



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Mark scheme

June 2003

GCSE

Human Biology

3415

Higher

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GCSE BIOLOGY (HUMAN)
HIGHER TIER 3415/H
INFORMATION 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 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

Examiners are reminded of the need to assess QoWC by the following statement appearing in the appropriate parts of the mark scheme:

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.

The maximum marks available to a candidate whose answer is not well expressed will be (the number of marks available –1).

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.

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

There should be no error carried forward from a previous answer which has been based on wrong science. Any error in the answers to a structured question should be penalised once only.

Examples

- (a) 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 credit for the use of the correct acceleration relationship but none for either numerical answer.
- (b) A candidate who incorrectly calculates average speed using $\text{speed} = \text{distance}/\text{time}$ and then proceeds to use this incorrect value to calculate an acceleration based on the correct quantitative relationship, should be given credit for the use of both correct quantitative relationships **and** for the correct substitution and use of the incorrect value in the calculation of the rate 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

(.....) is 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 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.



**GCSE Biology (Human)
Higher Tier 3415/H**

3415/H Q1

question	answers	extra information	mark
(a)(i)	L.H.S. – water / H ₂ O	accept H ² O	1
	R.H.S. – oxygen / O ₂	accept O ² / O	1
(ii)	chlorophyll	must make it clear that it is the chlorophyll do not credit chloroplast on its own do not accept chloroplast / chlorophyll without indication that it is chlorophyll	1
(b)(i)	light intensity / temperature is high enough for higher rate or light / temperature is not limiting		1
	low CO ₂ available or not enough CO ₂ available or rate would be higher with more CO ₂		1
(ii)	temperature	allow water / rain allow (too) cold / hot as a minimum allow wave length / frequency / colour ignore ions ignore heat	1
total			6

3415/H Q2

question	answers	extra information	mark
(a)	A = cornea B = suspensory ligament		1 1
(b)	H	extra letters cancel ignore any names	1
(c)	carries impulses / electrical signal / electrical messages / electrical pulses (to the brain)	do not accept “messages” or “the image” or “signal” or pulses unqualified not electronic	1
total			4

3415/H Q3

question	answers	extra information	mark
(a)	any two from: no nucleus or DNA / chromosome / genetic material free in cytoplasm (only) has one chromosome circular DNA / chromosome no mitochondria has cell wall	accept converse as long as specified not a chromosome ignore shape	2
(b)	any two from: skin – barrier (to entry) (blood) <u>clotting</u> – barrier to (entry) tears – kill bacteria (antiseptic / lysozyme) <u>mucus</u> – traps bacteria <u>cilia</u> – <u>remove</u> bacteria <u>stomach acid</u> – <u>kills</u> bacteria / <u>denatures</u> protein / <u>denatures</u> enzyme w.b.c.s. / phagocytes – (involved in) phagocytosis w.b.c.s. / lymphocytes / T or B cells – antibody / antitoxin production	must be feature and what it does allow alternatives to bacteria, germs etc accept scab ignore hairs accept ‘engulfs’ bacteria ignore ‘eats’ / ‘destroys’ bacteria	2
(c)(i)	kills / destroys <u>bacteria</u> or prevents growth of <u>bacteria</u>	do not allow germs do not allow fights or gets rid of	1
(ii)	any two from: bacteria may be resistant / immune (treatment futile) or bacteria would not be killed may select for resistant type may cause increased incidence of resistance or Penicillin less effective in future sore throat might be due to a virus – Penicillin would not work	accept descriptions from table accept ‘fights’ here do not accept people resistant	2
total			7

3415/H Q4

question	answers	extra information	mark
(a)	burning / combustion fossil fuels / burning wood deforestation	accept named fossil fuel accept driving cars / any vehicles do not accept burning / combustion unqualified do not accept factories ignore factory chimneys unqualified ignore respiration	1 1
(b)(i)	(overall) increase fluctuations	highs are higher <u>and</u> lows are not as low = 2 marks	1 1
(ii)	no – could be due to some other factor or could be coincidence or fluctuations \pm same size as the overall rise or large fluctuations or sometimes when CO ₂ rises temperature doesn't		1
(c)	any one biotic or abiotic effect eg: changes in rainfall ice-caps melting / rise in sea level changed pattern of winds changed pattern of migration changed species survival changed growth	do not credit just "climate / weather change" allow <u>extreme</u> climate / weather change accept drought, desert formation accept flooding	1
total			6

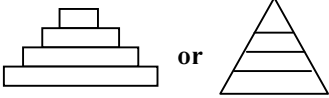
3415/H Q5

question	answers	extra information	mark
(a)(i)	(need new roots) to take in water	ignore minerals / anchorage	1
(ii)	create humid atmosphere or reduce water loss / transpiration or prevent wilting	ignore warmth	1
(b)	<p>Quality of written communication <i>The answer to this question requires 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.</i></p> <p><u>seed</u> because (no mark)</p> <p><u>sexual</u> reproduction or fusion of gametes / pollination / fertilisation</p> <p>2 sets of (different) genes / chromosomes / DNA combined</p> <p>causes variation in (appearance of) offspring / causes new variety</p>	<p><i>maximum of 2 marks if ideas not well expressed</i></p> <p>accept converse points re cuttings e.g. asexual or no fusion or only cell division / by mitosis</p> <p>do not accept breeding for sexual reproduction</p> <p>genetically identical / is a clone</p> <p>no variation / all identical (in appearance)</p>	<p>1</p> <p>1</p> <p>1</p>
total			5

3415/H Q6

question	answers	extra information	mark
(a)(i)	6		1
(ii)	4		1
(b)(i)	pancreas	ignore islets of langerhans	1
(ii)	'X' anywhere between >1 and ≤2 hours	anywhere in that column	1
(c)	<p>any four from:</p> <p><u>water</u> movement</p> <p><u>out</u> of cells</p> <p>dilute to concentrated solution</p> <p>reference to partially / selectively permeable membranes or described</p> <p>cells shrink / get smaller</p>	<p>do not accept solution</p> <p>accept reference to correct gradient - high Ψ to low Ψ or high to low '<u>water</u> concentration'</p> <p>must be unambiguous – i.e. not 'high to low concentration'</p> <p>accept low to high concentration</p> <p>allow crenated</p> <p>ignore plasmolysed / flaccid / floppy etc</p>	4
total			8

3415/H Q7

question	answers	extra information	mark
(a)	0.1	ignore working or lack of working $\frac{88 \times 100}{88\,000}$ for 1 mark	2
(b)	<u>shape</u> : pyramid with 4 tiers <u>labels</u> : Plants + Herbivores + Carnivores + Top carnivores (in sequence – largest to smallest)	 or allow suitable named examples inverted pyramid correctly labelled = 1 mark	1 1
(c)	more energy / biomass / materials / matter available or less energy lost or energy used up (by herbivores)	not just plants	1
total			5

3415/H Q8

question	answers	extra information	mark
(a)	1 and ligament	both answers are required	1
(b)	reduce friction or lubricate or stops friction	accept smooth movement ignore name ignore shock absorber or cushion ignore stops bones rubbing together	1
(c)	cartilage worn away or cartilage not covering end of bone	accept tissues worn away or damaged	1
	uneven surface of bone or outgrowths of bone or uneven surface of cartilage or ridges on bone / cartilage	accept bones become brittle	1
	bone surface / outgrowths will rub together or not move smoothly together	accept stiffness / pain / hurts accept bones grind together accept swelling / inflammation occurs	1
total			5

3415/H Q9

question	answers	extra information	mark
(a)(i)	count the pulse or count beats in artery in wrist / neck or feel the pulse or take the pulse or find the pulse	accept use of heart monitor or heart meter	1
(ii)	80	2 marks for correct answer if answer incorrect allow 1 mark for showing 8000 divided by 100 or indicating cardiac output divided by stroke volume	2
(iii)	increased activity stroke volume falls / gets less / should get higher / reach a peak	accept does not increase or changes from 134 cm ³ to 127 cm ³	1
(iv)	increased / more ventricle contractions	accept heart beat faster or it beats faster or more powerful contractions	1
(b)	(stronger heart muscle) increases cardiac output or increases stroke volume so more (oxygenated) blood can be sent <u>to muscles</u>	accept pumps more blood (per beat) or pumps blood faster ignore heart bigger accept more oxygen sent to muscles	1 1
total			7

3415/H Q10

question	answers	extra information	mark
(a)	forward facing eyes or large brain or social organisation	accept examples of social organisation such as living in groups	1
(b)	any one from: B has shorter tail / no tail / fewer caudal vertebrae A walking on all four legs B shows some indication of walking on hind limbs or bipedal	accept B has straighter back or more upright back accept (opposable) thumb in B	1
(c)	any two from: fore-limbs (arms) longer than hind-limbs (legs) not truly bipedal backbone arched up / is straight as in A or not showing curves of human backbone big toe further back / shorter	accept fore-limbs longer than humans accept uses fore-limbs for support / not so erect	2
total			4

3415/H Q11

question	answers	extra information	mark
(a)	arrow showing blood flow from placenta or arrow going upwards	arrow must not be ambiguous in position	1
(b)	oxygen or glucose	accept sugar or other suitable named substance or nutrients accept nicotine ignore food	1
(c)	(thin) to allow substances to pass through or useful substances from mother to embryo or waste substances from embryo to mother or allows diffusion or osmosis (not fully permeable) to prevent passage of pathogens / harmful substance / antibodies / antigens / toxins into embryo	accept prevents bloods mixing or a described effect of the bloods mixing	1 1
(d)	provides a larger surface or increases (surface) area	accept bacteria or germs	1
total			5

3415/H Q12

question	answers	extra information	mark
(a)	A = meiosis	accept 'mieosis'	1
	B = mitosis	do not accept 'miosis' do not accept 'meitosis' etc	1
(b)	fertilisation	allow conception	1
(c)(i)	23		1
(ii)	46		1
total			5

3415/H Q13

question	answers	extra information	mark
(a)	pituitary (gland / body)		1
(b)	oestrogen inhibits the release of FSH	ignore references to LH	1
	FSH stimulates follicle development / causes egg to develop or no follicle / egg development if high oestrogen	accept growth / maturing / ripening for development	1
	no ovulation / no egg release	do not accept no egg to be fertilised	1
total			4

3415/H Q14

question	answers	extra information	mark
(a)	lipase		1
(b)	fatty acid	ignore glycerol	1
(c)(i)	0.25 or $\frac{1}{4}$	if <u>correct</u> answer ignore working or lack of working $\frac{(8.7 - 7.7)}{4}$ for 1 mark	2
(ii)	fats emulsified or described re. small droplets or large S.A. (for enzyme action) or fats 'mix' better with water	do not allow breakdown / breakup unqualified	1
total			5

3415/H Q15

question	answers	extra information	mark
(a)(i)	oxygen		1
(ii)	for respiration / energy release	allow 'produce / make energy' do not accept 'anaerobic'	1
(b)	1 st box: putrefying and 2 nd box: nitrifying	accept decomposing / saprotrophic / saprobiotic / saprophytic accept Nitrobacter, Nitrosomonas	1
(c)(i)	human: makes lactic acid does not make methane or carbon dioxide		1 1
(ii)	best temperature for enzyme action / for chemical reactions / for growth / reproduction of bacteria	must be qualified accept named chemical reaction do not accept bacterial activity alone	1
(d)	Quality of written communication <i>The answer to this question requires 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.</i> any four from: sewage / dead plants used by bacteria / food for bacteria / broken down by bacteria number of bacteria increases / large number of bacteria present oxygen from water used (by bacteria) or less oxygen for fish less light (for plants) for photosynthesis plants produce less oxygen fish cannot respire / get energy	<i>maximum of 3 marks if ideas not well expressed</i> allow microorganisms / microbes do not accept 'germs' ignore fish suffocate or fish can't breathe do not accept in wrong context ignore references to disease / toxins ignore eutrophication	4
total			10

3415/H Q16

question	answers	extra information	mark
(a)(i)	glucose passes through the filter / from plasma to filtrate	ignore diffuses	1
(ii)	glucose is re absorbed or glucose taken back into the blood	ignore filtered	1
(b)	protein (molecules) are (too) large (to pass through the filter)		1
(c)	any three from: <u>blood</u> becomes more concentrated / too salty / has lower water potential or too little water in the <u>blood</u> hypothalamus detects this release of ADH by pituitary increased re absorption of water		3
total			6

3415/H Q17

question	answers	extra information	mark
(a)(i)	mutation		1
(ii)	not enough <u>oxygen</u> carried in <u>blood</u> or not enough <u>oxygen</u> to <u>body cells</u>	comment about <u>oxygen</u> carriage or delivery	1
(b)(i)	person 7 = H ^A H ^S and person 8 = H ^A H ^S	allow use of ‘A’ and ‘S’ for alleles	1
	sickle gamete from <u>each</u> parent	N.B. can pick up chain of logic at any point correctly derived from candidate’s previous line accept gametes correctly derived from P genotypes	1
	F ₁ genotype H ^S H ^S correctly derived from candidate’s gametes	accept F ₁ genotypes correct from candidate’s gametes	1
	F ₁ H ^S H ^S identified as having sickle cell anaemia		1
(ii)	$\frac{1}{4}$ / 0.25 / 25% / 1 in 4 / 1:3 / 1 to 3	not 1:4 / 1 to 4 / 3:1 / $\frac{1}{3}$	1
(c)	any one from: 2 / 3 / 6 / 9 / 10		1
total			8

3415/H Q18

question	answers	extra information	mark
(a)(i)	in diffusion: material moves high to low concentration		1
	here: concentration in cells > concentration in water or uptake is against the concentration gradient or by diffusion ions would move out		1
(ii)	active transport / active uptake		1
(b)	phosphate passes (mainly) through xylem only a little / no phosphate via phloem evidence: EITHER	allow 'inner tissue' for xylem allow 'outer tissue' for phloem	1
	if xylem intact / in cutting 1 – darkening of upper region occurs or phosphate or equivalent reaches upper region	allow radiation / material / the solution / ions etc	1
	OR if only phloem (&bark) intact / in cutting 2 – very little / no darkening of upper region or very little / no phosphate reaches upper region	allow radiation / material / the solution / ions etc	1
total			6

3415/H Q19

question	answers	extra information	mark
(a)	diaphragm flattens / goes down and ribs move up / out		1
	volume increase	allow chest bigger / expands / more space / more room do not accept more area	1
	pressure decrease	ignore extra points re. <u>exhalation</u> ignore how air passes into lungs ignore “suction”	1
(b)	thicker surface		1
	reduced surface area	accept fewer alveoli	1
total			5

3415/H Q20

question	answers	extra information	mark
(a)	show two eggs being fertilised (by separate sperm)	do not allow if any indication given that only one sperm used	1
(b)	<p>human chorionic gonadotrophin (HCG) or the secretion from embryo tissue cause corpus luteum / yellow body to be kept or release a hormone (progesterone)</p> <p>progesterone / secretion from ovary / corpus luteum / yellow body maintains endometrium or uterine lining</p> <p>progesterone / secretion by placenta / secretion from placenta takes over maintenance of endometrium / uterine lining</p>	<p>if sites of hormone secretion are not named or are incorrect but three hormone actions are correctly given allow 2 marks maximum</p>	<p>1</p> <p>1</p> <p>1</p>
(c)(i)	release of afterbirth / placenta		1
(ii)	contains antibodies or high in protein		1
total			6

3415/H Q21

question	answers	extra information	mark
(a)(i)	3 – shown as direct ancestor or in direct line of evolution	mark is for explanation if organism 3 identified	1
(ii)	X placed lower than 3 on Homo Sapiens line and not lower than dotted line from Australopithecus		1
(iii)	any one from: knowledge of organisms is uncertain no fossils found it is thought that they are linked in evolution no evidence or no trace of ancestors	accept may have been other lines of evolution	1
(b)	any one from: have evolved separately from same ancestor separate lines of evolution no direct link between chimpanzee / gorilla and humans		1
(c)	measure / study / find type of DNA from each organism if DNA very similar they are closely related or if DNA different they are not closely related	accept compare DNA of each	1 1
total			6

3415/H Q22

question	answers	extra information	mark
(a)	when muscle A contracts X or attachment to X moves	accept it is where the bone is pulled / muscle causes movement	1
(b)	transmits all the force of contracting muscle to bone	accept when muscles contract can pull on bone or no force lost in stretching tendon or bone is caused to move	1
(c)	third class – muscle or effort is between load and elbow	accept elbow is at one end and load is at the other accept load is at one end and muscle is in the middle accept elbow is furthest from the load a statement about effort, load and fulcrum in a third order lever is not sufficient. The parts of the area must be related to the parts of the lever	1
(d)	140 N	2 marks for correct answer if answer incorrect allow 1 mark for showing $20 \times 35 = 5X$ or 20×35 divided by 5	2
(e)	(advantage) – small contraction of muscle means larger movement of lever / hand / object (disadvantage) – uses more force than object exerts	accept 140 N to hold 20 N	1 1
total			7

3415/H Q23

question	answers	extra information	mark
(a)	<p>Quality of written communication <i>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</i></p> <p>any three from:</p> <p>accelerator centre sends out impulses or more impulses or increased rate of impulses</p> <p>no impulses from inhibitory centre or less impulses from inhibitory centre</p> <p>adrenal gland releases adrenalin or more adrenalin</p> <p>increased rate of heartbeat</p>	<p>maximum of 2 marks if ideas not well expressed</p> <p>accept impulses sent to pacemaker for either of first two points</p> <p>accept pacemaker stimulated</p>	3
(b)	<p>increases rate at which fatty substances / cholesterol deposited (in coronary arteries)</p> <p>causes arteries to become narrower and so carry less blood</p>	<p>accept heart <u>muscles</u> get less blood or less oxygen</p>	1 1
total			5