eye</p> <p>Takes nerve impulses to the brain</p> <p>Has receptors which are sensitive to light</p> <p>Helps to change shape of lens</p>		4 max
2(c)(i)	<p>Any two from:</p> <ul style="list-style-type: none"> • Eye fatigue / tired eyes / eye strain • Blurred vision • Watering eyes 	<p>Ignore dry / itchy</p> <p>Allow headaches</p> <p>Do not accept reference to change in eye structure / condition</p> <p>Do not accept reference to problems other than related to eyes, eg stiff necks / bad back</p>	2 max

Question	Answers	Extra information	Mark
2(c)(ii)	Any two from: <ul style="list-style-type: none">• Ensure computer well positioned• Ensure that (room) lighting is suitable• Brightness / contrast of screen adjusted• Have eye test / wear glasses if needed• Blink regularly• Take regular breaks		2 max
Total			9

Question	Answers	Extra information	Mark
3(a)(i)	2200		1
3(a)(ii)	485	2 marks given for correct answer regardless of correct working out If answer incorrect then evidence of 2200 – 1715 gains 1 mark Allow error carried forward from 3(a)(i)	2
3(a)(iii)	Any two from: <ul style="list-style-type: none"> • An 11-14 year old is bigger • Increased / quick growth in height / weight / increased bone mass (accept growth spurt) • More active / do more exercise / activities • Puberty 	Ignore reference to metabolism	2 max
3(a)(iv)	(Iron stores are lost from body during) menstruation / menstrual cycle / periods / monthly or regular blood loss	Not 'help' menstruation	1
3(b)(i)	Any one from: <ul style="list-style-type: none"> • Maintain healthy blood vessels • Improves resistance to infections / defence against disease • Healthy skin and gums • Helps wound healing 	Ignore reference to immune system and 'fighting' infection Not repair of cells	1
3(b)(ii)	Scurvy		1
3(c)(i)	The juices / liquids / drinks (being tested)		1
3(c)(ii)	Amount of DCPIP (in test tubes)	Allow '1 cm ³ DCPIP'	1
3(c)(iii)	<u>Fresh</u> orange (juice)		1

Question	Answers	Extra information	Mark
3(c)(iv)	Very little / no vitamin C present	Allow idea that the blackcurrant drink colours the DCPIP / same colour (as dye)	1
Total			12

Question	Answers	Extra information	Mark
4(a)	Oestrogen / progesterone		1
	A		1
	Adrenaline		1
	C		1
4(b)	(Controls) metabolic rate / metabolism		1
4(c)(i)	<p>Any two from:</p> <ul style="list-style-type: none"> • Blood (glucose) monitoring needs to be done / samples taken • (Insulin) Dose needs to be calculated / can give too much / too little • Idea of regular (painful) injections / carrying insulin pen/needle around / fear of needles • (Blood) glucose levels can change 	<p>Ignore 'may run out' (of insulin)</p> <p>Accept idea of infection qualified</p> <p>Accept idea of risk of high (hyper) and low (hypos) glucose level</p>	2 max
4(c)(ii)	<p>Any two from:</p> <ul style="list-style-type: none"> • Don't have to wear a (visible) artificial pancreas (on clothes) • Feel that they have more control by administering own medication • May trust injections more (as artificial pancreas is a very new treatment) 	<p>Ignore reference to costs of treatments</p>	2 max
Total			9

Question	Answers	Extra information	Mark
5(a)	Ribs	In this order	1
	Diaphragm		1
	Thorax		1
	Trachea		1
5(b)(i)	Diffusion		1
5(b)(ii)	Carbon dioxide		1
5(b)(iii)	Plasma		1
5(c)(i)	Any two from: <ul style="list-style-type: none"> • Washing hands • Wearing face mask / covering mouth • Wearing uniform / apron / cap 	Accept wearing PPE (personal protective equipment)	2 max
5(c)(ii)	Any two from: <ul style="list-style-type: none"> • Direct contact (eg touching objects / surfaces / skin / kissing) • (Contaminated) blood • (Contaminated) body fluids / saliva / sexual transmission / contact • (Contaminated) food / water • Vectors • Through placenta 	Not 'through the air' Ignore 'needles' unless qualified Accept correctly named insect	2 max
Total			11

Question	Answers	Extra information	Mark
6(a)(i)	Amino acids		1
6(a)(ii)	Sugars		1
6(a)(iii)	Fatty acids	Either order	1
	Glycerol		1
6(b)	Any two from: <ul style="list-style-type: none"> • Temperature • pH • Enzyme <u>concentration</u> • Substrate <u>concentration</u> 	Allow 'heavy metals' (enzyme inhibitors)	2 max
Total			6

Question	Answers	Extra information	Mark
7(a)	A Kidney(s)		1
	B <u>Ureter</u>		1
	C Bladder		1
7(b)(i)	Liver		1
7(b)(ii)	Glucose		1
7(c)(i)	<p>Any two from:</p> <ul style="list-style-type: none"> • Blurred eyesight • Slurred speech • Loss of balance • Nausea and vomiting • Increase reaction time • Heightened emotions • Loss of inhibitions • Dehydration / increased urination • Headaches • Confusion / sleepy 	<p>Allow dizzy</p> <p>Not decrease reaction time</p> <p>Accept 'memory loss' qualified</p>	2 max
7(c)(ii)	<p>Any two from:</p> <ul style="list-style-type: none"> • Liver disease / damage / failure (cirrhosis) • Heart failure / disease • Brain damage / memory loss • High blood pressure • Cancer 	<p>Ignore reference to kidney(s)</p> <p>Accept appropriate named cancers</p> <p>Ignore reference to weight gain / loss</p>	2 max
Total			9

Question	Answers	Extra information	Mark
8(a)(i)	18 000		1
8(a)(ii)	$\frac{3}{4}$ or 75% or 3 in 4	Allow 3:1 Not 7500:2500	1
8(a)(iii)	Any two from: <ul style="list-style-type: none"> • Surgery (to remove tumor) • Chemotherapy • Radiotherapy / gamma rays / high energy x-rays 	Accept mastectomy / remove breast Ignore 'operation' unqualified Ignore medication unqualified	2 max
8(b)			3 max
8(c)	Any two from: <ul style="list-style-type: none"> • Blood tests • X-rays / MRI / CT / mammogram / ultrasound / scan • Biopsies / tissue sample / examination (of lump) • Smear test • Bleeding from the bowel 	If no mark gained, allow 1 mark for screening	2 max
Total			9

Question	Answers	Extra information	Mark												
9(a)(i)	To carry / transport / deliver oxygen (around the body)		1												
9(a)(ii)	Not enough oxygen (being carried around the body)		1												
	Less respiration / energy released	Not energy produced / made or energy unqualified	1												
9(b)(i)	<table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;">R</td> <td style="text-align: center;">r</td> <td></td> </tr> <tr> <td style="text-align: center;">R</td> <td style="border: 1px solid black; padding: 5px;">RR</td> <td style="border: 1px solid black; padding: 5px;">Rr/rR</td> <td></td> </tr> <tr> <td style="text-align: center;">r</td> <td style="border: 1px solid black; padding: 5px;">rR/Rr</td> <td style="border: 1px solid black; padding: 5px;">rr</td> <td></td> </tr> </table>		R	r		R	RR	Rr/rR		r	rR/Rr	rr		<p>3 marks for 4 correct complete boxes</p> <p>2 marks for 3 correct complete boxes</p> <p>1 mark for 2/1 correct complete box(es)</p>	3 max
	R	r													
R	RR	Rr/rR													
r	rR/Rr	rr													
9(b)(ii)	Correctly identify box with rr		1												
Total			7												

Question		Mark
10	<i>Marks awarded for this answer will be influenced by the quality of written communication.</i>	
	<p>The answer is coherent and in a logical sequence. It contains a range of appropriate or relevant specialist terms used accurately.</p> <p>The answer includes correct references to the roles of parts of the heart and the blood vessels (arteries, capillaries and veins) and to double circulation.</p>	5
	<p>The answer has some structure and use of specialist terms has been attempted, but not always accurately.</p> <p>The answer includes correct references to both the role of the heart chambers and to blood vessels, but there are some omissions</p>	4/3
	<p>The answer is poorly constructed with an absence of specialist terms or their use demonstrates a lack of understanding in their meaning.</p> <p>The answer is restricted to either the roles of the heart chambers or the roles of the blood vessels</p>	2/1
	No relevant content	0
	<p>Example of scientific ideas that may contribute to a candidate's response:</p> <ul style="list-style-type: none"> • Ventricles pump blood out of the heart • Via arteries to body organs • (In organs) arteries divide to form capillaries • Reference to elasticity in artery walls to maintain flow • Capillaries rejoin to form veins • Veins return blood to the heart • Into atria • There is a separate circulation between the heart and the lungs • Valves in the heart and/or veins ensure blood flows in one direction through the heart and therefore throughout the body 	

Question	Answers	Extra information	Mark
11(a)	Osteopath / chiropractor	Allow phonetic spellings	1
11(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
11(c)(i)	Calcium	Allow phosphate	1
11(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
11(d)	Any two from: <p>eg</p> <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
12(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
12(b)(i)	Placenta		1
12(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
12(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

Question	Answers	Extra information	Mark
12(d)(i)	'The percentage of mothers who drank alcohol before pregnancy did not change with age' box ticked		1
12(d)(ii)	Percentage who drink increases with age Quantitative statement eg larger increase between age groups as age increases / overall increase of 18%	Eg it increases by 18% = 2 marks	1 1
12(d)(iii)	Sensible suggestion eg more stressed at older age / more chance of addiction at higher age or Educational reason – eg aware of consequences or Less likely to be served alcohol when young or More chance of addiction / habit with age or More confident / blasé with age or Older women can afford alcohol	Assume answer refers to older women unless otherwise stated	1
Total		12	

Question	Answers	Extra information	Mark
13(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
13(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
13(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
13(b)(ii)	B Largest clear zone / largest diameter / most bacteria killed	Allow 37	1 1
Total			8

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