

**2007 HSC Notes from
the Marking Centre
Biology**

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2007 HSC NOTES FROM THE MARKING CENTRE

BIOLOGY

Introduction

This document has been produced for the teachers and candidates of the Stage 6 course in Biology. It contains comments on candidate responses to the 2007 Higher School Certificate examination, indicating the quality of the responses and highlighting their relative strengths and weaknesses.

This document should be read along with the relevant syllabus, the 2007 Higher School Certificate examination, the marking guidelines and other support documents which have been developed by the Board of Studies to assist in the teaching and learning of Biology.

General Comments

In 2007, approximately 14,440 candidates attempted the Biology examination. The most popular Options were Communication (60%), and Genetics: The Code Broken? (20%).

Teachers and candidates should be aware that examiners may write questions that address the syllabus outcomes in a manner that requires candidates to respond by integrating their knowledge, understanding and skills developed through studying the course, including the Prescribed Focus Areas. This reflects the fact that the knowledge, understanding and skills developed through the study of discrete sections should accumulate to a more comprehensive understanding than may be described in each section separately. It is important to understand that the Preliminary HSC course is assumed knowledge for the HSC course.

Teachers and candidates are reminded that mandatory skills content in Module 9.1 is examinable in both the Core and Option questions.

Candidates need to be reminded that the answer space provided and the marks allocated are guides to the maximum length of response required. Candidates should use examination time to analyse the question and plan responses carefully, working within that framework to produce a clear and concise response. This may include the use of dot points, diagrams and/or tables, and avoid internal contradictions. This is particularly important in holistic questions that need to be logical and well structured.

Better responses indicate that candidates are following the instructions provided on the examination paper. In these responses, candidates:

- do not repeat the question as part of the response
- look at the structure of the whole question and note that in some questions the parts follow from each other (ie responses in part (a) lead to the required response in part (b) etc).

In Section II, the Option question is divided into a number of parts. Candidates should clearly label each part of the question when writing in their answer booklets. In part (c) of the 2007 Option questions, the best responses presented ideas coherently and included the correct use of scientific principles and ideas. Many candidates wrote a lot of information that was not relevant to the question. Some responses showed evidence of rote learning of an anticipated answer based on a single source. These responses did not address the syllabus content and/or outcomes being assessed and hence did not score full marks. Candidates are required to attempt one question only in Section II, but some candidates responded to more than one Option question. Candidates are strongly advised to answer the Option they have studied in class.

Section I – Core

Part A – Multiple-choice questions

Question	Correct Response
1	D
2	B
3	A
4	C
5	B
6	B
7	D
8	D

Question	Correct Response
9	D
10	A
11	B
12	A
13	C
14	C
15	D

Part B

Specific Comments

Question 16

- (a) In the better responses, candidates explained how the practice of wearing gloves assists in the control of disease. In the weaker responses, candidates were unable to identify human skin or hair as a source of pathogens.

Question 17

The better responses constructed a table with appropriate headings which was used to distinguish between environmental conditions and the urine production of each type of fish. The weaker responses did not correctly construct a table.

Question 18

- (a) Better responses named a blood product and outlined its use in restoring normal body function.
- (b) Better responses proposed two valid reasons for research into alternatives to donated blood.

Question 19

- (a) In weaker responses, candidates either named a disease caused by a micro-organism, or named a macroparasite without naming the disease it causes.
- (b) In better responses, candidates listed two features of prions that distinguished them from protozoans. Weaker responses showed a lack of specific knowledge about prions.
- (c) In better responses, candidates related transmission and entry to a specific infectious disease and the appropriate immune response. In weaker responses, transmission and entry to the body were treated in more general terms, and the triggering of an immune response was not addressed or related to a specific disease.

Question 20

- (a) In better responses, candidates showed a good understanding of the proportions of bases in DNA.
- (b) Better responses demonstrated an understanding of DNA structure. In weaker responses, candidates confused DNA replication with protein synthesis, or did not present their information in the form of a flow chart.

Question 21

- (b) In the better responses, candidates evaluated the effectiveness of a vaccination program. In the weaker responses, candidates described or outlined a program without an evaluation.

Question 22

- (a) In better responses, candidates described crossing-over and pairing of homologous chromosomes. In weaker responses, candidates identified these behaviours without a description.
- (b) In better responses, candidates correctly listed the four combinations of alleles possible. In weaker responses, candidates referred to only one pair of chromosomes or were not able to list any of the combinations correctly.
- (c) Better responses recognised variation as an advantage of meiosis.
- (d) In better responses, candidates distinguished between the two terms. In weaker responses, candidates only provided an outline of either an allele or gene, or could not provide a difference between them.

Question 23

Better responses designed a reliable and valid procedure. In weaker responses, candidates did not indicate how the temperature would be changed or did not provide a list of equipment to be used.

Question 24

- (b) Better responses explained the comparative advantage of the T-Stat oximeter. In weaker responses, candidates did not relate the improvement in the T-Stat oximeter to the advantage.
- (c) In better responses, candidates related changes in the chemical composition of the blood to the reasons for the changes. The weaker responses were not clear about the features of the chemical changes.

Question 25

In better responses, candidates identified characteristics of a sound epidemiological study and linked this to the need to establish a relationship between smoking and lung cancer. In weaker responses, candidates had difficulty expressing the aspects of a sound study or simply recited the words in the question.

Question 26

In better responses, candidates used specific examples to describe a clear link between genes and the maintenance of health.

Question 27

In better responses, candidates explained the consequences of temperature change using correct biological terminology for specific examples of both animals and plants, and demonstrated a sound understanding of natural selection.

In weaker responses, candidates simply stated some generalised animal and/or plant responses. Weaker responses incorrectly described the process of organisms adapting to climate change in a Lamarckian way. Some responses described responses to water loss in terms of the structural features of plants, without linking it to a rise in temperature.

Section II – Options

Question 28 – Communication

- (a) (i) Better responses were concise and did not attempt to give additional information. Weaker responses often showed confusion over the term ‘refractive media’.
- (ii) Better responses clearly showed how a problem with one of the refractive media could cause defective vision. Weaker responses simply described vision problems such as cataracts or myopia or demonstrated a limited knowledge of eye anatomy.
- (b) (i) Better responses provided the main characteristics and features of an appropriate first-hand investigation. These responses included a clear link to the secondary sources used to locate the regions involved in speech, sight and sound perception. In many weaker responses, candidates provided irrelevant information about the structure of the brain.
- (ii) Better responses related relevance to the investigation and reliability to the process of gathering information. Weaker responses did not distinguish between the terms *relevance* and *reliability*.

- (c) In better responses, candidates differentiated between the structures that produce, detect and perceive sound, detailing how they work to enable effective communication. Their responses demonstrated coherence and the correct use of scientific principles. Weaker responses often confused detection and perception and identified the structures without making a judgement about their effectiveness in communication.
- (d) (i) Better responses selected the relevant graph and identified a wavelength between 530nm and 550nm for peak absorption.
 - (ii) Better responses used quantitative data to describe the relevant graph. These responses indicated the different functions of each type of pigment cone and provided a reason for the necessity of all three in colour vision.
 - (iii) In better responses, candidates made the relationship between the occurrence of colour vision and its use for communication evident.

Question 29 – Biotechnology

- (a) (i) In better responses, candidates named organic compounds produced by fermentation since the early eighteenth century. Weaker responses confused earlier forms of fermentation naming compounds such as alcohol and bread.
 - (ii) Better responses clearly explained the use of one organic compound and the impact it had on society at the time of its introduction.
- (b) (i) In better responses, candidates provided features and characteristics of ways in which the information on a current application of transgenic technology was gathered and analysed. Weaker responses described gathering and analysing information in general terms without linking it to the investigation.
 - (ii) Better responses related relevance to the investigation and reliability to the process of gathering information. Weaker responses did not distinguish between the terms *relevance* and *reliability*.
- (c) In better responses, candidates outlined biotechnological processes used in aquaculture and provided detailed examples. The judgement provided in the response was coherent and included the correct use of scientific principles. Weaker responses identified some examples of aquaculture but not the processes involved. Weaker responses were often excessively long, showing little evidence of planning or structure.
- (d) (i) Better responses estimated the time at which ethanol concentration was at a maximum by using a narrow range or single number value.
 - (iii) In better responses, candidates explained how at least two changes in technology have modified traditional uses of biotechnology. Weaker responses mentioned the changes without the link to traditional processes.

Question 30 – Genetics: The Code Broken?

- (a) (i) In better responses, candidates correctly identified two examples of characteristics determined by multiple alleles in an organism other than a human.
- (ii) Better responses clearly showed how one of these characteristics provided variability in the phenotype. Weaker responses simply described the variability in the phenotype.
- (b) (i) In better responses, candidates were explicit in providing features and characteristics of how the information on the cloning of an animal was gathered. In addition, these responses clearly stated how the information was analysed. Weaker responses were general and did not indicate a link to animal cloning.
- (ii) Better responses related relevance to the investigation and reliability to the process of gathering information.
- (c) In better responses, candidates outlined the techniques of mapping and gene therapy to manage a genetic disease such as cystic fibrosis, giving a strong judgement for both techniques. Weaker responses addressed the Human Genome Project rather than the mapping aspect and judgement statements were often general or absent.
- (d) (ii) Better responses defined *trisomy* as an extra chromosome of an existing homologous pair of chromosomes.
- (iii) Better responses described the mechanism of gene relocation and provided points to illustrate how these transposals increased genetic diversity or variability.

Question 31 – The Human Story

- (a) (i) Weaker responses incorrectly named their examples with other applied names such as ‘Lucy’ or ‘the Hobbit’.
- (ii) Better responses clearly compared features of their named hominid with *Homo sapiens*. These answers were often tabulated. Weaker responses made incorrect comparisons or simply listed features of the hominid or *Homo sapiens*.
- (b) (i) Better responses described how information was processed and gathered and how it was assessed. Weaker responses indicated confusion with gathering and processing information.
- (ii) Better responses provided features of reliable data collection and identified how to judge the relevance of the material.
- (c) In better responses, candidates made a clear judgement about the impact of cultural development throughout human evolution. The judgement was demonstrated in a logical and coherent response. In weaker responses, candidates listed cultural developments without reference to their impact. Weaker responses were excessively long, showing little evidence of planning and structure.
- (d) (ii) In better responses, candidates used the graph to provide features of a change in the human population and suggested a specific reason for the change. Weaker responses suggested a reason that did not relate to the change.

- (iii) Better responses named a modern technology such as gene therapy or IVF, identified issues associated with the potential impact of the technology and provided points for and/or against the impact of the technology. Weaker responses did not name a modern technology.

Question 32 – Biochemistry

- (a) (i) Better responses correctly identified products of photosynthesis such as glucose and oxygen.
- (ii) Better responses identified the nature of a product named in (a) (i) and showed how it was used in plants. Weaker responses did not refer to the biochemical processes and used general non-specific explanations like ‘used to keep cells alive’ or ‘used to feed the plant’.
- (b) (i) Better responses described how the data on chloroplast size, shape and distribution was collected and then how this data was presented to show a comparison between angiosperms.
- (ii) Better responses provided features of reliable data collection and identified how to judge the relevance of the material. These judgements were made in the context of gathering and presenting information about the shape, size and distribution of chloroplasts in angiosperms.
- (c) In better responses, candidates correctly named at least two isotopes and outlined the role of each in photosynthetic research. These responses described examples of research where the isotopes had been used and gave a judgement of how this research has improved our understanding of photosynthetic pathways. Weaker responses did not name the isotopes or did not give specific information of their use in photosynthetic research.
- (d) (ii) Better responses identified the thylakoids as the location for chlorophyll *a* absorption and described the absorption trends using specific reference to wavelengths.
- (iii) Better responses identified at least two other pigments (eg chlorophyll *b*, carotenoids, xanthophylls). These responses provided information about the role of these pigments in the photosynthetic process. Many weaker responses identified the role of pigments in terms of the colour of the leaves of plants.

Biology

2007 HSC Examination Mapping Grid

Question	Marks	Content	Syllabus outcomes
Section I Part A			
1	1	9.2.1.2.1, 12.3(c)	H6, H12
2	1	9.2.1.2.1	H6
3	1	9.2.2.2.6, 9.2.2.3.6, 12.3(c)	H6, H12
4	1	9.4.7.2.1, 9.4.7.3.2, 14.3(c)	H8, H14
5	1	9.4.2.3.2, 11.2(a)	H11
6	1	9.4.4.2.4	H6
7	1	9.2.3.2.9	H7
8	1	9.4.3.2.1	H6
9	1	9.3.2.2.1, 9.3.2.2.2, 9.3.5.2.1	H9
10	1	9.3.4.2.3	H6, H9
11	1	9.3.2.2.3, 9.3.2.2.4, 9.3.2.3.1 12.3(c), 14.1(a)	H9, H12, H14
12	1	9.4.4.2.2, 9.4.5.2.1, 9.4.5.2.2, H14.1(a)	H6, H14
13	1	9.3.1.2.3, 9.3.1.3.2, 14.3(c)	H10, H14
14	1	9.2.3.2.7	H6
15	1	9.4.3.2.1	H9
Section I Part B			
16(a)	2	9.4.2.2.2, 14.3(d)	H8, H14
16(b)	1	9.4.2.2.2	H8
17	3	9.2.3.3.4, 13.1(e)	H6, H13
18 (a)	2	9.2.2.3.4	H6
18 (b)	2	9.2.2.3.5	H5
19 (a)	1	9.4.3.2.2	H6
19 (b)	2	9.4.3.2.2	H6

Question	Marks	Content	Syllabus outcomes
19 (c)	3	9.4.4.2.1, 9.4.3.3.3	H6
20 (a)	3	9.3.3.2.3	H9
20 (b)	3	9.3.4.2.1, 13.1(e)	H9, H13
21 (a)	2	9.4.3.3.3, 9.4.3.2.2, 12.3(c), 14.1(a, g)	H12, H14
21 (b)	4	9.4.5.3.1	H4, H6
22 (a)	2	9.3.3.2.4, 9.3.3.3.1, 12.3(c)	H9, H12
22(b)	2	9.3.3.2.4, 9.3.3.3.1, 13.1(e)	H9, H13
22(c)	2	9.3.3.2.5, 9.3.4.2.6	H9
22(d)	2	9.3.2.2.5	H9
23	4	9.1, 11.2 (b, c), 11.3 (a)	H11
24 (a)	1	9.2.2.2.5	H6
24 (b)	2	9.2.2.3.3, 12.3(c)	H3, H12
24 (c)	3	9.2.2.4, 9.2.2.5	H6
25	3	9.4.6.3.1, 9.4.6.2.1, 14.1 (a, c, g)	H14
26	3	9.4.1.2.2, 9.4.4, 9.4.5, 9.4.6	H6
27	8	9.2.3.2.9, 9.3.4.3.4, 9.3.1.2.1, 9.3.4.2.6, 9.2.1.2.7.8.9, 9.2.1.3.3, 14.3(b)	H4, H7, H8, H10, H14
Section II Communication			
28 (a) (i)	2	9.5.3.2.2	H6
28 (a) (ii)	3	9.5.3.2.2, 9.5.3.3.3, 9.5.3.2.5	H6
28 (b) (i)	3	9.5.7.3.2, 11.2(d), 12.2(b), 12.4 (a, c, d)	H6, H11, H12
28 (b) (ii)	3	9.1, 12.4 (d, e)	H12
28 (c)	7	9.5.1.2.1, 9.5.5.2.1, 9.5.5.2.3, 9.5.6.2.2, 9.5.6.2.5, 9.5.7.2.4, 9.5.6.3.1, 14.3(b)	H6, H14
28 (d) (i)	1	12.3 (e)	H12
28 (d) (ii)	2	9.5.4.2.4, 14.1(a)	H14
28 (d) (iii)	4	9.5.4.3.2, 14.1(h)	H6, H14

Question	Marks	Content	Syllabus outcomes
Section II			
Question 29— Biotechnology			
29 (a) (i)	2	9.6.3.2.1	H8
29 (a) (ii)	3	9.6.3.3.1	H8
29 (b) (i)	3	9.6.5.3.3, 12.3 (b, c, d), 14.1(a, c)	H6, H12, H14
29 (b) (ii)	3	12.4 (d, e)	H12
29 (c)	7	9.6.6.3.1, 9.6.7.3.1, 9.6.6.2.4, 14.3(b)	H3, H14
29 (d) (i)	1	9.1.12.3, 12.3(c)	H6, H12
29 (d) (ii)	2	9.6.2.2.1, 14.1(a)	H6, H14
29 (d) (iii)	4	9.6.3.3.2	H2, H6
Section II			
Genetics: The Code Broken?			
30 (a) (i)	2	9.7.2.2.1	H9
30 (a) (ii)	3	9.7.2.2.3, 9.7.2.3.2, 9.7.2.1, 9.7.2.2.1	H9
30 (b) (i)	3	9.7.7.3.2, 12.3 (a, b, c, d), 14.1 (a, e)	H9, H12, H14
30 (b) (ii)	3	12.4 (d, e)	H12
30 (c)	7	9.7.4, 9.7.5, 9.7.6.3.1, 14.3(b)	H4, H14
30 (d) (i)	1	12.3(e)	H9, H12
30 (d) (ii)	2	9.7.6.2.1, 14.1(a)	H9, H14
30 (d) (iii)	4	9.7.6.2.3	H9
Section II			
The Human Story			
31 (a) (i)	2	9.8.3.2.1	H10
31 (a) (ii)	3	9.8.3.2.2	H10
31 (b) (i)	3	9.8.3.3.2, 12.4 (a, c), 14.3 (c, d)	H10, H12, H14
31 (b) (ii)	3	9.8.2.2.5, 12.4 (d, e)	H12
31 (c)	7	9.8.3.2.2, 9.8.5, 9.8.6, 14.3(b)	H10, H14
31 (d) (i)	1	12.3(c)	H12
31 (d) (ii)	2	9.8.6.3.1, 14.1(a)	H10, H14

Question	Marks	Content	Syllabus outcomes
31 (d) (iii)	4	9.8.6.3.1, 14.3(c)	H10, H14
Section II Biochemistry			
32 (a) (i)	2	9.9.1.3.1	H6
32 (a) (ii)	3	9.9.1.3.1	H6
32 (b) (i)	3	9.9.8.3.1, 12.3 (a, b, c), 13.1 (a, b, c, e)	H6, H12
32 (b) (ii)	3	12.4 (d, e)	H6, H12
32 (c)	7	9.9.6.2.1, 9.9.5.1.3, 9.9.9.3.2, 14.3(b)	H14
32 (d) (i)	1	12.3 (c)	H12
32 (d) (ii)	2	9.9.8.3.2, 9.9.4.2.4, 14.1(a)	H6, H14
32 (d) (iii)	4	9.9.3.2.5, 9.9.3.3.4	H6

2007 HSC Biology Marking Guidelines

Section I, Part B

Question 16 (a)

Outcomes assessed: H8, H14

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Identifies a source of pathogens and relates the wearing of hat and/or gloves as a type of barrier to pathogen transfer 	2
<ul style="list-style-type: none"> Identifies a source of pathogens OR <ul style="list-style-type: none"> Identifies a barrier to pathogen transfer 	1

Question 16 (b)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Names a hygiene practice 	1

Question 17*Outcomes assessed: H6, H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Provides a table that shows difference of marine and freshwater fish in terms of:<ul style="list-style-type: none">– environmental conditions– urine production	3
<ul style="list-style-type: none">Provides a table that shows difference of marine and freshwater fish in terms of either:<ul style="list-style-type: none">– environmental conditions or urine production <p>OR</p> <ul style="list-style-type: none">Shows differences without the use of a table	2
<ul style="list-style-type: none">Constructs a table with appropriate headings (columns and rows) <p>OR</p> <ul style="list-style-type: none">Identifies a difference without the use of a table	1

Question 18 (a)*Outcomes assessed: H6***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Sketches in general terms how a named extracted blood product is used to restore normal body function	2
<ul style="list-style-type: none">Identifies an extracted blood product <p>OR</p> <ul style="list-style-type: none">Identifies a use of a product extracted from donated blood	1

Question 18 (b)*Outcomes assessed: H5***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Puts forward relevant reasons	2
<ul style="list-style-type: none">Puts forward a relevant reason	1

Question 19 (a)*Outcomes assessed: H6***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Correctly names one disease caused by a macro-parasite	1

Question 19 (b)*Outcomes assessed: H6***MARKING GUIDELINES**

Criteria	Marks
• Correctly identifies distinguishing features of prions from protozoans	2
• Correctly identifies a distinguishing feature of prions from protozoans	1

Question 19 (c)*Outcomes assessed: H6***MARKING GUIDELINES**

Criteria	Marks
• For a named infectious disease identifies: – the mode of transmission – the entry point – an immune response	3
• For a named infectious disease identifies TWO of: – the mode of transmission – the entry point – an immune response	2
• Identifies a mode of transmission or the entry point or an immune response of an infectious disease	1

Question 20 (a)*Outcomes assessed: H9***MARKING GUIDELINES**

Criteria	Marks
• Completes each row correctly	3
• Completes TWO rows correctly OR • Completes base column correctly • Provides correct % for T OR C/G	2
• Completes ONE row correctly OR • Completes base column correctly	1

Question 20 (b)*Outcomes assessed: H9, H13***MARKING GUIDELINES**

Criteria	Marks
• Provides a simple flowchart that provides features and characteristics of DNA replication in the correct sequence	3
• Provides a simple flowchart “or numbered sequence” that outlines DNA replication in the correct sequence	2
• Identifies the stages of DNA replication in the correct sequence with at least one step	1

Question 21 (a)*Outcomes assessed: H12, H14***MARKING GUIDELINES**

Criteria	Marks
• Identifies the most dangerous disease and provides two valid reasons	2
• Provides a valid reason OR • Identifies the most dangerous disease	1

Question 21 (b)

Outcomes assessed: H4, H6

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Identifies a disease from the table Describes the vaccination program for this disease Makes a judgment about the effectiveness of the program 	3-4
<ul style="list-style-type: none"> Describes features of a vaccination program or vaccination for a named disease. OR <ul style="list-style-type: none"> Describes a feature of a vaccination for a named disease and makes a judgement about the effectiveness of the program 	2
<ul style="list-style-type: none"> Outlines one feature of a vaccination for a named disease OR <ul style="list-style-type: none"> Make a judgement for a named disease without reference to the program 	1

Question 22 (a)

Outcomes assessed: H9, H12

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Provides the features of the behaviour of chromosomes between the steps by indicating the pairing of homologous chromosomes and crossing over 	2
<ul style="list-style-type: none"> Identifies a feature of the behaviour of chromosomes between the steps 	1

Outcomes assessed: H9, H13

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Provides four possible combinations 	2
<ul style="list-style-type: none"> Provides two or three possible combinations 	1

Question 22 (c)

Outcomes assessed: H9

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Shows how one result of the process is an advantage for a species 	2
<ul style="list-style-type: none"> Identifies either a result of the process or an advantage of the process 	1

Question 22 (d)*Outcomes assessed: H9***MARKING GUIDELINES**

Criteria	Marks
• Provides the difference between the terms allele and gene	2
• Provides an outline of either an allele OR a gene	1

Question 23*Outcomes assessed: H11***MARKING GUIDELINES**

Criteria	Marks
• Provides an ordered relevant procedure that: – states variables to be controlled – describes ways to collect reliable and valid data information – identifies equipment needed to undertake the investigation	4
• Provides an ordered relevant procedure • Provides details of at least TWO components of a controlled experiment	3
• Provides a relevant procedure • Provides details of ONE component of a controlled experiment	2
• Provides a procedure outlined in general terms only	1

Question 24 (a)*Outcomes assessed: H6***MARKING GUIDELINES**

Criteria	Marks
• Provides a correct reason for monitoring/need for oxygen	1

Question 24 (b)*Outcomes assessed: H3, H12***MARKING GUIDELINES**

Criteria	Marks
• Identifies one improvement in the T-Stat oximeter over the pulse oximeter • Gives a reason why this is advantageous	2
• Identifies one improvement in the T-Stat oximeter over the pulse oximeter	1

Question 24 (c)*Outcomes assessed: H6***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Provides features of changes in the chemical composition of blood as it moves along a capillary• States reasons for the changes	3
<ul style="list-style-type: none">• Provides features of changes in the chemical composition of blood as it moves along a capillary OR <ul style="list-style-type: none">• Provides a feature of a chemical change and a reason for the change	2
<ul style="list-style-type: none">• Provides a feature of a chemical change	1

Question 25*Outcomes assessed: H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Identifies characteristics of a sound epidemiological study• Links the type of data that needed to be collected to establish the relationship between smoking and lung cancer	3
<ul style="list-style-type: none">• Identifies characteristics of a sound epidemiological study• Identifies one type of data that needed to be collected to establish the relationship OR <ul style="list-style-type: none">• Identifies the types of data that needed to be collected to establish the relationship	2
<ul style="list-style-type: none">• Identifies a characteristic of an epidemiological study OR <ul style="list-style-type: none">• Identifies one type of data that needed to be collected to establish the relationship	1

Question 26*Outcomes assessed: H6***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Provides features of how genes assist in the maintenance of health	3
<ul style="list-style-type: none">Outlines how genes assist in the maintenance of health	2
<ul style="list-style-type: none">Provides an example OR <ul style="list-style-type: none">States a role of genes	1

Question 27*Outcomes assessed: H4, H7, H8, H10, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Explains possible consequences of temperature change for plants and animals using examples of individuals and speciesRelates implications of changes in survival of individuals to survival of speciesDemonstrates coherence and logical progression and includes correct use of scientific principles and ideas	7-8
<ul style="list-style-type: none">Explains possible consequences of temperature change for plants and/or animals using examples that may have limitationsDescribes some possible implications for individuals and species	5-6
<ul style="list-style-type: none">Describes some plant or animal responses to temperature changeProvides a statement about survival of individuals or extinction of species	3-4
<ul style="list-style-type: none">States some responses of plants and/or animals to temperature change.	1-2

Section II

Question 28 (a) (i)

Outcomes assessed: H6

MARKING GUIDELINES

Criteria	Marks
• Identifies TWO refractive media in the human eye	2
• Identifies ONE refractive medium in the human eye	1

Question 28 (a) (ii)

Outcomes assessed: H6

MARKING GUIDELINES

Criteria	Marks
• Shows how a problem may contribute to poor eye sight or blindness	3
• Describes the problem/change in the medium OR	2
• Describes the cause or outcome of the problem	
• States one possible change in one refractive medium	1

Question 28 (b) (i)

Outcomes assessed: H6, H11, H12

MARKING GUIDELINES

Criteria	Marks
• Provides features and characteristics of how to undertake the investigation showing a link to the way the information was gathered	3
• Outlines how to undertake the investigation showing a link to the way the information was gathered OR	2
• Provides features and characteristics of how to undertake the investigation or how the information was gathered	
• Provides some steps to undertake the investigation	1

Question 28 (b) (ii)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">States how both relevance and reliability of information can be judged and is linked to this investigation	3
<ul style="list-style-type: none">States how both relevance and reliability of information can be judged OR <ul style="list-style-type: none">States how relevance or reliability can be judged and how it relates to this investigation	2
<ul style="list-style-type: none">States how either relevance or reliability could be judged	1

Question 28 (c)*Outcomes assessed: H6, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Names structures that produce, detect and perceive soundsOutlines the roles of these structuresMakes a judgement about the value of each of these in effective human communicationDemonstrates coherence and logical progression and includes correct use of scientific principles and ideas.	6-7
<ul style="list-style-type: none">Names structures that are involved in communication using soundStates the role of some of the structuresMakes a judgement about the role of one of these in effective communication	4-5
<ul style="list-style-type: none">Names some relevant structuresStates the role of some of these structures in effective communication	1-3

Question 28 (d) (i)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Estimates wavelength the green pigment cone absorbs the most light.	1

Question 28 (d) (ii)*Outcomes assessed: H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Provides features of the pattern of light absorption for red pigment conesStates a correct reason for the need for 3 different pigments for colour vision	2
<ul style="list-style-type: none">Any one of the above	1

Question 28 (d) (iii)*Outcomes assessed: H6, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Identifies the use of colour for communication in animalsIdentifies the occurrence of colour vision in animalsMakes the relationship between the use of colour and the occurrence of colour vision evident	4
<ul style="list-style-type: none">Identifies the use of colour for communication in animalsIdentifies the occurrence of colour vision in animals	2-3
OR <ul style="list-style-type: none">Identifies the use of colour for communication in animalsIdentifies the occurrence of colour vision in animals	1

Question 29 (a) (i)*Outcomes assessed: H8***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Identifies organic compounds produced by fermentation techniques	2
<ul style="list-style-type: none">Identifies an organic compound produced by fermentation techniques	1

Question 29 (a) (ii)*Outcomes assessed: H8***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Shows how the use of an organic compound had an impact on society at the time of its introduction.	3
<ul style="list-style-type: none">Describes the use of an organic compound OR <ul style="list-style-type: none">Describes the impact of the compound on society at the time of its introduction	2
<ul style="list-style-type: none">States a use of the compound OR <ul style="list-style-type: none">States an impact on society	1

Question 29 (b) (i)*Outcomes assessed: H6, H12, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Provides features and characteristics of how the information was gathered and analysed in this investigation	3
<ul style="list-style-type: none">Outlines how the information was gathered and analysed in this investigation OR <ul style="list-style-type: none">Provides features and characteristics of how the information was gathered or analysed in this investigation	2
<ul style="list-style-type: none">Provides some steps to gather or analyse the information	1

Question 29 (b) (ii)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">States how both relevance and reliability of information can be judged and is linked to this investigation	3
<ul style="list-style-type: none">States how both relevance and reliability of information can be judged OR <ul style="list-style-type: none">States how relevance or reliability can be judged and how it relates to this investigation	2
<ul style="list-style-type: none">States how either relevance or reliability could be judged	1

Question 29 (c)*Outcomes assessed: H3, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Names techniques of aquacultureOutlines how these techniques are usedMakes a judgement about the value of the techniquesDemonstrates coherence and logical progression and includes correct use of scientific principles and ideas.	6-7
<ul style="list-style-type: none">Names techniques of aquacultureStates the uses of the techniquesMakes a judgement about the role of ONE of these techniques	4-5
<ul style="list-style-type: none">Names a relevant technique of aquacultureStates the use of the technique	2-3
<ul style="list-style-type: none">Names a relevant technique of aquaculture	1

Question 29 (d) (i)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Estimates a time at which ethanol concentration is at its maximum.	1

Question 29 (d) (ii)*Outcomes assessed: H6, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Provides features of the trend in glucose concentrationStates a correct reason for this pattern	2
<ul style="list-style-type: none">Any ONE of the above	1

Question 29 (d) (iii)*Outcomes assessed: H2, H6***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Identifies traditional uses of biotechnologyShows how changes in technology have modified traditional uses	4
<ul style="list-style-type: none">Identifies traditional uses of biotechnologyIdentifies changes in the technology that have modified traditional uses	3
<ul style="list-style-type: none">Identifies a traditional use of biotechnologyIdentifies a technological change in this traditional use	2
<ul style="list-style-type: none">Identifies a traditional use of biotechnology <p>OR</p> <ul style="list-style-type: none">Names an appropriate example	1

Question 30 (a) (i)*Outcomes assessed: H9***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Identifies characteristics determined by multiple alleles in a non-human organism	2
<ul style="list-style-type: none">Identifies a characteristics determined by multiple alleles in a non-human organism	1

Question 30 (a) (ii)*Outcomes assessed: H9***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Shows how one of these characteristics provide variability in phenotypes	3
<ul style="list-style-type: none">Describes variation in the phenotype <p>OR</p> <ul style="list-style-type: none">Describes variation in the genotype	2
<ul style="list-style-type: none">States a variation in the phenotype or genotype	1

Question 30 (b) (i)*Outcomes assessed: H9, H12, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Provides features and characteristics of how the information was gathered and analysed in this investigation.	3
<ul style="list-style-type: none">Outlines how the information was gathered and analysed in this investigation OR <ul style="list-style-type: none">Provides features and characteristics of how the information was gathered or analysed in this investigation	2
<ul style="list-style-type: none">Provides some steps to gather or analyse the information	1

Question 30 (b) (ii)*Outcomes assessed: H9, H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">States how both relevance and reliability of information can be judged and is linked to this investigation	3
<ul style="list-style-type: none">States how both relevance and reliability of information can be judged OR <ul style="list-style-type: none">States how relevance or reliability can be judged and how it relates to this investigation	2
<ul style="list-style-type: none">States how either relevance or reliability could be judged	1

Question 30 (c)*Outcomes assessed: H4, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Outlines in general terms the techniques• Gives an example of each• Makes a judgment about the value of each of the techniques in managing a genetic disease or a form of cancer or AIDS• Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas.	6-7
<ul style="list-style-type: none">• Outlines in general terms the techniques• Gives an example• Makes a statement about the value of the technique	4-5
<ul style="list-style-type: none">• Outlines in general terms a technique• Gives an example	2-3
<ul style="list-style-type: none">• Outlines an appropriate technique	1

Question 30 (d) (i)*Outcomes assessed: H9, H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Estimates a number of infants with Down syndrome per 1000 births for 40-year-old mothers	1

Question 30 (d) (ii)*Outcomes assessed H9, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Provides features of the trend• Provides a correct definition of the term <i>trisomy</i>	2
<ul style="list-style-type: none">• Provides one of the above	1

Question 30 (d) (iii)

Outcomes assessed: H9

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Defines transposable genetic elements Provides points for and/or against how these transposable genetic elements increase genetic diversity or variability Uses example(s) to support discussion 	4
<ul style="list-style-type: none"> Defines transposable genetic elements Provides points for and/or against how these transposable genetic elements increase generic diversity or variability 	3
<ul style="list-style-type: none"> Defines transposable genetic elements States how these elements increase genetic diversity or variability 	2
<ul style="list-style-type: none"> Defines transposable genetic elements 	1

Question 31 (a) (i)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Identifies TWO hominids known from fossil evidence 	2
<ul style="list-style-type: none"> Identifies ONE hominid known from fossil evidence 	1

Question 31 (a) (ii)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Shows how features and characteristics of one hominid (from a i) are different from <i>Homo sapiens</i> 	3
<ul style="list-style-type: none"> Describes features of one hominid Describes features of <i>Homo sapiens</i> but does not show how the listed features are different 	2
<ul style="list-style-type: none"> States a difference between one hominid and <i>Homo sapiens</i> OR <ul style="list-style-type: none"> Outlines features of either a hominid or <i>Homo sapiens</i> 	1

Question 31 (b) (i)

Outcomes assessed: H10, H12

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Provides features and characteristics of how the information was processed and how available evidence was used in the investigation. 	3
<ul style="list-style-type: none"> Outlines how the information was processed and how available evidence was used in the investigation OR <ul style="list-style-type: none"> Provides features and characteristics of how the information was processed OR available evidence used 	2
<ul style="list-style-type: none"> Provides some steps to undertake the investigation 	1

Question 31 (b) (ii)

Outcomes assessed: H12

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> States how both relevance and reliability of information can be judged and is linked to this investigation 	3
<ul style="list-style-type: none"> States how both relevance and reliability of information can be judged OR <ul style="list-style-type: none"> States how relevance or reliability can be judged and how it relates to this investigation 	2
<ul style="list-style-type: none"> States how either relevance or reliability could be judged 	1

Question 31 (c)

Outcomes assessed: H10, H14

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Names examples of cultural development Outlines how EACH of these has impacted Makes a judgement about the impact of cultural development Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas 	6–7
<ul style="list-style-type: none"> Names examples of cultural development Outlines how EACH of these has impacted Makes a judgement about the impact of ONE of these examples 	4–5
<ul style="list-style-type: none"> Names an example of cultural development AND outlines its impact 	2–3
<ul style="list-style-type: none"> Names an example of cultural development 	1

Question 31 (d) (i)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Estimates the human population 1000 years ago	1

Question 31 (d) (ii)*Outcomes assessed: H10, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Provides features of a changeSuggests a reason for this change	2
<ul style="list-style-type: none">Identifies a changeSuggests a reason for this change	1

Question 31 (d) (iii)*Outcomes assessed: H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Names a technology which could impact on future human populationsIdentifies issue(s) relating to the potential impact of the technologyProvides point(s) for and/or against the impact of the technology	3–4
<ul style="list-style-type: none">Names a technology which could impact on future human populations AND/OR <ul style="list-style-type: none">States a potential impact of the technology	1–2

Question 32 (a) (i)*Outcomes assessed: H6***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Identifies TWO products of photosynthesis	2
<ul style="list-style-type: none">Identifies ONE product of photosynthesis	1

Question 32 (a) (ii)*Outcomes assessed: H6***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Shows a relationship between the product and its use in living organisms	3
<ul style="list-style-type: none">Describes a product OR	2
<ul style="list-style-type: none">Describes the use of a product in living organisms	
<ul style="list-style-type: none">States the use of a product in an organism	1

Question 32 (b) (i)*Outcomes assessed: H6, H12, H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Provides features and characteristics of how the information was gathered and presented in the investigation	3
<ul style="list-style-type: none">Outlines how the information was gathered and presented in the investigation OR	2
<ul style="list-style-type: none">Provides features and characteristics of how the information was gathered or presented in the investigation	
<ul style="list-style-type: none">Provides some steps to undertake the investigation	1

Question 32 (b) (ii)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">States how both relevance and reliability of information can be judged and is linked to this investigation	3
<ul style="list-style-type: none">States how both relevance and reliability of information can be judged OR	2
<ul style="list-style-type: none">States how relevance or reliability can be judged and how it relates to this investigation	
<ul style="list-style-type: none">States how either relevance or reliability could be judged	1

Question 32 (c)

Outcomes assessed: H1, H2, H5

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Names isotopes Outlines the role of EACH in developing our understanding of photosynthesis Makes a judgement about the use of isotopes in relation to photosynthesis Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas. 	6–7
<ul style="list-style-type: none"> Names isotopes Outlines the role of EACH in developing our understanding of photosynthesis 	4–5
<ul style="list-style-type: none"> Names an isotope AND <ul style="list-style-type: none"> Outlines its role in developing our understanding of photosynthesis 	2–3
<ul style="list-style-type: none"> Names an isotope OR <ul style="list-style-type: none"> Makes a general statement about the use of isotopes in developing our understanding of photosynthesis. 	1

Question 32 (d) (i)

Outcomes assessed: H12

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Correctly estimates the wavelength at which most photosynthesis occurs 	1

Question 32 (d) (ii)

Outcomes assessed: H14

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> States where absorption occurs within a chloroplast Provides features of the absorption of chlorophyll <i>a</i> over the visible light spectrum 	2
<ul style="list-style-type: none"> States where absorption occurs within a chloroplast OR <ul style="list-style-type: none"> Provides features of absorption of chlorophyll <i>a</i> over the visible light spectrum 	1

Question 32 (d) (iii)*Outcomes assessed: H5***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Names other pigmentsProvides point(s) for and/or against the presence of these pigments	3–4
<ul style="list-style-type: none">Names another pigment AND/OR <ul style="list-style-type: none">States the role of this pigment in photosynthesis	1–2