

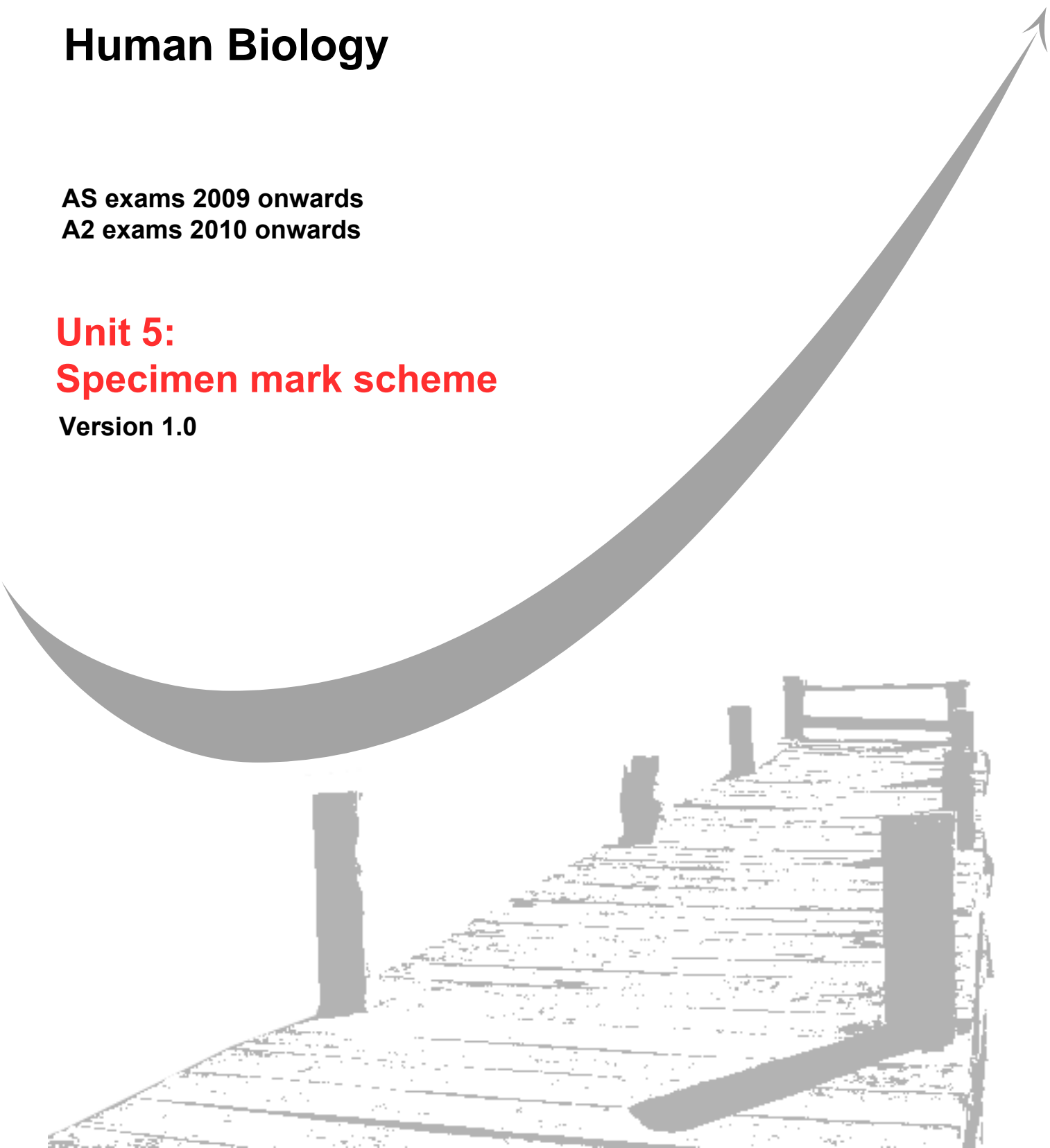
**GCE**  
**AS and A Level**

# **Human Biology**

**AS exams 2009 onwards**  
**A2 exams 2010 onwards**

## **Unit 5:** **Specimen mark scheme**

**Version 1.0**





## **General Certificate of Education**

# **Human Biology 2405**

**HBIO5      The air we breathe, the water we  
drink, the food we eat**

## **Mark Scheme**

*Specimen Paper*

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.

Further copies of this Mark Scheme are available to download from the AQA Website: [www.aqa.org.uk](http://www.aqa.org.uk)

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**Question 1**

- (a) Polluter pays the direct costs of pollution;  
And indirect costs; 2
- (b) Waste materials should be,  
Re-used;  
Recycled and used as raw material;  
Used as a substitute for non-renewable energy sources;  
Only sent to landfill if all above not possible; 3 max
- Total 5**

**Question 2**

- (a) (Cryptosporidium) oocyst;  
From (contaminating) faeces/slurry; 2
- (b) (i) Suitable advantage, explained;;  
  
For example,  
Saves electricity;  
So less carbon dioxide to atmosphere; 2
- (ii) Suitable disadvantage, explained;;  
  
For example,  
Some people still go into the sea (in winter);  
Get infected with (coliform) bacteria causing illness; 2
- Total 6**

**Question 3**

- (a) Two changes described,  
  
For example,  
Fewer species;  
Move north/get to Britain;  
Fewer in south/around Mediterranean; 2 max
- (b) Factor changing; with explanation;  
  
For example,  
Warmer in north;  
So plants able to survive winter; 2
- (c) Use of grid;  
Random numbers for coordinates;  
Count number of species/record species in each quadrat;  
Results from many quadrats; 3 max
- Total 7**

**Question 4**

- (a) Succession leads to changes in communities with time;  
Each community changes abiotic factors;  
Shrubs/trees outcompete orchids/change abiotic factors, so orchids cannot survive; 3
- (b) (i) PFA needed for orchid growth; 1
- (ii) In other experiment, two factors changed/woodland and soil removed;  
Could have been competition with trees that prevented orchids growing; 2

**Total 6****Question 5**

- (a) Reduces combustion of fossil fuels;  
Reduces carbon dioxide release;  
(Biofuel plants) absorb carbon dioxide;  
In photosynthesis; 3 max
- (b) Two suitable reasons;;
- For example;  
Larger the total area of agricultural land different, the less percentage to get same effect;  
Fewer the number of vehicles, the less land needed to get (10%) reduction;  
Different climates lead to different rates of growth/production of biofuel crops; 2 max

**Total 5****Question 6**

- (a) Reason and explanation;;
- Reduces secretion of protein;
- Suitable role of protein;  
And consequence of reduced secretion;
- For example,  
(Including) enzymes for extracellular digestion;  
So bacterium unable to absorb nutrients/named e.g.s; 3
- (b) *S. epidermis* feeds on the skin;  
Competes with other bacteria;  
Uses substance to prevent competitors growing; 3

- (c) Suitable suggestion; with explanation;

For example,  
 Substance binds to receptor on membrane of *S. aureus*;  
 This is a protein required for transport across membrane (of secreted protein);  
 Higher concentration of substance less effective, because all/most receptors full;

2 max

**Total 8**

### Question 7

- (a) B higher concentration of triclosan needed to kill them;  
 More triclosan needed where soap also present;
- 2

- (b) To separate effects of soap and triclosan;  
 Could have been soap that killed bacteria;
- 2

- (c) Suitable procedure; with explanation;

For example,  
 Bacteria exposed to solutions for two hours;  
 Nobody washes hands for that long;

No solution of soap on its own;  
 Soap might be effective on its own;

2 max

- (d) Suitable suggestion, explained;;

For example,  
 Mutation;  
 Leading to production of enzyme/protein giving resistance to triclosan;

Horizontal transmission;  
 Transfer of plasmid/genes from another bacterium;

2

**Total 8**

### Question 8

- (a) Populations;  
 Of different species of bacteria;  
 Living in the same place;
- 3

- (b) (Bacteria) in A and B survive stomach, C do not;  
 But C may survive if taken in capsule;  
 Result for A suggest capsule broken down;  
 But A could be different capsule to C;  
 Solution may not have same effect as stomach contents;
- 3 Max

**Total 6**

**Question 9**

- (a) Antigen;  
Producing an abnormal immune response; 2
- (b) Allergen still present after cooking/exposure to high temperature;  
Something in the peanut activated by heating;  
Albumin is major allergen;  
Not digested/hydrolysed by trypsin;  
So allergen remains active in small intestine; 4 max

**Total 6****Question 10**

- (a) Reason, with explanation;;  
  
For example,  
Knotweed outcompetes native plants;  
Removing food for animals/animals cannot eat knotweed; 2
- (b) (i) £108 000;; 2  
  
£36 000;  
(For 1 mark)
- (ii) First treatment leaves knotweed to re-grow;  
Next treatments remove 95% of any remainder/prevents regrowth; 2
- (c) (i) Two suitable suggestions, with explanations;;;;  
  
Lack of amino acids prevents some proteins being made;  
These essential enzymes/structural proteins;  
  
Shikimate is toxic;  
Kills cells/blocks metabolic pathway;  
  
Lot of ATP from respiration/photosynthesis used, so not enough for growth;  
  
Lot of reduced NADP/ATP taken from photosynthesis, so reduces light independent reaction/sugar formation; 4 max
- (ii) Similar shape to PEP;  
Competes for/binds to active site of enzyme; 2

**Total 12**

**General Principles for marking the Essay:**

Four skill areas will be marked: scientific content, breadth of knowledge, relevance and quality of language. The following descriptors will form a basis for marking.

**Scientific Content** (maximum 16 marks)

Marks for Scientific Content will be awarded for any suitable material. The following indicate areas of the Specification which contain content that might be relevant to the titles.

- |     |          |     |   |
|-----|----------|-----|---|
| (a) | Module 1 | 1.1 | We are what we eat  |
|     |          | 1.2 | Enzymes   |
|     |          | 1.3 | Cystic fibrosis   |
|     |          | 1.5 | How the body fights disease   |
|     | Module 2 | 2.1 | The information of life   |
|     |          | 2.3 | Adaptations to a way of life  |
|     |          | 2.5 | We have changed and are changing our environment                          |
|     | Module 4 | 4.2 | Growing up, growing old and passing on your genes                         |
|     |          | 4.3 | The management structure of cells   |
|     |          | 4.4 | New genes for old   |
|     |          | 4.5 | Drugs can affect how we perceive the world around us                      |
|     |          | 4.6 | Fight or flight   |
|     | Module 5 | 5.2 | Humans' health can be affected when they change their environment         |
| (b) | Module 1 | 1.4 | Microorganisms use us for food, shelter and their reproduction            |
|     | Module 2 | 2.4 | Where we fit in the world and how we came to be here                      |
|     |          | 2.5 | We have changed and are changing our environment                          |
|     | Module 4 | 4.4 | New genes for old   |
|     | Module 5 | 5.1 | People change communities   |
|     |          | 5.3 | Human activities can damage ecosystems and create new ones                |
|     |          | 5.4 | Plants can reduce the impact of the use of fossil fuels on climate change |
|     |          | 5.5 | People and their microorganisms   |
|     |          | 5.6 | Human impacts on evolution  |

Category	Mark	Descriptor
Good	16	Most of the material reflects a comprehensive understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. Some material, however, may be a little superficial. Material is accurate and free from fundamental errors but there may be minor errors which detract from the overall accuracy.
	14	
	12	
Average	10	Some of the content is of an appropriate depth, reflecting the depth of treatment expected from a programme of A-level study. Generally accurate with few, if any, fundamental errors. Shows a sound understanding of the key principles involved.
	8	
	6	
Poor	4	Material presented is largely superficial and fails to reflect the depth of treatment expected from a programme of A-level study. If greater depth of knowledge is demonstrated, then there are many fundamental errors.
	2	
	0	

**Breadth of Knowledge** (maximum 3 marks)

Mark	Descriptor
3	A balanced account making reference to most areas that might realistically be covered on an A-level course of study.
2	A number of aspects covered but a lack of balance. Some topics essential to an understanding at this level not covered.
1	Unbalanced account with all or almost all material based on a single aspect.
0	Material entirely irrelevant or too limited in quantity to judge.

**Relevance** (maximum 3 marks)

Mark	Descriptor
3	All material presented is clearly relevant to the title. Allowance should be made for judicious use of introductory material.
2	Material generally selected in support of title but some of the main content of the essay is of only marginal relevance.
1	Some attempt made to relate material to the title but considerable amounts largely irrelevant.
0	Material entirely irrelevant or too limited in quantity to judge.

**Quality of language** (maximum 3 marks)

Mark	Descriptor
3	Material is logically presented in clear, scientific English. Technical terminology has been used effectively and accurately throughout.
2	Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate.
1	The essay is generally poorly constructed and often fails to use an appropriate scientific style and terminology to express ideas.
0	Material entirely irrelevant or too limited in quantity to judge.

**Total 25**

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## Guidelines for marking the essay

### Introduction

The essay is intended for the assessment of AO4 (Synthesis of knowledge, understanding and skills) and Quality of Written Communication (Sections 6.4 and 6.5 in the specification).

Examiners are looking for

- evidence of knowledge and understanding at a depth appropriate to A level
- selection of relevant knowledge and understanding from different areas of the specification
- coverage of the main concepts and principles that might be reasonably be expected in relation to the essay title
- connection of concepts, principles and other information from different areas in response to the essay title
- construction of an account that forms a coherent response
- clear and logical expression, using accurate specialist vocabulary appropriate to A level

### Assessing Scientific Content

Maximum 16 marks.

Descriptors are divided into 3 categories: Good (16, 14, 12), Average (10, 8, 6) and Poor (4, 2, 0). Only even scores can be awarded, i.e. not 15, 13, etc.

Examiners need first to decide into which category an essay comes.

#### A good essay

- includes a level of detail that could be expected from a comprehensive knowledge and understanding of relevant parts of the specification
- maintains appropriate depth and accuracy throughout
- avoids fundamental errors
- covers a majority of the main areas that might be expected from the essay title (These areas will be indicated in the mark scheme). (Occasionally a candidate may tackle an essay in an original or unconventional way. Such essays may be biased in a particular way, but where a high level of understanding is shown a high mark may be justified.)
- demonstrates clearly the links between principles and concepts from different areas.

Note that it is not expected that an essay must be 'perfect' or exceptionally long in order to gain maximum marks, bearing in mind the limitations on time and the pressure arising from exam conditions.

#### An average essay

- should include material that might be expected of C/D/E grade candidates
- is likely to have less detail and be more patchy in the depth to which areas are covered, and to omit several relevant areas
- is likely to include some errors and misunderstandings, but should have few fundamental errors
- is likely to include mainly more superficial and less explicit connections

### A poor essay

- is largely below the standard expected of a grade E candidate
- shows limited knowledge and understanding of the topic
- is likely to cover only a limited number of relevant areas and may be relatively short
- is likely to provide superficial treatment of connections
- includes several errors, including some major ones

Having decided on the basic category, examiners may award the median mark, or the ones above or below the median according to whether the candidate exceeds the requirements or does not quite meet them.

### Marking the essay

In marking scientific content, letters in the margin show each key area covered; these are used to assess the breadth of criteria. A single tick is used to indicate accurate coverage of each significant area, and a double tick to emphasise 'good depth of content.' Errors are indicated with a cross. A squiggly line in the margin is used to highlight irrelevance and 'Q' to highlight poor use of terminology, unclear grammar and inappropriate style.

### Specific guidance for assessing Scientific Content and Breadth of Knowledge in Essays

The following provides guidance about topics which might be included in the essays. It is not an exclusive list; the assessment of scientific content does not place restrictions on topics that candidates might refer to, provided they are

- relevant;
- at an appropriate depth for A level and
- accurate.

It is not expected that candidates would refer to all, or even most, of the topics to gain a top mark; the list represents the variety of approaches commonly encountered in the assessment to the essays. In both essays, topics either from the option modules or beyond the scope of the specification should also given credit where appropriate.