

2001 HSC Notes from
the Examination Centre
Senior Science

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2001 HSC NOTES FROM THE EXAMINATION 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 2001 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 2001 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.

This subject was examined for the first time this year. It appears to have attracted a candidature comprising students who may previously have opted to study either General Science or Science For Life. Approximately 4700 candidates sat for the examination this year.

Teachers and candidates should be aware that examiners may ask questions that address the syllabus outcomes in a manner that requires candidates to respond by integrating their knowledge, understanding and skills developed through studying the course. This reflects the fact that the knowledge, understanding and skills, developed through the study of discrete sections, should accumulate to a more comprehensive understanding than may be described in each section separately.

Section I – Core

Part A – Multiple Choice

Question	Correct Response
1	B
2	D
3	D
4	B
5	C
6	C
7	B
8	C

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

Part B

General Comments

Part B contained questions with varying mark values. These were questions that enabled most candidates to score some marks but also presented opportunities for the more capable candidates to demonstrate their greater knowledge. The candidates were able to understand the key verbs and provide appropriate responses to the questions. Better responses showed an understanding of the more complex answers required by the higher-order questions asking candidates to ‘explain’, ‘describe’, ‘compare’, ‘assess’ or ‘analyse’.

Regardless of their level of competency, most candidates made some attempt to answer the questions. This enabled them to be awarded marks at the appropriate level. Most candidates demonstrated a level of literacy that enabled them to convey their thoughts and their knowledge satisfactorily.

The questions were framed in such a way that they can be clearly mapped back to the syllabus outcomes.

Specific Comments

Question 16

- (a) Most candidates were able to identify that the circulatory system transports materials. Some could not differentiate between the circulatory system and the digestive system. Many candidates demonstrated little awareness of the concept of diffusion of the medication.

Weaker answers gave irrelevant information and did not answer the question eg ‘The role of the circulatory system is to transport oxygen/nutrients and to remove wastes’.

- (b) Generally this part was well answered. The major weaknesses arose from candidates listing a problem without discussing why it was a problem. Some confused terms such as ‘dissolved’ instead of ‘digested’ when explaining the problem of the drug becoming inactive. Some candidates who answered 16(a) correctly identified problems that indicated a contradiction or a confusion of the role of the circulatory system.

Question 17

This question presented difficulties for many candidates, with many answering this question in a general way. Many discussed the validity but gave no conclusion or, instead, recorded facts about capsules/tablets which appeared not to have been obtained from a first-hand investigation. Others did not describe/explain how factors of the experimental design affected the outcome.

Question 18

Generally this question was well answered by the candidates who attempted it. Weaker answers included ambiguous examples of colloids and suspensions. Good examples of colloids and suspensions included those such as mayonnaise (colloid) or orange juice (suspension).

Question 19

Very few candidates were able to demonstrate the skills required by this question. Most candidates were familiar with the term biodegradability. Good answers discussed the environmental impacts related to biodegradability. However, weaker answers confused the term with ‘solubility’ or the ‘ability to clean, break down grease’ etc. A large number of candidates confused soap and soapless detergents in their answer.

Question 20

Most candidates displayed a significant knowledge of synovial joints. Weaker answers resulted from inaccurate placement of arrows to indicate exact parts of the skeleton, especially with the pivot joints. Circling of parts often resulted in an inaccurate response.

Question 21

The vast majority of candidates could name the pacemaker as the device that can perform the role of the sino-atrial node.

Superior responses successfully described initial effects of the abnormal functioning of the sino-atrial node and linked these to a subsequent problem. These answers usually identified a lack of oxygen as the link between initial effects and subsequent problems.

The use of simple lists in an answer often failed to show a link as required as the question asked the candidate to ‘explain’.

Question 22

- (a) This part was fairly well answered. Better answers linked a build-up of plaque and narrowing of blood vessels with a reduced flow of blood. Weaker answers did not link the reduced flow of blood with narrowing of blood vessels, although many were able to state an effect of plaque build-up.
- (b) Superior responses demonstrated a good understanding of the treatments of plaque build-up. Many candidates showed they understood the question but failed to include the advantages and disadvantages of the two treatments. This was a common weakness. Many described the actual procedure as the advantage or used very vague or general terms. The better responses had an extensive range of advantages and disadvantages, whereas weak answers showed a confusion of the type of treatments available, eg amputation, valve replacement and sucking the plaque out. Appropriate treatments included bypass surgery, angioplasty and laser treatments.

Question 23

- (a) Average responses showed knowledge of superalloys and a good understanding of their properties without the ability to relate these properties to their suitability for use in the human body. Some responses showed confusion in understanding of the terms ‘strength’, ‘durability’ and ‘polyethylene’.

- (b) Superior responses demonstrated an understanding of cartilage and frictionless movement. Average responses could not link the properties of polyethylene to the movement of joints.

Question 24

Superior answers described a number of properties or stated a property and described the usefulness of the property.

Most candidates were capable of entry level responses, stating one property of either microwaves or electromagnetic radiation eg very fast travel, travel in straight lines; however, a common misconception was that microwaves do not travel in straight lines.

Question 25

- (a) Superior responses usually showed a clear understanding of flow chart construction and the energy changes in the transfer process. These candidates gave a clear sequence illustrating transfer of the message between two features.

Weaker responses stated that light and sound were part of the energy transfer from the aerial to the television set. Decoding was often left out. The energy conversion was often poorly understood or not clearly stated.

- (b) Superior answers had a clear contrast between TV and radio, identified an aspect of the change with relevant social implications and supported this with a good example.

Weaker responses did not meet the requirement of drawing out implications of this change in mass communication.

Many candidates discussed the use of modern technologies in communication such as the Internet and mobile phones. This was not within the scope of the question.

Question 26

Good answers showed valid experimental design. Candidates:

- explained their method well using clear diagrams
- compared optic fibre with another comparable material
- made realistic comparisons eg chose materials of the same length
- made observations that were measurable eg the intensity of light emitted from the end of the fibre or projected onto a screen
- used simple tables to represent results
- made an analysis based on observed results using straightforward, applicable, concise statements
- made valid conclusions based on the analysis of the results
- often used headings like ‘method’, ‘observations’, and ‘analysis of results’ and ‘conclusion’.

Weaker responses indicated a poorer understanding of how experiments should be reported or showed little understanding of the experiment described in the syllabus. These weaker answers were demonstrated by:

- inappropriate comparisons eg comparing optic fibres with blocks or prisms of glass
- a confusion between observations (results) and the analysis of these results
- passing light through hollow tubes rather than the material eg glass or nylon
- writing notes (information) rather than writing an experimental report
- ‘modelling’ of optical fibres (eg with glass rod) but not explaining this as modelling
- drawing total internal reflection diagrams as observable results.

It was clear that many candidates had carried out an experiment and reported on that experiment while others had not actually carried out an experiment but had developed experimental results from theory.

Section II - Options

General Comments

The majority of candidates (approximately 64%) responded to Question 30 on the Disasters option. Question 27 (Polymers) was the next most popular with approximately 18% of candidates responding, while the other three options attracted the rest evenly distributed between them. A significant number of candidates responded to more than one question in this section despite clear instructions to answer ONE question.

Specific Comments

Question 27

- (a) (i) The majority of candidates were able to correctly define a polymer.
- (ii) Most candidates were able to name a natural polymer. A significant number were unable to link its properties to its use. A number of candidates named a synthetic polymer.
- (b) (i) This part was very well answered, with most candidates performing the correct calculation.
- (ii) Good responses compared the three given properties of silk and Kevlar. Weaker answers simply restated the properties. The scientific meaning of elasticity was not well understood, many candidates interpreting it as ‘stretchiness’.
- (c) Good responses showed an understanding of how the code was valuable for recycling. Weaker answers related the use of the code to identifying plastics, but did not explain the importance of it in recycling.
- (d) (i) This was well answered. A small but significant number of candidates selected an inappropriate piece of equipment for testing the effect of temperature on polymers. Many of those candidates chose equipment to test thermal properties.

- (ii) The better responses used a labelled table with clearly stated observations on two or more polymers. Weaker responses gave inferences or stated conclusions rather than results.
- (e) This part was not well answered by many candidates. Most candidates could identify a problem with the data collection procedure and could suggest an improvement to the methodology, but were unable to explain the likely impact of the problem in terms of accuracy and reliability.

Question 28

- (a) (i) Almost all candidates answered this part correctly.
- (ii) The average answer described the process without describing how this process preserved the food. Freezing was particularly poorly done – many candidates did not describe the process of freezing adequately or explain its effects on micro-organisms accurately.
- (b) (i) Most candidates correctly answered this part. A small number showed confusion about the meaning of the cartoon drawings.
- (ii) Strong answers identified links and showed how they would be manipulated to prevent food poisoning. Weaker answers failed to establish this link. Some candidates did not use the diagram as the basis for their answer but gave general hygiene directions.
- (c) Overall this part was poorly answered. Most candidates demonstrated poor knowledge of the history and of the steps involved in the discovery of penicillin. A significant number of candidates failed to relate their answer to the ‘discovery’ of the antibiotic, penicillin.

Confusion was evident in a number of areas:

- ascribing the role of Fleming to Florey and vice versa; also ascribing the discovery to Pasteur or some other surgical/medical pioneers of the 19th and early 20th centuries
 - belief that penicillin is a painkilling drug often used in surgery
 - lack of awareness that penicillin was produced from a mould, many believing it was produced by/from a bacterium.
- (d) (i) Many candidates chose indicators (eg litmus) that were unsuitable for determining pH. Others used universal indicator but failed to explain how a colour chart was needed to determine the pH.
 - (ii) Many candidates experienced difficulty with this part. Superior answers focused on the manufacture of products and how pH may affect this. Most mentioned the effects of an acidic environment on bacteria, but weaker answers confused the effect of basic pH on bacterial growth, implying an opposite effect to that of acidic pH.
 - (e) In weaker responses, the candidates failed to make a judgement as required when assessing the need. A number of candidates did not give any examples of labelling.

Question 29

- (a) (i) Most candidates were able to identify one type of blood vessel. A number of candidates named a specific blood vessel eg aorta, rather than a *type* of blood vessel.
- (a) (ii) In the weaker responses candidates did not carry out a comparison between the two blood vessels.
- (b) Weaker responses showed the pathway of the reflex arc but failed to explain the nature of the impulse.
- (c) Few candidates gave complete responses for this part. Many showed an incomplete understanding of the steps in the development of aspirin and were unable to clarify the relevance of each step. A significant number of candidates described the analgesic effects of aspirin, not its development.
- (d) (i) Many descriptions were incomplete in terms of scientific methodology and did not link the measurements to reaction times.
- (d) (ii) Weaker responses gave a reason for differences, but were not able to state clearly what the observed differences were.
- (e) In weaker responses the relationship between the bacteria and the penicillin was not well expressed.

Question 30

- (a) (i) Weaker responses failed to identify an Australian disaster, or referred to a disaster where there was no link between nature and human activity.
- (a) (ii) Most candidates could identify a human activity and many clearly described the contribution this made to the disaster.
- (b) (i) Few candidates identified the lowest air pressure indicated by an isobar.
- (b) (ii) The best responses linked the information provided in the weather map to the predicted weather conditions, such as linking the cold front to the predicted weather. Weaker responses identified the direction of movement of the weather pattern towards Melbourne, but confused the direction of movement (east) with position (west) relative to Melbourne. Of the others who linked the low to the wind direction and strength, many omitted any reference to the predicted rain.
- (c) The majority of stronger candidates referred to fire evacuation procedures of schools or businesses that they had visited. Many of these candidates clearly described the impact of the fire on the evacuation procedure. Many candidates successfully described an evacuation procedure using the case of a bushfire, and clearly identified the strengths and weaknesses of that procedure. A small but significant number of candidates failed to identify steps in a fire evacuation drill.

- (d) (i) This part of the question was well answered, with a large number of candidates providing clear and accurate descriptions. Strong responses described how they constructed an alarm or safety device. Weaker responses gave a brief description which left out specific details.
- (ii) Strong responses indicated parameters used to determine the effectiveness of the device and suggested a way of improving their device. Weaker responses failed to evaluate the effectiveness of the device.
- (e) Strong candidates analysed the role of emergency services and included how the groups would be ‘coordinated to achieve greatest effect’. Weaker candidates did suggest ‘the need for groups to work together’ or referred to ‘emergency services’ as a single entity and did not identify individual services such as police, fire brigade and SES.

Question 31

- (a) (i) While most candidates answered this question correctly, a small number gave no effect.
- (ii) Most candidates were able to state a method of overcoming the effect on the health of astronauts. The better candidates were able to describe how this method worked.
- (b) (i) Most candidates correctly described the relationship between weight and distance from Earth.
- (ii) Most candidates experienced difficulty with this part and some confused mass and weight. Some candidates demonstrated comprehensive knowledge with reference to the fact that ‘weightlessness’ is only experienced during freefall but that gravitation was still acting.
- (c) The strongest answers referred to the Hubble Telescope, Voyager Space Probes or the International Space Station and discussed how the technology increased our knowledge and understanding. Weaker candidates failed to provide an appropriate discussion, or gave an example that was a ‘space spin-off’ rather than something which gave an increased understanding of space.
- (d) (i) Most candidates gave appropriate answers by referring to simple equipment eg plastic bottles, water and air pressure.
- (ii) Most responses described the Aim, Method, Results and Conclusion but failed to justify its appropriateness. Almost no candidates gave an indication of making objective measurements. Few addressed the need for accuracy and reliability and those who did, failed to explain how they could be improved.
- (e) The more able candidates were able to assess the value of continuing or discontinuing the space program and considered the long-term future advantages and/or disadvantages.

Senior Science

2001 HSC Examination Mapping Grid

Question	Marks	Content	Syllabus outcomes
1	1	9.2.4	H8, H14
2	1	9.2.4	H6, H8
3	1	9.2.1	H8, H14
4	1	9.2.3	H7, H9
5	1	9.2.1	H2, H8, H11, H12
6	1	9.3.1	H9
7	1	9.3.1	H4, H9
8	1	9.3.5	H3, H4
9	1	9.3.4	H4, H9, H12.3
10	1	9.4.5, 9.4.1	H10
11	1	9.4.1	H10
12	1	9.4.2	H3, H10
13	1	9.4.5	H3, H10, H14
14	1	9.4.1, 9.4.5	H10, H14.1
15	1	9.4.2	H10, H11, H12.3, H14
Part B			
16 (a)	2	9.2.5, 9.3.2	H8, H9
16 (b)	4	9.2.5, 9.3.4	H8, H9
17	6	9.2.4	H11, H14
18	3	9.2.1	H8
19	7	9.2.2	H1, H8, H13
20	2	9.3.3	H9
21 (a)	1	9.3.2	H6, H9
21 (b)	5	9.3.2	H4, H7, H9
22 (a)	2	9.3.2	H7, H9
22 (b)	5	9.3.2	H1, H7, H9
23 (a)	2	9.3.3	H4, H6, H7
23 (b)	3	9.3.3	H6, H9
24	3	9.4.3	H3, H10
25 (a)	3	9.4.1	H3, H10
25 (b)	4	9.4.1	H3, H4, H5
26	8	9.4.6	H2, H10, H13
Polymers			
27 (a) (i)	1	9.5.1	H8
27 (a) (ii)	2	9.5.1	H8
27 (b) (i)	1	9.5.2	H8
27 (b) (ii)	3	9.5.2	H1, H8
27 (c)	5	9.5.4	H4, H6
27 (d) (i)	2	9.5.3	H6, H8, H11, H13
27 (d) (ii)	4	9.5.3	H6, H8, H13
27 (e)	7	9.5.4	H2, H4, H12

Question	Marks	Content	Syllabus outcomes
Preservatives and additives			
28 (a) (i)	1	9.6.2	H6, H8
28 (a) (ii)	2	9.6.2	H6, H8
28 (b) (i)	1	9.6.3	H4, H8
28 (b) (ii)	3	9.6.3	H4, H8
28 (c)	5	9.6.4	H1, H6
28 (d) (i)	3	9.6.2	H6, H12
28 (d) (ii)	3	9.6.2	H8
28 (e)	7	9.6.5	H4, H8, H13
Pharmaceuticals			
29 (a) (i)	1	9.7.2	H9
29 (a) (ii)	2	9.7.2	H9
29 (b)	4	9.7.1	H1, H9
29 (c)	5	9.7.3	H1, H4, H7
29 (d) (i)	3	9.7.1	H9, H11
29 (d) (ii)	3	9.7.1	H7, H9, H12
29 (e)	7	9.7.4	H4, H7, H13
Disasters			
30 (a) (i)	1	9.8.1	H6
30 (a) (ii)	2	9.8.1	H6
30 (b) (i)	1	9.8.2	H3, H6
30 (b) (ii)	3	9.8.2	H4, H10
30 (c)	5	9.8.4	H4, H6, H10
30 (d) (i)	2	9.8.4	H10, H11
30 (d) (ii)	4	9.8.4	H10, H12
30 (e)	7	9.8.5	H3, H4, H6, H13
Space Science			
31 (a) (i)	1	9.9.3	H7
31 (a) (ii)	2	9.9.3	H7, H9
31 (b) (i)	1	9.9.2	H4, H7
31 (b) (ii)	3	9.9.2	H4, H7
31 (c)	5	9.9.5	H1, H4, H10
31 (d) (i)	1	9.9.4	H2
31 (d) (ii)	5	9.9.4	H2, H10, H11, H12
31 (e)	7	9.9.6	H3, H4, H7, H13

2001 HSC Senior Science Marking Guidelines

Question 16 (a) (2 marks)

Outcomes assessed: H8, H9

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Indicates how the main features of the circulatory system enable the transport of oral medication 	2
<ul style="list-style-type: none"> Names one feature or one function of the circulatory system OR <ul style="list-style-type: none"> Simple statement such as medication goes into blood 	1

Question 16 (b) (4 marks)

Outcomes assessed: H8, H9

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Describes at least two relevant problems and identifies why they are problems 	4
<ul style="list-style-type: none"> Describes at least one relevant problem and identifies why it is a problem OR <ul style="list-style-type: none"> Identifies two or more relevant problems 	2–3
<ul style="list-style-type: none"> Identifies a problem 	1

Question 17 (6 marks)

Outcomes assessed: H11, H14
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Identifies at least one relevant conclusion drawn from the experimental results Describes one or two factors of the experimental design and explains how they could have influenced the experimental outcome Makes a judgement about the conclusion drawn based on the effect each factor had on experiment 	5–6
<ul style="list-style-type: none"> Identifies at least one relevant conclusion drawn Describes one or two relevant factors, that may have influenced the experimental outcome OR <ul style="list-style-type: none"> Describes several relevant experimental design factors in a general way 	3–4
<ul style="list-style-type: none"> Identifies one or two relevant experimental design factors OR <ul style="list-style-type: none"> Identifies one relevant conclusion 	1–2

Question 18 (3 marks)

Outcomes assessed: H8
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Identifies a specific colloid and another type of suspension Identifies a property of that colloid and how it differs from the other suspension and Provides a reason why this property is an advantage 	3
<ul style="list-style-type: none"> Identifies a property of colloids and a property of another type of suspension Provides a reason why this property of colloids is an advantage OR <ul style="list-style-type: none"> Identifies a colloid and a property of that colloid without explaining the advantage 	2
<ul style="list-style-type: none"> Identifies a property of colloids OR Identifies a colloid OR Identifies an advantage of colloids over other types of suspension 	1

Question 19 (7 marks)

Outcomes assessed: H1, H8, H13
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> • Shows an understanding of the term biodegradability by giving a definition or explanation • Describes the rates of biodegradation of soaps and soapless detergents <p>AND</p> <ul style="list-style-type: none"> • Identifies one impact of soaps and soapless detergents being biodegraded or not biodegraded • Indicates points for and/or against soaps and soapless detergents being biodegradable in relation to this impact <p>OR</p> <ul style="list-style-type: none"> • Identifies more than one impact of soaps and soapless detergents being biodegraded or not biodegraded • Indicates one point for and/or against soaps and soapless detergents being biodegradable in relation to these impacts <p>OR</p> <ul style="list-style-type: none"> • Discusses the biodegradability of soaps and soapless detergents by comparing their chemical structure in detail 	6–7
<ul style="list-style-type: none"> • Implies an understanding of biodegradability • Relates biodegradability to soaps and soapless detergents • Indicates one point for or against biodegradability in general terms • Identifies at least one impact of soaps and soapless detergents being biodegraded or not biodegraded <p>OR</p> <ul style="list-style-type: none"> • Describes biodegradability in terms of chemical structure 	4–5
<ul style="list-style-type: none"> • Implies an understanding of biodegradability • Identifies one point for or against biodegradability 	2–3
<ul style="list-style-type: none"> • Implies an understanding of biodegradability <p>OR</p> <ul style="list-style-type: none"> • Identifies an advantage of biodegradability 	1

Question 20 (2 marks)*Outcomes assessed: H9***MARKING GUIDELINES**

Criteria	Marks
• Two joints correctly labelled as a hinge joint or a pivot joint	2
• One joint only correctly labelled as a hinge or a pivot joint	1
OR	
• A hinge joint and a pivot joint correctly indicated by arrow or name (e.g. knee, axis/atlas) but not labelled as pivot and hinge joints	

Question 21 (a) (1 mark)*Outcomes assessed: H6, H9***MARKING GUIDELINES**

Criteria	Marks
• Pacemaker	1

Question 21 (b) (5 marks)*Outcomes assessed: H4, H7, H9***MARKING GUIDELINES**

Criteria	Marks
• Describes the abnormal functioning of the sino-atrial node	4–5
• Describes an initial and a subsequent effect of this	
• Relates this abnormal functioning of the sino-atrial node to the initial and subsequent effects on the body	
• Describes the abnormal function of the sino-atrial node and relates this to an effect	2–3
• Identifies one effect	1

Question 22 (a) (2 marks)*Outcomes assessed: H7, H9***MARKING GUIDELINES**

Criteria	Marks
• Describes the effect on blood vessels of a build up of plaque	2
• Relates this effect to changes in the flow of blood	
• States one effect of a build up of plaque	1

Question 22 (b) (5 marks)*Outcomes assessed: H1, H7, H9***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Identifies two treatments which could be used to eliminate or reduce plaque AND compares them by indicating at least one advantage and disadvantage of each	4–5
<ul style="list-style-type: none">Identifies one treatment AND contrasts its advantages with its disadvantages OR <ul style="list-style-type: none">Identifies two treatments AND compares them in terms of an advantage OR a disadvantage	2–3
<ul style="list-style-type: none">Identifies one treatment stating an advantage OR disadvantage OR <ul style="list-style-type: none">Identifies two treatments	1

Question 23 (a) (2 marks)*Outcomes assessed: H4, H6, H7***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Identifies two properties and states the characteristic of each property that makes it suitable	2
<ul style="list-style-type: none">Lists 2 properties of the superalloy without reference to how they make it useful OR <ul style="list-style-type: none">Identifies one property and states how it makes it suitable	1

Question 23 (b) (3 marks)*Outcomes assessed: H6, H9***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">States one property of polyethyleneLinks this property with the functioning of artificial joints to show how the property helps the joint function better	3
<ul style="list-style-type: none">States relevant facts about polyethylene and the artificial joint without linking them	2
<ul style="list-style-type: none">Identifies one feature of polyethylene OR <ul style="list-style-type: none">Identifies one feature of the movement of joints	1

Question 24 (3 marks)*Outcomes assessed: H3, H10***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Describes at least two relevant properties of microwaves and relates these to their use in communication	3
<ul style="list-style-type: none">States at least two relevant properties of microwaves OR <ul style="list-style-type: none">Describes one relevant property of microwaves and relates it to the use of microwaves in communications	2
<ul style="list-style-type: none">States one property	1

Question 25 (a) (3 marks)*Outcomes assessed: H3, H10***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Three features in the correct sequence including at least one energy transformation and indicating at least one decoding	3
<ul style="list-style-type: none">Two features of the system in the correct sequence including an energy transformation, and indicating one decoding OR <ul style="list-style-type: none">Three features in the correct sequence with either an energy transformation or a correct decoding	2
<ul style="list-style-type: none">Shows at least two features in the correct sequence	1

Question 25 (b) (4 marks)
Outcomes assessed: H3, H4, H5
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Contrasts features of radio and TV Identifies at least one aspect of the change Draws out implications of the change Supports ideas with relevant examples 	3–4
<ul style="list-style-type: none"> Contrasts features of radio and TV OR <ul style="list-style-type: none"> Provides a description of one impact of the change 	2
<ul style="list-style-type: none"> Describes features of radio and TV 	1

Question 26 (8 marks)
Outcomes assessed: H2, H10, H13
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Describes the equipment and method clearly enough to allow it to be repeated and to provide an opportunity for a realistic comparison. The diagram should contribute to this Provides one observation for each material Analysis and comparison of the results for different materials Any conclusion based on the analysis of the results. 	7–8
<ul style="list-style-type: none"> Description of activity, including results in some detail, any conclusion if stated is not clearly based on analysis of results 	5–6
<ul style="list-style-type: none"> Rudimentary description of activity lacking in cohesion and lacking a clear description of the results obtained 	3–4
<ul style="list-style-type: none"> Very brief description, typically of only one step 	1–2

Question 27 (a) (i) (1 mark)
Outcomes assessed: H8
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Correct description (may be a labelled diagram) 	1

Question 27 (a) (ii) (2 marks)
Outcomes assessed: H8
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Names a natural polymer AND states one of its properties AND how the property makes it useful for a stated purpose 	2
<ul style="list-style-type: none"> Names a polymer and one of its uses OR <ul style="list-style-type: none"> Names a polymer and one of its properties OR <ul style="list-style-type: none"> Names a SYNTHETIC polymer AND states one of its properties AND how the property makes it useful for a stated purpose OR <ul style="list-style-type: none"> Makes a judgement about suitability based on a given property 	1

Question 27 (b) (i) (1 mark)
Outcomes assessed: H8
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> 20 	1

Question 27 (b) (ii) (3 marks)
Outcomes assessed: H1, H8
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Compares each of the given properties of silk and Kevlar Makes a judgement about suitability based on properties given 	3
<ul style="list-style-type: none"> Compares each of the given properties of silk and Kevlar OR <ul style="list-style-type: none"> Compares 2 of the given properties and makes a judgement 	2
<ul style="list-style-type: none"> Compares 1 property of silk and Kevlar OR <ul style="list-style-type: none"> Makes a judgement about suitability based on a given property 	1

Question 27 (c) (5 marks)*Outcomes assessed: H4, H6***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Explains the importance of recycling materials, especially plasticsDescribes how the code is likely to be useful in recyclingMakes a judgement about the impact that implementation of the code may have on the environment	4–5
<ul style="list-style-type: none">Explains two linked ideas, related to the code OR recycling, without a judgement or example	2–3
<ul style="list-style-type: none">One statement about any effect, related to the code	1

Question 27 (d) (i) (2 marks)*Outcomes assessed: H6, H8, H11, H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Names an appropriate piece of equipment and links the reason for its use with a property of the equipment	2
<ul style="list-style-type: none">Names an appropriate piece of equipment used and describes its use	1

Question 27 (d) (ii) (4 marks)*Outcomes assessed: H6, H8, H13***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">Compares or contrasts two or more polymersUses quantified or qualified information when comparing/contrasting the polymersResults presented in an appropriate format eg. table or graph	3–4
<ul style="list-style-type: none">States a quantified or qualified observation for one polymer	2
<ul style="list-style-type: none">States one simple observation	1

Question 27 (e) (7 marks)
Outcomes assessed: H2, H4, H12
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> • Identifies one or more problems associated with data collection procedure • Explains the likely impact of the problem in terms of accuracy and reliability • Suggests an improved methodology and details its impact 	6–7
<ul style="list-style-type: none"> • Identifies one or more problems associated with data collection procedure • Details the likely impact of the problem in terms of accuracy OR reliability • Offers a simple improvement 	4–5
<ul style="list-style-type: none"> • Recognises a flaw in the data collection procedure • Offers a simple remedy (without describing the impact of the flaw) OR <ul style="list-style-type: none"> • Describes impact of flaw but offers no remedy 	3
<ul style="list-style-type: none"> • Identifies at least one problem with the data collection procedure 	2
<ul style="list-style-type: none"> • States a simple fact about the data collection procedure 	1

Question 28 (a) (i) (1 mark)
Outcomes assessed: H6, H8
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> • Identifies one correct process 	1

Question 28 (a) (ii) (2 marks)
Outcomes assessed: H6, H8
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> • Describes how the process named in (a) (i) preserves food 	2
<ul style="list-style-type: none"> • Describes the process 	1

Question 28 (b) (i) (1 mark)*Outcomes assessed: H4, H8***MARKING GUIDELINES**

Criteria	Marks
• Identifies one relevant problem related to food poisoning	1

Question 28 (b) (ii) (3 marks)*Outcomes assessed: H4, H8***MARKING GUIDELINES**

Criteria	Marks
• Relates cause and effect to a break in food poisoning chain	3
• Identifies a link in the chain (a cause or effect) and describes how it can be manipulated	2
• Identifies a link in the chain, that can be manipulated	1

Question 28 (c) (5 marks)*Outcomes assessed: H1, H6***MARKING GUIDELINES**

Criteria	Marks
• Identifies at least two important steps that contributed to the discovery of penicillin	4–5
• Describes each step	
• Clarifies the relevance of each step in the discovery of penicillin	
• Identifies one important step that contributed to the discovery of penicillin	2–3
• Describes the step and relates it to the discovery of penicillin	
• Identifies one important step	1

Question 28 (d) (i) (3 marks)*Outcomes assessed: H6, H12***MARKING GUIDELINES**

Criteria	Marks
• A scientific methodology (including correct use of equipment) that would produce valid results	3
• Incomplete description of a valid methodology. The methodology would give valid results.	2
• Names an appropriate piece of equipment used and describes its use	1

Question 28 (d) (ii) (3 marks)*Outcomes assessed: H8***MARKING GUIDELINES**

Criteria	Marks
• Describes the effect of the pH of a product mentioned in (d) (i) on the activity of micro-organisms in that product	2–3
• States that pH affects micro-organisms	1

Question 28 (e) (7 marks)*Outcomes assessed: H4, H8, H13***MARKING GUIDELINES**

Criteria	Marks
• Explains the need for the correct labelling • Provides at least two reasons for the need, supported by relevant examples • Makes a judgement as to its importance	6–7
• Explains the need for the correct labelling • Provides two reasons for the need • Makes statements only loosely linked to its importance	4–5
• Makes statements about correct labelling • Provides one reason for the need	2–3
• Provides an example of labelling	1

Question 29 (a) (i) (1 mark)
Outcomes assessed: H9
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Names one type of blood vessel. 	1

Question 29 (a) (ii) (2 marks)
Outcomes assessed: H9
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Names a second type of vessel; and Makes a clear comparison between their carrying capacities. 	2
<ul style="list-style-type: none"> Names a second type of blood vessel. OR <ul style="list-style-type: none"> Identifies the carrying capacity of the blood vessel named in (a)(i). 	1

Question 29 (b) (4 marks)
Outcomes assessed: H1, H9
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Shows a diagram with three neurones (sensory neurone, inter neurone and motor neurone) with indications (written or drawn) of sensory organ, spinal cord and muscle. Identifies the nature of the impulse in the neurone and in the synapse 	4
<ul style="list-style-type: none"> Shows a diagram with two neurones (sensory and motor) with indication of sensory organ and muscle (written or drawn) Describes nerve message as being of electrical nature and needing to jump a gap 	3
<ul style="list-style-type: none"> Diagram showing a path between a sensory organ (named or drawn) and a muscle (named or drawn) via neurones 	2
<ul style="list-style-type: none"> Diagram showing a path between a sensory organ (named or drawn) and a muscle (named or drawn) No written description 	1

Question 29 (c) (5 marks)
Outcomes assessed: H1, H4, H7
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Identifies at least two important steps that contributed to the development of aspirin and elaborates on their importance Describes each step Clarifies the relevance of each step in the development of aspirin 	4–5
<ul style="list-style-type: none"> Identifies one important step that contributed and clarifies its relevance OR <ul style="list-style-type: none"> Identifies two steps with no elaboration 	2–3
<ul style="list-style-type: none"> Identifies one important step with no elaboration 	1

Question 29 (d) (i) (3 marks)
Outcomes assessed: H9, H11
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> A scientific methodology (including correct use of equipment) that would produce valid results 	3
<ul style="list-style-type: none"> Incomplete description of a valid methodology. The methodology would give valid results 	2
<ul style="list-style-type: none"> Names an appropriate piece of equipment used and describes its use 	1

Question 29 (d) (ii) (3 marks)
Outcomes assessed: H7, H9, H12
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> States an(y) observed difference(s) Explains how individual differences OR experimental design may have led to different results 	3
<ul style="list-style-type: none"> States an(y) observed difference(s) Suggests a reason for the difference in terms of individual differences OR experimental design 	2
<ul style="list-style-type: none"> States an observed difference with an implausible reason 	1

Question 29 (e) (7 marks)
Outcomes assessed: H4, H7, H13
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Identifies at least two actions that may be useful to minimise future risk Describes the reason for each action by showing the relationship between bacteria and penicillin Identifies one consequence for each action 	6–7
<ul style="list-style-type: none"> Identifies at least two actions to minimise future risk Identifies one consequence for each action 	4–5
<ul style="list-style-type: none"> States two actions to minimise future risk OR <ul style="list-style-type: none"> Describes the reason for one action by showing the relationship between bacteria and penicillin OR <ul style="list-style-type: none"> Identifies the consequence of one action 	2–3
<ul style="list-style-type: none"> States one possible action 	1

Question 30 (a) (i) (1 mark)
Outcomes assessed: H6
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> States one correct disaster 	1

Question 30 (a) (ii) (2 marks)
Outcomes assessed: H6
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Links the human activity to the disaster named in (a) (i) 	2
<ul style="list-style-type: none"> States a human activity 	1

Question 30 (b) (i) (1 mark)
Outcomes assessed: H3, H6
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Gives 996 as the correct answer 	1

Question 30 (b) (ii) (3 marks)
Outcomes assessed: H4, H10
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Indicates an understanding of the symbols used Relates all the components of the prediction given in the question to the relevant features on the map showing depth of understanding 	3
<ul style="list-style-type: none"> Indicates that movement of weather pattern will bring on the conditions giving an example OR <ul style="list-style-type: none"> Uses at least one symbol on the map to describe current weather conditions 	2
<ul style="list-style-type: none"> Simple statement relating to one feature only OR <ul style="list-style-type: none"> Generalised statement about movement of weather pattern 	1

Question 30 (c) (5 marks)
Outcomes assessed: H4, H6, H10
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Describes the steps in the procedure Recognises particular risks/dangers involved in case of fire and how these impact on the evacuation procedures Decides whether the steps are appropriate in view of the risks/dangers involved in case of fire 	4–5
<ul style="list-style-type: none"> Describes the steps in the procedure Recognises risks/dangers involved in case of fire that may impact on the effectiveness of the evacuation procedure 	2–3
<ul style="list-style-type: none"> Simple statement of the procedures, without an attempt to assess 	1

Question 30 (d) (i) (2 marks)
Outcomes assessed: H10, H11
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> • A diagram showing a device that should function and a brief description of its working OR <ul style="list-style-type: none"> • More detailed written explanation that includes the minimum number of parts to make the device function 	2
<ul style="list-style-type: none"> • A diagram of a device that may function, but no description OR <ul style="list-style-type: none"> • Brief description which partly describes how the device functions 	1

Question 30 (d) (ii) (4 marks)
Outcomes assessed: H10, H12
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> • Indicates at least one parameter used to determine the effectiveness of the device • Describes the performance of the device when tested • Explains whether or not the device performed as was intended • Makes one suggestion to improve the device 	3–4
<ul style="list-style-type: none"> • Describes how the device was tested • Makes one suggestion on how to improve the device 	1–2

Question 30 (e) (7 marks)
Outcomes assessed: H3, H4, H6, H13
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> • Identifies at least two emergency services • Describes the role of each emergency service in preventing/minimising the impact of the disaster • Explains how the efforts of the groups would be coordinated to achieve greatest effect 	6–7
<ul style="list-style-type: none"> • Identifies at least two emergency service groups • Describes the role each of these groups would play • Suggests the need for groups to work together 	4–5
<ul style="list-style-type: none"> • Identifies two emergency service groups • Describes the role each of these groups would play 	2–3
<ul style="list-style-type: none"> • Identifies one emergency service OR <ul style="list-style-type: none"> • Describes one task that needs to be carried out in an emergency situation 	1

Question 31 (a) (i) (1 mark)
Outcomes assessed: H7
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> • Identifies one health effect of long periods in space 	1

Question 31 (a) (ii) (2 marks)
Outcomes assessed: H7, H9
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> • Describes the benefit of the remedy by relating the cause and effect of being in space on the astronaut's health 	2
<ul style="list-style-type: none"> • States an appropriate remedy to minimise the effect mentioned in (a)(i) 	1

Question 31 (b) (i) (1 mark)*Outcomes assessed: H4, H7***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Correct description of the relationship shown in the graph	1

Question 31 (b) (ii) (3 marks)*Outcomes assessed: H4, H7***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• States that true weightlessness occurs when all forces due to gravitational attraction vanish• Links the effect of free fall and gravitational pull• Establishes that the combined effect of free fall and gravitational pull means that any disturbances produce an overall effect equivalent to millionths of one g, ie microgravity	3
<ul style="list-style-type: none">• Describes or defines weightlessness and microgravity	2
<ul style="list-style-type: none">• Makes a correct statement about microgravity or gravity	1

Question 31 (c) (5 marks)*Outcomes assessed: H1, H4, H10***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Identifies an appropriate technology• Describes the role and impact of this technology in increasing our understanding of space	4–5
<ul style="list-style-type: none">• Identifies an appropriate technology• Describes the role the technology has played or the impact it has had	2–3
<ul style="list-style-type: none">• Identifies an appropriate technology <p>OR</p> <ul style="list-style-type: none">• States one better understanding of space	1

Question 31 (d) (i) (1 mark)*Outcomes assessed: H2***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Identification of equipment used in any appropriate experiment	1

Question 31 (d) (ii) (5 marks)*Outcomes assessed: H2, H10, H11, H12***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Describes the experimental plan• Explains how measurements were taken• Provides a reason for their particular experimental plan• Identifies how reliability could be improved• Identifies how accuracy could be improved	5
<ul style="list-style-type: none">• Describes the experimental plan• Explains how measurements were taken AND <ul style="list-style-type: none">• Provides a reason for their experimental plan OR <ul style="list-style-type: none">• Identifies factors that limited the accuracy or reliability of the experiment OR <ul style="list-style-type: none">• Identifies at least one way that the experiment could be made more accurate or reliable	3–4
<ul style="list-style-type: none">• Describes the experimental plan• Identifies how measurements were taken	1–2

Question 31 (e) (7 marks)

Outcomes assessed: H3, H4, H7, H13

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> • Identifies and discusses at least one benefit and one disadvantage associated with the space program • Predicts at least one future/possible benefit and one disadvantage for society • Makes a balanced judgement on the value of the space program based on the advantages and disadvantages described 	6–7
<ul style="list-style-type: none"> • Discusses benefits and/or disadvantages for society resulting from current and/or future developments of the space program • Predicts one future/possible benefit or disadvantage for society • Makes a judgement based only on advantages OR disadvantages 	4–5
<ul style="list-style-type: none"> • Identifies at least one current benefit or disadvantage that has resulted from the space program • Predicts at least one future/possible benefit or disadvantage for society 	2–3
<ul style="list-style-type: none"> • Identifies one benefit or disadvantage that has resulted from the space program <p>OR</p> <ul style="list-style-type: none"> • Predicts one future/possible benefit or disadvantage for society 	1