

Version 1.0



**General Certificate of Secondary Education  
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**Additional Science / Biology**

**BL2HP**

**(Specification 4408 / 4401)**

**Unit 2: Biology 2**

**Final**

***Mark Scheme***

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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 students' 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 students' 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 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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## 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. Boldening

- 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 boldened. 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 (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	green, 5	0
2	red*, 5	1
3	red*, 8	0

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

Candidate	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, 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.

### 3.4 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.

### 3.8 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.

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

In Question 3(b) candidates 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.

## Question 1

question	answers	extra information	mark
1(a)	xylem and phloem	either order allow words ringed in box allow mis-spelling if unambiguous	1
1(b)(i)	movement / spreading out of particles / molecules / ions / atoms	ignore names of substances / 'gases'	1
	from high to low concentration	accept down concentration gradient ignore 'along' / 'across' gradient ignore 'with' gradient	1
1(b)(ii)	oxygen / water (vapour)	allow O <sub>2</sub> /O <sub>2</sub> ignore O <sup>2</sup> /O allow H <sub>2</sub> O/H <sub>2</sub> O ignore H <sup>2</sup> O	1
<b>Total</b>			<b>4</b>

## Question 2

question	answers	extra information	mark
<b>2(a)</b>	chose places randomly method of obtaining randomness, e.g. (grid and) random numbers	allow thrown qualified e.g. over shoulder, eyes shut  allow max 1 for mention of a transect with sampling at regular or random intervals	1 1
<b>2(b)(i)</b>	7 or 8	allow fractions / decimals between 7 and 8	1
<b>2(b)(ii)</b>	count number of whole squares and add estimate of area covered by part squares	allow reference to counting squares with $\frac{1}{2}$ cover or more  allow clear working on diagram and / or (b)(i)	1
<b>2(b)(iii)</b>	28 – 32 (in range)	allow ecf  if answer incorrect allow 1 mark for reasonable reference to divided by 25 or multiplied by 4	2
<b>2(c)</b>	nutrients / minerals / ions / fertiliser / water	allow light / pH / trampling / soil texture / grazing / mowing / weed killer / where seeds originally fell  ignore pollution / soil / competition if unqualified  ignore temperature / wind	1
<b>Total</b>			<b>7</b>

**Question 3**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
<b>3(a)(i)</b>	8.6	accept value in range 8.5 to 8.7	1
<b>3(a)(ii)</b>	hydrochloric acid / HCl	accept HCL accept hydrogen chloride ignore hcl / etc.	1
<b>3(a)(iii)</b>	X		1

**Question 3 continues on the next page . . .**



**Question 3 continued . . .**

<b>3(b)</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 5.			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 simple description of part of a process including a reference to at least one of: mechanical digestion, lipase, product of enzyme action, bile, site of production or site of digestion	There is a description of at least one process <u>linking</u> ideas.	There is a clear description of the process including reference to the majority of: mechanical digestion, lipase, bile, where they are produced, products, function of bile and site of digestion / absorption	
<b>examples of biological points made in the response:</b>				
<ul style="list-style-type: none"> <li>• mechanical breakdown in mouth / stomach</li> <li>• fats → fatty acids and / or glycerol</li> <li>• by lipase</li> <li>• (produced by) pancreas</li> <li>• and small intestine</li> <li>• fat digestion occurs in small intestine</li> <li>• bile</li> <li>• produced by liver</li> <li>• neutralises acid from stomach</li> <li>• produces alkaline conditions in intestine</li> <li>• refs. to increased surface area related to emulsification or chewing</li> <li>• products are small molecules / water-soluble</li> <li>• products absorbed by small intestine</li> </ul>				
<b>Total</b>				<b>9</b>

## Question 4

question	answers	extra information	mark
4(a)	A = cytoplasm		1
	B = (cell) membrane		1
4(b)	in yeast: makes alcohol / makes CO <sub>2</sub> / does not make lactic acid	'it' equals yeast do not allow uses / involves alcohol / CO <sub>2</sub>	1
4(c)(i)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• volume of yeast / suspension</li> <li>• volume of sugar / solution</li> <li>• concentration of sugar</li> <li>• temperature</li> </ul>	allow amount of yeast amount of sugar = max 1 for sugar  (total) volume = 1 mark if no other volume  ignore concentration of yeast	2
4(c)(ii)	most / more CO <sub>2</sub> given off with fructose <b>or</b> faster CO <sub>2</sub> production <b>or</b> faster respiration	'it' equals fructose  allow faster fermentation do <b>not</b> allow aerobic respiration	1
	so (rate of) alcohol production will be greatest / more (with fructose)		1
<b>Total</b>			<b>7</b>

**Question 5**

question	answers	extra information	mark
<b>5(a)</b>	LHS – carbon dioxide / CO <sub>2</sub>	allow CO <sub>2</sub> ignore CO <sup>2</sup>	1
	RHS glucose / carbohydrate / sugar	in either order allow starch allow C <sub>6</sub> H <sub>12</sub> O <sub>6</sub> / C <sub>6</sub> H <sub>12</sub> O <sub>6</sub> ignore C <sup>6</sup> H <sup>12</sup> O <sup>6</sup>	1
	oxygen	allow O <sub>2</sub> / O <sub>2</sub> ignore O <sup>2</sup> / O	1

**Question 5 continues on the next page...**

## Question 5 continued...

question	answers	extra information	mark
5(b)	<p>any <b>five</b> from:</p> <ul style="list-style-type: none"> <li>• factor 1: CO<sub>2</sub> (concentration)</li> <li>• effect - as CO<sub>2</sub> increases so does rate and then it levels off or shown in a graph</li> <li>• explanation: (graph increases) because CO<sub>2</sub> is the raw material or <u>used</u> in photosynthesis / converted to organic substance / named eg</li> </ul> <p><b>or</b></p> <p>(graph levels off) when another factor limits the rate.</p> <ul style="list-style-type: none"> <li>• factor 2: temperature</li> <li>• effect – as temperature increases, so does the rate and then it decreases or shown in a graph</li> <li>• explanation: (rise in temp) increases rate of chemical reactions / more kinetic energy</li> </ul> <p><b>or</b></p> <p>(decreases) because the enzyme is denatured.</p>	<p>accept points made via an annotated / labelled graph</p> <p>allow warmth / heat</p> <p>allow 'it peaks' for description of both phases</p> <p>allow molecules move faster / more collisions</p> <p>context must be clear = high temperature</p> <p>allow other factor plus effect plus explanation: eg light wavelength / colour / pigments / chlorophyll / pH / minerals / ions / nutrients / size of leaves</p> <p>2<sup>nd</sup> or 3<sup>rd</sup> mark can be gained from correct description and explanation</p>	5
<b>Total</b>			<b>8</b>

## Question 6

question	answers	extra information	mark
<b>6(a)</b>	changes code /sequences of bases		1
	<b>or</b> sequence of amino acids is different		
	the enzyme has different / wrong shape / structure	allow the active site is changed	1
	so substrate will not fit into enzyme / will not join to enzyme		1
<b>6(b)(i)</b>	46	allow 23 pairs	1
<b>6(b)(ii)</b>	also inherited (from mother) normal chromosome 15 / normal allele / normal gene / boy is heterozygous / <b>Hh</b>	allow the boy is a carrier	1
	(allele for) this disorder is recessive <b>or</b> the normal allele would give a working enzyme	ignore converse	1
<b>6(b)(iii)</b>	genetic diagram including: Parental gametes: <b>H</b> and <b>h</b> from both parents	accept alternative symbols, if defined	1
	<u>derivation</u> of offspring genotypes: <b>HH Hh Hh hh</b>	allow alternative if correct for student's parental genotypes / gametes	1
	identification of <b>hh</b> (having the disorder) if 1 in 4		1
<b>Total</b>			<b>9</b>

## Question 7

question	answers	extra information	mark
7(a)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• product not contaminated with enzyme or is pure</li> <li>• enzyme can be reused</li> <li>• <u>continuous</u> flow process possible</li> <li>• enzyme more stable / can be used at higher temperature</li> </ul>	allow enzyme not wasted / less enzyme is needed  allow enzyme lasts longer  ignore refs. to cost / cheaper	2
7(b)	maximum fructose production / maximum enzyme activity  <b>or</b> increase in flow rate does not increase production  higher rate leaves some glucose unchanged	accept optimum / best   allow glucose not wasted / extra glucose wastes money	1   1
7(c)	less (fructose) needed (for same sweetness)  (less fructose ) → less fattening / fewer 'calories'	ignore fructose is sweeter unqualified   ignore refs. to cost / cheaper	1   1
<b>Total</b>			<b>6</b>

**Question 8**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
<b>8(a)(i)</b>	DNA replication / copies of genetic material were made	'it' = a chromosome allow chromosomes replicate / duplicate / are copied ignore chromosomes divide / split / double	1
<b>8(a)(ii)</b>	one copy of each (chromosome / chromatid / strand) to each offspring cell  each offspring cell receives a complete set of / the same genetic material	ignore ref. to gametes and fertilisation  allow 'so offspring (cells) are identical'	1  1
<b>8(b)(i)</b>	meiosis	allow mieosis as the only alternative spelling	1
<b>8(b)(ii)</b>	Species A = 4 <b>and</b> Species B = 8		1
<b>8(b)(iii)</b>	sum of A + B from (b)(ii) e.g. 12		1

**Question 8 continues on the next page...**

## Question 8 continued...

question	answers	extra information	mark
<b>8(c)(i)</b>	similarities between chromosomes  <b>or</b> similarities between flowers described	e.g. shape of petals / pattern on petals / colour / stamens	1
	can breed / can <u>sexually</u> reproduce	allow can reproduce with each other / they can produce offspring	1
<b>8(c)(ii)</b>	any <b>two</b> from: <ul style="list-style-type: none"> <li>• offspring contain 3 copies of each gene / of each chromosome / odd number of each of the chromosomes</li> <li>• some chromosomes unable to pair (in meiosis)</li> <li>• (viable) gametes not formed / some gametes with extra / too many genes / chromosomes</li> </ul> <b>or</b> some gametes with missing genes / chromosomes		2
<b>Total</b>			<b>10</b>

UMS Conversion Calculator: [www.aqa.org.uk/umsconversion](http://www.aqa.org.uk/umsconversion)