



General Certificate of Secondary Education

Human Physiology and Health 3417

3417/H

Mark Scheme

2007 examination - June series

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 meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting 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 the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting 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

Information to 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 lines 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 / ; e.g. allow smooth / free movement.)

3. Marking points

3.1 Marking of Quality of Written Communication

Where *Quality of written communication* appears in the mark scheme, one mark is to be awarded for either of the following points:

- Using correct scientific terms
- Correct sequencing or linking of ideas or points

The mark scheme will specify which of the points is to be awarded in a particular question. A QoWC mark can be awarded for a scientific answer, even if it is not accurate. It cannot be awarded for a nonsensical or non-scientific answer. On the script, the QoWC tick should be identified by a 'q' written next to it.

3.2 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 (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.3 Use of chemical symbols/formulae

If a candidate writes a chemical symbol/formula instead of a required chemical name, full credit can be given if the symbol/formula is correct and if, in the context of the question, such action is appropriate.

3.4 The marking of quantitative relationships

Full credit can be given for a correct quantitative relationship expressed in:

- named units;
- physical quantities;
- standard symbols;
- a combination of physical quantities and units.

No credit can be given for any quantitative relationship expressed in terms of:

- a combination of physical quantities, units and symbols;
- a diagram, e.g. the ohm's law triangle, unless the rest of the answer shows clearly that the candidate understands the relationships involved.

3.5 Marking procedure for calculations

3.5.1 Full marks can be given for a correct numerical answer, as shown in the column 'answers', 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;
- if the answer is correct, but an incorrect relationship is written in the working, then no marks can be awarded (see 3.5.2).

3.5.2 Where calculations are based on incorrectly recalled relationships, neither the incorrectly recalled relationship, nor the resulting calculation based on the incorrect relationship, will be credited.

3.6 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.

3.7 Errors carried forward

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

Example

A candidate who calculates average speed using $\text{speed} = \text{time}/\text{distance}$ **and** then proceeds to use this incorrect answer to calculate an acceleration based on the correct quantitative relationship should be given no credit for the speed calculation but full credit for the calculation of acceleration.

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.

3.8 Phonetic spelling

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

3.9 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.

3.10 Interpretation of marginal points

There will be times when the answer is almost, but not quite, correct. Some examiners would award a mark while others would not. In any one script, an attempt should be made to balance these nearly correct answers by giving the mark on some occasions but not on others. If this is not done, the marking would end up being too lenient or too harsh.

3.11 Unexpected Correct Answers not in the Mark Scheme

The Examiner should use professional judgement to award credit where a candidate has given an unexpected correct answer which is not covered by the mark scheme. The Examiner should consult with the Team Leader to confirm the judgement. The Team Leader should pass this answer on to the Principal Examiner with a view to informing all examiners.



3417/H Question 1

question	answers	extra information	mark
(a)(i)	40 (million)	2 marks for correct answer allow 1 for correct working if answer is incorrect	2
(ii)	fell from 20 (%) to 2 (%) / by 18%	allow any suitable numerical description	1 1
(b)	any three from: ref. to mutation some bacteria resistant to antibiotic <u>these</u> survive reproduce	ignore immune	3
(c)	any six from: ref. to Fleming ref. to dishes of bacteria growing ref. to (chance) observation / owtte ref. to mould / fungus <u>Pencillium</u> (ref. to hypothesis) / – chemical antibiotic from / produced / made secreted by mould which inhibits growth of / kills bacteria culture of mould in broth broth tested	the answer to this question requires ideas in good English in a sensible order with correct use of scientific terms. Quality of Written Communication should be considered in crediting points in the mark scheme - linking of any 2 ideas	6 1
total			14

3417/H Question 2

question	answers	extra information	mark
(a)	any two from: sex / gender freckles blood group		2
(b)	<p>XY ; XX</p> <p>X Y X X</p> <p>XX XX XY XY</p> <p>Debra / Ann Robert / Nigel</p>	allow error carried forward to	5
total			7

3417/H Question 3

question	answers	extra information	mark												
(a)	B – (left) ventricle	do not accept if ‘right’ given	1												
	D – (right) atrium	do not accept if ‘left’ given	1												
	E – pulmonary artery		1												
(b)	any five from: muscle of C / ventricle muscle contracts tricuspid valve closes / position valve described / semi lunar opens blood forced / pushed / pumped / squeezed into pulmonary artery / E semi-lunar valve closes / description blood to lungs (from E / pulmonary artery) pulmonary vein to left atrium / A ref. valves prevent backflow / owtte		5												
(c)	<table border="1"> <tr> <td></td> <td>vena cava</td> <td>renal artery</td> <td>capillary</td> </tr> <tr> <td>O₂</td> <td>(low)</td> <td>high</td> <td>low</td> </tr> <tr> <td>CO₂</td> <td>(high)</td> <td>low</td> <td>high</td> </tr> </table>		vena cava	renal artery	capillary	O ₂	(low)	high	low	CO ₂	(high)	low	high	minus 1 mark for each error	3
	vena cava	renal artery	capillary												
O ₂	(low)	high	low												
CO ₂	(high)	low	high												
total			11												

3417/H Question 4

question	answers	extra information	mark
(a)(i)	reflex	allow 'automatic', 'involuntary'	1
(ii)	drawing pin		1
(iii)	skin	allow 'dermis' do not accept 'epidermis'	1
(iv)	muscle / biceps	allow 'A' <u>motor</u> neurone ignore 'effector' unqualified	1
(b)	A – motor neurone		1
	B – sensory neurone		1
(c)	3 correct arrows arrows along sensory neurone to relay along motor neurone	no marks if any arrow in wrong direction	1
(d)(i)	0.54 (seconds)		1
(ii)	any two from: slower nerve impulses / slower reflexes e.g. poor eye- hand co-ordination / slow reactions eyesight deteriorated / poor eyesight weaker muscles arthritis / stiff joints	ignore reference to 'thinking', 'brain deterioration'	2
total			10

3417/H Question 5

question	answers	extra information	mark
(a)(i)	to allow both to reach correct / same temperature (before mixing)		1
(ii)	195 (seconds)		1
(iii)	40 (°C)		1
(b)(i)	no reaction / milk would not clot		1
	enzyme / protein / rennin denatured / destroyed / changes shape		1
(ii)	milk would clot / reaction would take place		1
	enzyme / rennin still able to work as not destroyed / denatured /	not just 'too cold' etc do not accept dormant	1
(c)	pH / acid / neutral / alkali	allow ref. to enzyme concentration, substrate, inhibitors, activators	1
total			8

3417/H Question 6

question	answers	extra information	mark
(a)	150		1
(b) (i)	5		1
(ii)	20		1
(c)	more cigarettes smoked, lower (birth) masses of babies	accept reverse argument	1
(d)	carbon monoxide in cigarette smoke	ignore references to other chemicals	1
	combines with haemoglobin / forms carboxyhaemoglobin		1
	less O ₂ carried		1
	less respiration / less energy		1
	less / reduced growth of fetus / lower birth mass	ignore development	1
total			9

3417/H Question 7

question	answers	extra information	mark
(a)(i)	circulation / pumping of the blood		1
	oxygenation of the blood	allow gas exchange ignore warm	1
(ii)	to maintain patient's body temperature	(37°C +/- 0.5) allow 'keep it warm'	1
(iii)	infection	ignore refs to power cuts stopping machine working allow possible blood vessel damage / blood cell damage / blood clotting	1
(b)	antibodies will destroy the donor organ / antigens not recognised		1
(c)(i)	minimise chances of rejection owtte		1
(ii)	prevent infection / unable to respond to infection		1
(iii)	inhibit white cell production	allow kills WBCs	1
total			8

3417/H Question 8

question	answers	extra information	mark
(a)(i)	ovaries		1
	causes egg to mature / causes lining of uterus to thicken / stimulates (pituitary) to produce LH	allow inhibits FSH	1
(ii)	pituitary gland		1
	causes rupture of follicle / ovulation / egg release / formation of corpus luteum		1
(iii)	placenta		1
	(causes ovaries) continued production of oestrogen and progesterone	do not accept stimulation. must be continued production ignore refs to FSH/LH inhibition	1
(b)	any two from: (uterus) contraction of muscle widening of cervix		2
	(mammary glands) stimulates milk secretion / milk release	allow milk production	
(c)(i)	<u>increase</u> of 20 (%) / from 13 to 33		1
(ii)	male sterilisation / cutting and tying sperm ducts / rhythm method / vasectomy/ abstinence / diaphragm	allow reasonable suggestions of contraceptives e.g deprevira implants	1
total			10

3417/H Question 9

question	answers	extra information	mark
(a)(i)	DNA	ignore genes do not accept protein	1
(ii)	order of bases is a code / blueprint	allow instructions allow 3 bases is a code for an amino acid	1
	for order of amino acids in a protein		1
	the order of bases/amino acids gives different proteins	allow ref. to a mutation causing a change	1
(b)(i)	allele is on X chromosome / missing from Y chromosome	allow gene for allele	1
	males need only inherit one allele / females must inherit 2 alleles		1
(ii)	father X^rY × mother $X^R X^r$ gametes X^r Y X^R X^r $X^R X^r$ $X^r X^r$ $X^R Y$ $Y X^r$ normal colour normal colour (female) blind (male) blind (female) (male)	allow marks on a labelled diagram Max. 2 for correctly derived offspring and phenotypes from non sex-linked cross	1 1 1 1
total			10

3417/H Question 10

question	answers	extra information	mark
(a)(i)	53 (mg per 100cm ³)	allow + 0.25	1
(ii)	fright (owtte) / meal		1
(iii)	increase in <u>blood</u> glucose level		1
(iv)	any two from: converted to glycogen increases rate of uptake by cells / named example increased rate of respiration		2
(b)	pancreas produces glucagon liver converts glycogen to glucose	ignore hypothalamus	1 1 1 1
total			9

3417/H Question 11

question	answers	extra information	mark
(a)	any six from: blood is filtered in the glomerulus glucose / sugar reabsorbed but all glucose reabsorbed needed ions reabsorbed / excess ions removed needed water reabsorbed / excess water removed reabsorption in tubules urea (in right context)	allow bowmans capsule allow minerals / salts	6
(b)(i)	pituitary gland		1
(ii)	hypothalamus	ignore brain	1
(iii)	fall (in flow rate) immediate / rapid / large from 13.6 to 0.4 / by 13.2 / over 36 minutes	accept correct references to figures or graph reading	1 1 1
(iv)	increased <u>re</u> absorption of water urine more concentrated owtte	do not accept absorption accept less volume	1 1 1
(c)	in solution / dissolved in blood / plasma	allow diffusion in/out of blood	1 1
total			16

