

**2003 HSC Notes from
the Marking Centre
Senior Science**

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2003 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 provides comments with regard to responses to the 2003 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 2003 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 2003, approximately 4200 candidates attempted the Senior Science examination.

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. 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
1	D
2	B
3	A
4	B
5	B
6	D
7	A
8	B

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

Part B

Question 16

Most students who understood the use of subdermal implants scored full marks. Incorrect answers included reference to dermal patches or other methods of obtaining medication.

Question 17

- (a) The majority of candidates attempted and answered this question correctly. Incorrect answers confused identifying the claim with writing a conclusion.
- (b) Most candidates could identify a safety issue.
- (c) Most candidates could identify one claim and provide a supporting statement from the results given. Responses gaining full marks identified more than one claim and provided the evidence for and/or against the manufacturer's claims.

Question 18

- (a) Virtually all candidates attempted to define a suspension. Many of the responses failed to recognise the insolubility of the particles which are mixed with the liquid involved, but rather gave a generalised description of a mixture or used terminology related to a solution.
- (b) Superior responses outlined only the contrasting features of these mixtures by identifying the relevant characteristics of each.
- (c) Most responses described a valid scientific test to determine which cleaner was easiest to use and identified at least one variable which was being controlled. Better responses identified how the dependent variable was measured.

Question 19

Superior responses related the research findings to microflora and their roles on the skin, and made a judgement about the findings of the research. The majority of responses included only a simple discussion of both research findings but did not include a judgement based on criteria.

Question 20

- (a) Most candidates answered this question. Superior responses demonstrated a good understanding of non-invasive medical diagnostic techniques. Weaker responses were based on descriptions of the MRI procedures.
- (b) (i) This question was answered well by most candidates. Better responses specified the size of the cut for keyhole surgery and employed the terms endoscope, laparoscopy and small cameras. Weaker responses used non-specific terms such as 'hole' and 'looking inside' and without stating there was a cut or an incision.
 - (ii) The majority of candidates were able to give an advantage of keyhole surgery. Many candidates stated more than one advantage, such as quicker recovery time, less infection and less scarring.

Question 21

This question presented difficulties for many candidates. Superior responses clearly demonstrated the need to show similarities and differences and did this either in a tabulated form or by discussion. Weaker responses included either a similarity or a difference. A small number of responses incorrectly referred to silicone implants such as breast/testicle/muscle.

Question 22

Most candidates made a good attempt to answer the question by providing relevant information about the differences between using cemented and uncemented implants. Superior responses identified a number of issues and provided points for and/or against the procedure. These candidates clearly understood that cementing related to gluing. Weaker responses showed several misconceptions, including joints having no movement once cemented and that one joint was stronger than the other. These responses used general or non-specific terms when discussing differences.

Question 23

- (a) (i) This question was well answered. A small number of candidates gave the examples listed in the question. Many responses gave more information than was required and described the devices. The device most commonly chosen was the pacemaker.
- (ii) This part was generally well answered but a significant number of responses demonstrated a lack of understanding of the situations where a pacemaker would be required.
- (b) Superior answers gave specific information, eg internet search for biomedical devices, medical text. A small number of responses detailed the historical development of a biomedical device but did not address the question.

Question 24

- (a) Candidates generally expressed a clear understanding of the safety aspects of the investigation, but sometimes merely identified the safety equipment rather than outline the precaution.
- (b) Most responses included a list of relevant equipment or chemicals used. Many responses clearly indicated that this experiment had not been performed.
- (c) Responses which referred to the mandatory experiment generally scored full marks because they clearly linked the results to the role of the skeleton. Most concentrated on the calcium giving strength to the skeleton for its supporting role. Some articulate candidates gave vivid descriptions of the structure of a joint but confused its degree of movement with the flexible nature of bone. Many failed to state a role of the skeleton and instead related the results to a theoretical knowledge of the properties of bone.

Question 25

- (a) This question was generally well answered with most candidates able to construct a simple ray diagram showing total internal reflection in an optic cable or prism. Superior responses showed the direction of light rays and equated angles of incidence and reflection.
- (b) Superior answers readily identified one consequence of total internal reflection and explained it clearly, or stated two consequences. Weaker responses merely stated one feature of internal reflection.
- (c) Superior responses were in tabulated form with the categories requested in the question clearly identified as headings in the rows and columns of the table. Once a table was established correctly, candidates were readily able to complete it and access the top range of marks. Some responses failed to correctly identify carrying capacity and security as the criteria needing to be contrasted in their table. Poorer responses either failed to present information in a tabulated form or could not contrast any of the required criteria.

Question 26

All parts of the question were well answered.

- a) Most candidates were able to correctly define ‘geostationary’ in terms of geostationary satellites. Better responses emphasised that a geostationary orbit places a satellite always above the same position on earth.
- b) Candidates could also easily identify a reason why geostationary satellites were important in global communication. Some candidates had difficulty in clearly expressing the concept that satellite’s position does not change relative to the earth.
- c) The better responses clearly explained how a live telecast of an event at a location Y one side of the globe is transmitted by satellites to a person X on the other side of the globe. Some candidates described the pathway of the signal in the reverse direction. Many good responses indicated the pathway of the transmission on the diagram shown in the introduction to the question.

Question 27

- (a) (i) & (ii) The vast majority of responses identified a communication system that used microwaves and another that used radio waves.
- (b) (i) The quality of the responses varied widely indicating that the way in which carrier waves are modulated to carry information is not well understood. Some students drew tables of wave properties. The candidates who gave good answers were able to reproduce well-labelled, correct diagrams
- (ii) Responses demonstrated a good understanding of the application of electronic waves used in communication systems, and their effect.

Section II – Options

Question 28 – Polymers

- (a) (i) Fewer than half the responses identified a plastic as a ‘synthetic polymer’. Many gave an example of a plastic instead of defining the term.
- (ii) Most candidates were able to describe the effect of heating and then cooling on thermoplastics but many were vague about these processes on thermosets.
- (b) (i) Most candidates responded with the name of a plastic from group 1 or 2 in the table.
- (ii) Almost all candidates chose examples from plastics numbered 1 or 2 that were given in the table and were able to describe an effect of these plastics on the environment in general terms. The better responses included a judgement about the consequences of these specific plastics on both the terrestrial and aquatic environments.
- (c) Almost every response included at least one source for the chemicals that are used as raw materials for polymer manufacture. Most candidates then identified at least one possible implication of a reduction of the raw materials. The best responses drew out and related one or more implications of such a reduction.
- (d) (i) This question was well answered by a majority of the candidates. The poorer answers confused natural polymers with synthetic ones or did not clearly describe the named property.
- (ii) Almost every candidate followed the guide given in the question. The better responses clearly described their method, often with a well-drawn diagram, and included multiple trials. They listed their results in a well-labelled table and gave a valid conclusion based upon their results. The poorer responses named only one material and could not compare it to other polymers. A few candidates did not investigate the property that they named.

Question 29 – Preservatives and Additives

(a) (i) While many candidates were able to identify a common bacterial microbe, a significant number of candidates answered ‘mould’ or ‘fungi’ as being bacterial.

(ii) A majority of candidates showed an understanding of the role of heat in destroying bacteria and were able to relate this to extended shelf life of foods. There was some evidence of confusing UHT treatment with the canning process. Better responses gave evidence of a more detailed understanding of the process and related this to broader societal advantages.

(b) (i) The role of bacteriocins in destroying bacteria was well understood, although many responses did not refer to bacteriocins specifically as chemical compounds. Poorer responses included an example of a bacteriocin (eg Nisin) but did not address the uses of bacteriocins.

(ii) Many candidates were able to identify the features of these labels and could indicate a problem with both labels and a good point about each. The responses clearly addressed the issues associated with usefulness of food labels and related these to the types of labels in the question. However, a large number of candidates did not refer to possible improvements to either or both labels. A significant number of candidates did not understand the meaning of ‘artificial’ colours and flavours.

(c) Many responses gave general statements about colour and flavour enhancers and made little reference to preservatives. The best answers identified the function of emulsifiers, anti-caking agent, anti-oxidants, humectants and other additives used to enhance the appearance and prolong the shelf life of cosmetics.

(d) (i) This question related to the role of preservatives and additives used in foods and was well answered by the majority of candidates.

(ii) Many candidates described a valid methodology. The better responses described the need to control or fix variables except for the one they changed. The concept of solubility was not understood by a number of candidates.

(iii) In general few responses indicated a sound understanding of the connection between solubility, concentration of the solution, and the ability of the salts to act in destroying bacteria.

Question 30 - Pharmaceuticals

- (a) (i) While most candidates did know the name of the type of bacteria many could not spell it correctly.
- (ii) Most candidates used the syllabus term 'fission'. The drawings varied in quality. The better drawings illustrated the process with a well-labelled diagram showing a sequence of steps.
- (b) (i) Most candidates responded with 'analgesic A' by correctly reading the graph.
- (ii) Generally the candidates answered this question satisfactorily. The better responses identified the different forms of analgesics and related their form to their solubility.
- (c) While most candidates were able to describe parts of the circulatory system, relatively few were able to support their judgement on the effectiveness of the system in transporting pharmaceuticals.
- (d) (i) Most candidates correctly identified the main sense organ involved in their investigation. Some candidates wrote the name of a sense, rather than the sense organ.
- (ii) Most flow charts were well attempted. Better responses used arrows to direct the reader. The poorer responses described steps involved in a reflex arc rather than the steps in their investigation. Most candidates stated their conclusion, but many discussed it in terms of reliability due to repetition in their investigation rather than in terms of the validity determined by good experimental design.

Question 31 Disasters

- (a) (i) Most candidates could name a specific natural disaster. A small number of candidates did not specify a particular disaster eg just wrote ‘bushfires’.
- (ii) Most candidates were able to give some techniques for reducing risk. The better responses provided appropriate detail when describing techniques.
- (b) (i) A large number of candidates failed to compare the effectiveness of the technological systems. A number of candidates thought a Richter scale was a measuring instrument to detect earthquakes. The best responses described two technologies and explained how they helped predict earthquakes and cyclones and made a valid comparison between the two.
- (ii) Generally well answered; however some responses indicated some confusion about the services and their roles.
- (c) Most candidates could outline precautions to minimise the likelihood of damage resulting from bushfire and the majority of these were able to describe the effect of implementing the precautions. A small number of weaker responses simply included lists of several precautions that could be taken.
- The better responses described the effect of implementing precautions and compared the effectiveness of the precaution. Most of these candidates compared the effectiveness of different methods of implementing a precaution, identifying the most appropriate method of implementation and providing scientific evidence to support their selection. The stronger responses made a judgement about the effectiveness of different precautions.
- (d) (i) Most candidates could identify a specific type of fire on which a water-based extinguisher must NOT be used. Some weaker responses referred to the size of the fire.
- (ii) Most candidates could identify another type of fire extinguisher and a specific fire on which it should be used. Some candidates correctly described how the fire extinguisher prevented combustion. A significant number of responses included incorrect statements about foam (water based) extinguishers being used on electrical fires.
- (iii) Most candidates outlined the construction and testing of their working alarm or safety device using large, clear, well-labelled diagrams. However, many responses included circuit diagrams that were incomplete, while a significant number of the weaker responses included diagrams which were small and lacking in detail. Most candidates performed tests to show that their device worked but did not identify an independent variable. Few candidates who referred to alarms tested their effectiveness by measuring the response of people to the sounding of the alarm.
- A small number of candidates described devices that were not either working alarms or safety devices. In most cases their responses appeared to be a recall of activities performed in core modules that did not relate to the question.

Question 32 – Space Science

- (a) (i) Most candidates had little difficulty identifying one advantage of using a shuttle. The most common response accepted was reusability. Some incorrect responses were based on rocketry in general rather than being Space Shuttle-specific.
- (ii) Superior responses focused on gravity and the use of solid rocket boosters and an external fuel tank to lift the entire payload, explaining rather than just identifying the problem.
- (b) (i) Most candidates could identify the spin-off (the alloy Nitinol used in dentistry) and give a beneficial impact of its use. Some candidates identified an impact but failed to identify the spin-off.
- (ii) Most candidates were able to identify two materials used in space suits and could relate these to conditions experienced in space by astronauts. Some candidates described properties of materials without specifying an actual space suit material.
- (c) Most candidates could state that ‘empty space’ was not empty at all. Some were able to give accurate composition details. Few responses clearly related the effect of gravity on layers of the Earth’s atmosphere. Most responses did not link the variations of density and concentration of gas particles in the atmosphere to the influence of gravity. Many candidates were unable to correctly describe the composition of gases in the atmosphere. Diagrams were effectively used by a number of candidates to compare the density of gas particles in the atmosphere to that in ‘empty space’.
- (d) (i) This was correctly answered by most candidates.
- (ii) The use of a second group as a comparison with the experimental group was acknowledged in many responses, however the term ‘control’ was not used by many candidates. Superior responses recognised a formal causal link between the low-gravity environment and the difference in soleus muscle mass.
- (iii) Most candidates were able to identify that the soleus muscle would not be used as much in a low-gravity environment. Many did not specify the function of the soleus muscle in body support and movement.

Senior Science

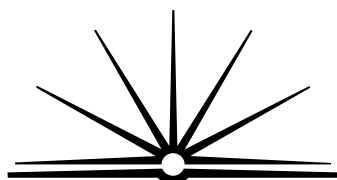
2003 HSC Examination Mapping Grid

Question	Marks	Content	Syllabus outcomes
Section I			
1	1	9.2.2, C2 dp5	H6, H8
2	1	9.2.3 C2 dp1	H7, H8
3	1	9.2.4 C2 dp3, dp4	H8
4	1	9.2.5, C2 dp3	H8
5	1	9.2.3 C2 dp3, dp4, C3 dp2	H8, H11.2 (b)
6	1	9.3.4 C2 dp4	H9
7	1	9.3.5 C2 dp3	H9
8	1	9.3.3 C2 dp2, dp3	H9
9	1	9.3.1 C2 dp1 , C3 dp1	H9
10	1	9.3.3 C2 dp2, dp6	H8, H9
11	1	9.3.2 C2 dp1 dp6	H7, H9
12	1	9.4.1 C2 dp1	H13.1 (a) + (b), H10
13	1	9.4.1 C2 dp5, dp1, C3 dp1	H10
14	1	9.4.5 C2 dp3	H10
15	1	9.4.2 C2 dp1	H10, H12.3 (c), H12.4 (d), H14.1 (b)
Section II			
16	3	9.2.4 C3 dp2	H4, H7, H8
17(a)	1	9.2.3 C3 dp3	H2, H4, H8
17(b)	1	9.2.3 C3 dp3	H12
17(c)	3	9.2.3 C3 dp3	H11, H14
18(a)	1	9.2.1 C2 dp3	H2, H8
18(b)	2	9.2.2 C3 dp1	H8
18(c)	3	9.2.2 C3 dp1	H2, H11, H12

Question	Marks	Content	Syllabus outcomes
19	7	9.2.3 C2 dp1 and dp2	H7, H9, H11
20(a)	1	9.3.5 C2 dp2	H1, H3, H4
20(b)(i)	1	9.3.5 C2 dp3	H1, H3, H4
20(b)(ii)	1	9.3.5 C2 dp3	H1, H3, H4
21	4	9.2.3 C2 dp4–6	H8, H9
22	3	9.2.3 C2 dp9 and dp10	H3, H4, H7, H9
23(a)(i)	1	9.3.1 C2 dp1	H1, H3, H4
23(a)(ii)	1	9.3.1 C2 dp1	H4, H9
23(b)	2	9.3.1 C2 dp1	H12
24(a)	2	9.3.3 C3 dp1	H11
24(b)	1	9.3.3 C3 dp1	H11
24(c)	3	9.3.3 C3 dp1	H7, H12, H14
25(a)	2	9.4.6 C2 dp2	H3, H10, H13.1 e
25(b)	2	9.4.6 C2 dp2	H2, H3, H10
25(c)	4	9.4.6 C2 dp3 and C2 dp3	H3, H4, H13.1 e
26(a)	1	9.4.4 C2 dp1	H10
26(b)	2	9.4.4 C2 dp1	H4
26(c)	2	9.4.4 C3 dp1	H4, H10
27(a)(i)	1	9.4.2 C2 dp3	H4, H10
27(a)(ii)	1	9.4.2 C2 dp3	H4, H10
27(b) (i)	2	9.4.2 C3 dp1	H10, H13
27(b) (ii)	2	9.4.2 C2 dp2	H3, H4, H10
Section III			
28(a)(i)	1	9.5.3 C2 dp1	H3, H8
28(a)(ii)	3	9.5.3 C2 dp2	H3, H8
28(b)(i)	1	9.5.4 C3 dp4	H8

Question	Marks	Content	Syllabus outcomes
28(b)(ii)	5	9.5.4 C2 dp3	H4, H8
28(c)	7	9.5.2 C2 dp3	H3, H4, H5, H6
28(d)(i)	2	9.5.1 C2 dp3	H8
28(d)(ii)	6	9.5.1 C3 dp2	H8, H11
29(a)(i)	1	9.6.3 C2 dp1	H4, H6
29(a)(ii)	3	9.6.3 C3 dp4	H4, H6
29(b)(i)	1	9.6.4 C2 dp2	H6
29(b)(ii)	5	9.6.5 C2 dp4 and dp5	H13
29(c)	7	9.6.1 C3 dp1	H1, H3, H4, H8
29(d)(i)	2	9.6.2 C2 dp4	H8, H11
29(d)(ii)	3	9.6.2 C3 dp2	H8, H11
29(d)(iii)	3	9.6.2, C3, dp2	H8, H11
30(a)(i)	1	9.7.4 C2 dp1	H7
30(a)(ii)	3	9.7.4 C2 dp3	H4, H7, H9, H13
30(b)(i)	1	9.7.3 C3 dp2	H7, H8
30(b)(ii)	5	9.7.3 C3 dp2	H7, H8, H13, H14
30(c)	7	9.7.2 C2 dp1	H1, H7, H9
30(d)(i)	1	9.7.1 C2 dp3	H7, H9
30(d)(ii)	3	9.7.1 C3 dp1	H7, H9, H13
30(d)(iii)	4	9.7.1 C3 dp1	H14
31(a)(i)	1	9.8.1 C2 dp2	H3, H4, H5
31(a)(ii)	3	9.8.2 C2 dp5 9.8.3, C2, dp4 9.8.3 C2, dp5	H3, H4, H5, H6, H10
31(b)(i)	3	9.8.2 C3 dp3 9.8.3 C2, dp4	H3, H4, H5, H6
31(b)(ii)	3	9.8.5 C2 dp1	H3, H4, H5, H6
31(c)	7	9.8.3 C2 dp8 9.8.3 C3, dp5	H3, H4, H6

Question	Marks	Content	Syllabus outcomes
31(d)(i)	1	9.8.4 C3 dp1	H9
31(d)(ii)	2	9.8.4 C3 dp1	H3, H8
31(d)(iii)	5	9.8.4 C3 dp2	H11, H12, H13
32(a)(i)	1	9.9.4 C3 dp1	H4
32(a)(ii)	3	9.9.4 C2 dp2 and dp 4	H4, H6
32(b)(i)	2	9.9.6 C2, dp2	H4, H14.1
32(b)(ii)	4	9.9.6 C2, dp1	H4
32(c)	7	9.9.1 C2 dp1, 2 and 3	H1, H2, H6
32(d)(i)	1	9.9.3 C2, dp6	H9, H11, H12, H14
32(d)(ii)	2	9.9.3 C2, dp6	H9, H11, H12, H14
32(d)(iii)	5	9.9.3 C2, dp6	H6, H9, H11, H12, H14



B O A R D O F S T U D I E S
NEW SOUTH WALES

2003 HSC Senior Science Marking Guidelines

Question 16

Outcomes assessed: H4, H7, H8

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none">• One statement about the characteristics of a subdermal implant• Two correct statements about release of medication into the body	3
<ul style="list-style-type: none">• Includes any two of the above points	2
<ul style="list-style-type: none">• Includes one of the above points	1

Question 17 (a)

Outcomes assessed: H2, H4, H8

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none">• Correctly identifies one claim under investigation	1

Question 17 (b)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
• Correctly outlines one safety issue relating to the investigation	1

Question 17 (c)*Outcomes assessed: H11, H14***MARKING GUIDELINES**

Criteria	Marks
• Provides points for and/or against the manufacturer's claims	3
• Provides points for and/or against one claim by the manufacturer	2
• Statement about the results not linked to the claims	1

Question 18 (a)*Outcomes assessed: H2, H8***MARKING GUIDELINES**

Criteria	Marks
• Definition or brief description of a suspension	1

Question 18 (b)*Outcomes assessed: H8***MARKING GUIDELINES**

Criteria	Marks
• Correctly identifies two differences OR • Correctly identifies one difference AND • Two correct statements about either emulsion or suspension	2
• Mentions any ONE of the properties	1

Question 18 (c)*Outcomes assessed: H2, H11, H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Describes a procedure that identifies the dependent variable AND <ul style="list-style-type: none">• Identifies how the dependent variable is measured• Identifies a controlled variable	3
<ul style="list-style-type: none">• Any two of the above	2
<ul style="list-style-type: none">• Any one of the above	1

Question 19*Outcomes assessed: H7, H9, H11***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Relates microflora to their roles on the skin• Links the findings from research 1 and 2 to the role of microflora on the skin• Makes a judgement about the findings of the research	7
Any TWO of the following: <ul style="list-style-type: none">• Relates microflora to their roles on the skin• Links the findings from research one and two to the role of microflora on the skin• Discusses the findings of the research	5–6
Any TWO of the following: <ul style="list-style-type: none">• Relates microflora to their roles on the skin• Links the findings from research one and two to the role of microflora on the skin• Discusses the findings of the research	3–4
<ul style="list-style-type: none">• Isolated statements about the roles of microflora on the skin AND/OR <ul style="list-style-type: none">• Discusses the findings of the research	1–2

Question 20 (a)*Outcomes assessed: H1, H3, H4***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Indicates why MRI is considered a non-invasive medical diagnostic technique	1

Question 20 (b) (i)*Outcomes assessed: H1, H3, H4***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Definition or brief description of keyhole surgery	1

Question 20 (b) (ii)*Outcomes assessed: H1, H3, H4***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Identifies one advantage of keyhole surgery	1

Question 21*Outcomes assessed: H8, H9***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Compares the properties of UHMWPE and silicone that make them suitable in artificial jointsContrasts the properties of UHMWPE and silicone that make them suitable in artificial joints	4
<ul style="list-style-type: none">Limited comparison and/or contrast of properties of UHMWPE and silicone that make them suitable in artificial joints	2–3
A correct statement about a property of <ul style="list-style-type: none">UHMWPE orsilicone orsuitability of these for artificial joints	1

Question 22*Outcomes assessed: H3, H4, H7, H9***MARKING GUIDELINES**

Criteria	Marks
• Discusses differences between cemented and uncemented implants	3
• Discusses a difference between a cemented and an uncemented artificial implant	2
• Identifies either a cemented or an uncemented artificial implant OR • Identifies a problem/or benefit with either implant OR • Describes a property of either	1

Question 23 (a) (i)*Outcomes assessed: H1, H3, H4***MARKING GUIDELINES**

Criteria	Marks
• Identify/state/name another biomedical device	1

Question 23 (a) (ii)*Outcomes assessed: H4, H9***MARKING GUIDELINES**

Criteria	Marks
• Provides one physical or medical condition that requires the use of the biomedical device in (i)	1

Question 23 (b)*Outcomes assessed: H12***MARKING GUIDELINES**

Criteria	Marks
• Correctly identifies two sources of information relevant to biomedical devices	2
• Correctly identifies only one source of information relating to biomedical devices	1

Question 24 (a)*Outcomes assessed: H11***MARKING GUIDELINES**

Criteria	Marks
• Outlines ONE safety precaution relevant to this investigation	1

Question 24 (b)*Outcomes assessed: H11***MARKING GUIDELINES**

Criteria	Marks
• Lists at least 2 pieces of relevant equipment	2
• Lists one piece of relevant equipment	1

Question 24 (c)*Outcomes assessed: H7, H12, H14***MARKING GUIDELINES**

Criteria	Marks
• Describes results and clearly relates the findings to the role of the skeleton	2–3
• Outlines results of investigation OR • Outlines role of skeleton	1

Question 25 (a)*Outcomes assessed: H3, H10, H13.1e***MARKING GUIDELINES**

Criteria	Marks
Correctly labelled diagram showing • total internal reflection • direction of light ray • an understanding (implied) of the law of reflection	2
• Provides diagram showing total internal reflection	1

Question 25 (b)*Outcomes assessed: H2, H3, H10***MARKING GUIDELINES**

Criteria	Marks
• Describes a consequence of total internal reflection and gives a reason why this benefits the transmission of information	2
• Lists one advantage of total internal reflection in communication	1

Question 25 (c)*Outcomes assessed: H3, H4, H13.1e***MARKING GUIDELINES**

Criteria	Marks
• Identifies at least one difference between optical fibres and copper cabling for each criterion • Information presented in a table	4
• Contrasted optical fibres and copper cabling for one criterion • Information presented in a table	2–3
• Identifies correct properties for EITHER optical fibres OR copper cables	1

Question 26 (a)*Outcomes assessed: H10***MARKING GUIDELINES**

Criteria	Marks
• Correctly defines geostationary with respect to geostationary satellite	1

Question 26 (b)*Outcomes assessed: H4***MARKING GUIDELINES**

Criteria	Marks
• Explains that the position of the satellite relative to the earth does not change. Gives a reason related to communication	2
• One of the above	1

Question 26 (c)*Outcomes assessed: H4, H10***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Outline of steps in the process to transmit images from Y to X involving B and A	2
<ul style="list-style-type: none">Outlines a process to transmit images from Y to X involving only one satellite OR <ul style="list-style-type: none">Outlines a process to transmit images from X to Y involving two satellites	1

Question 27 (a) (i)*Outcomes assessed: H4, H10***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Correctly identifies a communication system that uses microwaves	1

Question 27 (a) (ii)*Outcomes assessed: H4, H10***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Correctly identifies a communication system that uses radio waves other than AM and FM radio	1

Question 27 (b) (i)*Outcomes assessed: H10, H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Two correctly drawn diagrams of an AM wave and an FM wave	2
<ul style="list-style-type: none">One correctly drawn diagram of an AM wave or FM wave	1

**Question 27 (b) (ii)***Outcomes assessed: H3, H4, H10***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Identifies one disadvantage of microwavesStatement about why it is a disadvantage	2
<ul style="list-style-type: none">Either of the above	1

Question 28 (a) (i)*Outcomes assessed: H3, H8***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Correct definition includes the term <i>synthetic</i> polymer	1

Question 28 (a) (ii)*Outcomes assessed: H3, H8***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Describe clearly the effect of heating and cooling on both thermosetting and thermoplastic	3
<ul style="list-style-type: none">Describes clearly the effect of heating and cooling either thermosetting OR thermoplastic	2
<ul style="list-style-type: none">Some information about the effect of heating and cooling on both thermosetting and thermoplastic	
<ul style="list-style-type: none">Some information about heating one of the plastics	1

Question 28 (b) (i)*Outcomes assessed: H8***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Any item listed as examples for plastics type 1 (PET) or type 2 (HDPE)	1

Question 28 (b) (ii)*Outcomes assessed: H4, H8***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Assesses the impact of plastics in both terrestrial and aquatic environments by describing effects and consequencesNames at least TWO examples from table	4–5
<ul style="list-style-type: none">General discussion about the effects of plastics in both terrestrial and aquatic environments	2–3
<ul style="list-style-type: none">Description of an effect of a plastic in either terrestrial OR aquatic environment	1

Question 28 (c)*Outcomes assessed: H3, H4, H5, H6***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Identifies sources of chemicals used to make synthetic polymersAnalyses the implications of these sources running out	6–7
<ul style="list-style-type: none">Identifies sources of chemicals used to make synthetic polymersDiscusses the effect of these sources running out	4–5
<ul style="list-style-type: none">Identifies a source of chemicals AND <ul style="list-style-type: none">Describes an effect of the source running out	2–3
<ul style="list-style-type: none">Identifies a source of chemicals OR <ul style="list-style-type: none">Describes an effect of the source running out	1

Question 28 (d) (i)*Outcomes assessed: H8***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Name of the property and what is meant by that property	2
<ul style="list-style-type: none">Name of the property of a polymer OR <ul style="list-style-type: none">Describe a property of a polymer	1

Question 28 (d) (ii)*Outcomes assessed: H8, H11***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Name of property investigatedValid aimValid and relevant methodValid and relevant resultsCorrect conclusion for experiment	5–6
<ul style="list-style-type: none">At least THREE of the above	3–4
<ul style="list-style-type: none">At least ONE of the above	1–2

Question 29 (a) (i)*Outcomes assessed: H4, H6***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Names one bacterial microbe that causes spoilage in food	1

Question 29 (a) (ii)*Outcomes assessed: H4, H6***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Detailed description of the advantages, for society, of using UHT as a method of preserving food	3
<ul style="list-style-type: none">A description of the advantages of using UHT as a method of preserving food	2
<ul style="list-style-type: none">One advantage of using UHT	1

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

Criteria	Marks
<ul style="list-style-type: none">Identifies ONE way in which bacteriocins can be used to preserve food	1

Question 29 (b) (ii)*Outcomes assessed: H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Identifies at least two issues associated with the usefulness of food labels AND <ul style="list-style-type: none">Describes a problem associated with Food label 1 and describes how the label could be improved AND <ul style="list-style-type: none">Describes a problem associated with Food label 2 and describes how this label could be improved	5
<ul style="list-style-type: none">Two of the above	3–4
<ul style="list-style-type: none">One of the above	1–2

Question 29 (c)*Outcomes assessed: H1, H3, H4, H8***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Discusses at least two effects of preservatives and additives on cosmetics designed specifically to improve shelf life and appearanceProvides points for and/or against the uses of these additives and preservatives in cosmetics	6–7
<ul style="list-style-type: none">Describes the properties of preservatives and additives designed to improve shelf life and appearance in cosmeticsMakes some references to effects of additives	4–5
<ul style="list-style-type: none">Outlines the uses of preservatives and additives designed to improve shelf life and appearance	2–3
<ul style="list-style-type: none">Outlines effect of an additive or preservative in cosmetics	1

Question 29 (d) (i)*Outcomes assessed: H8, H11***MARKING GUIDELINES**

Criteria	Marks
• Clearly distinguishes between the roles of additives and preservatives used in foods	2
• Describes the role of EITHER an additive OR preservative used in foods	1

Question 29 (d) (ii)*Outcomes assessed: H8, H11***MARKING GUIDELINES**

Criteria	Marks
• A scientific methodology that would compare the solubilities of the preservatives • A summary of the results	2–3
• Description of a methodology that is relevant OR • A summary of the results	1

Question 29 (d) (iii)*Outcomes assessed: H8, H11***MARKING GUIDELINES**

Criteria	Marks
• An explanation that relates the solubilities of these substances to their role in preserving cured meats	2–3
• Statement that links solubility to role as preservative	1

Question 30 (a) (i)*Outcomes assessed: H7***MARKING GUIDELINES**

Criteria	Marks
• Correctly identifies the bacterium	1

Question 30 (a) (ii)*Outcomes assessed: H4, H7, H9, H13***MARKING GUIDELINES**

Criteria	Marks
• Correctly names the process of bacterial reproduction and uses an appropriate diagram to illustrate the process	3
• Correctly names the process of bacterial reproduction and uses a single unlabelled diagram as illustration OR • Uses a fully labelled diagram to illustrate the process	2
• Correctly names the process of bacterial reproduction OR • Provides a basic unlabelled diagram as illustration	1

Question 30 (b) (i)*Outcomes assessed: H7, H8***MARKING GUIDELINES**

Criteria	Marks
• Correctly identifies the analgesic	1

Question 30 (b) (ii)

Outcomes assessed: H7, H8, H13, H14

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Correctly names three forms of analgesics and relate each form to its solubility Gives a reason for the different forms 	4–5
<ul style="list-style-type: none"> Correctly names 2 forms of analgesic Describes the solubility of each 	2–3
<ul style="list-style-type: none"> Correctly names 1 form of analgesic OR <ul style="list-style-type: none"> Describes differences in solubility rates 	1

Question 30 (c)

Outcomes assessed: H1, H7, H9

MARKING GUIDELINES

Criteria	Marks
Makes a judgement about the effectiveness of the circulation system based on: <ul style="list-style-type: none"> A description of at least two features of the circulatory system that makes it suitable Linking properties of pharmaceuticals to the features of the circulatory system 	6–7
<ul style="list-style-type: none"> Describes at least two features of the circulatory system that makes it suitable to transport pharmaceuticals Describes a property of pharmaceuticals that enable them to be transported in the circulatory system 	4–5
<ul style="list-style-type: none"> Describes at least two features of the circulatory system which make it suitable to transport pharmaceuticals OR <ul style="list-style-type: none"> Describes at least one feature of the circulatory system that makes it suitable to transport pharmaceuticals AND <ul style="list-style-type: none"> Describes a property of pharmaceuticals that enables them to be transported by the circulatory system 	2–3
<ul style="list-style-type: none"> Identifies a feature of the circulatory system that makes it suitable to transport pharmaceuticals OR <ul style="list-style-type: none"> Identifies a property of pharmaceuticals that enable them to be transported in the circulatory system 	1

Question 30 (d) (i)*Outcomes assessed: H7, H9***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Correctly identifies the main sense organ involved in the particular investigation	1

Question 30 (d) (ii)*Outcomes assessed: H7, H9, H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Correctly illustrates logical steps involved in investigation in a flow chart format	2–3
<ul style="list-style-type: none">Attempts some steps in a flow chart format OR <ul style="list-style-type: none">Describes some steps not in a flow chart format	1

Question 30 (d) (iii)*Outcomes assessed: H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">States or describes a conclusionMakes a judgement on validityJustifies judgement in terms of results or procedures followed	3–4
<ul style="list-style-type: none">States or describes a conclusion AND <ul style="list-style-type: none">Justifies conclusion in terms of results or procedures OR <ul style="list-style-type: none">Makes a judgement on validity OR <ul style="list-style-type: none">Describes results of investigation	2
<ul style="list-style-type: none">Describes results of investigation OR <ul style="list-style-type: none">Identifies an area of concern with experiment	1

Question 31 (a) (i)*Outcomes assessed: H3, H4, H5***MARKING GUIDELINES**

Criteria	Marks
• Identifies specifically one natural disaster which has occurred in Australia	1

Question 31 (a) (ii)*Outcomes assessed: H3, H4, H5, H6, H10***MARKING GUIDELINES**

Criteria	Marks
• Outlines TWO techniques and a link to reduced incidence of damage OR • Identifies three techniques	3
• Outlines one technique linked to reduce the incidence of damage next time OR • Identifies two techniques	2
• Identifies one technique	1

Question 31 (b) (i)*Outcomes assessed: H3, H4, H5, H6***MARKING GUIDELINES**

Criteria	Marks
• Identifies monitoring systems used to predict earthquakes and tropical cyclones • Comparative statement of the effectiveness of the monitoring systems	3
• Identifies two monitoring systems OR • Identifies one monitoring system AND • Comparative statement of the effectiveness of the monitoring systems	2
• Comparative statement of the effectiveness of the monitoring systems OR • Identifies any monitoring system	1

Question 31 (b) (ii)*Outcomes assessed: H3, H4, H5, H6***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Names ONE specific bushfire help service AND <ul style="list-style-type: none">Provides TWO examples (or ways or strategies) of how this service assists in reducing bushfire risks to people and/or places and/or natural vegetation and/or environmental spaces	3
<ul style="list-style-type: none">Any TWO of the above	2
<ul style="list-style-type: none">Any ONE of the above	1

Question 31 (c)*Outcomes assessed: H3, H4, H6***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Outlines at least two precautionsDescribe the effect of implementing these precautionsMake a comparative judgement on the effectiveness of the precautions with supporting reasons	7
<ul style="list-style-type: none">Outline at least two precautionsDescribe the effect of implementing ONE or TWO of these precautionsImplies a comparative judgement on the effectiveness of precautions (supporting reasons not given)	5–6
<ul style="list-style-type: none">Outlines at least two precautionsDescribe the effect of implementing at least one of these precautions OR <ul style="list-style-type: none">Identifies the preferred/best/most effective precaution	3–4
<ul style="list-style-type: none">Outlines ONE or TWO precautions OR <ul style="list-style-type: none">Describe the effects of implementing one of these precautions OR <ul style="list-style-type: none">Identify the preferred/better/more effective precaution	1–2

Question 31 (d) (i)*Outcomes assessed: H9***MARKING GUIDELINES**

Criteria	Marks
• Name the type of fire	1

Question 31 (d) (ii)*Outcomes assessed: H3, H8***MARKING GUIDELINES**

Criteria	Marks
• State ONE type of fire-extinguisher that is not water-based AND	2
• State the specific use of this same type of fire extinguisher	
• Either one of the two points above	1

Question 31 (d) (iii)*Outcomes assessed: H11, H12, H13***MARKING GUIDELINES**

Criteria	Marks
• Labelled diagram • Description of how the device was constructed or built • Description of the conditions under which the device was tested • Description of how the effectiveness of the device was tested	5
• Three of the above	3–4
• At least one of the above	1–2

Question 32 (a) (i)*Outcomes assessed: H4***MARKING GUIDELINES**

Criteria	Marks
• State one advantage of using a shuttle	1

Question 32 (a) (ii)*Outcomes assessed: H4, H6***MARKING GUIDELINES**

Criteria	Marks
• Identify ONE problem on lift-off of shuttle AND • Explain how the shuttle overcomes the problem	3
• Identify ONE problem on lift-off of shuttle • Identify how the shuttle overcomes this problem	2
• Identifies a problem or solution	1

Question 32 (b) (i)*Outcomes assessed: H4, H14.1***MARKING GUIDELINES**

Criteria	Marks
• The spin-off identified • The impact identified	2
EITHER • The spin-off identified OR • The impact identified	1

Question 32 (b) (ii)*Outcomes assessed: H4***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Identify two materials and a property of eachRelates the properties to conditions experienced in space	4
<ul style="list-style-type: none">Identifies two materials and properties OR <ul style="list-style-type: none">Identifies one material and property andRelates the property to conditions experienced in space	2–3
<ul style="list-style-type: none">Identifies one material and property OR <ul style="list-style-type: none">Makes general statement about conditions in space that could affect the astronaut	1

Question 32 (c)*Outcomes assessed: H1, H2, H6,***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Identify that there is no clear boundary between the atmosphere and empty spaceA detailed description of the distribution and concentration of gas particles in the atmosphere linked to the role of gravityA description of empty space as having finite but very low concentrations of gas particles	6–7
<ul style="list-style-type: none">Clear descriptions of the distribution and concentration of gas particles in the atmosphereA description of empty space as having finite but very low concentrations of gas particles	4–5
<ul style="list-style-type: none">Clear descriptions of the distribution OR concentration of gas particles in the atmosphereA description of empty spaces as having very low concentration of gas particles	2–3
<ul style="list-style-type: none">Makes a correct statement about the distribution or concentration of gas particles in either the atmosphere or empty space	1

Question 32 (d) (i)*Outcomes assessed: H9, H11, H12, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Answer must include BOTH the numerical values (eg 75 _ 8 mg OR 67 mg to 83 mg) and the Units	1

Question 32 (d) (ii)*Outcomes assessed: H9, H11, H12, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">One group is the control group (Group 1) AND <ul style="list-style-type: none">The use of two groups allows scientist to make causal statements between the manipulated and responding variables	2
EITHER <ul style="list-style-type: none">One group is the control group (Group 1) OR <ul style="list-style-type: none">The use of two groups allows scientist to make causal statements between the manipulated and responding variables	1

**Question 32 (d) (iii)***Outcomes assessed: H6, H9, H11, H12, H14***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Identifies the soleus muscle as playing a role in supporting body/movement of rats AND <ul style="list-style-type: none">Clearly states the link between gravity and the role of the soleus muscle AND <ul style="list-style-type: none">Identify that the soleus muscle would NOT be used as much in space due to low or microgravity environment AND <ul style="list-style-type: none">Identifies that the percentage weight loss is greater in the soleus muscle than for any other body muscle	4–5
<ul style="list-style-type: none">Any TWO or THREE of the above listed points	2–3
<ul style="list-style-type: none">Any ONE of the above listed points	1