



# **General Certificate of Secondary Education**

## **Additional Science 4408 / Biology 4401**

**BL2HP**

**Unit Biology 2**

# **Mark Scheme**

*2012 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 students' 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 students' 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 students' 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 / ; 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 students 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)

Student	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)

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

### 3.2 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.

### 3.3 Marking procedure for calculations

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;

### 3.4 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.

### 3.5 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.

### 3.6 Phonetic spelling

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

### 3.7 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.

## **Quality of Written Communication and levels marking**

In Question 3(b) students are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Candidates will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

### **Level 1: Basic**

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

### **Level 2: Clear**

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

### **Level 3: Detailed**

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

## BL2HP

## Question 1

question	answers	extra information	mark
1(a)(i)	any <b>three</b> from: <ul style="list-style-type: none"> <li>• age (of athlete)</li> <li>• gender (of athlete)</li> <li>• <u>starting</u> concentration of glycogen</li> <li>• type / intensity of exercise</li> <li>• length of exercise period</li> <li>• number of training sessions</li> <li>• time interval between exercise sessions</li> <li>• exercise at same time of day</li> </ul>	if diet given as answer = max <b>2</b>  if none of these points gained amount of exercise = <b>1</b> mark  if last four points not awarded allow time (for exercise) for <b>1</b> mark ignore references to amount of energy ignore they are both athletes	3
1(a)(ii)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• intensity of exercise</li> <li>• amount of exercise between sessions</li> <li>• <u>starting</u> concentration of glycogen</li> <li>• fitness / health</li> <li>• metabolic rate / respiration rate</li> <li>• amount / mass of <u>muscle</u> / physique</li> <li>• aspects of diet qualified, eg amount of food eaten</li> </ul>	do <b>not</b> accept amount of carbohydrate  if no other marks awarded allow height / mass / weight for <b>1</b> mark	2

<b>1(a)(iii)</b>	(B has) less glycogen  <b>or</b> (B's glycogen) fell more  <b>or</b> (B's glycogen) built up less	he = B  accept use of approximate figures  allow other correct observations from graph eg A is lower at end of first session  ignore rate of fall	1
<b>1(b)</b>	athlete <b>A</b> (no mark)  athlete <b>A</b> had more glycogen / <b>B</b> has less (only if A chosen to complete marathon)  (glycogen / glucose) used in respiration  (more) energy released / available in athlete <b>A</b>  <b>and either</b> energy used for movement / muscle action / to run <b>or</b> (extra) glycogen → (more) glucose	to gain full marks 'more' must be given at least once  accept converse argument for <b>B</b>  ignore anaerobic  allow 'energy made'	1  1  1  1
<b>Total</b>			<b>10</b>

**BL2HP****Question 2**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
<b>2(a)(i)</b>	makes / produces / synthesises protein / enzyme		1
<b>2(a)(ii)</b>	plant cell has nucleus / vacuole / chloroplasts / chlorophyll <b>or</b> plant cell is <u>much</u> larger	'It' = plant cell  allow correct reference to DNA or chromosomes  allow plant cell has fewer ribosomes allow cellulose (cell wall)	1
<b>2(b)(i)</b>	200	correct answer with or without working gains <b>2</b> marks  if answer incorrect, allow <b>1</b> mark for $\frac{2 \times 50,000}{500}$ <b>or</b> $\frac{100,000}{500}$ <b>or</b> 100	2
<b>2(b)(ii)</b>	bacterial cell is too small / bacterial cell about same size as a mitochondrion / 'no room'	ignore references to respiration	1
<b>Total</b>			<b>5</b>



**BL2HP**

**Question 3**

question	answers	extra information	mark	
3(a)(i)	(white) clover		1	
3(a)(ii)	reed sweet-grass	allow reed allow grass	1	
3(a)(iii)	(only) found in swamp <u>and</u> aquatic zones <b>or</b> <u>only</u> found in water <b>or</b> doesn't grow in marsh	ignore wet conditions	1	
3(b)	Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 2, and apply a 'best-fit' approach to the marking.		6	
	<b>0 marks</b>	<b>Level 1 (1-2 marks)</b>	<b>Level 2 (3-4 marks)</b>	<b>Level 3 (5-6 marks)</b>
	No relevant content.	There is a basic description which describes how a quadrat <b>or</b> a metre tape could be used to collect data	There is a clear description of how a quadrat <b>and</b> a metre tape could be used to collect data along a line	There is a clear, logical and detailed description of a method that will produce valid, repeatable results across / at intervals along the stream.
<p><b>examples of procedural points made in the response:</b></p> <ul style="list-style-type: none"> <li>• use of tape measure to produce transect</li> <li>• placing of quadrats</li> <li>• transect placed across stream</li> <li>• score presence of each plant species</li> <li>• use quadrat at regular intervals along tape</li> <li>• repeat transect several times (<math>\geq 3</math>)</li> <li>• along stream</li> <li>• at random <b>or</b> regular intervals</li> </ul>				
<b>Total</b>			<b>9</b>	

**BL2HP****Question 4**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
<b>4(a)(i)</b>	mitosis	correct spelling only	1
<b>4(a)(ii)</b>	replicates / doubles / is copied / duplicates	accept cloned ignore multiplied / reproduced	1
<b>4(b)</b>	fertilisation occurs / fusion (of gametes)	accept converse for asexual, eg none in asexual / just division in asexual	1
	so leading to mixing of genetic information / genes / DNA / chromosomes	genes / DNA / chromosomes / genetic information comes from 1 parent in asexual ignore characteristics	1
	<u>one</u> copy (of each allele / gene / chromosome) from each parent <b>or</b> gametes produced by meiosis <b>or</b> meiosis causes variation	meiosis must be spelt correctly	1
<b>Total</b>			<b>5</b>

## BL2HP

## Question 5

question	answers	extra information	mark
5(a)	LHS: carbon dioxide <b>AND</b> water	in either order  accept CO <sub>2</sub> <b>and</b> H <sub>2</sub> O allow CO <sub>2</sub> and H <sub>2</sub> O if names given ignore symbols  do <b>not</b> accept CO <sup>2</sup> / H <sup>2</sup> O / Co / CO ignore balancing	1
	RHS: sugar(s) / glucose / starch / carbohydrate(s)	accept C <sub>6</sub> H <sub>12</sub> O <sub>6</sub> allow C <sub>6</sub> H <sub>12</sub> O <sub>6</sub> do <b>not</b> accept C <sup>6</sup> H <sup>12</sup> O <sup>6</sup>	1
5(b)(i)	light is needed for photosynthesis  <b>or</b>  no photosynthesis occurred (so no oxygen produced)		1
5(b)(ii)	oxygen is needed / used for (aerobic) respiration	full statement  respiration occurs <b>or</b> oxygen is needed for anaerobic respiration gains <b>1</b> mark	2
5(c)(i)	(with increasing temperature) rise then fall in rate		1
	use of figures, ie max. production at 40 °C <b>or</b> maximum rate of 37.5 to 38		1

Question 5 continues on the next page . . .

## BL2HP

## Question 5 continued

question	answers	extra information	mark
5(c)(ii)	<u>25 – 35 °C</u>  <b>either</b> faster movement of particles / molecules / more collisions <b>or</b> particles have more energy / enzymes have more energy  <b>or</b> temperature is a limiting factor over this range		1
	<u>40 – 50 °C</u>  denaturation of proteins / enzymes	ignore denaturation of cells ignore stomata	1
5(d)	above 35 °C (to 40 °C) – little increase in rate <b>or</b> >40 °C – causes decrease in rate		1
	so waste of money <b>or</b> less profit / expensive		1
	because respiration rate is higher at >35 °C <b>or</b> respiration reduces the effect of photosynthesis		1
<b>Total</b>			<b>12</b>

## BL2HP

## Question 6

question	answers	extra information	mark
<b>6(a)</b>	fossil is (remains / impression of) organism that lived a long time ago	if numbers, $\geq$ 1000s years	1
	fossils show changes over time <b>or</b> older fossils simpler <b>or</b> fossils simpler than present-day species		1
	fossils have similar features to present-day species	allow fossils allow us to compare old species with present-day species	1
<b>6(b)</b>	isolation / separation / splitting		1
	by geographical barrier / sea	ignore other examples	1
	there was variation (in these isolated populations) / different alleles	accept mutation	1
	different environmental conditions <b>or</b> example eg climate / predators / food		1
	natural selection acted on the isolated populations	accept became adapted <u>in each area</u>	1
	<b>OR</b> only certain allele(s) passed on to offspring / different alleles passed on in different environments	allow genes	
so <u>differences</u> lead to inability to interbreed	allow differences described – eg mismatch of genitalia / different courtship displays / different breeding seasons	1	
<b>Total</b>			<b>9</b>

**BL2HP****Question 7**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
<b>7(a)(i)</b>	(alternative) forms / types of <u>a</u> / the same gene		1
<b>7(a)(ii)</b>	only expressed if 2 copies inherited <b>or</b> not expressed if other allele present	allow over ruled / over powered by the other allele	1
<b>7(b)(i)</b>	<b>Nn</b>	ignore heterozygous	1
<b>7(b)(ii)</b>	genetic diagram including:  gametes: <b>N</b> and <b>n</b> from <u>both</u> parents  correct derivation of offspring genotypes: <b>    NN  Nn  Nn  nn</b>  identification of <b>nn</b> as having cystic fibrosis	accept alternative symbols, if defined  accept alternative symbols if correct for answer to (b)(i)  allow if correct for candidate's parental genotypes / gametes	1  1  1

**Question 7 continues on the next page . . .**

**BL2HP**

**Question 7 continued**

question	answers	extra information	mark
7(c)	<p><b>Argued evaluation</b></p> <p>any <b>four</b> from:</p> <ul style="list-style-type: none"> <li>• PGD <u>higher</u> financial cost</li> <li>• PGD occurs before pregnancy / implantation</li> <li>• PGD does not involve abortion so less trauma / less pain / ethical comparison</li> <li>• PGD higher incidence of false positive / use of numbers so higher risk of destroying healthy embryo</li> <li>• PGD no chance of miscarriage whereas CVS does <b>or</b> PGD less chance of miscarriage</li> </ul>	<p>accept CVS <u>only</u> costs £600</p> <p>accept detected at <u>earlier</u> stage so less unethical / less trauma</p> <p>accept PGD has (surplus) embryos so some destroyed / unethical</p>	4
<b>Total</b>			<b>10</b>

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