2007 HSC Notes from the Marking Centre

Senior Science

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2007 HSC NOTES FROM THE MARKING CENTRE SENIOR SCIENCE

Introduction

This document has been produced for the teachers and candidates of the Stage 6 course in Senior Science. 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 Senior Science.

General Comments

In 2007, approximately 4000 candidates attempted the Senior Science examination. The most popular electives were Disasters (61%) and Pharmaceuticals (17%).

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. Similarly, the keyword used in the question gives an indication of the depth of the required response. Candidates should use examination time to analyse the question and plan responses carefully, working within that framework to produce clear and concise responses. Responses may include the use of dot points, diagrams and/or tables, and should avoid internal contradictions. This is particularly so in holistic questions which 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:

- show all working where required by the question
- 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
- use appropriate equipment, for example, pencils and a ruler to draw diagrams and graphs. (A clear plastic ruler helps candidates to plot points that are further from the axes and rule straight lines of best fit.)

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

Part B

Question 16

(a) Better responses identified a solvent as the substance that does the dissolving. Weaker responses confused the term ‘solvent’ with ‘solute’.

(b) Better responses identified suitable examples of cosmetics and external medications which clearly used water and alcohol as their solvents. Weaker responses used general terms, for example, creams, or confused internal medications with external medications.

Question 17

Better responses related the difference in composition of an emulsion and a colloid which allowed them to justify the statement. These responses provided supporting examples from each group. Weaker responses only identified an example from either group but made no clear distinction of the composition of a colloid and/or an emulsion.

Question 18

Better responses clearly raised issues concerning the use of soapless detergents in body cleaning products. For example, biodegradability or lathering in hard water, then qualified each issue with further comment on a benefit or disadvantage of their use. Weaker responses assumed that a soapless detergent was just a surfactant without the soap in it and concluding that it would therefore not clean as well as soap. Weaker responses also demonstrated confusion between biodegradability and pH of these products and the effects on microflora.

Question 19

Better responses identified precautions to follow when using both these types of chemicals and then related them to specific properties of pesticides and of body hygiene products.

The weakest responses only included precautions with little or no mention of properties of either type of chemical.

Question 20

(a) Better responses identified the inward pull by water on the alveoli and related this to surface tension. Weaker responses identified a force acting on the alveoli or forces within the water.

(b) The best responses related a reduction in surfactant to no reduction in surface tension. These responses explained how this caused the alveoli to collapse which resulted in breathing difficulties. Some better responses described the effects this had on oxygen levels in the blood and resulting energy loss.

Weaker responses identified a reduction in surface tension and its effects but did not relate them. The weakest responses simply identified one effect only, such as the collapse of alveoli or poorer breathing.

Question 21

(a) The better responses correctly labelled the Y axis including units, and provided a correct linear scale for the Y axis. They also included a key which clearly identified the results for each student in the investigation.

Weaker responses did not label the Y axis correctly or did not provide a scale with equal divisions.

(b) Better responses clearly described several modifications to the method and explained how each modification improved the validity of the investigation. Better responses stated that the investigation was not a valid method for investigating the stated aim, and explained how to improve the method in order to test the aim as intended.

Weaker responses simply listed one or two modifications and did not explain how they improved experimental design. Many weaker responses confused validity with reliability.

Question 22

(a) Better responses correctly identified part X as cartilage or compact bone. Weaker responses identified it as synovial fluid.

Question 23

Better responses demonstrated a clear understanding of the usefulness of several non-invasive diagnostic techniques. They presented correct ideas about these diagnostic techniques replacing exploratory surgery.

Weaker responses generally confused non-invasive techniques with minimally invasive surgery.

Question 24

(a) Better responses outlined the principle of total internal reflection by relating it to light that reflects off a boundary as well as staying completely inside the material at the point of reflection.

The best answers used a correctly labelled diagram to do this, with or without using a text response.

(b) Better responses outlined reasons for the increased use of fibre optics and link each to increased use.

Weaker responses identified of reasons for increased but not in detail.

Question 25

The best responses stated two properties of microwaves and related each to a specific use in communication.

Weaker responses indicated one property with one use. The weakest responses stated one use without linking it to a use in communication.

Question 26

(a) Weaker responses confused amplitude modulation and frequency modulation.

(b) The better responses demonstrated an excellent understanding of the principles of modulation and discriminated between carrier waves and signal waves. The term *modulation* was defined in the best responses and clearly explained.

Weaker responses used simple descriptions of wave shapes.

Question 27

The better responses described the impacts of advances in communication and clearly related this to social impacts. These were kept within a scientific context and these responses included sound judgements.

Weaker responses simply described changes in, or improvements to, communications systems and they were vague in their descriptions of societal impacts.

Section II – Options

Question 28 – Polymers

(a) (i) Weaker responses did not accurately define a polymer.

(ii) Better responses gave clear examples of both properties and uses.

(b)(ii) Weaker responses confused a property with a type of material.

(c) Better responses related the impact of plastics on the environment. Weaker responses described classes of plastics and their uses without relating these to the environment.

(d) (i) The best responses gave direction on how to assess the reliability of other sources of information as well as the original statement. Weaker responses restated the information given.

(ii) Better responses were presented in a structured format with clear reference to experimental controls and variables. Weaker responses showed little understanding of the experimental method.

(iii) Better responses applied the information provided in the stimulus material to new situations. Weaker responses simply restated the stimulus material.

Question 29 – Preservatives and Additives

(a) (i) Better responses linked food preservation techniques to the reduction/elimination of microbial action. Weaker responses referred to preservation techniques stopping food from going off.

(ii) Better responses identified that chemical preservatives were restricted to a very narrow group of substances which can only be used in limited foods. Weaker responses incorrectly classified pickling, salting and smoking as chemical methods.

(b) (i) Better responses identified D as the most suitable bacteriocin and provided reasons such as the continuing activity over the four days and action against moulds/yeast. Superior responses gave reasons why the other bacteriocins were not suitable, thus strengthening their argument.

(ii) Better responses gave a condition that was independent of those given in the question such as temperature. Weaker responses did not propose another condition but suggested that the time of the experiment be lengthened.

(c) Better responses outlined the ability of consumers to identify and hence avoid allergens or other specific substances, as the major impact of Government food labelling regulations. Better responses included several reasons for wanting to know the ingredients in food and understood that food labelling could prevent false or misleading information being given to consumers. Some responses also identified the ability of negative statements to be used to tempt ill-informed consumers to buy particular products.

(d) (i) Better responses stated that the information presented were unreliable because no citation was given, as well as indicating that there was a need to support the claims with other independent data through further investigations.

(ii) Better responses stated the claim to be tested explicitly and understood that a large, random sample size was needed. Better responses used a survey as their method and this was appropriate given the nature of the claims made in this article. Weaker responses failed to link their method to the claim stated.

(iii) Better responses were able to identify areas of new and innovative research such as investigating inoculation or vaccination against food-borne illness. Weaker responses suggested things that are already in place such as determining which foods are responsible for most food-borne illness or increasing food inspection regimes.

Question 30 – Pharmaceuticals

(a) (i) Weaker responses identified parts of this nerve pathway shown in the diagram, but were unable to name it as a reflex arc.

(ii) The better responses included receptor or sense organ in the first box.

(b) (i) Better responses justified their choice by comparing the solubilities of all 4 analgesics. Weaker responses chose analgesic D on the basis of its short time to dissolve, ignoring the fact that it takes time to get to the small intestine.

(ii) Better responses proposed to test different modes of delivery or the effect of temperature of the analgesics.

(c) Better responses identified several social and economic impacts and explained them at depth in a coherent and logical manner. Weaker responses often explained at great depth the process of natural selection leading to bacterial resistance in antibiotics but only briefly analysed the impact of this on society.

(d) (i) Better responses outlined the need to refer to reputable sources such as textbooks or scientific organisations. Some referred to the need to carry out a practical investigation and compare the results with the information presented in the article. Weaker responses referred to the need to check with reliable sources without stating what is meant by the term reliable.

(ii) Better responses clearly identified the claim being tested and demonstrated a thorough understanding of experimental design, including repetition and the use of controls. Weaker responses failed to identify the claim and showed one or more flaws in their experimental design, for example, set up agar plates to culture viruses.

(iii) Weaker responses often confused Lister's and Pasteur's contributions.

Question 31– Disasters

(a) (i) Better responses linked isobars with lines on weather charts linking areas of equal air pressure. Weaker responses linked isobars to wind speed or temperature.

(ii) Better responses provided two technologies and their appropriate data. Weaker responses did not link the technology to the correct data.

(b)(i) Better responses used correct data and converted units to calculate the correct answer. Weaker responses used the duration of the wave or the difference in arrival times rather than the arrival time itself or failed to convert the units.

(ii) Better responses linked the hazards to the consequences for the emergency services. Weaker responses gave hazards only or linked the hazards incorrectly to the victims.

(c) Better responses identified specific impacts of warning devices on society and elaborated on these impacts.

Weaker responses gave details of the operation of warning devices but failed to link their use to societal impacts.

(d) (i) Better responses identified specific requirements that enabled reliability to be assessed, for example author, publisher and date.

Weaker responses criticised the content of the article.

(ii) The better responses designed a valid first-hand investigation and ensured that reliability and safety issues were addressed.

Weaker responses gave general answers where the control of variables was not adequate and the dependant variable was not identified. Responses based on surveys often lacked the appropriate methodology and usually relied on opinions.

(iii) Better responses identified specific directions for future research.

Weaker responses described precautions to be taken in the event of a bushfire.

Question 32 –Space Science

(a) (ii) Better responses produced 4 diagrams which displayed an accurate particle distribution for solids, liquids, gases and in space. Weaker responses did not adequately differentiate between each state and often omitted the diagram of particle distribution in space.

(b) (i) Better responses identified the program used by astronaut l and gave clear reasons to justify their selection. Weaker responses confused individual exercises with the programs although some were able to assign a good reason for their incorrect choice.

(ii) Better responses correctly identified a body system that needs to be maintained in space to allow an astronaut to live normally upon their return to earth for example, the skeletal

system. Weaker responses simply identified a bodily function and often failed to elaborate on how space travel affected the system.

(c) Better responses identified ways that space research and exploration programs affected society. Some weaker responses recorded a number of positive and negative impacts without providing an overall judgement. Many weaker responses identified the use of space spin-offs without fully explaining why each was developed for space and how this has changed the way we do things as a society.

(d) (i) Better responses identified the aspects of the article that could be checked to assess reliability and named suitable primary and/or secondary sources.

(ii) Better responses identified a claim to be tested and a simple method was provided that would lead to a result. Better responses also included aspects of design that would improve reliability and validity.

(iii) Better responses included identification of a space mission with a clear link to the contribution made to our understanding of the solar system and the universe. Weaker responses did not name a mission but adequately described a contribution to our understanding. Weaker responses produced a limited and/or confused description of a space mission without identification.

Senior Science

2007 HSC Examination Mapping Grid

Question	Marks	Content	Syllabus outcomes
Section I Part A			
1	1	9.2.3.2.3	H9
2	1	9.2.3.2.1, 9.2.3.2.2, 9.2.3.2.4	H7
3	1	9.2.2.2.3	H8
4	1	9.2.1.2.3	H8
5	1	9.2.1.2.3, 12.3(c)	H12
6	1	9.3.4.2.1	H9
7	1	9.3.1.2.1	H9
8	1	9.3.3.2.9 9.3.3.2.10	H9
9	1	9.3.4.3.2, 12.3(c), 14.1(a)	H12, H14
10	1	9.3.2.1.1	H9
11	1	9.4.1.2.3, 12.3(c)	H10, H12
12	1	9.4.5.2.1, 14.1(a)	H10, H14
13	1	9.4.1.2.1	H10
14	1	9.4.2.2.1, 12.3(c)	H10, H12
15	1	9.4.2.2.1, 14.1(a)	H14
Section I Part B			
16 (a)	1	9.2.4.1.2	H8
16 (b)	2	9.2.4.1.2, 13.1(e)	H8, H13
17	4	9.2.1.2.3	H8
18	4	9.2.2.2.3, 9.2.2.2.5	H6, H8
19	5	9.2.1.3.1	H7, H8
20 (a)	2	9.2.1.2.5, 9.3.4.2.1, 14.1(c)	H7, H8, H9, H14
20 (b)	3	9.2.1.2.5, 9.3.4.2.1, 14.1(g)	H7, H8, H9, H14

Question	Marks	Content	Syllabus outcomes
21 (a)	3	9.3.2.3.1, 13.1(f)	H7, H9, H13
21 (b)	4	9.3.2.3.1, 12.4(d)	H7, H12
22 (a)	2	9.3.3.2.3	H9
22 (b)	4	9.3.3.2.6	H6, H8
23	6	9.3.5.2.2, 9.3.5.3.2, 14.3(b)	H3, H10, H14
24 (a)	2	9.4.6.3.1, 9.4.6.2.2,	H10
24 (b)	4	9.4.6.2.2, 9.4.6.2.3	H6, H10
25	4	9.4.3.2.3, 9.4.3.2.2	H10
26 (a)	1	9.4.2.3.1	H10
26 (b)	3	9.4.2.3.1	H10
27	6	9.4.1.3.2, 14.1(g), 14.3(b)	H2, H4, H10, H14
Section II **Question 28 — Polymers**			
28 a (i)	1	9.5.1.2.1, 9.5.1.2.2	H8
28 a (ii)	4	9.5.2.2.1	H8
28 b (i)	4	9.5.1.1.4, 14.1(c)	H6, H14
28 b (ii)	2	9.5.1.1.4, 11.2(b)	H6, H11
28 c	6	9.5.4.3, 14.3(b)	H8, H14
28 d (i)	2	12.4 (e, f)	H12
28 d (ii)	4	11.1(b), 11.2 (a, b, c, d)	H11
28 d (iii)	2	14.1(d)	H5, H14

Section II **Question 29 — Preservatives and Additives**			
29 a (i)	1	9.6.2.2.1, 9.6.2.2.2	H8
29 a (ii)	4	9.6.2.2.1, 9.6.2.2.2	H8
29 b (i)	4	9.6.4.2.2, 14.1(c)	H14
29 b (ii)	2	9.6.3.2.2, 11.2(b)	H11
29 c	6	9.6.5.2.1, 9.6.5.2.4, 14.3(b)	H4, H8, H14
29 d (i)	2	12.4 (e, f)	H12
29 d (ii)	4	11.1(b), 11.2 (a, b, c, d)	H11
29 d (iii)	6	14.1(d)	H5, H14
Section II **Question 30 — Pharmaceuticals**			
30 a (i)	1	9.7.1.2.4, 9.7.1.2.6	H9
30 a (ii)	4	9.7.1.2.6, 9.7.1.1	H9
30 b (i)	4	9.7.3.3.2, 14.1(c)	H14
30 b (ii)	2	9.7.3.3.2, 9.7.3.1.6, 9.7.3.1.7, 11.2(b)	H7, H11
30 c	6	9.7.4.2.6, 14.3(b)	H4, H8, H14
30 d (i)	2	12.4 (e, f)	H12
30 d (ii)	4	11.1(b), 11.2 (a, b, c, d)	H11
30 d (iii)	2	9.7.4.3.1, 14.1(g)	H4, H14
Section II **Question 31 — Disasters**			
31 a (i)	1	9.8.2.2	H10
31 a (ii)	4	9.8.2.4	H10
31 b (i)	2	9.8.3.2.3, 9.8.3.3.2, 12.3(c), 12.4(b)	H12
31 b (ii)	4	9.8.3.2.4, 9.8.5.2.1, 14.1(b)	H14
31 c (i)	6	9.8.4.2.1, 9.8.4.3.4, 9.8.5.2.2, 9.8.4.2, 3, 4, 5, 14.3(b)	H4, H10, H14
31 d (i)	2	12.4 (e, f)	H12
31 d (ii)	4	11.1(b), 11.2 (a, b, c, d)	H11

30 d (iii)	2	14.1(d)	H5, H14
Section II **Question 32 — Space Science**			
32 a (i)	1	9.9.1.2.2, 9.9.1.3.1	H8
32 a (ii)	4	9.9.1.2.2, 9.9.1.3.1, 9.9.3.1, 13.1(e)	H8, H13
32 b (i)	4	9.9.3.2.6, 9.9.3.3.1, H14.1(c)	H14
32 b (ii)	2	9.9.3.2.5, 11.2(b)	H7, H11
32 c	6	9.9.6.3, 9.9.6.4, 9.9.6.5, 9.9.6.3.1, 14.3(b)	H4, H6, H7, H14
32 d (i)	2	12.4 (e, f)	H12
32 d (ii)	4	11.1(b), 11.2 (a, b, c, d)	H11
32 d (iii)	2	9.9.6.3.1, 14.1(d)	H5, H14

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NEW SOUTH WALES

2007 HSC Senior Science
Marking Guidelines

Section I, Part B

Question 16 (a)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• States meaning of the term	1

Question 16 (b)

Outcomes assessed: H8, H13

MARKING GUIDELINES

Criteria	Marks
• Provides FOUR correct examples	2
• Provides TWO or THREE correct examples	1

Question 17

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• Supports statement by identifying specific examples of both colloids and emulsions • Relates difference in composition to statement	4
• Supports statement by identifying one example of either a colloid or an emulsion • Relates difference in composition to statement OR • Identifies examples of both colloids and emulsions • Identifies composition of either colloid or emulsion	3
• Identifies examples of both colloids and emulsions OR • Relates difference in composition to statement OR • Identifies ONE example • Identifies composition of either colloid or emulsion	2
• Identifies one example OR • Identifies composition of either a colloid or an emulsion	1

Question 18

Outcomes assessed: H6, H8

MARKING GUIDELINES

Criteria	Marks
• Identifies issues for the use of detergents • Provides at least ONE point for and/or against each issue	4
• Identifies issues • Provides a point for or against ONE of these issues OR • Identifies an issue • Provides points for and/or against that issue	3
• Identifies issues OR • Identifies points for and/or against OR • Identifies ONE issue with a point for or against	2
• Identifies ONE issue or point	1

Question 19

Outcomes assessed: H7, H8

MARKING GUIDELINES

Criteria	Marks
• Relates properties to the precautions needed when using and handling pesticides AND hygiene products	5
• Relates properties to the precautions needed when using and handling EITHER pesticides OR hygiene products OR • Relates properties to the precautions needed when using and handling pesticides and hygiene products in general terms	4
• Identifies at least a total of 3 properties, uses and/or precautions when using and handling pesticide and/or hygiene products without a specific link between a property and precaution	3
• Identifies TWO properties, uses and/or precautions when using and handling pesticide and/or hygiene products OR • Identifies TWO or more general precautions when using chemicals	2
• Identifies a use of either a pesticide or a hygiene product OR • Identifies a property of either a pesticide or a hygiene product OR • Identifies a precaution when using and handling either a pesticide or a hygiene product	1

Question 20 (a)

Outcomes assessed: H7, H8, H9, H14

MARKING GUIDELINES

Criteria	Marks
• Relates inward pull of water layer to surface tension	2
• Identifies surface tension • Identifies inward pull of water layer	1

Question 20 (b)

Outcomes assessed: H7, H8, H9, H14

MARKING GUIDELINES

Criteria	Marks
• Relates lack of surfactant to no reduction in surface tension leading to collapse of alveoli and resulting breathing difficulties OR • Relates collapsed alveoli to breathing difficulties and further effects	3
• Outlines effect of the reduction of surface tension OR • Any TWO from below	2
Identifies either: • No reduction in surface tension OR • Collapse of alveoli OR • Poorer breathing	1

Question 21 (a)

Outcomes assessed: H7, H9, H13

MARKING GUIDELINES

Criteria	Marks
• Correctly labels all three components – Vertical axis – Vertical scale – Distinguishing key for each student	**3**
• Correctly labels two components	2
• Correctly labels one component	1

Question 21 (b)

Outcomes assessed: H7, H12.4d

MARKING GUIDELINES

Criteria	Marks
• Outlines modifications and relates these to improved validity of the data	4
• Outlines modifications and relates one to improved validity of the data	3
• Outlines one modification and relates it to validity of the data OR • Outlines modifications	2
• Makes a statement that refers to improved experimental design	1

Question 22 (a)

Outcomes assessed H9

MARKING GUIDELINES

Criteria	Marks
• Identifies cartilage • Provides a role	2
• Identifies cartilage OR • Provides a role	1

Question 22 (b)

Outcomes assessed: H6, H8

MARKING GUIDELINES

Criteria	Marks
• Provides supporting reasons for use of UHMWPE	4
• Provides limited support for use of UHMWPE	2-3
• Provides ONE supporting statement	1

Question 23

Outcomes assessed: H3, H10, H14

MARKING GUIDELINES

Criteria	Marks
• Correctly identifies non-invasive techniques • Makes a judgement of the reduced risk to patients based on criteria • Makes a judgement of the usefulness of each technique to diagnose medical problems based on criteria • Demonstrates coherence and logical progression and includes the correct use of scientific principles and ideas	5-6
• Correctly identifies non-invasive techniques AND EITHER • Makes a judgement of the reduced risk to patients based on criteria OR • Makes a judgement of the usefulness of each technique to diagnose medical problems based on criteria	3-4
• Correctly identifies non-invasive techniques OR • Demonstrates an understanding of a non-invasive technique	1-2

Question 24 (a)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• Sketches in general terms the principle of total internal reflection	2
• States a feature of the reflection light	1

Question 24 (b)

Outcomes assessed: H6, H10

MARKING GUIDELINES

Criteria	Marks
• Outlines reasons for using fibre optics for communication • Makes the relationship between the reasons and an increase in its use evident	4
• Identifies reasons for using fibre optics • Attempts to draw a relationship between reason(s) and increased use OR • Outlines reasons for using fibre optics	3
• Outlines a reason for using fibre optics OR • Identifies reasons for using fibre optics	2
• Identifies a reason for using fibre optics	1

Question 25

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• Identifies properties and links TWO properties to its use in communication technology	4
• Identifies properties and links one property to its use in communication technology	3
• Identifies a property and links it to its use	2
• Identifies a property OR • Identifies a use	1

Question 26 (a)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• States the type of modulation demonstrated	1

Question 26 (b)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• Outlines features of the waves • Relates these features to the process of modulation	2-3
• Outlines a feature of one wave OR • Defines modulation	1

Question 27

Outcomes assessed: H2, H4, H10, H14

MARKING GUIDELINES

Criteria	Marks
• Outlines changes in communication system • Describes the impacts that changes in communication systems have had on society with specific examples • Provides a judgement of the impacts • Demonstrates coherence and logical progression and includes the correct use of scientific principles and ideas	5-6
• Outlines change(s) in communication systems • Outlines impact(s) of communication systems on society	3-4
• Identifies an impact(s) of communication systems on society • Identifies a change in communication systems	1-2

Section II

Question 28 (a) (i)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• Outlines how polymers are formed	1

Question 28 (a) (ii)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• Provides FOUR correct responses	4
• Provides THREE correct responses	3
• Provides TWO correct responses	2
• Provides ONE correct response	1

Question 28 (b) (i)

Outcomes assessed: H6, H14

MARKING GUIDELINES

Criteria	Marks
• States best alternative and supports choice with three of the properties listed	4
• States best alternative and supports choice based on two properties listed	3
• States best alternative and supports choice based on one property OR • Chooses wrong alternative and supports it with suitable properties	2
• Identifies correct choice or identifies one useful property	1

Question 28 (b) (ii)

Outcomes assessed: H6, H11

MARKING GUIDELINES

Criteria	Marks
• Puts forward an additional property to be tested • Provides a reason for the choice	2
• Identifies a property to be tested OR • Provides a reason	1

Question 28 (c)

Outcomes assessed: H8, H14

MARKING GUIDELINES

Criteria	Marks
• Demonstrates a thorough understanding of the properties of synthetic polymers • Identifies the effects of synthetic polymers on the environment • Relates points for and/or against the use of synthetic polymers to their effect • Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas	5–6
• Demonstrates sound understanding of the properties of synthetic polymers • Identifies the effects of synthetic polymers on the environment • Provides a point for or against the use of synthetic polymers	3–4
• Identifies an effect of the synthetic polymers on the environment AND/OR • Identifies a point for or against the use AND/OR • Identifies a property of synthetic polymers	1–2

Question 28 (d) (i)

Outcomes assessed: H12.4c

MARKING GUIDELINES

Criteria	Marks
• Sketches in general terms how to assess the reliability of the information in the article	2
• Identifies the need to consider information from other sources OR • Identifies an appropriate source to access	1

Question 28 (d) (ii)

Outcomes assessed: H11

MARKING GUIDELINES

Criteria	Marks
• Demonstrates a thorough understanding of components of experimental design • Describes suitable scientific method linked to one of the claims	4
• Demonstrates sound knowledge of components of experimental design • Links method to claim	3
• Demonstrates basic knowledge of experimental design	1-2

Question 28 (d) (iii)

Outcomes assessed: H5, H14

MARKING GUIDELINES

Criteria	Marks
• Puts forward TWO appropriate areas of research OR • Puts forward ONE area of research and gives reason	2
• Puts forward ONE appropriate area of research	1

Question 29 (a) (i)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• Identifies how food preservation techniques increase shelf life of food	1

Question 29 (a) (ii)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• Provides FOUR correct responses	4
• Provides THREE correct responses	3
• Provides TWO correct responses	2
• Provides ONE correct response	1

Question 29 (b) (i)

Outcomes assessed: H14

MARKING GUIDELINES

Criteria	Marks
• States best alternative and supports choice with appropriate reasons	4
• States best alternative and supports choice with limited reasons	3
• States best alternative with a reason	2
• Identifies correct choice OR • Identifies a characteristic	1

Question 29 (b) (ii)

Outcomes assessed: H11

MARKING GUIDELINES

Criteria	Marks
• Puts forward an additional property to be tested • Provides a reason for the choice	2
• Identifies a property to be tested OR • Provides a reason	1

Question 29 (c)

Outcomes assessed: H4, H8, H14

MARKING GUIDELINES

Criteria	Marks
• Demonstrates a thorough understanding of the impacts on society of Government food labeling regulations • Identifies the impacts on society of food labelling • Relates points for and/or against the use of labelling food to the impacts identified • Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas	5–6
• Demonstrates sound understanding of the properties of food labelling • Identifies the impacts of food labelling on society • Provides a point for or against the use of labelling foods	3–4
• Identifies an impact of using food labels AND/OR • Identifies a point for or against the use of labels	1-2

Question 29 (d) (i)

Outcomes assessed: H12.4c

MARKING GUIDELINES

Criteria	Marks
• Sketches in general terms how to assess the reliability of the information in the article	2
• Identifies the need to consider information from other sources OR • Identifies an appropriate source to access	1

Question 29 (d) (ii)

Outcomes assessed: H11

MARKING GUIDELINES

Criteria	Marks
• Demonstrates a thorough understanding of components of experimental design • Describes suitable scientific method linked to one of the claims	4
• Demonstrates sound knowledge of components of experimental design • Links method to claim	3
• Demonstrates basic knowledge of experimental design	1-2

Question 29 (d) (iii)

Outcomes assessed: H5, H14

MARKING GUIDELINES

Criteria	Marks
• Puts forward TWO appropriate areas of research • OR • Puts forward ONE area of research and gives reasons	2
• Puts forward ONE appropriate area of research	1

Question 30 (a) (i)

Outcomes assessed: H9

MARKING GUIDELINES

Criteria	Marks
• Identifies reflex arc	1

Question 30 (a) (ii)

Outcomes assessed: H9

MARKING GUIDELINES

Criteria	Marks
• Identifies all FOUR components in the correct order	4
• Identifies THREE components in correct sequence	3
• Identifies TWO components	2
• Identifies ONE component	1

Question 30 (b) (i)

Outcomes assessed: H14

MARKING GUIDELINES

Criteria	Marks
• States best alternative and supports choice based on more than THREE pieces of evidence	4
• States best alternative and supports choice based on THREE pieces of evidence	3
• States best alternative and supports choice based on TWO pieces of evidence	2
• Identifies correct choice • Identifies ONE useful property	1

Question 30 (b) (ii)

Outcomes assessed: H7, H11

MARKING GUIDELINES

Criteria	Marks
• Outlines property to be tested	2
• Identifies a property to be tested	1

Question 30 (c)

Outcomes assessed: H4, H8, H14

MARKING GUIDELINES

Criteria	Marks
• Demonstrates a thorough knowledge of antibiotic resistance • Explains the impacts of antibiotic resistance on society • Provides a judgement • Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas	5–6
• Demonstrates sound understanding of antibiotic resistance • Describe impacts of antibiotic resistance on society • Provides a judgement	3–4
• Identifies an impact of antibiotic resistance AND/OR • Provides judgement	1–2

Question 30 (d) (i)

Outcomes assessed: H12.4c

MARKING GUIDELINES

Criteria	Marks
• Sketches in general terms how to assess the reliability of the information in the article	2
• Identifies the need to consider information from other sources (including a valid first-hand investigation) OR • Identifies an appropriate source to access	1

Question 30 (d) (ii)

Outcomes assessed: H11

MARKING GUIDELINES

Criteria	Marks
• Demonstrates a thorough understanding of components of experimental design • Describes suitable scientific method linked to one of the claims	4
• Demonstrates sound knowledge of components of experimental design • Links method to claim	3
• Demonstrates basic knowledge of experimental design	1-2

Question 30 (d) (iii)

Outcomes assessed H4, H14

MARKING GUIDELINES

Criteria	Marks
• Outlines the contribution of one scientist to our understanding of disease caused by bacteria	2
• Identifies the contribution of one scientist to our understanding of disease caused by bacteria	1

Question 31 (a) (i)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• Defines 'isobar'	1

Question 31 (a) (ii)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• Provides FOUR correct responses	4
• Provides THREE correct responses	3
• Provides TWO correct responses	2
• Provides ONE correct response	1

Question 31 (b) (i)

Outcomes assessed: H12

MARKING GUIDELINES

Criteria	Marks
• Correctly calculates answer • Shows working	2
• Provides correct answer, without working OR • Shows working but leads to incorrect answer	1

Question 31 (b) (ii)

Outcomes assessed: H14

MARKING GUIDELINES

Criteria	Marks
• Puts forward hazards linked to the earthquake described • Provides reasons for the hazards identified	4
• Puts forward hazards linked to earthquake • Provides a reason for one hazard OR • Puts forward a hazard and provides TWO reasons	3
• Puts forward a hazard and ONE reason OR • Identifies TWO hazards	2
• Identifies a hazard OR a reason	1

Question 31 (c)

Outcomes assessed: H4, H10, H14

MARKING GUIDELINES

Criteria	Marks
• Demonstrates a thorough understanding of the impacts on society of warning devices that can be used to detect disasters • Identifies the impacts on society of warning devices that can be used to detect disasters. • Relates points for and/or against the use of warning devices • Demonstrates coherence and logical progression and include correct use of scientific principles and ideas	5–6
• Demonstrates sound understanding of the impacts on society of warning devices • Identifies the impacts of warning devices • Provides a point for or against the use of warning devices	3–4
• Identifies an impact of the use of warning devices AND/OR • Identifies a point for or against the use of warning devices	1–2

Question 31 (d) (i)

Outcomes assessed: H12.4c

MARKING GUIDELINES

Criteria	Marks
• Sketches in general terms how to assess the reliability of the information in the article	2
• Identifies the need to consider information from other sources OR • Identifies an appropriate source to access	1

Question 31 (d) (ii)

Outcomes assessed: H11

MARKING GUIDELINES

Criteria	Marks
• Demonstrates a thorough understanding of components of experimental design • Describes suitable scientific method linked to one of the claims	4
• Demonstrates sound knowledge of components of experimental design • Links method to claim	3
• Demonstrates basic knowledge of experimental design	1-2

Question 31 (d) (iii)

Outcomes assessed: H5, H14

MARKING GUIDELINES

Criteria	Marks
• Puts forward TWO appropriate areas of research OR • Puts forward ONE area of research and gives reasons	2
• Puts forward an appropriate area of research	1

Question 32 (a) (i)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• Identifies the force that keeps Earth's atmosphere in place	1

Question 32 (a) (ii)

Outcomes assessed: H8, H13

MARKING GUIDELINES

Criteria	Marks
• Identifies relative distances in all FOUR diagrams	4
• Identifies relative distances in THREE diagrams	3
• Represents a model for TWO	2
• Represents a model for only ONE OR • Uses an appropriate diagram	1

Question 32 (b) (i)

Outcomes assessed: H14

MARKING GUIDELINES

Criteria	Marks
• States best alternative and supports choice with all properties listed	4
• States best alternative and supports choice based on two properties	3
• States best alternative and supports choice based on one property	2
• Identifies correct choice OR • Identifies ONE useful property	1

Question 32 (b) (ii)

Outcomes assessed H7, H11

MARKING GUIDELINES

Criteria	Marks
• Puts forward an additional body system which needs to be maintained • Provides a reason for the choice	2
• Identifies a body system OR • Provides a reason	1

Question 32 (c)

Outcomes assessed: H4, H6, H7, H14

MARKING GUIDELINES

Criteria	Marks
• Demonstrates a thorough knowledge of space research and exploration programs • Explains the impacts on society of space research and exploration programs • Provides a judgement • Demonstrates coherence and logical progression and includes correct use of scientific principles and ideas	5–6
• Demonstrates a sound understanding of space research and space exploration programs • Describes impacts on society of space research and exploration programs • Provides a judgement	3–4
• Identifies an impact of space research/exploration programs AND/OR • Provides a judgement	1-2

Question 32 (d) (i)

Outcomes assessed: H12.4c

MARKING GUIDELINES

Criteria	Marks
• Sketches in general terms how to assess the reliability of the information in the article	2
• Identifies the need to consider information from other sources OR • Identifies an appropriate source to access	1

Question 32 (d) (ii)

Outcomes assessed: H11

MARKING GUIDELINES

Criteria	Marks
• Demonstrates a thorough understanding of components of experimental design • Describes suitable scientific method linked to one of the claims	4
• Demonstrates sound knowledge of components of experimental design • Links method to claim	3
• Demonstrates basic knowledge of experimental design	1-2

Question 32 (d) (iii)

Outcomes assessed: H5

MARKING GUIDELINES

Criteria	Marks
• Sketches in general terms the contribution made by one space mission to our understanding of the solar system and universe	2
• Identifies the contribution made by one space mission to our understanding of the solar system and universe	1