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**1998** HSC

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**EXAMINATION  
REPORT**

**Science For Life**

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## 1998 HIGHER SCHOOL CERTIFICATE EXAMINATION

### SCIENCE FOR LIFE

In 1998, 3596 students presented for the examination in Science for Life.

#### General comments

- The quality of the responses was similar to that of previous years. It was generally felt that this year's paper challenged the students more than last year.
- Sometimes it was apparent that a candidate was particularly poorly prepared for a specific module. In these cases, it is likely that the candidate did not study the module in question, but based his/her answers on general knowledge.
- On the whole, candidates presenting for the module on Horticulture, in particular, were well prepared. Those who attempted the Space Science and Science Fiction modules this year did not seem to be as well prepared as in previous years.
- As in previous years, the quality of candidates who attempted the Biotechnology module was higher than that of the average candidate for the other modules.
- Words such as 'better, poor, stronger, weaker' were overused throughout student responses and were not acceptable answers to questions involving 'how'.
- Candidates need to read each question carefully and answer all the parts required. Students also should only answer the specified number of items in a question, rather than writing answers that address all items.
- Often answers were too general. While the answers showed that the candidates had learnt certain information, it did not mean that they could apply their learning to the specific situation in the question. The better answers related specifically to the questions given and gave relevant examples.
- Candidates must ensure that their answers relate to the specific questions and also that answers are well explained with reasons and examples being provided where required.

#### Marking Criteria

Marks for Science for Life questions in Section B and the Modules of the examination are awarded on the basis of the candidate's responses relative to the quality of all other responses, provided that the answer meets the minimum requirement for correctness. The specific marking criteria will vary from one year to another, depending on the range of responses.

Each year specific marking criteria are developed for each question based on the following general guidelines. An outline of the specific criteria used to mark questions 11 to 28 are provided in this report, together with the general report for each question.

### **Excellent Responses**

These points summarise the comprehensive and coherent answers provided by better students:

- show good knowledge of content of modules
- can express scientific ideas in technical terms
- can apply scientific ideas to novel situations
- are able to apply the scientific method, use appropriate design strategies and draw conclusions on the basis of data collected
- can identify and use relevant information
- can apply critical thinking to the solution of problems
- make accurate measurements
- show an understanding of the links between science, technology and society and also the limitations of science
- provide depth of detail in their discussions
- answer all parts of the question in a logical manner
- support arguments with relevant examples.

### **Average Responses**

Here candidates answer parts of the question with limited but relevant discussion – provide an excellent answer to only one part of the question:

- use appropriate scientific terms to convey ideas and closely relate descriptions to observations
- can use fundamental scientific concepts in the expression of ideas
- use measurements in descriptions
- can draw up tables and graphs correctly
- can identify cause and effect relationships
- their discussions of the questions tend to be general
- may include inappropriate information
- have coherence and organisation in the structure of their responses

### Poor Responses

These candidates provided limited information in their answers:

- use some scientific terms to communicate ideas
- can interpret simple mathematical or statistical data
- can apply scientific method across a narrow range of familiar situations
- can recall and identify fundamental scientific ideas
- may misinterpret information given in the stimulus material

### Section A – Multiple Choice

Question	A	B	C	D
1	1.49	0.62	4.27	93.40*
2	79.18*	9.95	6.10	4.44
3	5.54	4.16	82.83	7.16*
4	80.08*	4.38	12.03	3.23
5	1.99	1.88	74.32*	21.55
6	1.55	8.82	2.78	86.57*
7	4.13	75.02*	16.02	4.44
8	9.95	4.83	75.58*	9.24
9	58.08*	6.24	31.98	3.15
10	5.90	81.06*	9.27	3.34

N.B. Those answers with an asterisk (\*) indicate the correct response for that question.

## Section B

### Question 11

In general, it appeared that the diagram was too complex for ready analysis by the majority of candidates in this group; many tried to base their answers on general knowledge.

(a) The question required candidates to interpret the shading from the diagrams given. This question was worth one mark and candidates gained the mark by writing 'cooler' (for near Australia) and 'warmer' (for near South America). Some failed to answer the question in the expected manner, shading in the answer spaces in the answer booklet or trying to give a numerical answer instead of using words, which was difficult as no numerical information was given in the stimulus material. The majority, however, were able to identify the relationship shown.

(b) Candidates were expected to derive this information directly from the stimulus material.

Most could identify a change in wind direction, but many found it difficult to express this change in terms of a direction or result. Candidates scored the mark for this question if they identified the fact that, during El Nino, surface winds move away from each continent and towards the middle of the Pacific.

(c) This section was poorly answered. Candidates were unable to see that, if the surface winds over the ocean were blowing the moisture-laden air away from the continent, then a drought might result.

Candidates scored the mark for this question if they could state that El Nino keeps moist air away from Australia.

### Question 12

(a) Candidates found this part of the question easy and it was generally well answered. To score the mark for this part, they needed to list all the materials in the required order.

(b) Many candidates did not take this part of the question to its conclusion. They generally identified factors involved in making a fair comparison but did not specify what should be done with them. This part of the question was worth two marks and, in order to get the two marks, candidates needed to identify two factors and say what should be done with them. Examples of responses that scored full marks included:

'All the materials must be in the same condition at the start of the experiment, for example, the items should be new and she should make sure that there are equal numbers of worms and microorganisms in each location.'

### Question 13

(a) Most candidates were able to identify a sequence of steps in the DNA fingerprinting procedure, but a large number could not show a flow chart. It was obvious that many candidates identified each sentence as being a new step; they could not distinguish between each step in the experimental sequence and the result of the step.

This part of the question was worth 2 marks. One mark was awarded for being able to identify step 2 (cut the DNA into pieces using an enzyme) and the other mark was awarded for recording a correct sequence of steps. Even though the question asked for a flow chart, full marks were still awarded to those candidates who correctly detailed the steps but did not use a flow chart.

- (b) The majority of candidates correctly identified the fact that no two people could have the same DNA, but many failed to note that this was with the exception of identical twins. They needed to make this point to score the mark for the question.

#### **Question 14**

This question was not answered well. Good literacy levels were required of candidates to understand the question and to respond to it in full.

The differences between the tests (especially the first three) were very subtle and not well understood by the candidates. Many failed to see the relevance of the third measurement in Test 2 and, even though they identified it as being important. Test 4 contained good experimental procedures and was widely chosen as the best test. In fact, candidates scored the marks for this question no matter which test they chose, provided that they could justify their answers in an appropriate, scientific manner. Three acceptable reasons were necessary for candidates to score the marks for this question.

Many who scored poorly here made only one point rather than three.

The following answer would score full marks: 'Test 2. This is the best test because it measures Franz's lung capacity before and after taking the drug. These measurements can then be compared. After 10 minutes the effects of the drug had worn off. The test can be repeated to check what has happened.'

#### **Question 15**

- (a) This part was generally well answered. Some candidates plotted time on the vertical axis but many used a pen instead of pencil to draw graphs which then became messy when they tried to correct any mistakes. Marks were given for accurate plotting of the points given, drawing a line graph and using suitable and accurate scales on the axes.
- (b) This part was not well answered. Many candidates seemed confused by the question, answered 'yes' and then gave a correct explanation which contradicted their 'yes' response. A number of candidates confused 'slowing down' with not speeding up. An answer such as 'No. Dimitra's speed remained constant' gained full marks.

#### **Question 16 – Fashion and Science**

- (a) (i) No marks were awarded for giving the name of a fashion and the chosen fashion needed to be one which has a damaging effect on the environment.
- (ii) This part was worth one mark. To score the mark the candidate needed to make the link between the fashion and its effect, saying, for example: 'Plastic containers. These are colourful but do not break down easily and may clog up waterways.'

- (iii) This question was worth one mark which was awarded for one reasonable way of minimising the detrimental effect of a specific fashion, for example: 'Suggesting an alternative, using less.' The method chosen needed to relate to the specific fashion, eg 'Re-use the plastic containers.'
- (iv) This question was worth one mark. Candidates scored this mark for giving any valid reason for using certain fashions despite their environmental effect(s), eg 'People may not be able to afford the more environmentally friendly alternative.'
- (b) It was necessary to use the same fashion in answering both parts of this question. Those who did not do this did not score full marks.
  - (i) To gain one mark, the candidate was required to give a description of change to a particular fashion and to link this to science or technology. For example, 'Almost all shoes were once made of leather, but now many newer materials such as nylon or vinyl are used as well' would score the mark.

NOTE: The same change may be explained in terms of both science and technology.

- (ii) This question was worth one mark, which was awarded for an explanation of any change to the fashion not caused by science. This could include considerations such as cultural or economical reasons, eg a statement such as 'Different brands of shoes become fashionable according to the people who are seen wearing them or advertising them' was worth one mark.
- (c) (i) This question was worth two marks. The candidates were required to select two of the listed changes and a mark was awarded for a cultural reason to explain the changes. For example, 'The manufacturers do not want to be seen to be encouraging girls to try to develop an unattainable Barbie doll figure' would be an accepted answer for one of the changes and so would be worth one mark.
  - (ii) This question was worth one mark. To score the mark, candidates needed to name or describe the predicted feature and explain the reason for their choice. Saying for example 'Different coloured skin representing different racial groups' would score one mark.
- (d) (i) This question was worth one mark which candidates could score by answering either 'yes' or 'no' as long as they gave a reasoned explanation for their answer. Both the following answers would score the mark: 'Yes, because it enables the wearer to be identified with a particular group' or 'No, because only a minority group like it.'
  - (ii) This question was worth two marks. To be awarded two marks candidates needed to give two factors, with explanations. Examples of factors that would score the marks include: 'People may wish to be seen as being different from others' or 'If famous people wear these, others may wish to identify with these famous people.'
  - (iii) 1. This question was worth two marks. Candidates were awarded one mark for any three reasonable questions for this type of survey, provided that they related to the reasons for following the fashion. For example, questions that would score a mark include: '(a)What is your gender ? (b) Do any of your friends have body piercing? (c) Why did you get your body pierced ?' To score the remaining mark, candidates needed to relate the reason for including any one question to the reason for getting their body pierced. For example, 'The second question tries to identify whether peer pressure is an influence on those who have had body piercing' would score the mark for this question.



2. This question was worth one mark. Candidates were required to give a suitable description of a sample population for this survey. They could include information such as the sample size, or age, or the place where the survey was done. For example, the response 'I would choose 20 university students who have body piercing' would score one mark.

### Question 17 – Horticulture

In general, this module was handled well by candidates, with a large number displaying a wide knowledge base. In some sections, candidates had difficulty in working out the purpose of the question.

- (a) (i) Candidates needed to identify how either straighter trees or larger roots would make the plant more suitable for a specific situation or a particular industry. Candidates needed to be able to relate the example they had chosen with their reason. Some overlooked the fact that they needed to answer only one or other of the alternatives, and did both. They did not score any extra marks but could have wasted valuable examination time.
- (ii) Candidates were able to identify a scientific advance or new technology in the horticultural field but many had difficulty in linking the advance to the solution of a problem.
- (b) (i) This question was answered well. Candidates scored the mark by stating reasons for having public gardens or for looking after public gardens. Examples of reasons that scored the mark include: 'Public gardens provide a place to rest' or 'Public gardens attract tourists'.
- (ii) This question was also answered well. Candidates were able to identify problems such as vandalism, problems in garden design and the costs associated with maintaining a public garden. This question was worth one mark.
- (c) (i) Candidates were well aware of the value of wilderness areas and most answered this question well. Many answers, however, were too brief and did not discuss the key word 'preserving', in the question. To gain the two marks, candidates needed to give two different reasons for maintaining wilderness areas. Examples of reasons which gained a mark included answers such as: 'Preserving species for future research for medicines; providing wilderness experience for tourists and the general public; providing habitat for fauna'.
- (d) In general, candidates were able to design a suitable experiment to see if the yield of the native grass could be improved. Most candidates set out their experiments well and identified their Aim, Method and expected Results. The experimental method suggested by the majority was valid and adequate scientific controls were used. Most candidates identified the variables in their experiment and limited the number of variables. Some did not identify the sample size, or used a sample size that was too small, which limited the merit of their answers.

Many candidates, however, did not indicate how they would calculate the yield. It is difficult to determine whether students understood the term 'yield' as many students did not indicate how it could be calculated.

This question was worth three marks; one mark was awarded for experimental design, one mark for a comparison between the experimental crop and the sample crop and one mark for indicating how to determine the yield of each crop in order to quantify how much seed was produced.

- (e) (i) This part was generally well answered with a variety of acceptable reasons being given. In this instance, however, 'personal use' was not accepted, as the question clearly states that the farmer was growing 5000 lettuce. In these instances candidates needed to be careful not to state something that they memorized, but to apply their knowledge to the question given, which was worth one mark. An example of an answer that would be awarded the mark is: 'To provide year round income and for higher prices in winter'.
- (ii) This question was worth two marks, one mark each for the advantage and the disadvantage of using a climate-controlled greenhouse for growing lettuce. Examples of acceptable answers were:
- Advantage: 'To prevent climate damage' or 'to minimise pest damage' or 'to make the lettuce grow faster'
- Disadvantage: 'Expensive to build or to maintain and operate'; 'limited available space'; 'encourages fungal growth'
- (iii) Almost every candidate was able to answer this question correctly and included the units . The correct answer was '80 mL'.
- (iv) This was not well answered as candidates failed to identify a reason for the wording on the label. Often the answers were very brief and simply restated the information in the text. This section was worth one mark. An acceptable answer would be one in which the candidate made a connection between spray residue and people's health.

### Question 18 – The Human Body

- (a) (i) Some candidates were unable to name the specific stages (W and Z) asked for in the question. Many attempted to name ALL stages. Some described the stages, rather than naming the stages. This question was worth one mark and full marks would be scored for the following statement: 'W = Toddler; Z = Old age'
- (ii) To score the mark for this part, the candidates needed to name two developmental stages and link their chosen activities to these stages. The poorer candidates did not do this. This question was worth one mark and the following is an example of an answer which would score the mark.
- 'A child (Stage X) can run around more easily with its stronger, flexible skeleton, while an elderly person (Stage Z) cannot as their bones are brittle and contain less calcium'.
- (iii) Candidates were able to give physical characteristics of various stages. Few, however, were able to use the same physical change to link two successive stages together.
- (b) (i) Many candidates provided answers which lacked specific information. To score the mark, a specific positive physical effect had to be mentioned, eg 'Playing netball would improve a person's cardiovascular fitness.'

- (ii) Many candidates provided answers that were very vague or referred to a gain in knowledge rather than a SPECIFIC positive effect on mental health, eg 'relieving stress by bike riding' or 'winning a soccer game increases self esteem'.
  - (iii) Candidates generally answered this part of the question well. Examples of answers that scored the mark include: 'Using computers can cause eye strain' or 'Laboratory work can be repetitive and boring'.
- (c) (i) This question was worth one mark and required candidates to be able to name a disease which most candidates were able to do. Poorer candidates were unable to name a disease, but gave the symptoms instead. AIDS was by far the most common disease named, although some candidates could not make a distinction between HIV and AIDS. Many described HIV as being the disease rather than the virus which causes the disease.
- (ii) Generally, candidates were able to give some specific details about how the disease they had named was contracted. With regard to AIDS, many candidates did not mention that the source of the disease is a carrier of the disease. Poorer candidates wrote 'AIDS is contracted through unprotected sex with a person' whereas the better candidates wrote: 'AIDS is contracted through unprotected sex with an infected person.'
  - (iii) Very few candidates were able to give details which showed their understanding of the disease. Many just named a cure or preventative measure. To gain the mark for this question, candidates needed to make a correct link between the current understanding of the disease and its prevention or cure. For example, 'AIDS is spread through contact with body fluids, so preventative measures include screening blood for blood transfusions, using condoms, the safe disposal of used syringes.'
- (d) (i) 1. This question proved hard for many candidates, who seemed to have difficulty in correctly reading the graph or providing accurate units. The question was worth one mark and answers between 350-450 thousand millions of people scored the mark.
2. This question was satisfactorily answered, although some candidates wrote the date at which the population doubled, rather than the time it took to double.
- (ii) 1. A large number of candidates were able to list three impacts of people on the biosphere. In their answers, the better candidates were able to link these impacts to an explanation of the involvement by humans.

2. This question was not well answered, as very few candidates referred to the information presented in the graph, as requested in the question. To gain the marks for this question, candidates needed to realise that the impact of each person on the biosphere may be individually small, but as numbers of humans increase greatly, then the total impact would be very large.

3. Candidates in general agreed that, in the future, humans would have an effect on the biosphere, but did not state whether the effect was an increase or decrease. The better candidates were able to explain the reasons for their answers, as requested. For example, some candidates were able to link the increase in the population in the future with an increase in the amount of pollution produced by the population as a whole.

### Question 19 – Science Fiction

This was poorly answered and the majority of candidates gave vague and unqualified answers.

- (a) (i) Candidates needed to support their reasons for the portrayal of interaction with extra-terrestrials as being violent by referring to science fiction literature or movies where such reactions are frequently depicted, or as a response to emotions such as fear of the unknown or greed. Many responses were too vague, suggesting that humans react to aliens this way simply because they are different. Examples of answers that would score the mark for this question include: ‘The aliens may be scared of us and fight to protect themselves or their territory’ or ‘This type of action makes science fiction films and books exciting.’
- (ii) Once again, many candidates failed to give specific details. Better answers for the proof of the existence of extraterrestrials included reference to hard evidence (citing at least one example such as photographs) or to our inability to travel to places where aliens may be. This part of the question was worth one mark which candidates scored for answers such as:
- ‘There are no DNA samples of aliens’ or ‘We may not realise that they are trying to communicate with us.’
- (b) (i) Many candidates had difficulty in stating how the structure and function of a human body would be affected by shrinking. Many candidates mentioned environmental factors such as being eaten by insects. This question was worth two marks and, in order to score both marks, candidates needed to relate the structure and function of some aspect of human biology to the size of an insect. Examples of answers that would score the marks include ‘Smaller size means that they would lose heat quickly and get very cold’ or ‘Having smaller lungs means less oxygen and therefore less energy’ or ‘Having smaller legs means that they couldn’t move around as quickly’.
- (b) (ii) 1. This was well answered by the majority of candidates.
2. This part was poorly answered. Many candidates did not clearly explain how a scientific idea contributes to the function of the device chosen. Poorer candidates simply wrote things such as ‘Electricity makes it work.’ Parts 1 and 2 were each worth one mark and a good answer for part (ii) was ‘1. rockets; 2. The exhaust pushes the rocket due to the action reaction principle (Newton’s third law)’.
- (iii) 1. This part was also well done by the majority of candidates.
2. Few candidates could give a good reason to explain why a device is unlikely to become part of everyday life. Poorer answers stated ‘it’s impossible’ or ‘we don’t have the technology at this time’ but failed to look to the future. Many overlooked the implications of the word ‘everyday’ and focused on why such evidence may not be available. Reasons why something is unlikely to become part of everyday life may relate to cost, or danger caused by the technology or the device.
- Each part of this question was worth one mark and an example of an answer that would score both marks is: ‘Time travel is unlikely as it requires speeds nearer to or faster than the speed of light.’

- (c) This question caused some difficulty as many candidates interpreted the stimulus material as requiring a detailed biotechnology answer. In fact, a candidate could have answered the question completely by referring to the information given in the stimulus material. Some candidates had difficulty in translating the idea of cloning in sheep (from the diagram) to human examples.

Most candidates were able to give at least one good reason to show why cloning is not a part of everyday life. Good answers included ethical/moral reasons, identity confusion related to a crime and possible problems or mistakes in the cloning process. Candidates could also answer that the technology as applied to sheep is recent, or that cloning of humans has been banned in some countries as being reasons why the cloning of humans is not part of everyday life.

- (d) The question was generally answered well, with the candidates adequately describing examples to show that the idea or device would be harmful. Time machines, laser guns and teleporters were commonly referred to. Parts (i) and (ii) were each worth one mark and the following is an example of an answer that would score the mark: 'Guns that disintegrate things are dangerous because you may accidentally kill people.'
- (e) Candidates generally performed very poorly in this question and appeared to be unable to apply the basic principles of experimental design such as sample size, repeating experiments, use of a control, and the control of variables. Some candidates could not clearly and logically describe an experimental procedure, with the poorer answers simply restating the question.

The question was worth 3 marks and to score the marks, the experiment needed to be practical and to have some of the elements of scientific method, eg large sample size, replication, implied control group, recording of thoughts, counting, separation of participants, reporting structure, eg aim, method.

### **Question 20 – Science of Toys**

- (a) (i) Candidates had no difficulty in naming two of the items given; some named all four items even though the question asked for only two. Naming the items does not attract any marks, but helps the marker to interpret the next two questions. Students were required to relate their answers in the next two parts to their named items.
- (ii) Candidates needed to read the question carefully. Many supplied answers for all four items shown in the diagram, while some gave only one safety precaution for each item they named in part (i), when two such precautions were asked for. A lot of candidates repeated the same safety precaution for two different items, eg 'the swing needs a back support so you don't fall off', and, 'the see-saw needs a back support so you don't fall off.' Answers that were repeated giving no additional information received a mark only once. Examples of answers that scored marks include: 'swing – rubber covering on chain; cement legs firmly in the ground' or 'Slippery dip – rounded edges on frame, side supports for children to hold on to.'
- (iii) This was poorly answered by the majority of candidates who were often not able to relate a scientific principle to the safe use of the equipment. Many repeated the information they gave in part (ii), while a significant number did not attempt this part.



To score the mark for this question, candidates needed to state an appropriate scientific principle and then relate this to the safe use of the item of equipment chosen. Examples of answers that scored the mark include: 'Soft material at the base of the slippery dip protects children from injury if they fall, since the material absorbs the shock' or 'The fulcrum of the slippery dip must be in the middle for balance.'

- (b) Those candidates who were well-prepared gave excellent, well thought-out answers and easily scored the five marks for this question. Some gave very obscure or inappropriate toys in the context of Science (pet rocks, a cardboard box) although there is a wide range to choose from in order to give good answers.
- (i) This was well answered by the majority of candidates. The better candidates chose three different criteria which were unrelated, saying for example, 'The Toy of the Year should be educational and develop skills, be designed and built safely, and be longlasting.' This question was worth one mark.
- (ii) This was fairly well done. The better candidates expanded on their answers to part (i) by giving reasons to support two of the criteria they chose. For example, an answer which would score the mark for this question would be: 'It is important for a toy to be imaginative as it can hold a child's interest for a long time and he/she doesn't become bored. A safe toy can be used by a child of that age group without injury.' This question was worth two marks.
- (iii) Many poorer candidates repeated the information they gave in part (ii) or described a toy without giving good reasons related to the kind of criteria they had discussed in the previous questions. This part was worth two marks. To score the marks, the candidates needed to relate clearly the toy they described to sound reasons, saying for example, 'The toy of the year is the play gym. This encourages the child to use gross motor skills and to develop coordination and balance.'
- (c) (i) This question, which was worth one mark, was generally well answered. Although a description was asked for in the question, some poorer answers were too generalised to score well, eg 'hand-eye co-ordination' by itself was not considered adequate, but saying 'Bouncing the ball or catching the ball can help to improve hand-eye co-ordination' was acceptable.
- (ii) This part was well answered. The question was worth one mark and an example of an answer that scored the mark is: 'Playing a game of basketball helps the child develop tactics and game strategy.'
- (d) (i) On the whole, this question was well answered. A few candidates confused a psychological message with the consequences of giving a child a gun. This part of the question was worth two marks if two suitable psychological messages were given. For example, 'Two psychological messages from the gift of a gun are that shooting is OK and that guns are fun.'
- (ii) This part was generally well answered. Poorer candidates simply restated information from the passage while some others did not adequately explain why guns are not regarded as toys. The case for either the 'yes' or the 'no' answer was acceptable as long as the reason was consistent. This question was worth one mark and a suitable answer is: 'Yes, guns are dangerous and can hurt or maim people.' or 'No, they are OK, if used with parental supervision as they can teach skills.'

- (iii) Candidates had a good idea of how to source information by doing a survey and they knew where to get the correct information (in this case hospital records or the Bureau of Statistics). Many candidates, however, did not realise the survey would need to be conducted all over Australia in order to have access to all the data. This question was worth two marks. The answer needed to include the method to be used (eg survey), the source to be accessed (e.g. police records, medical records of hospitals) and the number or the scope of the survey (eg from hospitals Australia-wide.)

### Question 21 – Sports Science

- (a) (i) This question was well answered and most candidates related their answers well to the stimulus material i.e. ballet, as given in the question.

This question was worth one mark which was awarded for answers such as: ‘strength for support’, ‘balance’, ‘prevent injury’.

- (ii)
  1. All candidates named a sport but marks were not awarded for doing so.
  2. To score the marks, candidates needed to discuss both a training program and the change that they would expect to occur in the body as a result of such a program. Very few candidates described or even mentioned a training program, although most could describe a change in the body. Often, this change was too generalised to score full marks e.g. ‘big muscles’ or ‘fitter’. In addition, the training program had to be suitable for the named sport. e.g. for swimming, an acceptable training program would include swimming laps. A change could be ‘increased muscle mass’.
  3. This question was poorly done and, in fact, a significant number did not attempt it. Many designs were either not feasible or not scientific, i.e. they often lacked a control or a specified measurement. The question was worth two marks. One mark was given for stating a factor that indicated a fair comparison or a controlled experiment, and the second mark was given if the candidate indicated how he/she would determine whether the change happened e.g. a specific thing that could be measured (for example, the size of the biceps).
- (b) (i) This part was worth one mark and was generally well answered; candidates needed to show that they understood the information given in the stimulus material. Examples of answers that scored the mark include two features such as ‘big toe the longest and the first metatarsal bone hangs lower than the others.’
- (ii) This part was generally well answered. Again, candidates could use the information in the stimulus material and apply this to the question, which was worth one mark. An example of an answer which scored the mark is: ‘This foot would be a disadvantage because of the increased risk of injury due to of the nature of the activity. A fracture may occur because of the pounding of the foot in marathon running.’
- (iii)
  1. Somatotypes were often referred to correctly. No marks were awarded for this part of the question.

2. Most candidates chose an appropriate sport for the named body type. The best answers linked an advantage of this body type to the sport in terms of performance or reduced risk of injury in the sport. This question was worth one mark.

3. To score the mark, the candidate needed to correctly name a sport in which that body type is a distinct disadvantage and link the disadvantage to performance or safety in the sport.

- (c) (i) Most candidates recognised the fact that muscle dysmorphia is a psychological disease, though some had difficulty in expressing the link between the disease and the idea of false body image.

This section was worth one mark and to score the mark the candidates had to reflect the idea of false body image in their answer: saying for example, ‘a person with muscle dysmorphia mistakenly believes he is puny.’

- (ii) 1. The better candidates in this question gave a scientific reason for their answers; the poorer candidates gave an opinion. This question was worth one mark and an example of an answer that scored the mark is: ‘Yes, since an exercise program can lead to fitness and health’ or ‘No – an exercise program can set up false expectations.’

2. This question had two parts, each worth one mark, with candidates doing the first part well. All candidates were able to give a valid reason for participating in an appropriate physical activity. Most candidates, however, failed to explain how the reason they gave was attained by participating in the physical activity they named. To achieve both marks they needed to make this link.

## Question 22 – Disasters

- (a) (i) Candidates were able to select a natural disaster from the table given but some were unable to state the characteristics of a natural disaster. The example and the explanation together were worth one mark. An example of an answer that scored the mark is: ‘Earthquake. It is a natural disaster because it is caused by stresses in the Earth’s crust and is not caused by mankind.’

- (ii) The majority of candidates chose a symbol from the table as asked. To score the marks, they needed to explain that the essential features of a disaster (large scale damage and loss of life) were missing from the example given. The question was worth one mark. An example of an answer that scored the mark was: ‘Wild Animals, because there was no large scale damage and no one died.’

- (iii) Most candidates selected a symbol from the map given, as was the intention of the question. After choosing a symbol, the candidate needed to give the meaning of that symbol and provide one of the two possible examples given from the map. A significant number of candidates, however, elected to draw their own symbol instead of choosing one from the map. This answer still scored the mark as long as the candidate’s symbol and meaning made sense.

This section of the question was worth one mark. An example of an answer that scored the mark is: (drawing of the symbol for temperature ie thermometer, as shown on the map); meaning of the symbol is the temperature at that place; Example ‘It was  $-68^{\circ}\text{C}$  at Vostok, Antarctica.’ or ‘It was  $+42^{\circ}\text{C}$  at Karima, Sudan.’



- (iv) Most candidates successfully tabulated the data. A significant number, however, presented the information in the form of a graph. This question was awarded three marks, given for correct table format, any six events recorded correctly and any six correct corresponding tallies.
- (v) This question was answered correctly by most candidates. The question was worth one mark and the mark was awarded for the answer 'earthquakes'.
- (b) (i) Most candidates had difficulty in naming an appropriate technology and linking it to how it would prevent loss of life in a disaster. This question was worth two marks and an example of an answer that was awarded two marks is: 'Using a boat to rescue people, or satellites to show weather patterns to warn of cyclones.'
- (ii) This question was answered well. Candidates were able to name two services and explain how these services supported people in times of emergency. This question was worth two marks and an example of an answer that would score the marks is: 'The SES rescue people stranded on rooftops in a flood and the Salvation Army provide clothing and blankets and food for people who have lost their homes.'
- (c) (i) Candidates seemed to have some difficulty here in interpreting the stimulus material and were somewhat confused in their answers which showed a lack of understanding of what the question required them to do. This question was worth one mark and an example of an answer that would score the mark is: 'Yes, because it resulted from a language misunderstanding' or 'Yes, because the people did not watch the radar' or 'No, because perhaps the altimeter of one of the planes was faulty and this caused the planes to cross paths.'
- (ii) A large number of candidates answered this question well. They could interpret the future as being the immediate future (ie, what would you do to stop the accident from occurring tomorrow?) or as the distant future (ie, in the next twelve months.) Either a procedural or technological method was accepted. This question was worth one mark and examples of answers that scored the mark are: 'Only one language should be used for all flight instructions and all pilots should have to learn this language' or 'Warnings should be given from a radar if planes are in close proximity to one another.' Answers such as 'Bigger, better radar' did not score the marks.
- (d) This question was not answered very well by the majority of candidates, who seemed unable to identify what 'failure of materials' meant even though this term is specified in the Syllabus. Candidates were generally unable to distinguish between 'materials' and 'technology', often describing technology (which is asked for in part (e) of the question).

This question was worth one mark and, to score the mark, the candidate was required to link HOW materials can cause a disaster. An example of an answer that would score the mark is: 'The Thredbo disaster was due to a water pipe failure which soaked the earth around the site causing it to slide.'
- (e) Again, candidates seemed confused between technology and materials. They were unable to show how the failure of technology could lead to a disaster. A significant number of candidates described the disaster rather than outlining the technological failure that caused it. To score the mark for this question, the candidate should have clearly shown HOW technology failure leads to a disaster. In this question, it was acceptable for examples of materials to be used as a technology. This question was worth one mark and an example of an answer which would score that mark is: 'The Chernobyl radiation leak was caused by safety systems not activating.'

### Question 23 – Managing Natural Resources

(a) Candidates scored well in this section.

(i) This question was generally answered well, particularly in relation to habitat destruction. Any type of logging would score the marks, if an adequate explanation was given. This question was worth one mark and an example of an answer that would score the mark includes: ‘Modified clearfelling, since it protects a variety of species, as some trees are retained.’

(ii) 1. Most candidates answered this part well, although some candidates interpreted ‘worst’ as meaning ‘best’ in relation to the logging company. This question was worth one mark and an example of an answer which would score one mark is: ‘Clearfelling, as the complete removal of trees leads to erosion which affects regrowth and causes objections by environmentalists which can hamper timber operations.’

2. Again, most candidates scored well in this section. This question was worth one mark and an example of an answer that scored the mark was: ‘Clearfelling, as the complete removal of trees leads to a large reduction in biodiversity.’

(b) (i) The candidates needed to read this value from the graph. The difficulty lay in reading the correct line given in the key (the dotted line was for nitrogen) and from the correct scale, which was the axis given on the right. Many candidates failed to read from the correct axis. This question was worth one mark and any value between 11.05 PPM – 12.05 PPM was accepted as correct.

(ii) In general, this question was well answered, but some candidates gave inferences based on the results given in the graphs, rather than on an hypothesis. This question was worth one mark and an example of an answer that would score the mark is: ‘Wool production depends on grass availability.’

(iii) The better answers included details of good scientific method including repetition, use of appropriate experimental controls and control of variables. This was worth three marks, one mark each for an appropriate item of experimental design.

(c) (i) Most candidates used ‘food’ as a resource, as suggested in the question. They associated the availability of the resource with geographic or climatic influences and neglected other reasons that might limit a resource, for example, technology, or economic reasons.

This question was worth one mark and an example of an answer that would score the mark is: ‘Water is a resource which is more accessible to some people than others. This may be because a country may have a very dry climate and not have technology or money available to build wells or dams.’

(ii) This part was poorly answered, as many candidates could not explain how science and technology could assist countries which have limited resource storage. This question was worth one mark and an answer that would score the mark was: ‘Science and technology help by providing improved crops which suit local conditions. For example, Australian wattle trees are planted in India as their seeds are high in protein.’

(d) (i) Most candidates answered this part well. The question was worth one mark and an example of an answer that was worth the mark is: ‘Solar energy’. ‘Electricity’ by itself was not accepted as a renewable energy source unless the candidate explained that it was produced by some renewable form such as solar energy or hydroelectricity.

- (ii) This was also answered well. An example of an answer that scored the mark is: 'Oil'.
- (iii) 1. This question was poorly answered by the majority of candidates who simply stated that it was either cheap or expensive . To score the mark for this question, candidates needed to make a comparison with another energy type , for example 'Compared to electricity, solar energy is expensive to set up but cheaper to run.'  
2. Most candidates could relate environmental consequences to energy production but many answers were very general e.g. 'Causes pollution'. This question was worth one mark and an answer that scored the mark is: 'Solar power has a low impact on the environment as it does not create pollution and uses few resources.'

### Question 24 – Marine or River Studies

- (a) (i) The question was generally answered well. Common mistakes were the use of a single cumulative column as the only column on the graph and incorrect scale on the vertical axis. The graph was worth three marks. The graph required was a column graph. Candidates needed to make a correct calculation for the total global fish catch for 1950, and to use correct scales on the Y- axis.  
(ii) To score marks in this question, candidates needed to do more than simply repeat the information in the stimulus. Many candidates gave only one answer even though the question clearly asked for two. This question was worth two marks and the following answer would score the marks: 'The drop in fish populations is caused by overfishing of fish stocks and destruction of fish habitats.'
- (b) Candidates found the diagram difficult to interpret, and some students misinterpreted the information given, eg 'Small animals and algae living on the seagrass...' was interpreted by candidates as meaning that small animals and algae ate seagrass. However, the food chain itself did not imply this. Many candidates had difficulty in recognising the significance of arrows in the food chain.  
(i) Candidates showed some knowledge of food chain structure. The question was worth one mark which the candidates scored if they could make a valid connection between the seagrass and the fish.  
(ii) For both parts 1 and 2, candidates frequently failed to make a prediction, i.e. suggest an increase or decrease in the plant plankton or the number of large fish. Many candidates failed to follow up their statement with a reasonable explanation. Both parts 1 and 2 were worth one mark each. The following are examples of answers that scored the mark for part 1: 'There would be a greater number of phyto plankton because there are fewer zoo plankton to eat them.' and for part 2, 'There will be a decrease in large fish because there is not as much food, since the animals that feed on the zoo plankton will die.'
- (c) (i) This part was well answered. This question was worth one mark and an example of an answer that scored the mark is: 'Swimming and fishing.'  
(ii) Many candidates answered this well. A significant number lacked knowledge of what the activities they had listed in (i) involved and such candidates had difficulty in explaining their answer. This question was worth one mark and an example of a response which scored the mark included: 'Fishing could still be carried out in polluted water, but the fish may carry poisons.' Some candidates made this question difficult for

themselves, depending on the activities they chose in (i). If they chose two activities that could not be continued in polluted water, they were unable to answer the question. It is another example showing why candidates should always read the whole question before answering.

- (iii) This question was well answered by the majority of candidates. It was worth two marks and an example of an answer that would score the marks is: 'Oil or petrol from the boat, which can suffocate or harm animals.'
- (iv) This question was answered well, it was worth one mark and an answer that scored the mark is: 'The community could reinforce the bank with rocks, plants or mesh to stabilise the banks.'
- (v) Candidates generally showed a lack of ability to apply the scientific method to the question asked. The better answers included the following elements: valid measurements, the use of a control, sample ranges, and repetition. The question was worth three marks and those who included three elements of the scientific method scored three marks. Many candidates were confused about how to measure erosion, and often wrote about testing pollution instead.

### **Question 25 – Biotechnology**

- (a) (i) Most candidates gave an example of a biotechnology and a product produced, but few gave a description of the biotechnology. This question was worth one mark and an example of an answer that would score the mark is: 'In-vitro fertilisation. An ovum is fertilised by a sperm outside the body, then implanted back into the female.'
- (ii) This part was generally well answered. The question was worth one mark and an example of an answer that scored the mark is: 'This allows people who cannot normally have children to have children.'
- (b) (i) Many candidates could name an improved product but some did not give the biotechnology used to alter the product. This question was worth one mark and an answer that gained the mark is: 'A gene is put into tomatoes to stop them from ripening, so that they transport better.'
- (ii) This part was generally well answered. For two marks, candidates were required to include some of the following points: the poster should attract attention, the biotechnology must be mentioned, it should state how the product has been improved and why it is good for the consumer.
- (iii) 1. Very general and vague answers were given here, eg 'Is it safe?' instead of 'Is it safe for human consumption?' This question was worth one mark and an example of an answer that would score the mark is: 'The changed tomatoes may not be as tasty as normal tomatoes.'
- 2. General type answers were given here. For example, many candidates wrote: 'Test the product' rather than 'Compare the new product with the old.' This question was worth two marks. An example of an answer that would score the marks is: 'Conduct taste tests at various supermarkets. Ask a large number of people to taste both the genetically changed tomato and the unchanged tomato and compare their responses.'

- (c) This question was answered poorly with ‘control biological systems’ being confused with the term Biological Control. Also, many candidates gave one word answers such as ‘beer’ rather than ‘using microbes to brew beer’ for the ‘alter biological systems’ part of the question. The question was worth three marks and the following responses would score three marks:

control biological systems	control yeast to brew beer
alter biological systems	transgenic animals
repair biological system	In-vitro fertilisation

- (d) (i) This was well answered, with a range of answers being provided. This part was worth one mark and an example of an answer that would score the mark is: ‘As every person’s DNA is unique, identification can be made without confusion (excluding identical twins)’.
- (ii) Answers were good. This part was also worth one mark and an example of an answer that would score the mark is: ‘Having someone’s DNA on record is an invasion of privacy.’
- (e) Most candidates could give valid reasons for their decision, but many used vague statements such as ‘Who are we to play God!’ This part was worth one mark and an example of an answer that would score the mark is: ‘No human cloning should go ahead as the consequences for future generations are not known. For example, cloned people may be preferred to people who aren’t cloned. What will happen to ‘mistakes’ made along the way?’

### Question 26 – Communications

- (a) (i) This question was well answered. This part was worth one mark and a suitable answer is: ‘These handshakes are a form of non-verbal communication as they convey a message to the receiver.’
- (ii) This question proved difficult for candidates to answer. Some mistakenly designed experiments to test whether people with particular handshakes were of the character described, rather than whether the handshake conveyed the hypothesised message. There was a maximum of three marks for this question and these were given for three of the following elements of the scientific method: replication, a description of some type of appropriate test procedure, ascertaining the impression received by the people shaking hands and comparing this impression with the hypothesised message. For example, an answer that would receive full marks would be: ‘Select 20 people and give them the politician’s handshake. Ask each one what message they thought the handshake sent, see how many thought that this person was trustworthy.’
- (b) (i) This question was well answered; it was worth one mark and a suitable answer is: ‘The evidence presented in the article that suggested that mobile phones were a health hazard is that 50 people rang Dr. Marker, claiming that their mobile phones gave them headaches.’



- (ii) This question was well answered. Only a few candidates were able to argue the case for a 'yes' response. The question was worth one mark and an answer that would score the mark is: 'No, this is not convincing, as there are thousands of people using mobile phones who have not claimed that their phones gave them headaches. Their headaches may have been caused by something other than the phones.'
- (c) (i) No mark was given for this section. All candidates could give a suitable example of a type of communication, for example, 'Radio'.
- (ii) This was well answered and was worth one mark. An example of an answer that would score the mark is 'Radios used to be much bigger, they are now smaller and can be put into ear-muff type headphones.'
- (iii) Candidates found it difficult to distinguish between sending, receiving, noise, decoding and coding. The concept of noise in many of the forms of communication identified seemed poorly understood. Most candidates equated noise with communication, which only involved 'transmission' as 'sound'. This problem has been consistently identified in previous years. This point should be carefully dealt with in class. The question was worth three marks, one for each point. An example of an answer that would score the marks is:
  - 1. Sending: Programs are sent to a radio transmitting tower and radio waves are sent through the air in all directions.
  - 2. Receiving: The radio waves travel from the transmitting tower to the radio's antennae.
  - 3. Minimising of noise: Move the antennae around to get the best reception of radio waves and to minimize any static interference.
- (d) (i) This question was well answered, though some candidates merely named a device rather than describing a system. It was worth one mark and an answer that would score the mark is: 'The Internet, which is made up of millions of computers, connected worldwide through service providers.'
- (ii) Many candidates found it difficult to describe one impact of the selected communication on society. A number of students stated an effect, such as quick access to world news, without suggesting any impact of this access. The question was worth one mark and an example of an answer that would score the mark is: 'This has a big impact on society as people anywhere in the world are able to communicate quickly with each other'.
- (e) (i) This question was well answered, although some candidates simply counted all the arrows in the diagram.
- (ii) Candidates found this question difficult. Many did not seem to understand the means by which communication is transmitted. The role of light in many forms of communication was ignored.

This question was worth one mark for each part and an example of an answer that would score the mark is: (i) 4 changes (ii) All communication does not involve waves. Touch, such as handshakes, does not use waves.

## Question 27 – Consumer Science

### General comments

This module was generally well answered. Candidates needed to read all of the question carefully before starting an answer, highlighted by the problems that arose in answering section (a). Candidates also need to learn to analyse the question accurately in order to identify its emphasis. All the questions were attempted and many students received full marks for this section.

- (a) Presenting information in a table was generally well done, although many candidates attempted this question at least twice, with the second attempt usually being in a table format. Some candidates selected, as their examples, products that did not provide entries for all the categories given in the question (or so they thought). Also, the ‘environmental impact’ needed more than a term (eg. ‘Not biodegradable’) to achieve a mark. In this instance, candidates needed to explain why the fact that shopping bags are non - biodegradable creates an environmental impact. This question was worth two marks.
- (b) (i) This question was worth one mark. Answers here were generally good. The explanation and identification of the man as an expert or scientist, was well explained. The idea of the trust that experts generate was also well explained and understood by almost all the candidates. An example of a suitable answer is: ‘The man looks like a scientist and so people think he has tested the product.’
  - (ii) The experimental method was usually well explained, although some candidates chose not to complete this section. The bulleted points in the question should have been included in the answer to score full marks and this proved a problem for some candidates. One mark was given for each of the first two bullet points and one mark for each of three variables to be controlled.
- (c) (i) This section was answered correctly by almost every candidate who completed this question. The answer was ‘cigarette butts’ and the question was worth one mark.
  - (ii) Candidates tended to answer with a brief statement that did not always identify a reason. The ‘FACT BOX’ in the question was used by some candidates. Most identified the reason as being a result of human habit. This question was worth one mark and a suitable answer was: ‘Because people put them out on the ground by stamping on them and don’t pick them up again.’
  - (iii) Candidates found it difficult to make a generalisation in relation to the items in the question, consequently it was not answered well by the majority of candidates. It was worth one mark and a suitable answer was: ‘Fast foods would generate much of the litter shown in the pie chart.’
  - (iv) The majority of candidates were able to answer this question well, although relating the strategies to the actions of individuals did pose a problem for some. Two marks were given for any two appropriate strategies and these included such answers as: ‘Ask the council to put more bins in the street. When you go shopping, take a bag along for your own purchases or rubbish and take it home with you.’

## Question 28 – Space Science

- (a) This question was generally well answered.
- (i) Most candidates were able to state one incorrect impression about space travel, although many had difficulty in expressing it clearly. Many candidates used the stimulus material to answer the question.
- The question was worth one mark and an example of an answer that would score the mark is: ‘People wrongly think that people can fly about in space in the middle of twinkling planets and far away constellations.’
- (ii) The poorer candidates simply stated ‘It’s not possible.’ The better candidates answered this by using scientific explanations. One mark was awarded for a suitable answer, with an extra mark for a scientific answer. An example of an answer that would score two marks is: ‘In outer space, there is no air. An astronaut can survive in space only inside a pressurised cabin, or in a pressurised space suit with the right levels of oxygen provided.’
- (b) (i) Many candidates failed to read or understand the phrase ‘that has been overcome’ at the end of the question, consequently these candidates gave examples of problems or dangers that have not yet been overcome. Candidates consistently referred to there being no gravity, not only in space, but also on planets or on the moon. It would be beneficial if these common misconceptions could be discussed in the classroom. This part was worth one mark.
- (ii) 1. Candidates’ explanation for the cause of the problem needed to be linked to the example given in (i).
2. The solution also needed to be clearly explained and correct. The question was worth one mark.
- This question was worth three marks and an example of an answer that would score full marks is:
- (i) Eating or drinking in a weightless environment.
- (ii) 1. In a weightless environment, food and liquid float around.
2. This problem was solved by making food and drinks which could be sucked through straws.
- (c) Only a very small percentage of candidates scored the mark for this question. Answers were philosophical or humanitarian, but did not draw a clear link between starving people and space travel. Either the ‘yes’ or ‘no’ case was accepted, but an explanation was needed. For example, the candidate needed to show how the money could be used to develop better farming techniques or for education or similar needs. An example of an answer that would score the mark is: ‘I disagree. Space travel and research from satellites have given us lots of information on where food and mineral resources are on Earth. This has allowed us to exploit or manage these resources better.’
- (d) (i) This question was very well answered. Most candidates seemed to recognise that most pieces of garbage would burn up in the Earth’s atmosphere on re-entry. This question was worth one mark.



- (ii) The major misconception which showed up here was the idea that all space garbage will fall to Earth. In addition, the question clearly asks about problems created by garbage which remains in orbit. Answers that scored the mark for this question included: 'Space garbage in orbit may interfere with or damage satellites in orbit.'
  - (iii) Some of the answers to this question were highly unrealistic, almost belonging to science fiction. The question was worth one mark and a suitable answer would be: 'Countries should have a quota system restricting the number of probes or satellites allowed in orbit.'
- (e)
- (i) There are a large number of spin-offs from space travel research, along with items not invented for space travel but improved as a result of space research. There was also a lot of misinformation about spin-offs from space travel. For example, candidates quoted that velcro was invented by the space program but, in fact, various publications show that it was invented in 1948. Most candidates scored the mark for this question.
  - (ii) Most candidates were unable to explain the role that this development played in space travel. This question was worth one mark.
  - (iii) Candidates were able to state how these technological developments have benefited people in everyday life. However, describing a 'benefit' implies an improvement and most candidates failed to mention a benefit.

A good example of an answer for this question is:

- (i) Gold coating on lenses.
  - (ii) This coating was developed to reflect damaging rays from the sun away from the astronaut's eyes.
  - (iii) In everyday life, welders use these lenses on their face shields to prevent damaging rays from the welding process entering their eyes.
- (f)
- (i) This was generally poorly answered. Candidates stated what satellites could do, but did not describe an advantage of their use. For example, communication around the globe is possible without satellites, and, to score the mark, candidates needed to say why it can be better to use a satellite. This question was worth one mark, and an answer that scored the mark is: 'Satellites are able to gather and send information to a large part of the Earth at once, without actually being on Earth. They gain an image of the Earth as an entire planet, rather than of sections of the planet.'
  - (ii) On the whole, candidates did not answer this well. Many found it difficult to interpret 'type of information' and their answers tended to be very general. This question was worth one mark and an example of a correct response is: 'Information about moisture in soil or the amount of sunlight reflected from crops.'
  - (iii) Many candidates misinterpreted this question as asking 'How is this information obtained?', not 'How is it used?' To score marks, the candidates needed to relate their answer in (iii) to that in (ii). For example, 'The moisture levels in crops tell you if they are ready to harvest' would score the mark for this question.

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