Mark scheme
June 2003

GCSE

Biology

3411

Higher

GCSE BIOLOGY
HIGHER TIER 3411/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 speed = time/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 speed = distance/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.

++++++++++++++++++++++++++++++

3411/H   Q1

question	answers	extra information	mark
(a)(i)	L.H.S. – water / H_2O	accept H^2O	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

3411/H Q2

question	answers	extra information	mark
(a)	A = cornea		1
	B = suspensory ligament		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

3411/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** <u>a</u> 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

AQA

3411/H   Q4

question	answers	extra information	mark
(a)	burning / combustion fossil fuels / burning wood	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
	deforestation		1
(b)(i)	(overall) increase		1
	fluctuations	highs are higher <u>and</u> lows are not as low = **2** marks	1
(ii)	no – could be due to some other factor **or** could be coincidence **or** fluctuations ± 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:	do **not** credit just "climate / weather change" allow <u>extreme</u> climate / weather change	1
	changes in rainfall	accept drought, desert formation	
	ice-caps melting / rise in sea level	accept flooding	
	changed pattern of winds		
	changed pattern of migration		
	changed species survival		
	changed growth		
total			6
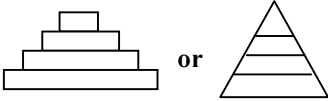
3411/H Q5

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)	**Quality of written communication** *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.* <u>seed</u> because (no mark) <u>sexual</u> reproduction **or** fusion of gametes / pollination / fertilisation	*maximum of 2 marks if ideas not well expressed* accept converse points re cuttings e.g. asexual **or** no fusion **or** only cell division / by mitosis do **not** accept breeding for sexual reproduction	1
	2 sets of (different) genes / chromosomes / DNA combined	genetically identical / is a clone	1
	causes variation in (appearance of) offspring / causes new variety	no variation / all identical (in appearance)	1
total			5

AQA

3411/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)	any **four** from: water movement out of cells dilute to concentrated solution reference to partially / selectively permeable membranes **or** described cells shrink / get smaller	 do **not** accept solution accept reference to correct gradient - high Ψ to low Ψ **or** high to low 'water concentration' must be unambiguous – i.e. **not** 'high to low concentration' accept low to high concentration allow crenated ignore plasmolysed / flaccid / floppy etc	4
total			8

3411/H   Q7

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

3411/H   Q8

question	answers	extra information	mark
(a)(i)	<u>downstroke</u>: X contracts; Y relaxes <u>upstroke</u>: X relaxes; Y contracts	 if stroke direction is not identified or incorrect award **2** marks maximum accept 'antagonism' for max **2** marks X pulls wing down **AND** Y pulls wing up = max **1** mark	max 3
(ii)	generates <u>more</u> force (for downstroke) **or** does <u>more</u> work (for downstroke)	accept reasonable descriptions of this idea e.g. wings push har<u>der</u> **or** muscle pulls har<u>der</u> i.e. a comparison must be made	1
(b)	reduced mass strong **or** retain strength		1 1
total			6

3411/H   Q9

question	answers	extra information	mark
(a)	measles	ignore mumps	1
	rubella	accept German measles	1
(b)	viruses are 'dead'	accept other viral treatments accept 'non-virulent' 'mild' must be qualified do **not** accept 'small dose'	1
(c)	**Quality of written communication** *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.* any **five** from: contains antigens or proteins white cells (accept lymphocytes) idea of specificity in antibodies or antigens antibody <u>production</u> antigens destroyed / virus destroyed <u>rapid</u> antibody production if infected	*maximum of **4** marks if ideas not well expressed* accept reference to immunological memory **or** 'memory cells' do **not** accept phagocytes ignore engulfing	max 5
(d)	antibiotics do not kill / affect viruses		1
total			9

AQA

3411/H   Q10

question	answers	extra information	mark
(a)	enzymes	accept correctly named carbohydrases	1
	break down / digest <u>starch</u>		1
(b)	any **two** from: anaerobic respiration (converted into) carbon dioxide alcohol		2
(c)	different flavours (for beer) / tastes / bitterness	ignore 'strengths'	1
total			5

3411/H   Q11

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

3411/H   Q12

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

3411/H   Q13

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

AQA

3411/H   Q14

question	answers	extra information	mark
(a)(i)	oxygen		1
(ii)	for respiration / energy release	allow 'produce / make energy' do **not** accept 'anaerobic'	1
(b)	1st box: putrefying **and** 2nd 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** *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.* 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	*maximum of **3** marks if ideas not well expressed* 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

3411/H   Q15

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: blood becomes more concentrated / too salty / has lower water potential **or** too little water in the blood hypothalamus detects this release of ADH by pituitary increased **re**absorption of water		3
total			6

AQA

3411/H   Q16

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
		N.B. can pick up chain of logic at any point correctly derived from candidate's previous line	1
	sickle gamete from <u>each</u> parent	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

3411/H   Q17

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	allow 'inner tissue' for xylem	1
	only a little / no phosphate via phloem	allow 'outer tissue' for phloem	1
	evidence: **EITHER**		
	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	
total			6

3411/H   Q18

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. exhalation ignore how air passes into lungs ignore "suction"	1
(b)	thicker surface		1
	reduced surface area	accept fewer alveoli	1
total			5

3411/H   Q19

question	answers	extra information	mark
(a)	contains gas	accept air **or** any named gas	1
	provides buoyancy	accept good description of buoyancy in relation to swimming	1
(b)(i)	use of paired fins	accept names – pectoral **or** pelvic ignore other fins	1
(ii)	any **one** from:		1
	median fin(s) damaged	accept names – dorsal, ventral ignore other fins	
	swim bladder damaged	ignore other damage	
total			4

3411/H Q20

question	answers	extra information	mark
(a)	any **three** from: 1960: $\dfrac{132}{186} \times 100$ 71(%) 1970: $\dfrac{161}{247} \times 100$ 65(%)	if both correct – **3** marks if one correct – **2** marks if neither correct – check working – **1** mark max	3
(b)	**advantages (maximum 3 marks)** reduced use of coal / oil / non renewable / fossil fuels less smoke / sulphur dioxide cheaper <u>in long term / over 8+ years / few years</u> (energy) self-sufficiency idea fertiliser <u>to help crop growth</u> means of waste disposal **disadvantages (maximum 3 marks)** high initial cost explosion risk technical **or** training required	 ignore pollution accept less fertiliser bought accept any other appropriate responses accept any other appropriate responses	max 4

AQA

3411/H   Q20 continued

question	answers	extra information	mark
(c)(i)	suitable scales;	S	1
	all plots accurate;	P	1
	suitable curve **or** ruled dot-to-dot **or** straight line of best fit	L do **not** accept lines through origin line must not be thicker than half square	1
(ii)	insulation / less temperature variation / maintain temperature	do **not** accept 'kept cool' **or** 'warm'	1
	less chance of microbes being killed / enzymes denatured **or** keep at optimum temperature **or** maintain high gas production		1
total			12

3411/H   Q21

question	answers	extra information	mark
(a)	(rabbits have) herbivorous diet / eat <u>only</u> plants		1
	bacteria digest cellulose / cell walls	accept bacteria produce cellulase	1
	into sugars		1
	fox has no cellulose in diet **or** is a carnivore / eat <u>only</u> meat / <u>mainly</u> meat		1
(b)	food has already passed through small intestine **or** cellulose / this digestion takes place after small intestine		1
	small intestine is where absorption occurs		1
(c)	both organisms / rabbit and bacteria benefit	if second **AND** third points awarded credit first point	1
	rabbit obtains sugar		1
	bacteria obtain cellulose / nutrients / suitable habitat described		1
total			9

3411/H   Q21

AQA