2002 HSC Notes from the Marking Centre Biology

Contents

2002 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 provides comments with regard to responses to the 2002 Higher School Certificate Examination, indicating the quality of candidate responses and highlighting the relative strengths and weaknesses of the candidature in each section and each question.

It is essential for this document to be read in conjunction with the relevant syllabus, the 2002 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 2002, approximately 12164 candidates attempted the Biology examination.

Teachers and candidates should be aware that examiners may ask 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. 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.

Section I – Core

Part A – Multiple choice

Question	Correct Response		Question	Correct Response
1	A		9	D
2	C		10	B
3	D		11	C
4	A		12	B
5	C		13	B
6	C		14	B
7	D		15	A
8	D			

Part B

General Comments

Overall, the candidates' responses indicated that the majority had a good grasp of biological concepts, appropriate for HSC candidates. Candidates need to be aware that the answer space allocated is a guide to the length of the required response. Many candidates exceeded the space provided. Skills in scientific method, experimental design and graphing were assessed in 2002.

Specific Comments

Question 16

This question was generally well answered. Most candidates chose an appropriate example to discuss. Candidates need to be aware of the difference between prevention and treatment.

Question 17

(a)   This was a skills based question. Many candidates failed to recall the difference between a transverse section and a longitudinal section and their diagram and marks suffered accordingly. Labelling was appropriate in the diagrams that were well drawn.

(b)   Most candidates found this question difficult. Some did not describe a current theory at all. The better candidates described the pressure-flow hypothesis, source to sinks, active transport processes, the multi-directional aspect of translocation and hydrostatic pressure mechanisms.

Question 18

Most candidates gave an appropriate response for this question. Features of the experimental design that earned marks included sample size (make larger), control group (non-smokers), repeat the experiment, length of time (make longer) and control variables.

Question 19

Most candidates used the diagram provided to answer the question. Some answers seemed to rely on general knowledge rather than biological knowledge. The better responses presented a well-described, removal process that indicated how the process reduced the risk of disease. Some candidates struggled with the last part of the response and did not clearly indicate the action of the process.

Question 20

Most candidates were able to define mitosis and correctly link this to the maintenance of health. Some candidates had difficulty relating cell differentiation to health. The concept that mitosis provides new cells for growth of tissues and organs was better understood than the specific nature of cell differentiation.

Question 21

A significant number of candidates had obviously done this first hand investigation very well and were able to score good marks as a result. Some indicated that they used fresh blood samples to make their own slides rather than use permanent, prepared slides. The frequent references to the use of stains indicate that there may be some candidates who were still doing this, even though this practice has been banned for some time.

Many candidates were able to correctly describe the process of estimating size under a microscope using mini-grids, eyepiece scales or graph paper and many candidates were able to correctly draw, label and state a correct scale for the red blood cell. One other concern is the simplistic safety precautions that were mentioned. The safety precaution should relate to the practical that is being performed and not just be generic like 'do not run around the laboratory'.

Question 22

This question required a table for the presentation of possible genotypes produced during meiosis and their expected frequencies. A significant number of candidates attempted to use Punnet squares to answer this question. This is inappropriate to represent genotypes of sex cells. Most candidates who referred to meiosis in their answer achieved full marks as they could correctly list the genotypes and frequencies produced, in table form.

Question 23

(a)   This was answered well. Most candidates were able to correctly label the area where filtration occurs.

(b)   This part was also well answered with the majority of candidates correctly labelling where reabsorption occurs.

(c)   Most candidates were able to describe hormone replacement therapy. Some candidates had difficulty linking this to the role of aldosterone in fluid balance and homeostasis.

Question 24

Many candidates discussed cloning rather than assess the impact on genetic diversity. Some candidates did not fully understand that asexual reproduction does not produce genetic variation and there is little variation in the original banana population. Consequently there would be little impact on genetic diversity from cloning.

Question 25

(a)   The majority of candidates were able to give a satisfactory definition of punctuated equilibrium using terms like a rapid, sudden or quick change over a short period of time followed by periods of little or no change.

(b)   Candidates who were unable to correctly define punctuated equilibrium struggled to compare this process with Darwinian evolution. Most candidates indicated a knowledge of natural selection. Better responses described a rapid versus a gradual change, short versus long time period and absence versus presence of transitional forms as the main differences.

Question 26

This question highlighted some problems in experimental design for some candidates. While the majority of responses demonstrated a good understanding of experimental design, there was a significant number of candidates who struggled with the concept of 'risk assessment' as suggested in the guidelines. Safety was also not covered very well. Most candidates were able to express the need for controls and the variables required. Many described measures to assist reliability and validity with ideas like large numbers and repetition of the procedure. The better answers demonstrated a good understanding of scientific method.

Question 27

This question was well answered. Most candidates were able to describe Pasteur's experiment and Koch's postulates. Candidates were also able to evaluate, but many wrote more than required and went beyond the space suggested in the answer booklet. There was a small number of candidates who found it difficult to relate the work of these scientists to modern practices. This was particularly so for Koch. A small number of candidates did not discuss the scientists separately. The best responses included a judgement about the scientists' work as part of their evaluation.

Section II – Options

General Comments

The most popular option in 2002 was Communication followed by Genetics – The Code Broken? and The Human Story. Overall, the candidates' responses were appropriate and indicated a level of understanding expected for HSC candidates. A small number of candidates responded to more than one question in this section and there was some evidence of candidates attempting options that they had not studied. These candidates tended to score low marks.

Question 28 – Communication

(a) (i) Most candidates had some knowledge of the organ of Corti. A number of candidates outlined the organ's structure or location rather than its function.
(ii) Most candidates exhibited some understanding of the relationship between wavelength, frequency and pitch of sound waves. Some candidates defined terms without demonstrating the relationship between them.
(iii) The majority of candidates correctly identified and described two structures used by animals to produce sound. However, many candidates did not attempt to compare these structures.

(b) (i) While most candidates had an understanding of the shape and position of the sections of the brain, fewer candidates could describe the structural features of all three sections. This was particularly so for the medulla oblongata.
(ii) Many candidates found this question difficult. Some candidates neglected to label any speech areas on the sketch. Sketches were often of the cerebrum only.

(c) (i) This was a skills based question that was well answered by most candidates. Common errors included inappropriate choice of graph, plotting errors and reversal of axes for the dependent and independent variables.

(ii) This part was well answered. Most candidates correctly stated the relationship between lens thickness and focal length.

(iii) Some candidates had difficulty explaining accommodation.

(d) There was a wide range of responses. Many candidates gave simple answers about the function of rods and cones with a brief statement about rhodopsin. Better responses explained the relationship between changes to rhodopsin and the formation of electrochemical signals.

Question 29 – Biotechnology

(a) (i) This question was well answered.

(ii) A number of candidates confused PCR with protein synthesis or DNA replication. As a result, these candidates were unable to identify each step in the process.

(b) (i) Most candidates described a first-hand investigation, although a significant number did not identify the enzyme or substrate. A significant number of candidates did not identify repetition in their method.

(ii) This question was generally well answered. Some candidates did not distinguish between controls and variables.

(c) (i) This was a skills based question that was well answered by most candidates. Common errors included inappropriate choice of graph, plotting errors and reversal of axes for the dependent and independent variables.

(ii) Many candidates identified higher production or higher rate for Yeast B, without identifying both.

(iii) Most candidates could identify the process of strain isolation. Fewer candidates successfully described the process.

(d) Candidates gave a wide range of responses for this question. Some candidates chose simple examples of biotechnology and did not fully describe both the process and the outcomes. Better responses demonstrated a depth of knowledge and understanding of the process and outcomes for their chosen biotechnology. Many candidates wrote unnecessarily long responses to this question.

Question 30 - Genetics – The Code Broken?

(a) (i) This question was well answered by most candidates. Some candidates gave unnecessarily long answers for the mark allocation.

(ii) Most candidates had an understanding of linkage. Some candidates did not refer to linked genes as being on the same chromosome.

(iii) Some candidates explained the process very well referring to test crosses and the frequency of recombinants in offspring. However, many candidates did not indicate how linkage can be used to map chromosomes.

(b) (i) Candidates should be guided by the allocated marks as to the detail required in a response, as some candidates' responses lacked detail. Many candidates described in detail models built from wood, wire, lollies, styrofoam and cardboard. Better responses often included a diagram of the model with molecular components labelled.

(ii)   Candidates had difficulty justifying the design of their model. Instead, many candidates evaluated their model. A number of candidates justified the Watson and Crick model rather than the design of their own model.

(c)   (i)   This was a skills based question that was well answered by most candidates. Common errors included inappropriate choice of graph, plotting errors and reversal of axes for the dependent and independent variables.
(ii)   This question was well answered by most candidates.
(iii)   A significant number of candidates had difficulty comparing the processes. Most candidates could describe one or both processes.

(d)   Candidates gave a wide range of responses to this question. Some candidates did not describe the differences between selective breeding and gene cloning. Many candidates did not discriminate between whole organism cloning and gene cloning. Better responses included specific examples to explain the processes. Many candidates wrote unnecessarily long responses to this question.

Question 31 - The Human Story

(a)   (i)   Most candidates could name a hominid fossil.
(ii)   Generally well answered. Some candidates chose features that were not structural.
(iii)   Most candidates could make the comparison between humans and apes. A significant number of candidates did not link (iii) to (ii).

(b)   (i)   Most candidates could describe a scientific discovery. A significant number of candidates did not link the discovery with the appropriate scientist.
(ii)   Many candidates were unable to explain how the discovery increased understanding of hominid evolution.

(c)   (i)   This was a skills based question that was well answered by most candidates. Common errors included inappropriate choice of graph, plotting errors and reversal of axes for the dependent and independent variables.
(ii)   Most candidates correctly read from the graph. Some candidates, however, employed mathematical calculations to determine the answer.
(iii)   This question was poorly answered by many candidates. The concept of half-life and its implication for the dating process was not well explained. Many candidates incorrectly linked the limitations of C^{14} dating to environmental factors.

(d)   There was a wide range of responses. Better responses gave detailed and specific examples of the complexity of human cultural development and compared this with other primates. Many candidates wrote unnecessarily long responses to this question.

Question 32 – Biochemistry

(a)   (i)   Most candidates could provide a correct definition.
(ii)   Most candidates correctly described a use of radioisotopes.
(iii)   For most candidates, the work of Ruben was well understood and outlined. Candidates generally did not identify that Hill and Scarisbruck worked with isolated chloroplasts.

(b) (i)   Most candidates were able to link an investigation to an identified scientist. Responses varied from simple recounts of the work done by a scientist to detailed description of first-hand investigations. A significant number of candidates did not identify replication in their method.

(ii) Most candidates were able to correctly identify variables.

(c) (i)   This was a skills based question that was well answered by most candidates. Common errors included inappropriate choice of graph, plotting errors and reversal of axes for the dependent and independent variables.

(ii) This question was well answered.

(iii) Many candidates found this explanation difficult. A common error was to simply state the action spectrum of chlorophyll.

(d)   There was a wide range of responses to this question. Many candidates described in detailed biochemical terms the production of ATP and its relationship to photosynthesis without mentioning the role of photosynthesis research. Better responses included an explanation of the role of photosynthesis research in the answer.

Biology

2002 HSC Examination Mapping Grid

Question	Marks	Content	Syllabus outcomes
Section I Part A			
1	1	9.3.2	H9
2	1	9.2.1	H6
3	1	9.2.1	H7, H14
4	1	9.4.5	H4, H6, H14
5	1	9.3.4	H4, H7, H10
6	1	9.2.3	H6
7	1	9.2.3	H6
8	1	9.4.4	H4, H8
9	1	9.4.4	H8
10	1	9.4.8	H3, H7, H8
11	1	9.3.2, 9.3.3	H4, H9
12	1	9.4.5	H2, H4, H6
13	1	9.3.2	H3
14	1	9.3.1	H3, H10, H11, H12
15	1	9.3.4	H4
Section I Part B			
16	4	9.4.8	H4, H8, H13
17 (a)	3	9.2.2	H12, H13
17 (b)	3	9.2.2	H6
18	4	9.4.7	H5, H8, H11, H12, H14
19	3	9.4.2	H4, H8, H12
20	4	9.4.1	H6, H13
21	8	9.2.2	H2, H6, H11, H12, H13, H14
22	4	9.3.3	H9, H12, H14
23 (a)	1	9.2.3	H6, H12
23 (b)	1	9.2.3	H6, H12
23 (c)	4	9.2.3	H3, H4, H6, H8, H13
24	4	9.3.5	H3, H4, H10, H12, H13
25 (a)	1	9.3.4	H10
25 (b)	3	9.3.4	H10, H13, H14
26	5	9.3.3	H11, H12, H14
27	8	9.4.3	H1, H2, H3, H4, H6, H8, H13, H14

Question	Marks	Content	Syllabus outcomes
Section II Communication			
28 (a) (i)	1	9.5.6	H6
28 (a) (ii)	2	9.5.5	H6, H14
28 (a) (iii)	2	9.5.5	H6, H13
28 (b) (i)	3	9.5.1, 9.5.8	H6, H13, H14
28 (b) (ii)	3	9.5.8	H6, H8, H13
28(c) (i)	4	9.1	H12, H13
28 (c) (ii)	1	9.5.3	H14
28 (c) (iii)	2	9.5.3	H6, H14
28 (d)	7	9.5.4	H6, H13
Section II Biotechnology			
29 (a) (i)	1	9.6.4	H6, H9
29 (a) (ii) 1	1	9.6.5	H3, H6
29 (a) (ii) 2	3	9.6.5	H3, H6, H12, H14
29 (b) (i)	4	9.6.4	H6, H11, H12, H14
29 (b) (ii)	2	9.6.1	H6, H11, H12, H14
29 (c) (i)	4	9.1	H12, H13
29 (c) (ii)	1	9.6.3	H14
29 (c) (iii)	2	9.6.3	H4, H8, H14
29 (d)	7	9.6.6	H3, H4, H6, H8, H13, H14
Section II Genetics – The Code Broken?			
30 (a) (i)	1	9.7.3	H6
30 (a) (ii)	1	9.7.3	H9
30 (a) (iii)	3	9.7.3	H9, H13
30 (b) (i)	3	9.1, 9.7.1	H9, H11, H13
30 (b) (ii)	3	9.7.7	H11, H12, H14
30 (c) (i)	4	9.1	H12, H13
30 (c) (ii)	1	9.7.2	H9
30 (c) (iii)	2	9.7.3	H9, H14
30 (d)	7	9.7.7	H3, H5, H6, H7, H8, H9, H13

Question	Marks	Content	Syllabus outcomes
Section II The Human Story			
31 (a) (i)	1	9.8.3	H10
31 (a) (ii)	2	9.8.3	H10, H13
31 (a) (iii)	2	9.8.1	H10, H13, H14
31 (b) (i)	3	9.8.3	H1, H10, H13, H14
31 (b) (ii)	3	9.8.2, 9.8.3	H1, H2, H10, H13, H14
31 (c) (i)	4	9.1	H12, H13
31 (c) (ii)	1	9.8.2	H14
31 (c) (iii)	2	9.8.2, 9.8.3	H1, H2, H11, H13, H14
31 (d)	7	9.8.5, 9.8.6	H1, H7, H8, H10, H13, H14
Section II Biochemistry			
32 (a) (i)	1	9.9.5	H3
32 (a) (ii)	1	9.9.5	H1, H3
32 (a) (iii)	3	9.9.5	H1, H2
32 (b) (i)	4	9.1, 9.9.2	H6, H11, H12, H14
32 (b) (ii)	2	9.1	H6, H11, H12, H14
32 (c) (i)	4	9.1	H12, H13
32 (c) (ii)	1	9.9.3	H12, H14
32 (c) (iii)	2	9.9.3, 9.9.4	H12, H13, H14
32 (d)	7	9.9.6, 9.9.7, 9.9.8	H1, H3, H5, H6, H13

BOARD OF STUDIES
NEW SOUTH WALES

2002 HSC Biology
Marking Guidelines

Section I

Question 16

Outcomes assessed: H4, H8, H13

MARKING GUIDELINES

Criteria	Marks
• Provides points for and/or against the possibility of prevention rather than treatment in at least one example of a disease • Distinction included between prevention and treatment	4
• Distinction between treatment and prevention identified using one example	3
• Description of example of treatment and prevention only OR • Further elaboration of treatment or prevention using an example of a disease	2
• Names an example of a modern method of disease treatment or prevention	1

Question 17 (a)

Outcomes assessed: H12, H13

MARKING GUIDELINES

Criteria	Marks
• Correct section drawn • Xylem and phloem placed and labelled correctly • Relative dimensions appropriate	3
• 2 of the above correctly done	2
• 1 of the above correctly done	1

Question 17 (b)

Outcomes assessed: H6

MARKING GUIDELINES

Criteria	Marks
• 3 features or detailed elaboration of 1 or 2 features of theory described	3
• 2 features or some elaboration of 1 feature of theory described	2
• 1 feature of theory described	1

Question 18

Outcomes assessed: H5, H8, H11, H12, H14

MARKING GUIDELINES

Criteria	Marks
• Provides at least two ways to remedy errors or weaknesses in the investigation described	4
• Provides at least one way to remedy an error or weakness in the investigation OR • Provides two remedies that do not both clearly relate to an error or weakness in the investigation	2–3
• Mentions a control group	1

Question 19

Outcomes assessed: H4, H8, H12

MARKING GUIDELINES

Criteria	Marks
• Process named, description of removal process provided and related to how this reduces the risk of disease	3
• Process named with a simple description of the removal process	2
• Process named and a feature identified	1

Question 20

Outcomes assessed: H6, H13

MARKING GUIDELINES

Criteria	Marks
• The main features, of the way in which mitosis and cell differentiation help to maintain health, are provided	3–4
• Description of mitosis and/or cell differentiation • Definition of health and/or description of how health is maintained	1–2

Question 21

Outcomes assessed: H2, H6, H11, H12, H13, H14

MARKING GUIDELINES

Criteria	Marks
• Complete list of equipment • At least one safety precaution identified • Method described, with all necessary steps for estimating size of red blood cells in correct order • Description of observations including scaled diagram indicating size of red blood cells	7–8
• List of equipment • At least one safety precaution identified • Most steps in the method to estimate the size of red blood cells are identified, in correct order • Description of observations including a diagram, does not need to include actual size of red blood cells	5–6
Any three out of the four • Equipment list may not be complete • Some steps in the method to estimate the size of red blood cells are identified, in correct order • Possible observations of red blood cells • Safety precaution mentioned	3–4
• Equipment list provided incomplete OR • Some steps in method provided OR • Possible observations of red blood cells OR • Safety precaution mentioned	1–2

Question 22

Outcomes assessed: H9, H12, H14

MARKING GUIDELINES

Criteria	Marks
• Table complete with appropriate headings and all data included • Genotypes correct • Frequencies correct	3–4
• Table with appropriate headings and some correct data included OR • Most genotypes correct AND • Frequencies incorrect or absent	1–2

Question 23 (a)

Outcomes assessed: H6, H12

MARKING GUIDELINES

Criteria	Marks
• Area of glomerulus marked with "X"	1

Question 23 (b)

Outcomes assessed: H6, H12

MARKING GUIDELINES

Criteria	Marks
• Some or all of area from the proximal tubule to the collecting tubule shaded	1

Question 23 (c)

Outcomes assessed: H3, H4, H6, H8, H13

MARKING GUIDELINES

Criteria	Marks
• Describes hormone replacement therapy • Refers to the role of aldosterone in discussing the importance of hormone replacement therapy • Refers to fluid balance and homeostasis/maintenance of constant internal conditions	3–4
• Describes the functions of aldosterone • Some knowledge of hormone replacement therapy demonstrated	1–2

Question 24

Outcomes assessed: H3, H4, H10, H12, H13

MARKING GUIDELINES

Criteria	Marks
• Relationship between cloning and reduced genetic diversity identified • Recognises that there is no potential impact in this situation	3–4
• Relationship between cloning and reduced genetic diversity identified	1–2

Question 25 (a)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• Correct definition of punctuated equilibrium	1

Question 25 (b)

Outcomes assessed: H10, H13, H14

MARKING GUIDELINES

Criteria	Marks
• Correct comparison of *punctuated equilibrium* (as proposed by Eldridge and Gould) and the process proposed by Darwin	2–3
• Either process described adequately	1

Question 26

Outcomes assessed: H11, H12, H14

MARKING GUIDELINES

Criteria	Marks
• Describes an experimental method that should provide reliable and valid results and allow the experiment to be replicated from the description given	4–5
• Describes a method that should yield valid results	2–3
• Elementary experimental design without consideration of variables and controls	1

Question 27

Outcomes assessed: H1, H2, H3, H4, H6, H8, H13, H14

MARKING GUIDELINES

Criteria	Marks
• Describes the work of Koch and Pasteur and relates these to our present understanding of both the cause and possible methods of prevention of disease caused by micro-organisms. Includes a judgement of the impact of Pasteur and Koch's work	7–8
Includes most of the following • Brief outline of the work of Pasteur and Koch, our present understanding of disease caused by micro-organisms and current strategies for the prevention of diseases caused by micro-organisms • Evaluation of the significance of the contributions made by Pasteur and Koch • Identification of the significance of Pasteur and Koch's work	5–6
Includes some of the following • Brief outline of the work of Pasteur and Koch, our present understanding of disease caused by micro-organisms and current strategies for the prevention of diseases caused by micro-organisms • Evaluation of the significance of the contributions made by Pasteur and Koch • Identification of the significance of Pasteur and Koch's work	3–4
• Outlines some information relevant to Pasteur or Koch's work	1–2

Section II

Question 28 — Communication

Question 28 (a) (i)

Outcomes assessed:H6

MARKING GUIDELINES

Criteria	Marks
• Correct function outlined	1

Question 28 (a) (ii)

Outcomes assessed:H6, H14

MARKING GUIDELINES

Criteria	Marks
• Relationship between all THREE factors stated	2
• Relationship between any TWO factors stated	1

Question 28 (a) (iii)

Outcomes assessed:H6, H13

MARKING GUIDELINES

Criteria	Marks
• Describes similarities or differences between TWO named structures	2
• TWO structures named and described	1

Question 28 (b) (i)

Outcomes assessed:H6, H13, H14

MARKING GUIDELINES

Criteria	Marks
• Describes structural features of each of the brain regions	3
• Describes structural features of 2 of the 3 brain regions	2
• Describes structural features of 1 of the 3 brain regions	1

Question 28 (b) (ii)

Outcomes assessed:H6, H8, H13

MARKING GUIDELINES

Criteria	Marks
• Recognisable and anatomically correct sketch of the brain with at least TWO speech areas of brain correctly located and labelled	3
• Recognisable and anatomically correct sketch of brain with ONE speech area correctly located and labelled	2
• Recognisable sketch of brain with speech area labelled in cerebrum	1

Question 28 (c) (i)

Outcomes assessed:H12, H13

MARKING GUIDELINES

Criteria	Marks
• Appropriate graph, plotted correctly with axes labelled including units and title for graph	3–4
• Graph plotted with some plotting errors or missing axis labels or title missing	1–2

Question 28 (c) (ii)

Outcomes assessed: H14

MARKING GUIDELINES

Criteria	Marks
• Correct relationship identified	1

Question 28 (c) (iii)

Outcomes assessed: H6, H14

MARKING GUIDELINES

Criteria	Marks
• Detailed explanation of how the lens of the human eye can change shape to focus on objects at different distances	2
• Brief outline of how the lens of a human eye changes, to focus on different objects at different distances	1

Question 28 (d)

Outcomes assessed: H6, H13

MARKING GUIDELINES

Criteria	Marks
• Energy transformation in the retina described, all associated structures and processes identified	6–7
• Structure and functions of photo-receptor cells described, attempt made at describing what is involved in the energy transformation	4–5
• Photo-receptor cells named and described in terms of structure or function or role of rhodopsin identified	2–3
• Photo-receptor cells in the retina named	1

Section II

Question 29 — Biotechnology

Question 29 (a) (i)

Outcomes assessed: H6, H9

MARKING GUIDELINES

Criteria	Marks
• States one difference between DNA and RNA	1

Question 29 (a) (ii) 1

Outcomes assessed: H3, H6

MARKING GUIDELINES

Criteria	Marks
• States one use of PCR	1

Question 29 (a) (ii) 2

Outcomes assessed: H3, H6, H12, H14

MARKING GUIDELINES

Criteria	Marks
• Correct statements for each of the three steps of PCR	3
• Two correct statements	2
• One correct statement	1

Question 29 (b) (i)

Outcomes assessed: H6, H11, H12, H14

MARKING GUIDELINES

Criteria	Marks
• Detailed method including variables, repetition, controls and data to be collected on enzyme rate (must include all elements of first-hand investigation)	3–4
• Brief or incomplete description includes some elements of a first-hand investigation	1–2

Question 29 (b) (ii)

Outcomes assessed: H6, H11, H12, H14

MARKING GUIDELINES

Criteria	Marks
• Two variables identified	2
• One variable identified	1

Question 29 (c) (i)

Outcomes assessed: H12, H13

MARKING GUIDELINES

Criteria	Marks
• Appropriate graph, plotted correctly with axes labelled including units and title for graph	3–4
• Graph plotted with some plotting errors or missing axis labels or title missing	1–2

Question 29 (c) (ii)

Outcomes assessed: H14

MARKING GUIDELINES

Criteria	Marks
• Correct comparison of the yeasts with reference to alcohol production	1

Question 29 (c) (iii)

Outcomes assessed: H4, H8, H14

MARKING GUIDELINES

Criteria	Marks
• A process that could produce strain *B* identified and described	2
• Process named but description incomplete	1

Question 29 (d)

Outcomes assessed: H3, H4, H6, H8, H13, H14

MARKING GUIDELINES

Criteria	Marks
• Identifies one application of biotechnology. Provides detailed features of the steps involved in the process and links the outcome(s) to the process	6–7
• Provides details about a biotechnology application, describes related processes and identifies outcome(s) of the process	4–5
• Names one biotechnology application and outlines the process involved • Identifies an outcome of the process	2–3
• Names one biotechnology application and outlines the process involved or an outcome	1

Section II

Question 30 — Genetics – The Code Broken?

Question 30 (a) (i)

Outcomes assessed: H6

MARKING GUIDELINES

Criteria	Marks
• One relevant difference stated	1

Question 30 (a) (ii)

Outcomes assessed: H9

MARKING GUIDELINES

Criteria	Marks
• Correct definition provided	1

Question 30 (a) (iii)

Outcomes assessed: H9, H13

MARKING GUIDELINES

Criteria	Marks
• Correct explanation of mapping process	3
• Some relationship between linkage maps and chromosomes developed	2
• Recombinant frequencies mentioned in simple terms	1

Question 30 (b) (i)

Outcomes assessed: H9, H11, H13

MARKING GUIDELINES

Criteria	Marks
• Detailed description of model with molecular components correctly identified	3
• Description of model incomplete or with some aspects of molecular components absent or oversimplified	1–2

Question 30 (b) (ii)

Outcomes assessed: H11, H12, H14

MARKING GUIDELINES

Criteria	Marks
• All components of model justified with reference to DNA structure	3
• Low level justification for design and structure of model	1–2

Question 30 (c) (i)

Outcomes assessed: H12, H13

MARKING GUIDELINES

Criteria	Marks
• Appropriate graph, plotted correctly with axes labelled including units and title for graph	3–4
• Graph plotted with some plotting errors or missing axis labels or title missing	1–2

Question 30 (c) (ii)

Outcomes assessed: H9

MARKING GUIDELINES

Criteria	Marks
• Process correctly defined	1

Question 30 (c) (iii)

Outcomes assessed: H9, H14

MARKING GUIDELINES

Criteria	Marks
• Correct comparison provided	2
• Correct description of one or both processes but no comparison provided	1

Question 30 (d)

Outcomes assessed: H3, H5, H6, H7, H8, H9, H13

MARKING GUIDELINES

Criteria	Marks
• Fully distinguishes between selective breeding and gene cloning • Explains how both processes affect the genetic nature of the species • Describes at least TWO relevant examples	6–7
• Describes selective breeding and gene cloning • Explains the change in species caused by the processes • Describes at least ONE correct example of selective breeding and gene cloning	4–5
• Describes selective breeding or gene cloning • Identifies correct examples of selective breeding and/or gene cloning • Explains the change in species caused by the process that is correctly described	2–3
• Identifies an example of selective breeding and/or gene cloning OR • Defines selective breeding OR • Defines gene cloning	1

Section II

Question 31 — The Human Story

Question 31 (a) (i)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• One hominid fossil named	1

Question 31 (a) (ii)

Outcomes assessed: H10, H13

MARKING GUIDELINES

Criteria	Marks
• Two correct distinguishing structural features for classification as a primate described	2
• One correct distinguishing structural feature for classification as primate described	1

Question 31 (a) (iii)

Outcomes assessed: H10, H13, H14

MARKING GUIDELINES

Criteria	Marks
• Correct comparison of named structural feature in human and ape	2
• Correct description of named structural feature in human and ape	1

Question 31 (b) (i)

Outcomes assessed: H1, H10, H13, H14

MARKING GUIDELINES

Criteria	Marks
• Major discovery named and described • Name of scientist correctly linked with discovery	3
• Major discovery named but incompletely described • Name of scientist not correctly linked to discovery	1–2

Question 31 (b) (ii)

Outcomes assessed: H1, H2, H10, H13, H14

MARKING GUIDELINES

Criteria	Marks
• Links discovery to a well described change in thinking about hominid evolution	3
• Discovery described but links to understanding of hominid evolution may be unclear	1–2

Question 31 (c) (i)

Outcomes assessed: H12, H13

MARKING GUIDELINES

Criteria	Marks
• Appropriate graph, plotted correctly with axes labelled including units and title for graph	3–4
• Graph plotted with some plotting errors or missing axis labels or title missing	1–2

Question 31 (c) (ii)

Outcomes assessed: H14

MARKING GUIDELINES

Criteria	Marks
• Age of fossil estimated correctly	1

Question 31 (c) (iii)

Outcomes assessed: H1, H2, H11, H13, H14

MARKING GUIDELINES

Criteria	Marks
• Explains half-life limitation of C^{14} • Link to age of most hominid fossils	2
• Explains half-life limitation of C^{14} OR • States age of hominid fossils	1

Question 31 (d)

Outcomes assessed: H1, H7, H8, H10, H13, H14

MARKING GUIDELINES

Criteria	Marks
• Discusses the complexity of human cultural development by describing and/or explaining examples of cultural development and comparing these examples with other primates	6–7
• Defines cultural development • Describes examples of cultural development • Compares humans with other primates	4–5
• Describes at least one example of cultural development • Identifies at least one comparison with primates	2–3
• Lists examples of cultural development OR • Gives some correct information about human cultural development	1

Section II

Question 32 — Biochemistry

Question 32 (a) (i)

Outcomes assessed: H3

MARKING GUIDELINES

Criteria	Marks
• Correct definition of half-life of an isotope	1

Question 32 (a) (ii)

Outcomes assessed: H1, H3

MARKING GUIDELINES

Criteria	Marks
• One use of radioisotopes in biochemistry correctly described	1

Question 32 (a) (iii)

Outcomes assessed: H1, H2

MARKING GUIDELINES

Criteria	Marks
• Correct outline of the evidence provided by Hill, Scarisbruck and Ruben, and the understanding that resulted	3
• Correct outline of evidence provided by Hill, Scarisbruck or Ruben	1–2

Question 32 (b) (i)

Outcomes assessed: H6, H11, H12, H14

MARKING GUIDELINES

Criteria	Marks
• Investigation must relate to scientist selected • Detailed method including variables, repetition, controls and collection of data (must include all elements of first-hand investigation)	3–4
• Brief or incomplete description includes some elements of a relevant first–hand investigation	1–2

Question 32 (b) (ii)

Outcomes assessed: H6, H11, H12, H14

MARKING GUIDELINES

Criteria	Marks
• Two variables identified	2
• One variable identified	1

Question 32 (c) (i)

Outcomes assessed: H12, H13

MARKING GUIDELINES

Criteria	Marks
• Appropriate graph, plotted correctly with axes labelled including units and title for graph	3–4
• Graph plotted with some plotting errors, or missing axis labels, or title missing	1–2

Question 32 (c) (ii)

Outcomes assessed: H12, H14

MARKING GUIDELINES

Criteria	Marks
• Correct rate of photosynthesis predicted	1

Question 32 (c) (iii)

Outcomes assessed: H12, H13, H14

MARKING GUIDELINES

Criteria	Marks
• Correct explanation	2
• Partial explanation or description provided	1

Question 32 (d)

Outcomes assessed: H1, H3, H5, H6, H13

MARKING GUIDELINES

Criteria	Marks
• Relates specific examples of photosynthesis research to identified links between ATP production and photosynthesis Includes: – identification of role of ATP – discovery of ATP synthesis – role of photosynthesis in ATP production	6–7
• Describes at least ONE important factor that identifies relationship between ATP production and photosynthesis • Describes at least ONE example of photosynthesis research that is related to ATP production	4–5
• Describes at least ONE example of photosynthesis research • Identifies/describes the role of ATP OR • Describes at least ONE important factor that identifies the relationship between ATP production and photosynthesis	2–3
• Describes at least ONE example of photosynthesis research OR • Identifies/describes the role of ATP	1