2008 HSC Notes from the Marking Centre

Senior Science

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2008 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 2008 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 2008 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 2008, approximately 4500 candidates attempted the Senior Science examination. The most popular electives were Disasters (65%) and Pharmaceuticals (18%).

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 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 2008 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	B
2	B
3	C
4	A
5	C
6	B
7	D
8	C
9	D
10	B
11	D
12	A
13	A
14	A
15	C

Part B

Question 16

(a) Better responses identified nail polish as a suspension which, when left to stand, would settle into layers and therefore require shaking to form a uniform mixture.

Some responses confused the terms *suspension*, *colloid*, *surfactant* and *emulsion*. Weaker responses simply stated that nail polish would settle into layers OR that it needed mixing.

(b) (i) Better responses indicated that because nail polish remover was a solvent, it dissolved the nail polish (the solute) to form a solution. Other responses described the forces between the solute and solvent which led to one dissolving the other.

Weaker responses simply repeated the information given in the question or confused the term solvent with surfactant or emulsifier.

(ii) Better responses linked a specific safety issue relevant to solvents with the relevant safety precaution.

Weaker responses simply listed a safety issue OR a precaution.

Question 17

(a) Better responses included a specific indicator, such as universal indicator, that would measure pH rather than an indicator which simply showed whether a liquid was acidic or alkaline. Some better responses included the use of specific technology which would measure pH.

(b) Better responses identified the time taken to dissolve as the dependent variable. Weaker responses confused the term *dependent* and *independent* variable as well as confusing these with controlled variables.

(c) Better responses explained how to improve the reliability of the experiment and gave a reason. Weaker responses gave either the cause or effect or confused reliability with validity.

(d) Better responses demonstrated their sound understanding by providing a valid judgement about the conclusion. This judgement was supported by reasons which related to the different pH of relevant parts of the digestive system as well as providing supportive statements about properties of the medications involved in the experiment.

Weaker responses only described the pH of parts of the digestive system or properties of the medication, or simply interpreted data from the table provided.

Question 18

(b) Better responses outlined an example of chemical and mechanical digestion that occurred in the stomach. Weaker responses listed digestive processes that occurred in other parts of the digestive system or functions other than the breakdown of food.

Question 19

Better responses clearly identified at least two advantages and provided features/characteristics of these.

Weaker responses identified one advantage without describing an associated feature/characteristic or simply listed features/characteristics for example an implant releases the drug slowly.

Question 20

(a) Better responses clearly identified the left atrium. Some responses incorrectly based their responses on a schematic diagram of the heart that implies that the atria are simply the top portions but failed to realise that the left atrium is the chamber between the pulmonary vein and the bicuspid valve.

Weaker responses confused the left side of the heart (with respect to the position in the body) and the left side of the page the diagram is printed on. Other weak responses confused atrium with ventricle.

(b) Correct responses recognised labels ‘2’ and ‘4’ as being those vessels that carry deoxygenated blood.

(c) Better responses included clear links between the thicker wall 'A' and its ability to create a higher blood pressure to push the blood through the systemic circuit. Alternatively, they included clear links between the thinner wall 'B' and it producing a lower blood pressure since it only needed to pump to the pulmonary circuit.

Weaker responses discussed wall thickness and either blood destination or the resulting blood pressures but failed to link these two concepts.

Question 21

Better responses correctly identified the diagram as a heart/lung machine and further explained how this machine replaces the heart by circulating blood around the body whilst an operation was being performed. They also explained how this machine replaces the lungs by removing carbon dioxide from the blood and providing oxygen to it.

Weaker responses confused the role of the heart as being responsible for both pumping blood throughout the body and oxygenating it. Other weak responses did not recognise that this machine replaced the heart and lungs during an operation or simply repeated information given within the question.

Question 22

Better responses included in the table a correct example with a related advantage and disadvantage.

Question 23

Better responses answered the question with a coherent discussion. The discussion included two issues related to the use of light in communication supported by examples related to the uses and properties of light.

Weaker responses did not provide any form of discussion. They provided lists of uses or focused on one aspect of the use of light.

Question 24

(a) Better responses clearly identified electricity as the type of energy used in land connected telephones (with copper cable), and the medium of transmission for television. Weaker responses confused the term *electromagnetic energy* with *electricity*. Some responses gave a type of transmitter such as an aerial or tower as the medium of transmission.

Weaker responses confused mobile phones with land connected telephones.

(b) Better responses clearly identified advantages of using a variety of information systems. Weaker responses merely outlined some advantages of modern communication systems without addressing the reasons and advantages of using a range of systems.

Question 25

(a) (i) The best responses correctly identified two resources used to gather information from secondary sources. Weaker responses identified only one correct resource.

(ii) Better responses outlined two correct reasons for using information from more than one source.

(b) Better responses correctly graphed the information from the table provided.

(c) Better responses provided a judgement and gave a reason for controlling two variables which were not controlled in the experiment or provided a judgement whilst demonstrating a sound understanding of the importance of variables in experimental design.

Question 26

Better responses identified a number of different biomaterials in both pacemakers and heart valves and related their properties to the reasons for their use. These responses demonstrated a clear and logical analysis.

Section II – Options

Question 27 – Polymers

(a) Weaker responses confused the slime ingredients with playdough ingredients.

(b) (i) Some weaker responses included names of two thermoplastics without identifying a thermoset plastic or provided uses for different types of plastics.

(iii) Better responses provided reasons to justify their choice of a suitable plastic for a bench top.

(c) Better responses identified issues related to the future of production of polymers from petrochemicals, with points for and/or against. Some responses included as their supporting arguments benefits to society or pollution problems or dangers to wildlife. Weaker responses merely gave a list of the uses of plastics or discussed one of the above.

(d) Better responses linked the use of these polymers on sailing boats to their properties.

(e) The better responses included two or more different types of plastics and gave a clear statement of their recycling potential. Weaker responses gave a very general statement about recycling plastics, without addressing the viability of recycling of these plastics.

Question 28 – Preservatives and Additives

(a) (i) Superior responses named two specific organisms that caused food spoilage for example, *Clostridium botulinum*. Weaker responses simply gave a group of organisms for example bacteria and fungi, without referring to actual species.

(ii) Better responses stated that the treatment for food poisoning was to remain hydrated and let the illness take its course.

(b) (i) Better responses identified osmosis as the movement of a solvent across a concentration gradient through a semi-permeable membrane to 'even' out the concentrations of the solute. They described a first-hand investigation in detail with a clear, valid method.

(ii) Better responses identified methods such as salting that used osmosis and explained clearly the role of osmosis in preservation.

(c) Better responses included clear examples to show several different uses of food additives.

(d) Better responses named and outlined two methods such as pasteurisation and canning.

(e) Better responses explained that chemical preservatives either slowed down or killed microbes and thus preserved the food, correctly identifying that these preservatives were mainly used in cured meats such as salami.

(f) Better responses explained the links between specific food additives and clinical disorders, for example red food colouring linked to hyperactivity in children, the use of MSG linked to headaches and/or asthma attacks.

Question 29 – Pharmaceuticals

(a) (i) Correct responses identified Y as the white blood cell and Z as the red blood cell.

(ii) Better responses correctly outlined two roles of white blood cells for example phagocytosis and inflammation response.

(b) (i) Best responses constructed a flow chart showing a basic understanding of a nervous system pathway and identified five components in the pathway.

(ii) Better responses sketched in general terms the method of a valid first-hand investigation and provided results – often in a table. These showed an understanding of reliability by including a reference to repeating the experiment, averaging results and comparing with other people's reaction times.

(c) Better responses described the causes and symptoms of inflammation and described how aspirin's inhibition of the production of prostaglandins resulted in alleviation of these symptoms. They also discussed aspirin's role in treating inflammation and identified issues such as aspirin's solubility, its ability to block the pain signal crossing the nerve synapses and its anti-clotting properties.

(d) (i) Better responses explained how penicillin inhibited the formation of the cell wall during bacterial reproduction, leading to their death.

(ii) Better responses outlined how two or more features of the circulatory system were an advantage in transporting penicillin around the human body.

(iii) Better responses outlined the main events in Fleming's research as culturing bacteria on agar plates, accidental contamination by a mould which, Fleming realised, inhibited the growth of the bacteria, and the later isolation of penicillin from the mould by Florey and Chain.

Question 30– Disasters

(a) Better responses gave specific examples of known disasters, like the Thredbo landslide and the Granville train crash.

Weaker responses used generic terms like landslides and shipwrecks, used non-Australian examples used natural disasters as their examples.

(b) (i) Better responses clearly outlined an appropriate experiment to show the effects of changes in air pressure, included a labelled diagram and clearly stated results.

Weaker responses used second hand data like weather maps, or first-hand investigations that demonstrated the effects of changes in air temperature rather than changes in pressure.

(ii) Better responses clearly linked their experiment to the concept that winds are caused by air moving from areas of high pressure to areas of low pressure.

(c) Better responses clearly identified human activities, gave each a brief description, then linked them to the effect on the severity of the bushfires by including some scientific principle like the reduction in fuel.

Weaker responses only listed human activities, often those that start bushfires.

Common misconceptions were that 'man-made ' bushfires are more severe than natural fires and that global warming causes bushfires.

(d) (i) Better responses drew a well labelled circuit that included a warning device (light or buzzer) and a bi-metallic strip.

Weaker responses showed poorly constructed or incomplete circuits.

(ii) Better responses identified a correct location and justified their choice on the basis that the other location would give frequent false alarms.

Weaker responses chose a poor location and ignored the problem of frequent false alarms in the kitchen.

(e) Better responses demonstrated their knowledge of specific improved technology that allowed earlier warning of Cyclone Larry. This was then linked to either faster evacuation or safety in more secure buildings, which in turn resulted in reduced death toll.

Weaker responses were very generalised with no specific knowledge of how 'improved technology ' might save lives.

Common misconceptions were that there was no technology in 1974 for early detection of cyclones or communication of this information to the public.

Question 31 –Space Science

(a) (i) Better responses indicated that mass difference between earth and the moon was the cause of the difference in gravitational pull and that earth's larger mass produced a stronger gravitational force. Weaker responses just referred to earth being bigger.

(ii) Better responses identified two situations where weightlessness could be experienced. Situations could be on earth or in space but needed to indicate an accurate location or

motion. Weaker responses generalised, for example, ‘in a space ship’ rather than, ‘in an orbiting space ship’.

(b) (i) Better responses identified components from both craft and made accurate comparisons. Weaker responses identified components without comparisons. Some responses simply compared data given in the stimulus material without reference to functions.

(ii) Better responses outlined how the shuttle design reduced dangers in lift-off, orbiting and re-entry. Weaker responses identified some safety aspects without relating them to all required periods of flight.

(c) Better responses described effects on human body functions and correctly identified them as long or short term problems. Weaker responses identified some effects without correctly identifying them as long or short term.

(d) Better responses correctly identified materials developed for space and compared their space use with their current use on earth. Weaker responses identified materials or spin-offs without clearly stating their uses in space and on earth.

(e) Better responses identified suitable projects and explained reasons that did or did not support the program. These responses also assessed the value of the projects and gave a judgement. Weaker responses gave limited reasons for the projects without any judgement.

Senior Science

2008 HSC Examination Mapping Grid

Question	Marks	Content	Syllabus outcomes
Section I Part A			
1	1	9.4.2.2.1	H10
2	1	9.4.1.2.5	H10
3	1	9.4.3.2.2, 9.4.6.3.2	H10
4	1	9.4.4.2.2, 9.4.4.2.1	H10
5	1	9.4.5.2.3	H10, H14.1
6	1	9.3.4.3.1	H7, H9
7	1	9.3.3.2.5	H9
8	1	9.3.3.2.2	H9
9	1	9.3.2.3.6	H9
10	1	9.2.1.2.4	H8
11	1	9.2.1.2.4, 9.2.1.2.5	H8, H14
12	1	9.2.3.2.1	H9
13	1	9.3.2.2.1	H9
14	1	9.2.4.2.2	H8
15	1	9.2.1.3.3	H8, H14
Section I Part B			
16 (a)	2	9.2.1.2.3	H8
16 (b) (i)	2	9.2.1.2.3	H8
16 (b) (ii)	2	9.2.1.3.1	H8
17 (a)	1	9.2.3.3.2, 11.3a	H11
17 (b)	1	9.2.4.3.1, 9.1, 11.2a	H11
17 (c)	2	11.2d, 12.2b	H11, H12
17 (d)	4	9.2.5.2.3, 9.2.5.2.5	H9, H14
18 (a)	1	9.2.5.2.1	H9
18 (b)	2	9.2.5.2.2	H9
19	3	9.2.4.3.2	H9
20 (a)	1	9.3.2.2.1	H9
20 (b)	1	9.3.2.2.1	H9
20 (c)	2	9.3.2.2.1	H9, H14
21	3	9.3.2.1, 9.3.4.2.3	H9, H12
22	6	9.3.5.2.1, 9.3.5.3.1	H9
23	6	9.4.3.2.2, 9.4.3.2.3, 9.4.6.3.1, 14.3b	H4, H10, H14
24 (a)	2	9.4.3.2.1	H10
24 (b)	2	9.4.1.2.6	H10
25 (a) (i)	1	12.3a	H12

Question	Marks	Content	Syllabus outcomes
25 (a) (ii)	2	12.4e	H12
25 (b)	3	9.4.2.1	H13
25 (c)	4	11.2, 12.4	H11, H12
26	7	9.3.2.2.5, 9.3.2.2.7, 14.3b	H3, H7, H9, H14
Section II Question 27 — Polymers			
(a)	4	9.5.2.3.1	H8
(b) (i)	2	9.5.3.2.3	H8
(b) (ii)	2	9.5.3.2.1, 9.5.3.2.2	H8
(b) (iii)	3	9.5.3.2.2, 9.5.3.2.4	H8
(c)	6	9.5.2.2.3, 9.5.4.2.3, 9.5.4.2.4, 14.3b	H4, H5, H6, H14
(d)	4	9.5.4.2.1, 9.5.4.2.2	H3, H8
(e)	4	9.5.4.3.1	H4, H8
Section II Question 28 — Preservatives and Additives			
(a) (i)	2	9.6.3.2.1	H7
(a) (ii)	2	9.6.3.3.1	H7
(b) (i)	4	9.6.3.3.3	H11, H14
(b) (ii)	3	9.6.2.2.2, 9.6.3.3.3	H8
(c)	6	9.6.1.2.2, 9.6.1.3.1, 14.3b	H3, H4, H8, H14
(d)	2	9.6.2.2.2, 9.6.3.3.4	H8
(e)	2	9.6.2.2.3	H8
(f)	4	9.6.5.3.2, 9.6.5.2.1, 9.6.2.2.4	H4, H8
Section II Question 29 — Pharmaceuticals			
(a) (i)	2	9.7.2.3.2	H9
(a) (ii)	2	9.7.2.2.4	H9
(b) (i)	3	9.7.1.2.6	H9, H13
(b) (ii)	4	9.7.1.3.1	H9, H11, H14
(c)	6	9.7.3.2.2, 9.7.3.2.3, 9.7.3.2.4, 9.7.3.2.5, 9.7.3.2.7, 14.3b	H9, H14
(d) (i)	2	9.7.4.2.5	H9
(d) (ii)	2	9.7.2.2.5	H9
(d) (iii)	4	9.7.4.3.4	H1, H9
Section II Question 30 — Disasters			
(a)	4	9.8.1.2.3, 9.8.1.2.4	H10
(b) (i)	4	9.8.2.3.1	H11, H14
(b) (ii)	3	9.8.2.2.1	H10
(c)	6	9.8.3.2.8, 9.8.3.3.5, 9.8.3.3.4, 14.3b	H3, H4, H14
(d) (i)	2	9.8.4.3.2, 13.1e	H13
(d) (ii)	2	9.8.4.3.4, 13.1e, 14.1b	H10, H13, H14
(e)	4	9.8.1.3.2, 9.8.2.2.4, 9.8.2.2.5, 9.8.2.2.6	H4, H10

Question	Marks	Content	Syllabus outcomes
Section II **Question 31 — Space Science**			
(a) (i)	2	9.9.2.2.1	H10
(a) (ii)	2	9.9.2.2.2, 9.9.2.2.3	H10
(b) (i)	4	9.9.4.2.1, 9.9.4.3.1	H10
(b) (ii)	3	9.9.4.2.1, 9.9.5.3.5	H10
(c)	6	9.9.3, 14.3b	H7, H9, H14
(d) (i)	4	9.9.6.2.2	H4
(e)	4	9.9.6.3.1	H3, H5

BOARD OF STUDIES
NEW SOUTH WALES

2008 HSC Senior Science
Marking Guidelines

The following marking guidelines were developed by the examination committee for the 2008 HSC examination in Senior Science, and were used at the marking centre in marking student responses. For each question the marking guidelines are contained in a table showing the criteria associated with each mark or mark range. For some questions, 'Sample Answers' or 'Answers may include' sections are included. These are developed by the examination committee for two purposes. The committee does this:

(1) as part of the development of the examination paper to ensure the questions will effectively assess students' knowledge and skills, and

(2) in order to provide some advice to the Supervisor of Marking about the nature and scope of the responses expected of students.

The examination committee develops the marking guidelines concurrently with the examination paper. The 'Sample Answers' or similar advice are not intended to be exemplary or even complete answers or responses. As they are part of the examination committee's 'working document', they may contain typographical errors, omissions, or only some of the possible correct answers.

The information in the marking guidelines is further supplemented as required by the Supervisor of Marking and the senior markers at the marking centre.

A range of different organisations produce booklets of sample answers for HSC examinations, and other notes for students and teachers. The Board of Studies does not attest to the correctness or suitability of the answers, sample responses or explanations provided. Nevertheless, many students and teachers have found such publications to be useful in their preparation for the HSC examinations.

A copy of the Mapping Grid, which maps each question in the examination to course outcomes and content as detailed in the syllabus, is also included.

Section I, Part B

Question 16 (a)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• Identifies the mixture as a suspension • States that shaking is necessary to mix ingredients	2
• Identifies the mixture as a suspension OR • Identifies a property of suspension OR • States that shaking mixes ingredients	1

Sample answer:

Nail polish is a suspension, shaking is necessary to produce a uniform mixture.

Question 16 (b) (i)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• Shows how nail polish remover acts as a solvent	2
• Identifies an effect of using a solvent	1

Sample answer:

Nail polish dissolves the nail polish to form a solution.

Question 16 (b) (ii)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• Identifies precaution and relates this to a property of a solvent	2
• Identifies precaution OR • Identifies property of solvents	1

Sample answer:

Solvents can be flammable so must be kept away from flames.

Question 17 (a)

Outcomes assessed: H11

MARKING GUIDELINES

Criteria	Marks
• Identifies correct method	1

Sample answer:

pH meter

Question 17 (b)

Outcomes assessed: H11

MARKING GUIDELINES

Criteria	Marks
• Identifies dependent variable	1

Sample answer:

The time taken to dissolve.

Question 17 (c)

Outcomes assessed: H11, H12

MARKING GUIDELINES

Criteria	Marks
• Identifies ONE way to improve reliability and gives a reason to support this choice	2
• Identifies ONE way to improve reliability without a reason	1

Answers could include:

Repeat the experiment a number of times under identical circumstances and compare results.

Question 17 (d)

Outcomes assessed: H9, H14

MARKING GUIDELINES

Criteria	Marks
• Provides a valid judgement about conclusion • Provides reasons to support judgement by relating results to pH of different parts of digestive system	4
• Provides a valid judgement • Provides supporting statements about medication OR pH of different parts of digestive system OR • Provides supporting statements about medication AND pH of different parts of digestive system	3
• Provides a valid judgement supported by a correct statement related to the results OR • Provides supporting statements about medication or pH of different parts of digestive system	2
• Provides correct statement(s) related to the results OR • Makes a valid judgement	1

Sample answer:

This statement is incorrect. Although the medication C dissolves faster it only dissolves in pH9. Therefore it will not be absorbed by the stomach and will need to reach the small intestine to enter the bloodstream. This will take longer to occur.

Question 18 (a)

Outcomes assessed: H9

MARKING GUIDELINES

Criteria	Marks
• Labels stomach correctly	1

Question 18 (b)

Outcomes assessed: H9

MARKING GUIDELINES

Criteria	Marks
• Sketches in general terms TWO roles of the stomach	2
• Identifies TWO roles OR • Outlines ONE role	1

Sample answer:

The stomach mechanically breaks down food into smaller pieces for easier digestion. It also begins the process of protein digestion.

Question 19

Outcomes assessed: H9

MARKING GUIDELINES

Criteria	Marks
• Provides features and characteristics of the advantages of using sub-dermal implants	3
• Outlines advantages OR • Provides features and characteristics of ONE advantage	2
• Identify ONE advantage OR • Identify ONE characteristic	1

Answers could include:

- The drug is released slowly and continuously over a long period of time.
- The drug is absorbed straight into the circulatory system and bypasses the skin and digestive system.

Question 20 (a)

Outcomes assessed: H9, H12, H14

MARKING GUIDELINES

Criteria	Marks
• Identifies left atrium	1

Question 20 (b)

Outcomes assessed: H12

MARKING GUIDELINES

Criteria	Marks
• Identifies 2 and 4 only	1

Sample answer:

2 and 4.

Question 20 (c)

Outcomes assessed: H9, H14

MARKING GUIDELINES

Criteria	Marks
• Relates destination of blood to reason for thickness of wall.	2
• Identifies a destination of blood from one chamber. OR • Identifies one reason for thickness.	1

Sample answer:

Blood pumped from left ventricle (A) is pumped under higher pressure to reach all parts of the body. Therefore, the wall of ventricle (A) is thicker.

Question 21

Outcomes assessed: H9, H12

MARKING GUIDELINES

Criteria	Marks
• Links roles of machine to replacing heart and lungs	3
• Links role of machine to replacing the heart and lungs	2
• Provides a role of the machine OR • Identifies the machine	1

Sample answer:

This machine takes the place of the heart and lungs. When heart is removed the machine takes its place to pump blood around body. It also replaces lungs by adding O_2 to blood and removing CO_2.

Question 22

Outcomes assessed: H9

MARKING GUIDELINES

Criteria	Marks
• Provides an example of each technique • Relates the advantages and disadvantages to the example	6
• Provides an example of each • Provides THREE of the FOUR advantages and disadvantages related to example	5
• Provides disadvantages and advantages that relate to the TWO techniques OR • Provides an example of each technique • Provides TWO advantage(s) AND/OR disadvantage(s) of each OR • Provides ONE example of a technique • Provides THREE advantages AND/OR disadvantages of each	4
• Provides an example of each technique • Provides an advantage AND/OR disadvantage OR • Provides THREE advantages/disadvantages that relate to the TWO techniques	3
• Provides TWO examples or TWO advantages/disadvantages • Provides an example and either advantage or disadvantage	2
• Provides an example OR • Provides an advantage or disadvantage	1

Question 22 (continued)

Sample answer:

Technique	Example	Advantage	Disadvantage
Minimally invasive	Key hole surgery	Small scar; less trauma to body	Miss finding diseased cells
Non-invasive	X-ray	Identify broken bone	Can't image soft tissue

Question 23

Outcomes assessed: H4, H10, H14

MARKING GUIDELINES

Criteria	Marks
• Identifies issues related to the use of visible light in communication systems • Outlines uses related to properties of light • Provides points for AND/OR against identified issues • Demonstrates coherent and logical arguments	5–6
• Identifies ONE issue related to the use of visible light in communication systems • Provides points for AND/OR against identified issues • Identifies uses AND/OR properties of light	3–4
• Outlines uses of visible light OR • Outlines TWO properties of light OR • Outlines ONE use and ONE property of light	2
• Identifies ONE use of visible light in communication systems OR • Identifies ONE property of light	1

Answers could include:

Visible light can be used in simple communication systems such as traffic lights and lighthouses.

The advantages of using light in such communication systems are that light travels at very high speeds and the information is sent virtually instantaneously.

The ability of light to be reflected allows the information to be sent through underground cables between the source and destination.

One disadvantage of light is that it cannot always be used to transmit information through the atmosphere during the day due to interference with natural light. This is why lighthouses only operate at night-time.

Question 24 (a)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• Completes table correctly	2
• Completes ONE box correctly	1

Answers could include:

1st box: atmosphere/space/none

2nd box: visible light

Question 24 (b)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• Sketches in general terms TWO advantages	2
• Sketches in general terms ONE advantage	1

Sample answer:

If one system is not functioning or not available, a person may use one of the other systems. Computers have greater security than mobile phones so can be used if communication needs to be secure.

Question 25 (a) (i)

Outcomes assessed: H12

MARKING GUIDELINES

Criteria	Marks
• Names TWO sources that could be used to collect secondary information	1

Sample answer:

Scientific journals, internet

Question 25 (a) (ii)

Outcomes assessed: H12

MARKING GUIDELINES

Criteria	Marks
• Sketches in general terms reasons for collecting information from more than ONE source	2
• Sketches in general terms a reason for collecting information from more than ONE source OR • Identifies reasons for collecting information from more than ONE source	1

Sample answer:

A number of sources are needed to ensure the accuracy and reliability of the information being collected.

Also by using more than one source you can eliminate any possible bias coming from a single source.

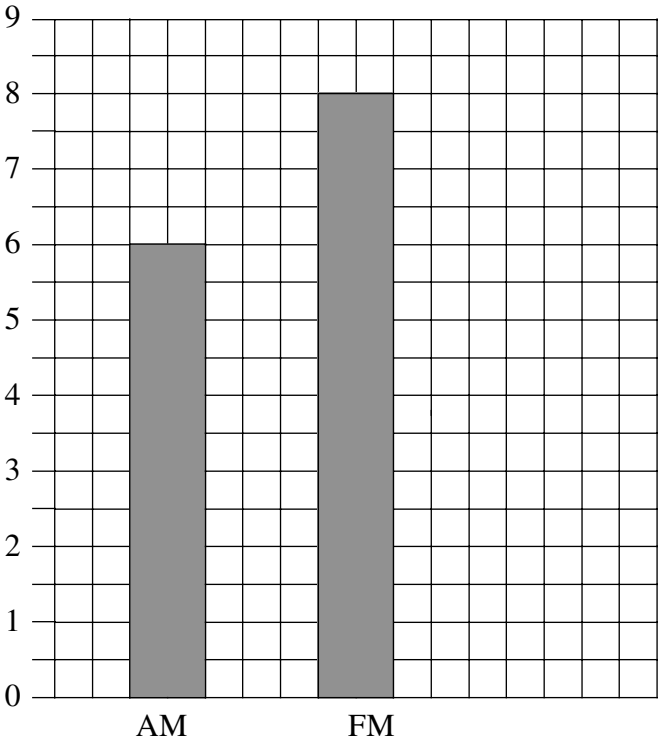
Question 25 (b)

Outcomes assessed: H13

MARKING GUIDELINES

Criteria	Marks
• Provides a correct graph • Draws a column graph • Plots accurately AM & FM values on graph	3
• Any TWO of the above	2
• One of the above	1

Sample answer:



Question 25 (c)

Outcomes assessed: H11, H12

MARKING GUIDELINES

Criteria	Marks
• Provides judgement for controlling variables • Provides reasons for controlling specific variables	4
• Provides reasons for controlling specific variables OR • Provides judgement for controlling variable • Provides a reason for controlling ONE variable	3
• Outlines variables not controlled in experiment OR • Outlines importance of controlling variables	2
• Identifies variable not controlled OR • Identifies importance of controlling variables	1

Sample answer:

Controlling variables is very important to ensure the validity of the design of an investigation. In this experiment the following variables needed to be controlled:

(i) The type of station either news stations or music stations, as the material that is being broadcast may make it difficult to recognise differences in reception quality

(ii) The radio must be kept in the same position at all times as reception could be affected by other sources, altering reception quality

(iii) The reception of the radio needs to be tested under the same conditions to ensure validity. If the AM station was tested and then the FM station was tested later, the conditions eg, atmospheric conditions may have been different

Question 26

Outcomes assessed: H3, H7, H9, H14

MARKING GUIDELINES

Criteria	Marks
• Identifies appropriate biomaterials in both devices • Relates their properties to their uses in these devices • Demonstrates coherence and logical progression and includes correct use of scientific principles	7
• Identifies biomaterials in both devices • Relates their properties to their uses in these devices	5–6
• Identifies biomaterials • Relates property to use in one device	3–4
• Identifies biomaterial(s) OR • Link ONE biomaterial to a property OR • States ONE property of biomaterials	1–2

Answers could include:

- Pacemakers – use – control heartbeat by electrical signals
  - Made from titanium, which is a light, inert material, no allergic reactions. Titanium reduces interference from household devices
- Valves – use – keep blood flowing one way
  - Made from stainless steel, dacron or teflon – all smooth to allow blood flow (no clotting) – inert material
  - Pyrolytic carbon for the leaflets of the valve, smooth chemically inert surface

All substances specifically designed for their use.

Question 27 (a)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• States correct classification and ingredients for the TWO substances	4
• States correctly THREE choices	3
• States correctly TWO choices	2
• States correctly ONE choice	1

Sample answer:

Slime	Synthetic	PVA
Play dough	Natural	Flour

Question 27 (b) (i)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• Names TWO examples	2
• Names ONE example	1

Sample answer:

Thermoset = polyurethane
Thermoplastic = polyethylene

Question 27 (b) (ii)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• Sketches in general terms TWO observations	2
• Sketches in general terms ONE observation	1

Answers could include:

- Melting
- Totally heat resistant
- Charring

Question 27 (b) (iii)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• Names the most suitable plastic for a kitchen bench top • Provides reasons to support their choice of plastic	3
• Names the most suitable plastic for a kitchen bench top • Provides a reason to support	2
• Names the most suitable plastic for a kitchen bench top	1

Sample answer:

A thermoset plastic is the most suitable type of plastic for kitchen bench tops. This is due to the fact that thermoset plastics have been permanently hardened by heat during their production and they will not melt or become softened when a hot pot or dish is placed on the bench top. Thermoset plastics also do not generate toxic fumes when heat is applied which would also be useful to avoid harm to the health of the people living in the house.

Question 27 (c)

Outcomes assessed: H4, H5, H6, H14

MARKING GUIDELINES

Criteria	Marks
• Identifies issues • Provides points for/against these issues • Demonstrates coherence and logical progression and includes correct use of scientific principles	5–6
• Outlines issues OR • Identifies ONE issue linked with points for/against	3–4
• Outlines ONE issue OR • Identifies TWO issues OR • Identifies advantages/disadvantages	2
• Identifies ONE issue OR • Identifies ONE advantage/disadvantage	1

Answers could include:

Polymers from petrochemicals are versatile and can therefore be used for many applications including packaging, clothing and transport.

The future of polymers from petrochemicals may be limited due to the reduced availability of petrochemicals, eg oil.

The manufacture of these polymers produces pollution in the forms of greenhouse gases and substances which are non-biodegradable threatening aquatic and terrestrial environments, eg plastic bags.

Question 27 (d)

Outcomes assessed: H3, H8

MARKING GUIDELINES

Criteria	Marks
• Identifies polymers • Links properties to use	4
• Identifies polymers • Links ONE property to use	3
• Identifies polymers and their properties OR • Identifies ONE polymer AND links property to use	2
• Identifies ONE polymer and its property	1

Sample answer:

- Nylon for ropes because it has high tensile strength.
- Spectra fibres for sails because it is light and strong.

Question 27 (e)

Outcomes assessed: H4, H8

MARKING GUIDELINES

Criteria	Marks
• Makes a valid judgement • Identifies TWO plastics and links characteristics to its ability to be recycled	3–4
• Identifies ONE plastic linked to its recyclability	2
• Provides statement concerning recyclability of plastics	1

Answers could include:

PET can be recycled therefore it doesn't accumulate in the environment.

PVC cannot be recycled because the monomer used to produce it is a carcinogen and it contains stabilisers.

Recycling is not a viable process because most plastics are non recyclable.

Question 28 (a) (i)

Outcomes assessed: H7

MARKING GUIDELINES

Criteria	Marks
• Identifies TWO microbes	2
• Identifies ONE microbe	1

Sample answer:

- E-coli
- Salmonella

Question 28 (a) (ii)

Outcomes assessed: H7

MARKING GUIDELINES

Criteria	Marks
• States ONE symptom • States ONE treatment	2
• States ONE symptom OR • States ONE treatment	1

Sample answer:

- Vomiting
- I.V. antibiotic drip

Question 28 (b) (i)

Outcomes assessed: H11, H14

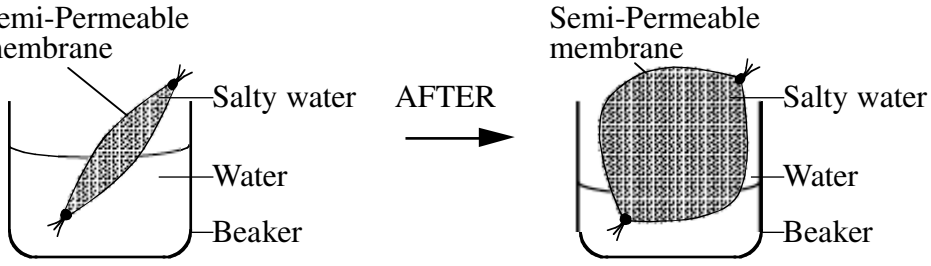
MARKING GUIDELINES

Criteria	Marks
• Sketch in general terms the method and results of the investigation	4
• Sketch in general terms the method or results	2–3
• Identifies ONE step in method OR • Identifies ONE result	1

Sample answer:

Method:

Repeat expt
Average class
results of % increase.



Result: the bag of salty water gets bigger and gains weight.

Question 28 (b) (ii)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• Identifies relevant technique • Provides an explanation of the process of preservation	3
• Identifies relevant technique • Provides a partial explanation of the process	2
• Identifies relevant technique OR • Provides a partial explanation of the process	1

Sample answer:

Drying

Removing water from the food inhibits micro organisms growing and reproducing and spoiling the food.

Question 28 (c)

Outcomes assessed: H3, H4, H8, H14

MARKING GUIDELINES

Criteria	Marks
• Identifies types of additives • States purpose for each type of additive • Gives specific examples of additives • Demonstrates a coherence and logical progression and includes correct use of scientific principles	5-6
• Identifies types of additives AND • Links TWO additives to purpose	3-4
• Identifies more than ONE purpose OR • Identifies more than TWO additives OR • Links ONE additive to its purpose	2
• Identifies ONE additive OR • Identifies ONE purpose	1

Answers could include:

Silicon dioxide is an anti-caking and free flowing agent to prevent the particles sticking together.

Aspartame is an artificial sweetening substance used to sweeten low joule foods.

Lecithin is an emulsifier that is added to oil-water mixtures do not separate into layers.

Question 28 (d)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• Sketches in general terms TWO methods	2
• Sketches in general terms ONE method OR • Identifies TWO methods	1

Sample answer:

UHT – rapid heating of product to very high temperature, then cooling.

Pasteurisation – heating a product to 72°C for 15 mins then cooled.

Question 28 (e)

Outcomes assessed: H8

MARKING GUIDELINES

Criteria	Marks
• Identifies a chemical additive • Relates role to preservation of food	2
• Identifies a chemical additive OR • Identifies role of chemical additives	1

Sample answer:

Sulphates act on food to kill yeasts, mould, fungi or bacteria that are present in the food. These organisms cause breakdown/spoilage of food.

Question 28 (f)

Outcomes assessed: H4, H8

MARKING GUIDELINES

Criteria	Marks
• Identifies TWO negative impacts • Links impacts to reduced health	4
• Identify TWO negative impact(s) • Links ONE to reduced health	2–3
• Identifies ONE negative impact	1

Answers could include:

- Certain additives cause allergic responses, which untreated can lead to death.

- Added sugar can add to obesity and related health issues (diabetes).

Question 29 (a) (i)

Outcomes assessed: H9

MARKING GUIDELINES

Criteria	Marks
• Identifies Y and Z correctly	2
• Identifies Y OR Z correctly	1

Sample answer:

Y is a white blood cell and Z is a red blood cell.

Question 29 (a) (ii)

Outcomes assessed: H9

MARKING GUIDELINES

Criteria	Marks
• Identifies TWO roles of white blood cells	2
• Identifies ONE role of white blood cells	1

Answers could include:

- Increase inflammation
- Identify areas of tissue damage
- Involved in phagocytosis
- Produce active immunisation

Question 29 (b) (i)

Outcomes assessed: H9, H13

MARKING GUIDELINES

Criteria	Marks
• Provides a flowchart with FIVE correct components	3
• Lists FIVE components of the pathway OR • Provides a flowchart with less than FIVE components of pathway	2
• Identifies components of the pathway OR • Constructs a simple flow chart	1

Sample answer:

Receptor → sensory nerve → brain/CNS/spinal cord → motor nerve → muscles/effectors

Question 29 (b) (ii)

Outcomes assessed: H9, H11, H14

MARKING GUIDELINES

Criteria	Marks
• Sketch in general terms the method and results of the investigation	4
• Sketch in general terms the method or results	2–3
• Identifies ONE step in method OR • Identifies ONE result	1

Sample answer:

- Measure distance ruler falls while partner drops it and you catch it.
- Repeat several times under same conditions and average results.
- Compare class results for differences.
- Results – different people exhibited different reaction times.

Question 29 (c)

Outcomes assessed: H9, H14

MARKING GUIDELINES

Criteria	Marks
• Identifies issues • Provides points for/against these issues • Demonstrates a coherence and logical progression and includes correct use of scientific principles	5–6
• Outlines issues OR • Identifies ONE issue linked with points for/against	3–4
• Outlines ONE issue OR • Identifies TWO issues OR • Identifies advantages/disadvantages	2
• Identifies ONE issue OR • Identifies ONE advantage/disadvantage	1

Question 29 (c) (continued)

Answers could include:

Advantage:

- Aspirin reduces the synthesis of prostaglandins which are responsible for increasing the inflammation response reduces pain, and fever and blood clotting.

Disadvantages:

- Over use of aspirin reduces inflammation which prolongs the time for the healing response in the body.
- Reduced inflammation will lead to less white blood cells at the site which could increase the risk of infection by microorganisms.

Question 29 (d) (i)

Outcomes assessed: H9

MARKING GUIDELINES

Criteria	Marks
• Relates the action of penicillin to the effects on bacteria	2
• Outlines an effect of penicillin on bacteria	1

Sample answer:

Penicillin destroys the cell wall and inhibits the formation of the cell wall and therefore stops the invading bacteria from replicating/reproducing which leads to the death of the bacteria.

Question 29 (d) (ii)

Outcomes assessed: H9

MARKING GUIDELINES

Criteria	Marks
• Outlines the features of the circulatory system related to transporting penicillin	2
• Identifies a feature of the circulatory system in transporting penicillin	1

Answers could include:

The circulatory system is a fast and efficient transporter of substances which are carried to every part of the human body.

Question 29 (d) (iii)

Outcomes assessed: H1, H9

MARKING GUIDELINES

Criteria	Marks
• Sketches in general terms relevant events	4
• Sketches in general terms some events	2–3
• Identifies ONE event	1

Answers could include:

- Research work on growing bacteria on agar plate.
- Accidental contamination of agar plates by fungus.
- Effect of fungus was to reduce/inhibit bacterial growth.
- Isolated substance called penicillin from the fungus/mould.

Question 30 (a)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• Identifies TWO consequences and TWO examples of Australian disasters	4
• Identifies TWO consequences and ONE example OR • Identifies ONE consequence and TWO examples	3
• Identifies ONE consequence and ONE example	2
• Identifies ONE consequence OR ONE example	1

Sample answer:

	Disaster associated with Nature and human activity	**Disaster associated with human activity only**
Australian Example	Thredbo Landslide	Granville Train Crash
Consequence	Damage of residences	Death of passengers

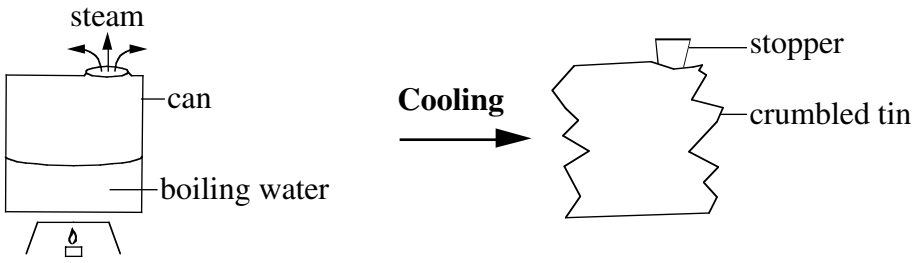
Question 30 (b) (i)

Outcomes assessed: H11, H14

MARKING GUIDELINES

Criteria	Marks
• Sketch in general terms the method and results of the investigation	4
• Sketch in general terms the appropriate method or results	2–3
• Identifies ONE step in method OR • Identifies ONE result of their investigation	1

Answers could include:



Question 30 (b) (ii)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• Relates air pressure differences to how winds are formed AND link this to the results of their investigation	3
• Relates air pressure differences to how winds are formed but no clear link to their results of the investigation	2
• Provides a simple statement relating to wind and/or air pressure OR • Provides a link to their investigation	1

Answers could include:

- External air pressure greater than internal indicated by crumpled tin.
- If no stopper then external air would have moved into tin to equalize.
- Winds are formed when air moves from areas high to low pressure.

Question 30 (c)

Outcomes assessed: H3, H4, H14

MARKING GUIDELINES

Criteria	Marks
• Outlines relevant human activities • Relate activities to severity of bushfires • Demonstrates a coherent and logical progression and includes correct use of scientific principles	5–6
• Outlines human activities related to bushfires	3–4
• Identifies human activities related to bushfires OR • Outline ONE activity related to bushfires	2
• Identifies ONE human activity	1

Answers could include:

Back burning reduces the amount of available fuel in an area and so the severity of future bushfires is reduced. Clearing vegetation and flammable materials from an area reduces the severity of a bushfire by removing potential fuel sources.

Declaration of National Park areas can increase the severity of bushfires if back burning or controlled burns are not allowed to occur and so a large amount of potential fuel is available for the fires every part of the human body.

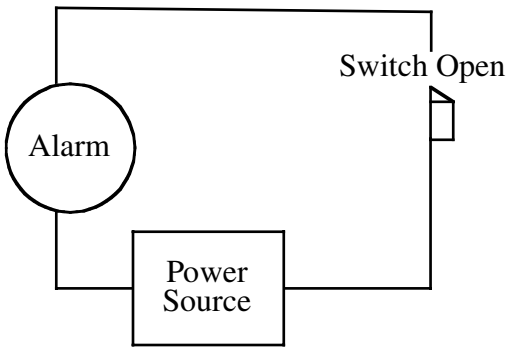
Question 30 (d) (i)

Outcomes assessed: H13

MARKING GUIDELINES

Criteria	Marks
• Draws a fully labelled appropriate diagram	2
• Draws an incomplete diagram	1

Sample answer:



Question 30 (d) (ii)

Outcomes assessed: H10, H13, H14

MARKING GUIDELINES

Criteria	Marks
• Names correct location and supports their choice with appropriate reasoning	2
• Names correct location	1

Sample answer:

Location 2 is the best because in Location 1 the normal heat and steam from the kitchen could easily set it off. Also, the patrons in the dining room may not hear the alarm if it is located in the kitchen.

Question 30 (e)

Outcomes assessed: H4, H10

MARKING GUIDELINES

Criteria	Marks
• Provides reasons for the differences in loss of life • Relates reasons to improvements in early warning devices	3–4
• Provides reasons for differences	2
• Identifies ONE reason/improvement	1

Sample answer:

In 1974, early warning systems such as satellite photography, computer simulations and radar tracking of cloud patterns did not exist. Therefore, people were not able to monitor and track the movement and development of the cyclone as it moved towards the coast and so people did not receive much warning of the arrival of Tracy. As a result, very few people were able to evacuate Darwin before Tracy arrived.

In 2006, the development of and improvements in satellite imaging, radar tracking and computer analysis allowed for substantial tracking, monitoring and prediction of the path of cyclone Larry. Therefore, authorities were able to issue warnings well before Larry crossed the coast and so people were able to evacuate the area and/or make the appropriate preparations to increase their chances of surviving the effects of the cyclone, even though the cyclone was stronger than cyclone Tracy.

Question 31 (a) (i)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• Identifies the moon has less gravitational pull and states a reason	2
• Identifies that the moon has less gravitational pull	1

Sample answer:

The moon has less gravitational pull because it has less mass then the Earth.

Question 31 (a) (ii)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• Names TWO situations	2
• Names ONE situation	1

Sample answer:

A person in freefall such as a skydiver.
An astronaut in orbit.

Question 31 (b) (i)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• Provides a comparison of the functions of the corresponding components of the rocket and the space shuttle	4
• Provides ONE comparison of a function of a component OR • Identifies the functions of specified components	2–3
• Identify ONE component and its function	1

Sample answer:

The command module is similar to the orbiter of the space shuttle, which is responsible for the safe return of the astronauts.

The rocket booster and external fuel tank of the shuttle are similar to the launcher vehicle of Saturn V.

These are responsible for providing thrust for the rocket to propel it into orbit.

Question 31 (b) (ii)

Outcomes assessed: H10

MARKING GUIDELINES

Criteria	Marks
• Sketch in general terms ONE design feature for each stage of mission	3
• Sketch in general terms TWO design features	2
• Sketch in general terms ONE design feature	1

Sample answer:

Silica tiles that absorb heat on re-entry. Filters are installed on the windows of the shuttle to protect against radiation when in orbit. The rocket boosters are designed to combine the fuel and oxygen so that it doesn't explode during lift-off.

Question 31 (c)

Outcomes assessed: H7, H9, H14

MARKING GUIDELINES

Criteria	Marks
• Provides features and characteristics of short-term and long-term effects • Demonstrates cohesive and logical progression and correct use of scientific terminology	5–6
• Provides features of some effects	3–4
• Identifies ONE/TWO effects	1–2

Answers could include:

- Reduced gravity can diminish bone mass as forces placed on bones are less in space.
- Reduced gravity decreases muscle strength because the muscles are not working to oppose the force of gravity pushing a person down.
- Circadian rhythms are controlled by changing amounts of light during the day and night. Astronauts in space don't have day and night and this disrupts normal circadian rhythms.

Question 31 (d)

Outcomes assessed: H4

MARKING GUIDELINES

Criteria	Marks
• Identifies TWO materials and compares uses of the materials	4
• Identifies TWO materials or ONE material and compares use	2–3
• Identifies ONE material/use	1

Sample answer:

Thermal wear made of phase change material developed for astronauts gloves is now used in fire protecting gear.

Space suits made of a carbon fibre composition material is now used in deep sea diving suits because of its strength.

Question 31 (e)

Outcomes assessed: H3, H5

MARKING GUIDELINES

Criteria	Marks
• Provides a judgement with supporting valid reasons	4
• Provides a judgement with a supporting reason OR • Outlines relevant projects	2–3
• Identifies a space program OR • Identifies a relevant issue	1

Answers could include:

Many programs have been developed to search for life in the universe such as the SETI and OSETI programs. Such programs are of little value because they are expensive and money invested could be better spent on public projects. Also, even if we were to identify distant life forms they are so far away that we could never hope to communicate effectively with them.