



BOARD OF STUDIES
NEW SOUTH WALES

2012 HSC Biology Marking Guidelines

Section I, Part A

Multiple-choice Answer Key

Question	Answer
1	B
2	C
3	A
4	C
5	A
6	C
7	B
8	B
9	B
10	D
11	C
12	C
13	D
14	A
15	A
16	D
17	D
18	B
19	C
20	B

Section I, Part B

Question 21 (a)

Criteria	Marks
<ul style="list-style-type: none">Identifies that cells are viewed by a microscope or equivalent AND <ul style="list-style-type: none">Correctly states a mechanism or piece of equipment for measuring size of cells	2
<ul style="list-style-type: none">One of the above	1

Question 21 (b)

Criteria	Marks
<ul style="list-style-type: none">Correctly draws the cells at the right relative scales and appropriate detail and has a correct scale as part of the drawing	3
<ul style="list-style-type: none">Draws the cells identifiable as the appropriate types OR <ul style="list-style-type: none">Draws one of the cells that is identifiable and includes a correct scale	2
<ul style="list-style-type: none">Draws a cell of an identifiable type OR <ul style="list-style-type: none">Gives correct information about the size of blood cells	1

Question 22 (a)

Criteria	Marks
<ul style="list-style-type: none">Constructs a table that includes ALL of the following: headings, units and ordered data	2
<ul style="list-style-type: none">Constructs a table that includes TWO of the following: headings, units and ordered data	1

Question 22 (b)

Criteria	Marks
<ul style="list-style-type: none">Includes ALL of the following: X-axis correctly labelled; scaled (linear); points plotted correctly from data table; curve of best fit correct	3
<ul style="list-style-type: none">Includes any THREE of the above	2
<ul style="list-style-type: none">Includes any ONE of the above	1

Question 22 (c)

Criteria	Marks
• States that the independent variable is continuous, and not linear	2
• States ONE of the above	1

Question 23 (a)

Criteria	Marks
• Provides any relevant data	1

Question 23 (b) (i)

Criteria	Marks
• Constructs an appropriate pedigree using accepted symbols	2
• Constructs an appropriate pedigree without accepted symbols OR • Constructs a pedigree with some correct information	1

Question 23 (b) (ii)

Criteria	Marks
• Provides ONE piece of evidence that indicates why the gene is recessive AND • Provides ONE piece of evidence that indicates why the gene cannot be sex linked	2
• Provides ONE of the above or does not link the correct answer with the condition (recessive or sex linked)	1

Question 24 (a)

Criteria	Marks
• Correctly identifies the independent and dependent variables	1

Question 24 (b)

Criteria	Marks
<ul style="list-style-type: none"> Correctly identifies a named enzyme and describes how its activity is measured 	2
<ul style="list-style-type: none"> Names an enzyme OR <ul style="list-style-type: none"> Explains in general terms how the activity of an enzyme might be measured 	1

Question 24 (c)

Criteria	Marks
<ul style="list-style-type: none"> Demonstrates a difference in enzyme activity between endotherms and ectotherms 	2
<ul style="list-style-type: none"> Identifies one difference between ectotherms and endotherms 	1

Question 25 (a)

Criteria	Marks
<ul style="list-style-type: none"> Identifies a link between X-rays and mutation Identifies the result and links it to a gene mutation Identifies the gene mutation as being related to arginine synthesis Correctly links these ideas to the ‘one gene–one protein’ hypothesis 	4
<ul style="list-style-type: none"> Any THREE of the FOUR above 	3
<ul style="list-style-type: none"> Any TWO of the FOUR above 	2
<ul style="list-style-type: none"> Any ONE of the FOUR above OR <ul style="list-style-type: none"> Provides some information about the ‘one gene–one protein’ hypothesis. 	1

Question 25 (b)

Criteria	Marks
<ul style="list-style-type: none"> Gives reasons for the appropriateness of TWO or more secondary sources 	2
<ul style="list-style-type: none"> Names TWO appropriate secondary sources OR <ul style="list-style-type: none"> Names ONE source with relevant reason 	1

Question 26

Criteria	Marks
<ul style="list-style-type: none">Analyses the methodology of epidemiologyIdentifies strengths and/or weaknesses in each part of the study from the information provided	5
<ul style="list-style-type: none">Analyses the methodology of epidemiologyIdentifies strengths and/or weaknesses in most but not all parts of the study (does not address all points of the study) from the information provided	4
<ul style="list-style-type: none">Demonstrates a basic knowledge of the methodology of epidemiologyIdentifies strengths or weaknesses in some parts of the study OR identifies strengths and weaknesses in one part of the study	3
<ul style="list-style-type: none">Recalls a feature of epidemiologyIdentifies a weakness or a strength of the method	2
<ul style="list-style-type: none">Identifies a feature of epidemiology OR <ul style="list-style-type: none">Identifies a weakness or a strength of the method	1

Question 27

Criteria	Marks
<ul style="list-style-type: none">Supports at least TWO strategies with an argument for each	4
<ul style="list-style-type: none">Identifies TWO appropriate strategies with one supporting reason	3
<ul style="list-style-type: none">Identifies TWO appropriate strategies with no supporting reasons OR <ul style="list-style-type: none">Supports at least ONE strategy with an argument	2
<ul style="list-style-type: none">Identifies ONE appropriate strategy with no supporting reason	1

Question 28

Criteria	Marks
<ul style="list-style-type: none"> • Demonstrates an understanding of the biological concepts that link DNA replication to sexual and asexual reproduction • Links changes to DNA during DNA replication to the generation of variants in a species • Relates new variants which arise to changes in gene frequencies of a population as a result of natural selection • Identifies the above as evolution 	4–5
<ul style="list-style-type: none"> • Demonstrates an understanding of the biological concepts that link DNA replication to sexual or asexual reproduction • Links changes to DNA during DNA replication to the generation of variants in a species • Identifies that variation in the population will result in changes in the species due to natural selection 	3
<ul style="list-style-type: none"> • Demonstrates an understanding of the biological concepts that link DNA replication to sexual or asexual reproduction AND <ul style="list-style-type: none"> • Links changes to DNA during DNA replication to the generation of variants in a species OR identifies that variation in the population will result in changes in the species due to natural selection 	2
<ul style="list-style-type: none"> • Provides some relevant information about DNA replication OR <ul style="list-style-type: none"> • Provides some relevant information about evolution 	1

Question 29 (a)

Criteria	Marks
<ul style="list-style-type: none"> • Diagram 1: tetrad line up correctly, alleles in correct position, homologous chromosomes paired and joined correctly and crossing over has occurred • Diagram 2: haploid, with appropriate chromosomes and alleles in both 	3
<ul style="list-style-type: none"> • Diagram 1 as above OR <ul style="list-style-type: none"> • TWO elements of Diagram 1 and Diagram 2 as above 	2
<ul style="list-style-type: none"> • Provides correct information about ONE element in correct cell 	1

Question 29 (b)

Criteria	Marks
• Demonstrates a sound knowledge of independent assortment during gamete formation and relates to a range of gamete combinations	2
• Provides some information about independent assortment	1

Question 30

Criteria	Marks
<ul style="list-style-type: none"> • Communicates succinctly, logically and sequentially using precise biological terms • Provides a detailed knowledge and understanding of biological methodology and concepts and is able to adequately link these to the nature and prevention of disease • Identifies biological research relationships between the named scientists • Provides a clear understanding of the historical development of biological concepts and their applications and implications for society and the environment. • Provides an understanding of valid experimental processes or appropriate technologies for developing biological ideas and their application to society 	7–8
<ul style="list-style-type: none"> • Communicates effectively using biological terms • Provides some knowledge and understanding of biological methodology and concepts and is able to adequately link some of these to the nature and prevention of disease • Provides an understanding of some historical developments of biological concepts and their applications and implications for society and the environment <p>AND</p> <ul style="list-style-type: none"> • Identifies biological research relationships between the named scientists OR links experimental processes and appropriate technologies to their application to society as related to the topic. 	5–6
<ul style="list-style-type: none"> • Communicates using clear written expression • Provides knowledge and understanding of some biological methodology and concepts and is able to show some linkage between them • Provides some understanding of historical developments of biological concepts <p>AND</p> <ul style="list-style-type: none"> • Identifies biological relationships between the named scientists OR identifies a named scientist and shows how their findings have assisted our understanding of the nature and prevention of disease OR links experimental processes and appropriate technologies to their application to society as related to the topic 	3–4
<ul style="list-style-type: none"> • Provides a limited understanding and knowledge of the topic areas 	2
<ul style="list-style-type: none"> • Provides some relevant information 	1

Question 31 (a) (i)

Criteria	Marks
• All THREE structures correctly named	2
• Names at least ONE structure correctly	1

Question 31 (a) (ii)

Criteria	Marks
• Clearly indicates the functions of the identified structure	2
• Provides some information about the function of the identified structure	1

Question 31 (b) (i)

Criteria	Marks
• Corresponds THREE ocular structures with the experimental apparatus	2
• Corresponds at least ONE ocular structure with the experimental apparatus	1

Question 31 (b) (ii)

Criteria	Marks
• Provides the characteristics of the ‘quantitative data’	2
• Provides some information about the ‘quantitative data’	1

Question 31 (b) (iii)

Criteria	Marks
• Shows similarities and/or differences between the model and the eye	2
• Shows a similarity or a difference between the model and the eye	1

Question 31 (c) (i)

Criteria	Marks
Outlines features of the eyes of TWO animals and relates features to their environment	2
Outlines features of the eyes for TWO animals OR Outlines features of the eyes for ONE animal or relates features to their environment	1

Question 31 (c) (ii)

Criteria	Marks
<ul style="list-style-type: none"> For both fish and insects identifies the structures for detecting vibration and includes their location, nature and gives some examples Outlines the process from detection of vibration to response Provides some information about frequencies and identification of the source of the sound 	4-5
<ul style="list-style-type: none"> Provides some information about structures for detecting vibration in insects and fish Outlines the process from detection of vibration to response OR provides some information about frequencies and identification of the source of the sound 	3
<ul style="list-style-type: none"> Provides some information about structures for detecting vibration in insects or fish Outlines the process from detection of vibration to response or provides some information about frequencies and identification of the source of the sound OR <ul style="list-style-type: none"> Provides some information about structures for detecting vibration in insects and fish OR <ul style="list-style-type: none"> Outlines the process from detection of vibration to response and provides some information about frequencies and identification of the source of the sound 	2
<ul style="list-style-type: none"> Provides some relevant information about detection OR processing of vibrations in insects or fish 	1

Question 31 (d)

Criteria	Marks
<ul style="list-style-type: none"> Shows in detail a range of biological problems associated with communication and links these to technological measures that have been used to correct them Identifies different strategies for correcting the problems Articulates ideas in a coherent and logical manner and includes the correct use of scientific principles and ideas 	7–8
<ul style="list-style-type: none"> Shows some biological problems associated with communication and links these to technological measures that have been used to correct them Identifies different strategies for correcting some of these Articulates ideas in a coherent and logical manner and includes the correct use of scientific principles and ideas 	5–6
<ul style="list-style-type: none"> Shows a biological problem associated with each of two modalities of communication and identifies a technological measure to correct each of them OR <ul style="list-style-type: none"> Shows a biological problem associated with a modality of communication and identifies technological measures and a strategy to correct it 	3–4
<ul style="list-style-type: none"> Shows a biological problem associated with communication and outlines a technological measure to correct it OR <ul style="list-style-type: none"> Identifies technological measures for correcting communication problems but does not link them to the biological problem 	2
<ul style="list-style-type: none"> Provides some information relevant to human communication or its treatment 	1

Question 32 (a)

Criteria	Marks
<ul style="list-style-type: none"> Identifies two biotechnological practices that use yeast, the chemicals produced and their purpose 	4
<ul style="list-style-type: none"> Identifies two biotechnological practices that use yeast, includes product and purpose for one and product or purpose for the other 	3
<ul style="list-style-type: none"> Identifies the product and purpose of one named biotechnological practice that uses yeast OR <ul style="list-style-type: none"> Identifies two different biotechnological practices that use yeast 	2
<ul style="list-style-type: none"> Identifies some information about a biotechnological practice, product or purpose for the use of yeast 	1

Question 32 (b) (i)

Criteria	Marks
• Clearly provides the relationship between a transgenic organism and its purpose	3
• Names a transgenic organism and its purpose	2
• Provides some information about a transgenic organism	1

Question 32 (b) (ii)

Criteria	Marks
• Diagram shows a detailed description of the major steps required to produce a named transgenic species	3
• Conveys an adequate description of the major steps required to produce a named transgenic species	2
• Provides information about producing a transgenic species	1

Question 32 (c) (i)

Criteria	Marks
• Relates manipulation of the environment and/or the species to provide a product for humans	2
• Defines biotechnology OR • Provides some information about aquaculture	1

Question 32 (c) (ii)

Criteria	Marks
<ul style="list-style-type: none">• For aquaculture and traditional agriculture, identifies key features for both that are common and/or different• Provides specific examples that highlight the biotechnologies being used.	4-5
<ul style="list-style-type: none">• Provides some information about features that are common and/or different in both aquaculture and traditional agriculture• Gives an example of a biotechnology being used	3
<ul style="list-style-type: none">• Provides some information about aquaculture or traditional agriculture and gives an example of a biotechnology being used <p>OR</p> <ul style="list-style-type: none">• Provides some information about aquaculture and traditional agriculture	2
<ul style="list-style-type: none">• Provides some relevant information about aquaculture or traditional agriculture	1

Question 32 (d)

Criteria	Marks
<ul style="list-style-type: none"> Clearly identifies components of early biotechnology and relates how knowledge of cell biochemistry has implications for specific targeting of biotechnology in the modern context Relates an extensive and detailed understanding of cellular biochemical processes to the development of several named biotechnological processes Relates the implications of specific biochemical processes to the development of specific biotechnological products Articulates ideas in a coherent and logical manner and includes the correct use of scientific principles and ideas 	7–8
<ul style="list-style-type: none"> Identifies at least ONE component of early biotechnology and shows how knowledge of cell biochemistry has changed biotechnology Relates in general terms the understanding of cellular biochemistry to the development of modern biotechnology processes OR <ul style="list-style-type: none"> Provides an extensive understanding of cellular biochemical processes and relates them to several named biotechnological processes 	5–6
<ul style="list-style-type: none"> Identifies a component of early biotechnology Relates a biochemical process to a modern biotechnology OR <ul style="list-style-type: none"> Relates in general terms an understanding of cellular biochemical processes to modern biotechnology processes 	3–4
<ul style="list-style-type: none"> Provides some relevant information about cell biochemistry and a biotechnology 	2
<ul style="list-style-type: none"> Provides some relevant information that identifies a link between cell biochemistry or biotechnology 	1

Question 33 (a)

Criteria	Marks
<ul style="list-style-type: none"> Identifies processes used and specific examples for TWO types of cloning 	4
<ul style="list-style-type: none"> Identifies two named cloning processes, includes process used and specific example for one type of cloning and process or specific example for the second type 	3
<ul style="list-style-type: none"> Identifies a cloning process and example of ONE named type of cloning OR <ul style="list-style-type: none"> Partially describes two named types of cloning 	2
<ul style="list-style-type: none"> Identifies TWO of: a type of cloning, purpose or example 	1

Question 33 (b) (i)

Criteria	Marks
<ul style="list-style-type: none"> Provides the main features of DNA structure Provides a key for the model 	3
<ul style="list-style-type: none"> Provides some features of DNA structure Provides a key for the model 	2
<ul style="list-style-type: none"> Provides some information about DNA structure OR <ul style="list-style-type: none"> Provides a key 	1

Question 33 (b) (ii)

Criteria	Marks
<ul style="list-style-type: none"> Indicates main features of the process and communicates it succinctly and logically 	3
<ul style="list-style-type: none"> Indicates main features of the process 	2
<ul style="list-style-type: none"> Provides some information about the process 	1

Question 33 (c) (i)

Criteria	Marks
<ul style="list-style-type: none"> Lists at least two main features of the HGP 	2
<ul style="list-style-type: none"> Lists one feature of the HGP 	1

Question 33 (c) (ii)

Criteria	Marks
<ul style="list-style-type: none"> Provides a good understanding of recombinant DNA technologies Identifies the need for a probe Identifies the labelling of the probe as a necessity Identifies that the sequence of the gene of interest must exist on an intact chromosome 	4–5
<ul style="list-style-type: none"> Identifies the need for a probe AND the necessity of a labelling method OR <ul style="list-style-type: none"> Provides a list of techniques that can be used but does not link 	2–3
<ul style="list-style-type: none"> Provides some information on recombinant DNA technologies that can be used 	1

Question 33 (d)

Criteria	Marks
<ul style="list-style-type: none"> • Provides an in-depth understanding of germ line mutation and reasons for its impact on whole organism phenotypes <ul style="list-style-type: none"> – transmitted to offspring – all cells of offspring contain mutation • Provides an in-depth understanding of transposons in their disruption of genes in genomes <ul style="list-style-type: none"> – insertion destroys gene – replication and relocation increases effect – chromosome elongation can disrupt cell division • Articulates in a coherent and logical manner and includes the correct use of scientific principles and ideas 	7–8
<ul style="list-style-type: none"> • Provides some understanding of germ line mutation and reasons for its impact on whole organisms • Provides some understanding of transposons in their disruption of genes in genomes • Articulates in a coherent and logical manner and includes the correct use of scientific principles and ideas 	5–6
<ul style="list-style-type: none"> • Provides some knowledge of mutation in general terms and its potential to affect whole organisms OR <ul style="list-style-type: none"> • Provides some understanding of germ line mutation and reasons for its impact on whole organisms OR <ul style="list-style-type: none"> • Provides some understanding of transposons in their disruption of genes in genomes 	3–4
<ul style="list-style-type: none"> • Provides some knowledge of mutations in general terms OR <ul style="list-style-type: none"> • Provides some relevant information on germ line mutations OR <ul style="list-style-type: none"> • Provides some relevant information on transposons 	1–2

Question 34 (a) (i)

Criteria	Marks
<ul style="list-style-type: none"> • Provides TWO unique skeletal features 	2
<ul style="list-style-type: none"> • Provides ONE unique skeletal feature 	1

Question 34 (a) (ii)

Criteria	Marks
<ul style="list-style-type: none"> Provides one named non-skeletal feature and its associated correct evolution advantage 	2
<ul style="list-style-type: none"> Provides some information about a non-skeletal feature 	1

Question 34 (b) (i)

Criteria	Marks
<ul style="list-style-type: none"> Comparatively describes the data from 2008 Relates cause and effect for TWO relevant conclusions drawn from the data about m-DNA 	3
<ul style="list-style-type: none"> Comparatively describes the data from 2008 Relates cause and effect for ONE relevant conclusion drawn from the data about m-DNA 	2
<ul style="list-style-type: none"> Describes the data from 2008 OR <ul style="list-style-type: none"> Relates cause and effect for ONE relevant conclusion drawn from the data about m-DNA 	1

Question 34 (b) (ii)

Criteria	Marks
<ul style="list-style-type: none"> Comparatively describes the data from 2010 Relates cause and effect for TWO relevant conclusions drawn from the data about migration and breeding 	3
<ul style="list-style-type: none"> Comparatively describes the data from 2010 Relates cause and effect for ONE relevant conclusion drawn from the data about migration and breeding 	2
<ul style="list-style-type: none"> Describes the data from 2010 OR <ul style="list-style-type: none"> Relates cause and effect for ONE relevant conclusion drawn from the data about migration and breeding 	1

Question 34 (c)

Criteria	Marks
<ul style="list-style-type: none"> Provides a clear distinction between polymorphism and clinal gradation as they relate to populations Identifies the events that lead to polymorphism and clinal gradation and links to phenotype survival Includes at least one human phenotype as an example 	6–7
<ul style="list-style-type: none"> Provides an understanding of the differences between polymorphism and clinal gradation Includes at least one human phenotype as an example OR <ul style="list-style-type: none"> Identifies the events that lead to polymorphism and clinal gradation Includes at least one human phenotype as an example 	4–5
<ul style="list-style-type: none"> Provides an understanding of polymorphism or clinal gradation Includes a human example OR <ul style="list-style-type: none"> Identifies the events that lead to polymorphism or clinal gradation Includes a human example 	2–3
<ul style="list-style-type: none"> Provides some statement relevant to polymorphism or clinal gradation 	1

Question 34 (d) (i)

Criteria	Marks
<ul style="list-style-type: none"> Names TWO hominids and links correct fossil evidence to technology and cultural development 	2
<ul style="list-style-type: none"> Names TWO fossil hominids and links to correct fossil evidence OR <ul style="list-style-type: none"> Names ONE fossil hominid and links correct fossil evidence to technology and cultural development 	1

Question 34 (d) (ii)

Criteria	Marks
<ul style="list-style-type: none"> Communicates understanding of biological evolution Identifies at least TWO relevant technologies developed by modern humans Relates in detail the possible effect of the use of each technology on human biological evolution Articulates ideas in a coherent and logical manner and includes the correct use of scientific principles and ideas 	5–6
<ul style="list-style-type: none"> Communicates understanding of biological evolution Identifies at least ONE relevant technology developed by modern humans Relates in detail the possible effect of the use of ONE technology on human biological evolution OR <ul style="list-style-type: none"> Identifies at least TWO relevant technologies developed by modern humans Relates the possible effect of the use of each technology on human biological evolution 	3–4
<ul style="list-style-type: none"> Identifies at least ONE relevant technology developed by modern humans Relates the possible effect of use of ONE technology on human biological evolution 	2
<ul style="list-style-type: none"> Provides some information about a relevant technology used by modern humans 	1

Question 35 (a) (i)

Criteria	Marks
<ul style="list-style-type: none"> Identifies a product of photosynthesis and its related source 	2
<ul style="list-style-type: none"> Identifies either a product of photosynthesis OR source of photosynthesis 	1

Question 35 (a) (ii)

Criteria	Marks
<ul style="list-style-type: none"> Identifies TWO non-renewable resources and links their replacement with photosynthesis 	2
<ul style="list-style-type: none"> Identifies ONE non-renewable resource and links its replacement with photosynthesis OR <ul style="list-style-type: none"> Identifies TWO non-renewable resources but does not relate to photosynthesis 	1

Question 35 (b) (i)

Criteria	Marks
• Diagram provides a detailed description of the experimental set-up	2
• Diagram conveys an adequate description of the experimental set-up	1

Question 35 (b) (ii)

Criteria	Marks
• Identifies that volume of gas is measured and relates it to a variable	2
• Identifies that a gas is being measured	1

Question 35 (b) (iii)

Criteria	Marks
• Identifies how the model could be changed to vary carbon dioxide and keep the light levels constant	2
• Identifies how carbon dioxide levels could be changed	1

Question 35 (c) (i)

Criteria	Marks
• Relates the diagram to the storage and release of energy in a biological context	2
• Gives a biological function of ATP OR	1
• Relates the diagram to the storage and release of energy	

Question 35 (c) (ii)

Criteria	Marks
<ul style="list-style-type: none"> Provides extensive and detailed knowledge and superior understanding of the series of steps associated with photosynthesis that lead to the production of energy stores 	5
<ul style="list-style-type: none"> Provides extensive knowledge and understanding of the series of steps associated with photosynthesis that lead to the production of energy stores 	4
<ul style="list-style-type: none"> Provides some knowledge of the series of steps associated with photosynthesis OR <ul style="list-style-type: none"> Provides some knowledge about the production of ATP OR <ul style="list-style-type: none"> Provides some knowledge about the production of NADPH 	2–3
<ul style="list-style-type: none"> Provides some statement relevant to the light-dependent reaction pathway 	1

Question 35 (d)

Criteria	Marks
<ul style="list-style-type: none"> Provides extensive knowledge of the historical development of biochemical pathway investigation Includes names of specific scientists and describes what they did Provides knowledge of different radioisotopes and their half-lives and is able to relate this to use in biochemical pathway tracing. Articulates ideas in a coherent and logical manner and includes the correct use of scientific principles and ideas 	7–8
<ul style="list-style-type: none"> Provides some knowledge of the historical development of pathway investigation Includes names of specific scientists and describes what they did Provides knowledge of a radioisotope and how it could be used in biochemical pathway tracing Articulates ideas in a coherent and logical manner and includes the correct use of scientific principles and ideas 	5–6
<ul style="list-style-type: none"> Provides some knowledge of the historical development of pathway investigation Includes the name of a specific scientist and describes what he/she did Provides knowledge of a radioisotope 	3–4
<ul style="list-style-type: none"> Shows some understanding of the historical development of the understanding of photosynthesis 	2
<ul style="list-style-type: none"> Provides some statement relevant to radioisotopes 	1

Biology

2012 HSC Examination Mapping Grid

Question	Marks	Content	Syllabus outcomes
Section I Part A			
1	1	9.3.5.2.2, 9.3.4.2.2, 9.3.5.3.3.2	H3, H7, H9
2	1	9.3.1.2.2, 9.3.1.2.3, 9.1.14.1.a, 9.1.14.1.c	H10, H14
3	1	9.4.4.2.1, 9.4.4.2.4, 9.4.5.2.1	H6
4	1	9.4.3.2.2, 9.1.11.1(c), 9.1.14.1(d)	H6 H14
5	1	9.4.6.2.2,	H6, H9
6	1	9.4.5.2.3	H6
7	1	9.4.3.2.3, 9.4.3.3.4	H4
8	1	9.3.3.2.5, 9.3.3.2.6, 9.3.3.2.9, 9.3.3.3.1, 9.3.3.3.3	H9
9	1	9.2.2.3.6	H6
10	1	9.2.3.2.4, 9.2.3.2.5, 9.1.14.1d, 9.1.14.1f	H6, H14
11	1	9.3.5.2.1, 9.3.5.2.2, 9.3.2.3.3	H9
12	1	9.2.2.2.4, 9.2.3.3.1, 9.2.3.2.6	H6
13	1	9.4.4.2.2, 9.4.4.2.3, 9.4.5.2.1, 9.4.5.2.4	H4, H6
14	1	9.2.3.2.3, 9.2.3.3.4	H6, H7
15	1	9.2.3.2.5, 9.2.3.3.2, 9.2.3.2.7	H6
16	1	9.4.2.3.1, 9.1.11.2b, 9.1.12.4d. 9.1.14.1(a)	H2, H11, H12, H14
17	1	9.3.2.2.5	H6, H9
18	1	9.2.1.2.9, 9.2.1.3.3	H7, H10
19	1	9.2.2.2.1, 9.2.2.2.2, 9.2.2.2.5	H6, H10
20	1	9.3.1.3.1, 9.1.14.1a, 9.1.14.1b, 9.1.14.1f	H10, H14
Section I Part B			
21 (a)	2	9.2.2.3.2, 9.1.11.3.a, 9.1.11.1b, 9.1.13.1e	H6
21 (b)	3	9.2.2.3.2	H6
22 (a)	2	9.1.12.3.c, 9.1.13.1.e, 9.2.2.3.1	H6, H13
22 (b)	3	9.1.13.1.f	H2, H13
22 (c)	2	9.1.13.1.f, 9.1.13.1.g	H13
23 (a)	1	9.4.6.2.2, 9.1.11.1b	H9, H11
23 (b) (i)	2	9.3.2.3.1, 9.1.13.1e	H9, H13
23 (b) (ii)	2	9.3.2.2.6, 9.1.14.1b	H9, H14
24 (a)	1	9.2.1.3.1, 9.1.11.2.a, 9.1.11.2.b	H6, H11
24 (b)	2	9.2.1.3.1, 9.1.11.1b	H6, H11

Question	Marks	Content	Syllabus outcomes
24 (c)	2	9.2.1.2.3, 9.2.1.2.4, 9.2.1.2.7, 9.2.1.2.8	H6
25 (a)	4	9.3.4.2.5, 9.3.4.3.2, 9.3.4.3.3, 9.1.14.1g	H6, H9, H14
25 (b)	2	9.1.12.4d, 9.1.12.4e, 9.1.12.4f	H6, H9, H12
26	5	9.4.6.3.1, 9.4.6.2.1, 9.1.11.1b, 9.1.11.1a	H2, H11
27	4	9.4.7.1, 9.4.7.2.1, 9.4.7.3.2, 9.4.7.3.3, 9.1.14.2b, 9.1.14.2c	H4
28	5	9.3.4.1.1, 9.3.4.2.1, 9.3.4.2.4, 9.3.3.2.5	H9, H10
29 (a)	3	9.3.3.2.5, 9.3.3.3.1, 9.1.13.1.e, 9.1.14.1.1, 9.1.14.1a, 9.1.14.3b	H9, H13, H14
29 (b)	2	9.3.3.2.5, 9.3.3.3.1	H9
30	8	9.4.3.1, 9.4.5.1, 9.4.6.1, 9.4.7.1	H1, H3, H4:
Section II			
Question 31 — Communication			
(a) (i)	2	9.5.6.2.2, 9.1.13.1e	H6, H13
(a) (ii)	2	9.5.6.2.2, 9.5.6.3.1, 9.5.6.2.4	H6
(b) (i)	2	9.5.2.2.1, 9.5.3.2.3, 9.5.3.3.1, 9.5.3.3.2, 9.1.11.3a, 9.1.14.1f	H6, H11, H14
(b) (ii)	2	9.5.2.2.1, 9.5.3.2.3, 9.5.3.2.4, 9.5.3.3.1, 9.5.3.3.2, 9.1.11.1b	H6, H11
(b) (iii)	2	9.5.2.2.1, 9.5.3.2.3, 9.5.3.2.4, 9.5.3.3.1, 9.5.3.3.2, 9.1.14.3c, 9.1.14.1f	H6, H14
(c) (i)	2	9.5.1.1, 9.5.2.2.1, 9.5.4.3.2	H1, H4, H6, H14
(c) (ii)	5	9.5.6.3.2, 9.5.6.2.1, 9.1.14.3b, 9.5.7.1	H1, H4, H6, H14
(d)	8	9.5.3.2.5, 9.5.3.3.3, 9.5.6.3.3, 9.5.7.2.5, 9.5.7.3.2, 9.1.14.1g, 9.1.14.3b, 9.1.14.3d	H2, H4, H14
Section II			
Question 32 — Biotechnology			
(a)	4	9.6.2.2.1, 9.1.13.1.b	H6, H13
(b) (i)	3	9.6.5.3.3	H9
(b) (ii)	3	9.6.5.3.3, 9.1.13.1.e, 9.6.5.3.2	H9, H13
(c) (i)	2	9.6, 9.6.6.3.1	H2, H4, H6
(c) (ii)	5	9.6.1, 9.6.6.2.4, 9.6.6.3.1	H2, H4, H6
(d)	8	9.1.14.3, 9.6.1, 9.6.2, 9.6.3, 9.6.4, 9.6.5, 9.6.6	H1, H2, H3, H4, H14

Section II			
Question 33 — Genetics: The Code Broken?			
(a)	4	9.7.7.2.2, 9.7.7.2.3, 9.7.7.3.2, 9.1.12.3c	H 9, H12
(b) (i)	3	9.7.1.3.1 9.1.14.1f	H2, H14
(b) (ii)	3	9.7.1.2.1, 9.7.1.3.2	H9
(c) (i)	2	9.7.4.1, 9.7.4.2.1, 9.7.4.2.2, 9.7.4.3.1	H1, H3
(c) (ii)	5	9.7.3.2.4, 9.7.4.3.1, 9.7.4.2.4	H1, H3
(d)	8	9.7.6.2.3, 9.7.6.2.1, 9.7.7.3.1	H4
Section II			
Question 34 — The Human Story			
(a) (i)	2	9.8.1.2.5, 9.8.1.2.6	H10
(a) (ii)	2	9.8.5.3.1	H10
(b) (i)	3	9.8.2.3.3 9.1.14.1.b, 9.1.14.1.c, 9.1.14.1.d	H6, H10, H14
(b) (ii)	3	9.8.3.2.2, 9.8.3.3.3, 9.8.5.3.1, 9.1.14.1b, 9.1.14.1.c, 9.1.14.1.d	H6, H10, H14
(c)	7	9.8.4.2.2, 9.8.4.3.1, 9.8.4.2.1	H2, H10
(d) (i)	2	9.8.5, 9.8.3.2.1, 9.8.3.2.2, 9.8.3.3.1	H4, H10
(d) (ii)	6	9.8.6, 9.8.6.2.1, 9.8.6.3.2	H4, H10
Section II			
Question 35 — Biochemistry			
(a) (i)	2	9.9.1.3.1	H6
(a) (ii)	2	9.9.1.2.1, 9.9.1.3.2	H5
(b) (i)	2	9.9.3.3.1, 9.1.11.3a 9.1.13.1.e	H2, H6, H11, H13
(b) (ii)	2	9.9.3.3.1, 9.1.11.1b	H6, H11
(b) (iii)	2	9.9.3.3.1, 9.1.11.1a, 9.1.12.1.a, 9.1.12.2a, 9.1.14.3a	H2, H6, H11, H12, H14
(c) (i)	2	9.9.7.2.1, 9.9.7.2.2, 9.9.7.3.1, 9.1.13.1e	H6, H13
(c) (ii)	5	9.9.4.2.3, 9.9.4.2.4, 9.9.4.2.5, 9.9.4.2.6, 9.9.4.3.2	H6
(d)	8	9.9.5	H1, H2, H6