ACKNOWLEDGEMENTS

Question 26 – Switching from Analogue to Digital, Toronto Star, 9.10.97, p. J2

Question 30 (a) – Food facts, Delia Clarke and Elizabeth Herbert, 1986, Macmillan Education.

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2001 Higher School Certificate Specimen Examination Paper

Senior Science

Introduction
This booklet contains the specimen examination paper for the 2001 Higher School Certificate examination in Senior Science. A mapping grid is also included, showing how each question in the examination relates to the syllabus outcomes and content, and to the performance bands.

The specimen paper shows the format of the New HSC examination. It has been printed on A4 paper and side-stapled to make it convenient for use in schools. Actual examination papers will be produced as A4 booklets. All New HSC papers will be printed on white paper.

The 2001 HSC specimen papers have been produced in accordance with the Board’s Principles for Setting HSC Examinations in a Standards-Referenced Framework, published in Board Bulletin Volume 8 Number 9 (Nov/Dec 99). Questions are closely related to the outcomes of the course, and the paper as a whole is structured to allow for appropriate differentiation of student performance at all levels on the performance scale.

The papers have been designed so that students have a clear understanding of what they are required to do in each question and in working through the paper. Instructions have been standardised, and the demands of the questions have been made explicit. Key words in questions, such as ‘discuss’, ‘analyse’, and ‘explain’, have been used consistently in accordance with the glossary published in the Board’s Assessment Support Document.

This specimen paper is an example of the type of examination that could be prepared within the examination specifications in the Senior Science syllabus. Examinations will be based on the syllabus, and will test a representative sample of syllabus outcomes. Therefore, the range and balance of outcomes tested in HSC examinations in 2001 and subsequent years may differ from those addressed in the specimen paper.

The mapping grid is an important feature of the development of the examination. It aids in ensuring that the examination as a whole samples a range of content and outcomes, and allows all students the opportunity to demonstrate their level of achievement. Where courses have components in the examination other than written papers, the grid indicates the wider range of outcomes that are assessed by including these other components.

There are a number of points to note in considering the Senior Science specimen paper:

- There is a variety of question types. Some questions have parts while others ask a single question that requires an integrated response. Together, these question types provide candidates with opportunities to demonstrate a range of skills across different levels of the performance scale.
- The number of questions and the marks allocated to each question in Part B, and the number of parts and the marks allocated to each part in the Option questions, may vary from year to year.
• All question parts are out of whole marks. This will assist candidates in determining the relative value of questions and parts, and in allocating their time appropriately.
• The number of Part B Answer Booklets and the number of questions to be answered in each Answer Booklet may vary from year to year.
Senior Science
HSC Specimen Examination Mapping Grid

For each item in the examination, the grid shows the marks allocated, the syllabus content and syllabus outcomes it relates to, and the bands on the performance scale it is targeting. The range of bands shown indicates the performance candidates may be able to demonstrate in their responses. That is, if an item is shown as targeting Bands 3 – 5, it indicates that candidates who demonstrate performance equivalent to the Band 3 descriptions should be able to score some marks on the item, while those who perform at Band 5 or above could reasonably be expected to gain high marks. In the case of one-mark items, candidates who demonstrate performance at or above the bands shown generally could be expected to answer the item correctly.

<table>
<thead>
<tr>
<th>Question</th>
<th>Marks</th>
<th>Content</th>
<th>Syllabus outcomes</th>
<th>Targeted performance bands</th>
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Sample marking guidelines for Senior Science

The following marking guidelines have been developed for selected questions from the 2001 HSC Specimen Examination in Senior Science. These guidelines indicate the approach that would be taken to marking questions.

For each question, the following are typically included:
1. The syllabus outcomes that are targeted by the question.
2. The assessment rubric from the specimen paper, where there is one, listing the set of general criteria that are used to assess responses.
3. The marking guidelines, which show the criteria to be applied to responses along with the marks to be awarded in line with the quality of the responses. For extended-response questions, performance is described at a number of levels of performance, each covering a range of marks.
4. A sample answer or some points that answers might include. Sample answers indicate the scope and depth of treatment expected, and are not intended to be prescriptive. Similarly, the points that could be included in answers are not intended to be an exhaustive list, but rather an indication of the considerations that students could include in their responses.

Marking guidelines will generally require some refinement at the Marking Centre to take account of unanticipated responses that students present. For essay-type questions, the standard described at each mark range will be made clear during pilot-marking by the selection of sample scripts.

In a standards-referenced framework, examination questions are closely linked to syllabus content and outcomes. Expectations of the question are to be clear in the wording of the question. Marking guidelines will be developed at the same time as the examination questions, by examination committees. The development of marking guidelines will be guided by the Board’s Principles for Developing Marking Guidelines Examinations in a Standards-Referenced Framework, published in Board Bulletin Volume 9 Number 3 (May 2000).
Sample Marking Guidelines – Senior Science

Question 23 (10 marks)

From about 3000 BC to AD 1870, the life expectancy of humans increased from approximately 25 years to 40 years.

The following data show approximately how life expectancy for Australians has changed since 1870.

<table>
<thead>
<tr>
<th>Date</th>
<th>Human Life Expectancy (years)</th>
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<tbody>
<tr>
<td>1870</td>
<td>40</td>
</tr>
<tr>
<td>1915</td>
<td>50</td>
</tr>
<tr>
<td>1930</td>
<td>60</td>
</tr>
<tr>
<td>1955</td>
<td>70</td>
</tr>
<tr>
<td>1995</td>
<td>76</td>
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</table>

(a) Draw a line graph to represent these data.

Outcomes assessed: H12, H13

MARKING GUIDELINES

Criteria | Marks |
---|---|
• Labels and provides units for both horizontal and vertical axes AND | 3 |
• Provides a correct scale for both axes AND | |
• Correctly plots and joins all 5 points. If the origin is plotted and the graph connects to the origin then this mark is not awarded | |
• Any TWO of the above points | 2 |
• Any ONE of the above points | 1 |

(b) Between which two consecutive dates given in the table did the most rapid increase in human life expectancy occur?

Outcomes assessed: H14

MARKING GUIDELINES

Criteria | Marks |
---|---|
• Identifies 1915 and 1930 | 1 |
Assess technology’s contribution to the changes in human life expectancy.

**Outcomes assessed: H4, H12, H13, H14**

<table>
<thead>
<tr>
<th>MARKING GUIDELINES</th>
<th>Marks</th>
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<tr>
<td><strong>Criteria</strong></td>
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<tr>
<td>Demonstrates a knowledge of technological developments that have increased our understanding of how the body works and that have contributed to the development of biomedical devices and medical techniques</td>
<td>5 – 6</td>
</tr>
<tr>
<td>Describes how these developments relate to changes in human life expectancy and makes a valid judgement about their contribution</td>
<td></td>
</tr>
<tr>
<td>Discussion is supported by the use of relevant examples</td>
<td></td>
</tr>
<tr>
<td>Provides a general description of medical techniques and biomedical devices and their related body functions</td>
<td>3 – 4</td>
</tr>
<tr>
<td>Describes basic relationships between these techniques and devices, and changes in life expectancy</td>
<td></td>
</tr>
<tr>
<td>Identifies some examples of medical techniques and biomedical devices and their related body functions</td>
<td>1 – 2</td>
</tr>
</tbody>
</table>

**Answers could include:**

References to technologies, medical techniques and biomedical devices such as:
- X-rays, MRI, PET scans
- Heart/lung machines
- Dialysis machines
- Pacemakers
- Transplants
- Artificial body parts eg heart valves, blood vessels
- Joint replacement
- Laser treatment for cancers
- Advances that enable an understanding of the processes of ageing
- Potential advances in growing spare body parts
- New interventions to prevent, diagnose and treat disease
- Technologies that enable a better understanding of disease and how it affects the body
- Development of biomaterials and biocompatible materials
- Biochemical testing in pathology
- Use of computers to analyse biomedical data
General Instructions
• Reading time – 5 minutes
• Working time – 3 hours
• Board-approved calculators may be used
• Write using black or blue pen
• Draw diagrams using pencil
• Write a Centre Number and Student Number at the top of page 13

Section I  Pages 2–25
Total marks (75)
This section has two parts, Part A and Part B

Part A
Total marks (15)
• Attempt Questions 1–15
• Allow about 30 minutes for this part

Part B
Total marks (60)
• Attempt Questions 16–28
• Allow about 1 hour and 45 minutes for this part

Section II  Pages 29–36
Total marks (25)
• Attempt ONE question from Questions 29–33
• Allow about 45 minutes for this section
Section I
Total marks (75)

Part A
Total marks (15)
Attempt Questions 1–15
Allow about 30 minutes for this part

Use the multiple-choice answer sheet.
Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

Sample  \[ 2 + 4 = (A) 2 \quad (B) 6 \quad (C) 8 \quad (D) 9 \]
\[ \begin{array}{cccc}
A \circ & B \bullet & C \circ & D \circ \\
\end{array} \]

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

\[ \begin{array}{cccc}
A \bullet & B \xmark & C \circ & D \circ \\
\end{array} \]

If you change your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word *correct* and drawing an arrow as follows:

\[ \begin{array}{cccc}
A \xmark & B \xmark & C \circ & D \circ \\
\end{array} \]
1  Dr Yates’ Miracle Hair Shampoo claims to have a pH neutral formula.

If students tested this shampoo, what pH would they expect to get?

(A) 0
(B) 7
(C) 10
(D) 14

2  The table shows a range of chemicals used in everyday living.

Which category of chemical is matched correctly with its property?

<table>
<thead>
<tr>
<th>Category of chemical</th>
<th>Property</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degreasers</td>
<td>Emulsify fats and oils to allow their removal</td>
</tr>
<tr>
<td>Pesticides</td>
<td>Affect nervous system of specific mammals</td>
</tr>
<tr>
<td>Body hygiene chemicals</td>
<td>Inhibit growth of dangerous bacteria</td>
</tr>
<tr>
<td>Lubricants</td>
<td>Increase friction between two surfaces</td>
</tr>
</tbody>
</table>

(A) Degreasers
(B) Pesticides
(C) Body hygiene chemicals
(D) Lubricants
The table shows the ingredients of Thorpe’s Eucalyptus Oil Lotion.

<table>
<thead>
<tr>
<th>Key</th>
<th>Ingredient</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sorbolene</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Water</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Eucalyptus extract</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Sodium stearate</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Emulsifier</td>
<td>5</td>
</tr>
</tbody>
</table>

Which sector (pie) graph represents these data?

(A)  
(B)  
(C)  
(D)
Sam carried out an experiment to see how quickly soluble aspirin tablets dissolved in 200 mL of water at 20°C. In each test the mass of soluble aspirin was the same. Sam’s results are shown in the diagram.

![Table of results]

What conclusion could Sam make from this experiment?

(A) Aspirin tablets are readily soluble in water.
(B) Insoluble aspirin takes longer to dissolve than soluble aspirin.
(C) The longer the tablet takes to dissolve, the less effective it will be.
(D) The greater the area of the tablet exposed to the water, the less time it takes to dissolve.

Titanium is a metal that is suitable for use in artificial hip joints. Which feature would be most important for this selection?

(A) Titanium is not magnetic.
(B) Titanium is compatible with body tissues.
(C) Titanium is a component of bone tissue.
(D) Titanium is a good conductor of electricity.
The type of bonds in chemicals found in nature helps to determine their solubility. Highly polar bonds, such as O—H and N—H make a chemical water-soluble.

Bonds such as C—C and C—H are low polar bonds and decrease the solubility of the chemical.

Which of the following chemicals would be LEAST soluble in water?

(A) \[ \text{H} \quad \text{H} \]
\[ \text{H—C—C—C} \]
\[ \text{O—H} \]

(B) \[ \text{H—C—C—C—C—O} \]
\[ \text{H—C—C—C—C} \]

(C) \[ \text{H—C—C—C—C—C—C—H} \]
\[ \text{H—C—C—C—C—C—C} \]

(D) \[ \text{H—C—C—H} \]
\[ \text{H—C} \]
\[ \text{O—H} \]
\[ \text{H—N—H} \]
Plaque on the walls of major arteries can affect the flow of blood and cause blood pressure problems. Blood pressure is shown as two numbers, for example 120/85. The first number is called the systolic pressure and the second number is called the diastolic pressure.

The table shows the ranges of normal systolic and diastolic blood pressures for various age groups.

<table>
<thead>
<tr>
<th>Age</th>
<th>Systolic Male</th>
<th>Systolic Female</th>
<th>Diastolic Male</th>
<th>Diastolic Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 – 44</td>
<td>110 – 150</td>
<td>105 – 150</td>
<td>40 – 44</td>
<td>70 – 94</td>
</tr>
</tbody>
</table>

Which of the following shows normal systolic and diastolic blood pressures for a 35-year-old female?

(A) 110/70
(B) 115/95
(C) 130/100
(D) 145/80

Which non-invasive diagnostic technology would most likely be used to test for a possible brain tumour?

(A) Angioplasty
(B) MRI
(C) X-rays
(D) Ultrasound
9 What is the function of heart valves?

(A) To produce electrical signals to stimulate heartbeat  
(B) To ensure one-way flow of blood through the heart  
(C) To separate the blood from the body and blood from the lungs  
(D) To help eliminate plaque to ease blood flow  

10 There is a series of steps involved in any communication system. What is the correct sequence of steps for communication?

(A) Decode, send, code, receive, reply  
(B) Send, receive, code, decode, reply  
(C) Code, send, receive, decode, reply  
(D) Send, code, receive, decode, reply  

11 The electromagnetic spectrum is used as a means of carrying many forms of communication. Which means of communication does NOT use the electromagnetic spectrum?

(A) Human speech  
(B) Mobile telephone  
(C) Television broadcast  
(D) FM radio communication
The barcode shown in Diagram 1 is designed to be read by a scanner.

Diagram 1

The scanner sends an electrical signal such as the one shown in Diagram 2 to a computer.

Diagram 2

Which of the following represents the electrical signal that corresponds to the left side of the barcode in Diagram 1?

(A) \[ \quad \]

(B) \[ \quad \]

(C) \[ \quad \]

(D) \[ \quad \]
Kim designed the following model to demonstrate how electromagnetic radiation is relayed by some satellites in space.

What property of electromagnetic radiation does this model demonstrate?

(A) It is able to be transformed into electrical energy.
(B) It is able to be reflected.
(C) It is able to spread out.
(D) It is able to travel through space.

A geostationary satellite can relay information from one side of the Earth to the other side. It is at a height of 35 800 kilometres above the Earth’s surface.

Geoff in Broken Hill made a satellite telephone call to a friend in Sydney. The speed of the signal is given by the equation:

\[ \text{Speed} = \frac{\text{distance}}{\text{time}}. \]

What will be the approximate time delay between the signal leaving Broken Hill and its arrival in Sydney, if the speed of travel is \(3.00 \times 10^8 \text{ m s}^{-1}\)?

(A) 0.125 seconds
(B) 0.25 seconds
(C) 0.5 seconds
(D) 1.0 seconds
An optical fibre is a material that can be used to carry messages in the form of light.

<table>
<thead>
<tr>
<th>Optical fibre</th>
<th>Fibre cost for 1 metre (cents)</th>
<th>Number of messages carried by 1 fibre</th>
<th>Maximum distance between each transmitting station (kilometres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>30</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>X</td>
<td>20</td>
<td>200</td>
<td>40</td>
</tr>
<tr>
<td>Y</td>
<td>50</td>
<td>300</td>
<td>50</td>
</tr>
<tr>
<td>Z</td>
<td>40</td>
<td>400</td>
<td>70</td>
</tr>
</tbody>
</table>

A telecommunications company wishes to choose an optical fibre that has all the following characteristics:

• it must carry at least 180 messages;
• it must allow at least 50 kilometres between each transmitting station; and
• it must cost as little as possible.

Which optical fibre is the best to use?

(A) W
(B) X
(C) Y
(D) Z
Section I

Part B
Total marks (60)
Attempt Questions 16–28
Allow about 1 hour and 45 minutes for this part

Answer the questions in the spaces provided

Question 16 (2 marks)

Emulsions used in consumer products include oil-in-water emulsions and water-in-oil emulsions. Explain how the properties of ONE of these types of emulsion relate to its use in a consumer product.

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Marks

2
Question 17 (3 marks)

Solutions, colloids and suspensions are types of mixtures that occur in a wide range of consumer products.

The following list gives some information about colloids, solutions, and suspensions.

- Colloids have particles larger in size than those in a solution.
- Colloids have particles smaller in size than those in a suspension.
- A beam of light is not visible as it passes through a solution, but is visible in a colloid and a suspension.
- The particles of a colloid don’t settle out upon standing.
- The particles of a colloid cannot be collected by filtering.

Compare the properties of these mixtures by completing the table.

<table>
<thead>
<tr>
<th>Type of mixture</th>
<th>Colloid</th>
<th>Solution</th>
<th>Suspension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do particles settle out? (Yes/No)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can particles be separated by filtering? (Yes/No)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do particles scatter light? (Yes/No)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Question 18 (2 marks)

Pseudoephedrine is a common drug used in some cold and flu tablets.

Describe TWO properties of drugs like pseudoephedrine that allow them to be taken as tablets.

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Question 19 (3 marks)
Explain the action of microflora on the skin’s natural pH.

Question 20 (7 marks)
(a) Describe a demonstration to show the effect of the surface tension of water, and explain how surface tension causes the effect demonstrated.
Question 20 (continued)

(b) A beaker contains water with a few drops of oil forming a thin layer on the surface. Describe and explain what would happen to the mixture if some detergent were added.

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Question 21 (3 marks)

A student in your laboratory lesson has just accidentally swallowed a chemical left in a beaker on the benchtop. You do not know the name of the chemical. It may be poisonous. Outline the steps you would take to treat this emergency in the best way.

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Question 22 (6 marks)

(a) On the diagram of a body, identify and label ONE site where artificial or replacement body parts could be used.

[Diagram of a body with a site marked for replacement parts]

Question 22 continues on page 18
(b) For your chosen site, describe the material or technology used that allows for this replacement. Explain TWO properties of this material or technology that make it suitable for this use.

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End of Question 22
Question 23 (10 marks)

From about 3000 BC to AD 1870, the life expectancy of humans increased from approximately 25 years to 40 years.

The following data show approximately how life expectancy for Australians has changed since 1870.

<table>
<thead>
<tr>
<th>Date</th>
<th>Human Life Expectancy (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1870</td>
<td>40</td>
</tr>
<tr>
<td>1915</td>
<td>50</td>
</tr>
<tr>
<td>1930</td>
<td>60</td>
</tr>
<tr>
<td>1955</td>
<td>70</td>
</tr>
<tr>
<td>1995</td>
<td>76</td>
</tr>
</tbody>
</table>

(a) Draw a line graph to represent these data.

(b) Between which two consecutive dates given in the table did the most rapid increase in human life expectancy occur?

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Question 23 continues on page 20
Assess technology’s contribution to the changes in human life expectancy.

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Question 24 (4 marks)

Terry has a lung disease. Four tests were suggested to see whether taking a drug increases the volume of air he can breathe out. The effects of the drug last for only about five minutes.

Which test would be the best way to find out if the drug affected the volume of air Terry can breathe out? Explain why this is the best test.

Test 1: First measure the volume Terry can breathe out without the drug. Then give Terry the drug and measure the volume of air breathed out.

Test 2: First measure the volume Terry can breathe out without the drug. Then give Terry the drug and measure the volume of air breathed out. Then, wait ten minutes and again measure the volume of air breathed out by Terry.

Test 3: First measure the volume Terry can breathe out without the drug. Then give Terry the drug and measure the volume of air breathed out. Then, have Terry exercise for ten minutes and again measure the volume of air breathed out by Terry.

Test 4: Randomly select twenty people. Measure the volume breathed out by each person. Give the drug to ten of these people. Measure the volume breathed out by all twenty people. Compare the volumes of air breathed out by those given the drug and those not given the drug (the control group).
Question 25 (6 marks)

New technologies such as mobile phones and fax machines have enabled rapid long-distance methods of communication to be developed.

(a) Outline the energy transformations that occur in ONE rapid communication system that works over long distances.

<table>
<thead>
<tr>
<th>Energy transformations</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

(b) Compare the system in part (a) to a communication system that uses a different method of carrying the signal.

<table>
<thead>
<tr>
<th>Energy transformations</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>
To record the human voice, a microphone converts sound waves into electrical waves. Inside an analogue tape recorder, the electrical waves are used as a guide to rearrange magnetic particles on the recording tape into an identical waveform. When the recording is played back, the wave on the tape is transformed back to an electrical wave, and it is fed through a speaker that produces sound.

In analogue recording, the sound entering the microphone goes through a number of changes before it comes out of the speaker.

In the space below draw a flowchart to show these changes.
Compare the properties of AM and FM radio waves and relate these to their use in communication.
Telecommunication systems have changed dramatically since telephones were first used in the late 19th century.

Assess the impact that ONE technological improvement in telecommunications systems has had on society.

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Section II

Total marks (25)
Attempt ONE question from Questions 29–33
Allow about 45 minutes for this section

Answer the question in a writing booklet. Extra writing booklets are available.

Question 29  Polymers ........................................................................................................... 30
Question 30  Preservatives and Additives ................................................................. 3–32
Question 31  Pharmaceuticals ......................................................................................... 33
Question 32  Disasters ................................................................................................. 34–35
Question 33  Space Science ......................................................................................... 36
**Question 29 — Polymers (25 marks)**

(a) PVC is a strong, rigid, heat-resistant *polymer*. It is used to make cups, dishes, pipes, rainwater gutters and rainwear.

(i) Use diagrams to explain the term *polymer*.  

(ii) For a synthetic polymer other than PVC, explain what properties it has that make it particularly suited to its use.  

(b) Describe the main differences between thermoplastic and thermosetting plastics.  

(c) During your studies into Polymers, you performed a first-hand investigation of the properties of a variety of natural polymers. For ONE property of natural polymers you studied, state the purpose of your investigation and describe:

(i) the equipment you used;  

(ii) in point form, the steps you took to complete your investigation. Identify those factors that you varied and those that you kept constant in your investigation;  

(iii) any concerns or possible hazards you allowed for when planning your investigation. Justify your concerns; and  

(iv) the results you obtained from your investigation.  

(d) One problem with the use of some synthetic polymers is that they are highly durable. After they have been used, they do not biodegrade and therefore take up space in landfills. Some people believe we should use biodegradable plastics, while others feel we should concentrate on recycling.

Analyse these two points of view.

**End of Question 29**
(a) Micro-organisms have an optimum temperature for survival. When this temperature is exceeded, their metabolism slows down and they will eventually be killed by the heat.

The diagram gives some information about the temperature requirements for two types of micro-organisms.
A piece of frozen chicken was left on a kitchen bench to defrost for 6 hours. It was defrosted after 4 hours, but remained on the bench at room temperature for the next 2 hours.

(i) Use the information in the diagram to describe the rate of micro-organism growth in the piece of chicken at the end of the 6 hours.  

(ii) When it came time to cook the chicken, the chef decided that the chicken could not be used as it had become spoiled. Suggest what evidence the chef may have used to come to this conclusion.

(iii) Micro-organisms require specific environmental conditions to grow and reproduce. Apart from temperature, describe ONE other condition needed by micro-organisms to grow and reproduce.

(b) Explain the principles involved in TWO different physical means of food preservation.

(c) During your study of Preservatives and Additives, you performed a number of first-hand investigations to study food preservation techniques and principles. Clearly identify ONE of your investigations, and describe:

   (i) the equipment you used; 
   
   (ii) in point form, the steps you took to complete your investigation. Identify those factors that you varied and those that you kept constant in your investigation; 
   
   (iii) any concerns or possible hazards you allowed for when planning your investigation. Justify your concerns; and 
   
   (iv) the results you obtained from the investigation. 

(d) Food producers must conform to standards developed by the National Food Authority. These standards include labelling, advertising, food additives and preservatives.

Why is there a need for control and labelling of food additives and preservatives?
(a) The diagram shows a reflex arc. Outline the steps in the pathway of the nervous impulse from the stimulus to the muscle.

(b) One of the body’s responses to injury, infection or trauma is the inflammation response. Explain the effect of chemicals such as prostaglandins and aspirin on the body’s inflammation response.

(c) During your study of Pharmaceuticals, you performed a first-hand investigation to study the effect of temperature on the growth of bacteria present in our surroundings. Describe:

(i) the equipment you used;  
(ii) in point form, the steps you took to complete your investigation. Identify those factors that you varied and those that you kept constant in your investigation;  
(iii) any concerns or possible hazards you allowed for when planning your investigation. Justify your concerns; and  
(iv) the results you obtained from the investigation.

(d) In recent years medical practitioners have had to examine the widespread use of antibiotics. Assess the concern that bacteria have become resistant to antibiotics such as penicillin, and discuss possible implications for the future use of antibiotics.

End of Question 31
(a) The diagram shows how a simple smoke detector works.

Describe the energy transformations that occur in the operation of this smoke detector when smoke is present.

(b) Explain how a seismograph is used to record earthquake activity.

(c) During your study of Disasters, you performed an investigation to compare the flammability of dry and fresh leaves. Describe:

(i) the equipment you used;
(ii) in point form, the steps you took to complete your investigation. Identify those factors that you varied and those that you kept constant in your investigation;
(iii) any concerns or possible hazards you allowed for when planning your investigation. Justify your concerns; and
(iv) the results you obtained from your investigation.

Question 32 continues on page 35
Question 32 (continued)

(d) Choose a natural disaster that has occurred within Australia.

For this disaster:

(i) state where and when it occurred;  
    1

(ii) describe the damage it caused; and  
    2

(iii) assess the role of technology in monitoring and minimising the effects  
     of a similar disaster in the future.  
    6

End of Question 32
Question 33 — Space Science (25 marks)

(a) Space is often described as empty.
   
   (i) With the aid of diagrams, explain the relative distance of particles in solids, liquids and gases.  
       2 marks
   
   (ii) Explain why there is no such thing as empty space.  
       2 marks

(b) Describe TWO effects on body functions of living in a reduced-gravity environment and explain how equipment or technologies may be used to minimise ONE of these effects.  
   
   5 marks

(c) During your study of Space Science, you performed an investigation to demonstrate why a large booster rocket is required during lift-off but not on re-entry. Describe:

   (i) the equipment you used;  
       1 mark
   
   (ii) in point form, the steps you took to complete your investigation. Identify those factors that you varied and those that you kept constant in your investigation;  
       5 marks
   
   (iii) any concerns or possible hazards you allowed for when planning your investigation. Justify your concerns; and  
       2 marks
   
   (iv) the results you obtained from your investigation.  
       2 marks

(d) Analyse the impact that equipment or technologies developed for the space program have had on society. In your answer refer to examples of equipment or technologies.  
   
   6 marks

End of paper