BOARD OF STUDIES
NEW SOUTH WALES

1997 HSC

EXAMINATION REPORT

Science for Life

1997 HIGHER SCHOOL CERTIFICATE

EXAMINATION REPORT

SCIENCE FOR LIFE

In 1997, 3914 candidates presented for the examination in 2 Unit Science for Life compared with 4531 in 1996.

SECTION I — General

Part A

Some aspects of candidates' answers were better than in previous years: this includes graphing skills in general. Candidates did not, however, show such ability in converting information into tabular form.

Some areas which have been poorly answered previously, continue to be poorly answered. These include:

Lifestyle questions (Human Body); physical and mental development of toys (Science of Toys); misconceptions about the Greenhouse effect (Managing Natural Resources); and the meaning of the term *noise* (Communications). Specific comments are given in the relevant section below. The biases or misconceptions that students have in these areas should be thoroughly dealt with in class.

Graphs

Most modules required candidates to draw a graph. Many, when drawing graphs used Question 15 as a model and plotted only the points. This was inappropriate for many graphs.

A number of candidates used pie charts to answer graph questions in the modules. These candidates may have used the pie charts in Question 2 and Question 9 as models; sometimes pie charts were appropriate, sometimes they were not.

Candidates should be encouraged to exercise caution when using information or examples given in other questions, as this information may sometimes be inappropriate.

Section 1   Core

Part A

Multiple Choice Questions

The answers considered to be most suitable for each of these questions were as follows:

Approximate percentage choosing each alternative					
Item	**Omit**	**A**	**B**	**C**	**D**
1	.03	.54	.52	.21	**98.71***
2	.18	**76.67***	8.43	12.67	2.04
3	.08	1.47	19.09	**78.25***	1.11
4	.10	3.41	**81.56***	13.11	1.81
5	.21	9.23	**54.68***	2.10	33.73
6	.10	22.30	8.48	**50.62***	18.49
7	.21	**72.19***	3.21	21.39	2.97
8	.16	20.28	**50.83***	21.93	6.75
9	.18	**58.30***	1.94	7.73	31.79
10	.39	6.18	9.52	8.74	**75.14***

The correct answers are marked with an asterisk (*****).

Part B

Question 11

This question was answered very well by most candidates. The better answers gave accurate and full descriptions of the killer, screw-worm maggot, including its appearance and measurements of its dimensions, giving a ratio of length to width.

Question 12

(a)   Answers here were generally very good.

- A number of candidates, however, graphed the data rather than tabulating it as requested.

- Many did not know how to rank Toni and Kim equally in the table and simply listed them one after the other, rather than indicating that they were of the same ranking.

(b)   Most candidates recognised that not enough information was given in the table to confirm that Jackie was the tallest in the class, but many did not explain this adequately. Many stated that there were two candidates in Jackie's group but did not say that the other student might be taller.

Question 13

(a)   This question was, on the whole, not well answered. Few candidates identified a scientific idea regarding sun-safe practices that they could include on their poster; many simply listed things they would show on a poster.

(b)   The majority of candidates were able to state where they would place the poster and gave their reasons for their choice of position.

(c)   Candidates showed good knowledge of poster design.

Question 14

Here there was evidence of suitable project work from most candidates, who were able to relate their project to one of the Syllabus Understandings listed in the question.

There were, however, a large number of candidates who either did not attempt the question, or linked it to Module work rather than their own project. Such candidates scored poorly.

Some candidates focussed on a narrow perspective which made scoring full marks difficult. Many failed to discuss the impact of science on their project.

Question 15

(a)   Many candidates failed to realise that it was a *lack of data* which would lead a scientist to doubt Martin's estimate.

(b)   Many candidates interpreted the meaning of this question to be *deaths from snakebite*, **not** the snakebite itself. Consequently, only a small number of candidates managed to score full marks here.

(c)   Most candidates were able to present well reasoned support for their chosen comment.

Modules

Question 16   **Fashion and Science** (454 Candidates)

This module required candidates to explain their answers a number of times; those who were not good at explanations did not score well here.

(a)   This question was reasonably well answered. To score full marks, candidates were required to describe two changes in sporting equipment and to show how science and technology have caused the changes. Many candidates were not able to do this.

(b)   The quality of survey questions varied greatly. Poor answers tended to restate the aim of the survey, but good answers gave two distinct and appropriate survey items, which were supported by explanations in part (ii). Some explanations were very poor and lent no support to the survey questions. Poor answers simply restated survey questions.

(c)   (i)   All candidates were able to name an item which has had a detrimental effect on the environment. Many chose drink containers as their fashion item.

        (ii)   This question was poorly answered. Few candidates gave *reasons* for the changes, as required by the question, with the majority simply stating the changes themselves.

        (iii)   The quality of answers for this question varied greatly. The better candidates related the item to a specific detrimental effect. Too many candidates stated that plastic was much better for the environment than glass. Many saw plastic as being biodegradable and glass as non-recyclable!

        (iv)   This part was generally poorly answered. Many candidates chose to NAME two ways of overcoming detrimental effects but few could clearly explain two ways of doing so. Some candidates stated the opposite of their answer for part (iii). These candidates scored no marks.

(d)   (i)   Most candidates were able to name an appropriate activity that is popular among the students at their school.

        (ii)   Answers here were generally of a poor standard. To score full marks, candidates were required to link the activity chosen in part (i) to cultural heritage. Few explained their answers coherently and in sufficient detail.

(iii)   This question was, on the whole, poorly answered. In the better answers students sought to describe differences in terms of cultural heritage or environmental conditions. Poorer answers gave reasons that were contrary to those in their answers for part (ii).

(e)   (i)   The graph of the given data was generally drawn well, with the most common errors occurring in the labelling of the axes or the scale chosen.

(ii)   The majority of candidates made a reasonable prediction, although some failed to use the graph or all the data from the table.

(iii)   The most common mistake that occurred in answering this question was failure to note the exponential growth of the amount of plastic given in the table. Generally the explanations lacked detail and some poor answers were simply a guess.

Question 17   Horticulture (553 candidates)

(a)   This question was generally well answered. Some candidates failed to name the *part of plant* correctly. Many selected the plants listed in the table, yet often made errors in completing the table.

(b)   (i)   Candidates were able to state clearly two reasons for growing their own tomatoes.

(ii)   The better candidates clearly stated an appropriate experimental design, including:

   •   a scientific control;

   •   use of a large number of plants for each trial;

   •   controlled variables and several examples eg same temperature, same type of tomatoes, same amount of light, same nutrients;

   •   the fact that one or more factors were measured and compared eg height of plants, number of fruit, weight of fruit, taste of fruit.

(c)   This was poorly answered; candidates did not name and clearly explain an advantage and disadvantage of each pest control method.

(d)   (i)   The graph was drawn by the majority of candidates. Those who did well in this question:

   •   clearly named their graph, labelled the axes, and added the appropriate units

   •   used an appropriate linear scale

   •   plotted their points accurately

   •   used a column or pie graph since a line graph was inappropriate. Most of those who chose to use a pie chart did not realise that components must total 100%.

(ii)   Some candidates experienced difficulties with the calculation in this part. Those who appeared to identify the proportions were able to answer the question without any trouble.

Question 18   The Human Body (1181 candidates)

(a) (i)
     and   Candidates were generally able to identify the stages from the diagram
     (ii)   and label them accordingly.

     (iii)   Most candidates were familiar with features of each stage but often did not show how a feature changes from one stage to another.

(b)   This question was poorly answered by most candidates who failed to link a specific lifestyle with either a physical or emotional consequence. A small number of candidates thought that they had to describe how people could improve their lifestyles.

     Students showed a high level of sexist stereotyping in their answers to both parts of this question.

(c)   Candidates were able to state that immunisation is a form of *prevention of disease*. Many explanations were poor, with candidates simply restating the information given in the question.

(d)   The majority of candidates generally realised that the statement of risk was applied to men and not boys and that eight boys was too small a sample on which to base such a definitive assertion.

(e) (i)   Most students appeared to understand the concept of the biosphere but had difficulty in expressing this knowledge.

     (ii)   Candidates generally knew two ways of helping people to reduce their impact on the biosphere. The better answers included a description of what the effect or impact would be.

(f) (i)   Most candidates were able to determine the diet deficiency from the table but gave poor explanations in their answers.

     (ii)   Candidates were able to interpret the food pyramid and to link the diet deficiency to the foods needed.

Question 19   Science Fiction (720 candidates)

(a) (i)   On the whole this question was well answered. The weaker candidates listed only a few parts of the spacecraft, but good candidates listed many parts and identified their position and/or function.

     (ii)   This question was generally quite well answered. Many poorer answers tended to use inappropriate names taken from the diagram in part (i) and apply them to a movie. Other poor answers named an *idea* but **not** a *device* as required by the question.

     (iii) Most candidates named well known books, movies or TV shows and answered this question well.

(b) (i)   Poorer candidates simply restated the stimulus material, while better candidates gave more detail in their answer. Answers to this question were generally poor.

     (ii)   This part of the question was answered well by the majority of candidates. Reactions to the unknown living thing varied from panic and staying away to killing it!

(c) (i) Most candidates were able to identify two similarities between the different robots, and good candidates were able to suggest *why* the robots had these similarities.

(ii) Answers here were generally good. Popular reasons given included those for stability, balance and ease of movement.

(iii) Most candidates stated that the reason for trying to build two-legged robots is to make them more human in appearance.

(iv) This question was generally well answered. Although it was not about robots, many candidates still related it to the previous three parts which were about robots.

(d) (i) This question elicited a range of responses. Most candidates drew line graphs and bar graphs.

(ii) Various types of answers were given for this question. Good responses explained scientifically why this sudden exponential growth is not possible. Poor answers were vague and were not justified.

Question 20   Science of Toys (1338 candidates)

(a) (i) Most candidates named a toy and described two features, but often their descriptions were too brief.

(ii) Some candidates gave an example of both a physical and a mental development for the first and second feature of the toy, rather than a different feature for each.

(iii) This part was omitted by many candidates who did not consider satisfactorily the suitability of the toy for the age group five to seven years and stated safety features which are applicable to toys designed for children under three years.

(b) This question was not well answered by many candidates. The poorer answers included opinions about sex stereotyping that were either unsubstantiated by suitable reasons or contained insufficient detail.

(c) (i) Some candidates *named* a toy rather than *outlining features* that make a good toy.

(ii) Some candidates did not know what an *electronic personal organiser* was. Many simply restated the descriptions given in the question.

(iii) Most candidates gave a satisfactory explanation of the difference between a toy of 50 years ago and a modern toy. The better answers gave the development in a toy over 50 years, eg development of porcelain dolls and plastic dolls. Poorer answers did not include an account of the material available 50 years ago for the toys they had chosen.

(iv) This question was poorly answered since very few candidates named a branch of science that has been used to improve the specific toy. Most stated the improvement and the area to which it belongs, saying, for example, *Dolls can talk now due to electronics.*

(d) (i) The table based on the information in the graph was done well by most candidates; a few, however, simply redrew the graph or drew a bar graph.

(ii)   Most candidates answered this correctly. A few confused *distance travelled* with *speed or time taken*.

(iii)   Few candidates realised that the graph was exponential and, consequently, the predictions for distance travelled were generally too low.

Question 21   **Sports Science** (1298 candidates)

(a)   The majority of candidates were able to describe correctly at least one harmful consequence of taking steroids. Many, however, gave *positive* consequences, eg increase in performance. There were many general comments, eg *affects liver*. The better answers correctly gave specific information.

(b)   (i)   This part was well answered by the majority of candidates.

(ii)   Answers here were poor, since few *described* a method for improving fitness. Many gave an answer that was too general, *eg training more or jogging* but gave no justification. Some candidates named a system of training, eg Fartleg, but failed to describe it.

(iii)   The better answers gave a reason for a preferred age range for the sport. Poorer answers gave very limited ranges for sports, suggesting that people over 40 are unsuitable for any sport.

(c)   Some candidates did not answer parts (ii) and (iii) of this question.

(i)   Answers here were generally good. Graphs were well drawn and well labelled. Most students chose column graphs, line graphs were accepted, however, when they differentiated between males and females.

(ii)   A number of candidates correctly picked the obvious trend in the data, though some saw a relationship between leg-strength needed in the specific sport and the height of the vertical jump.

(iii)   Some candidates compared leg-strength in males and females, though many related it to the height of the person, which might not be relevant to all the sports listed, eg sprint cyclist.

(d)   (i)   Candidates had no trouble in naming a sport.

(ii)   Here students argued either the *yes* case or the *no* case.

•   For the *yes* case, a number of candidates answered well. Many, however, failed to include arguments about a body type or to give an appropriate reason to justify their opinion.

•   For the *no* case, many candidates failed to give an appropriate reason to show **why** there was no perfect body shape for their sport.

(iii)   Most candidates could give two factors other than body shape to be considered in taking up the specific sport. Many, however, gave a factor/factors which was/were related to body shape.

(iv)   This part was well answered by many candidates. Some did not answer this part or gave poor reasons for considering the two specific factors.

(e)   (i)   The majority of candidates gave an experimental design improvement, eg repeating the experiment, or measuring the frequency of rotations before and after the spin. Many poor responses suggested a change to the whole experiment, eg use an automatic spinning machine; get the student to stand up; strap the student in the chair by his/her hands/legs.

        (ii)   Most candidates were able to name a suitable sport.

        (iii)
        and   Both parts were either very poorly answered or not attempted at all, suggesting
        (iv)   that the candidates had difficulty with this question. Some failed to give a physics principle, giving instead, answers about *practice* exercises to improve skill levels for their sport. Other candidates mentioned appropriate skills for playing their sport with no reference to any underlying physics principle.

Question 22   **Disasters** (2073 candidates)

(a)   (i)
        and   These parts were answered well by the majority of candidates.
        (ii)

(b)   (i)   The majority of candidates did not express themselves well and found it difficult to give an example of each type of disaster. Few used examples to explain how a disaster could be caused by failure of materials.

        (ii)   Candidates were often not specific in describing the disaster. Those who did so usually answered the rest of the question well.

(c)   (i)   An appropriate graph was generally drawn. An appropriate graph was, for example, a histogram, with correct scale/labelling, and correctly plotted points. Many candidates drew line graphs which were inappropriate, while a few drew pie-charts.

        (ii)   This part was well answered by most candidates.

(d)   (i)   Many candidates stated how individual Australians could help reduce the effects of a specific disaster, rather than describing how Australia as a whole could assist. Although the candidates were able to select any natural disaster they had studied, many provided little detailed information about reducing the effects of a disaster.

        (ii)   The majority answered this using the information given in the stimulus material.

Question 23   **Managing Natural Resources** (313 candidates)

Greenhouse Effect

A large number of candidates continue to show a poor or inaccurate knowledge and understanding of *Global Warming* due to an increased Greenhouse effect and of the hole in the ozone layer. Many ascribed the causes and effects of global warming to the hole in the ozone layer. This inability to discriminate between the two issues usually resulted in a loss of marks in the relevant questions.

(a)   (i)   The responses to this question showed that most candidates, who had a good understanding of the types of resources that are not equally accessible to all people, generally answered the question well.

(ii)   Candidates had some difficulty in expressing the effects on people of *not* having this resource.

(iii) This part was poorly answered, since most candidates gave very general statements rather than specific answers or examples.

(b)   (i)   Answers here were generally very good, although some candidates confused the greenhouse effect with the depleting ozone layer.

(ii)   This part was also very well answered; most candidates appreciated the effect that one person can have on the environment.

(iii) Answers here were very good as well.

(iv) The majority of candidates could provide an example of a suitable renewable resource that could be used instead of coal.

(c)   (i)   Answers here were also good, as most candidates could give an example from the table, thus showing their understanding of the information.

(ii)   Most candidates were able to draw an appropriate graph in answer to this question. Some, however, used a line graph which was inappropriate.

(d)   (i)   This question was generally poorly answered since most candidates simply restated the information in the question and showed little understanding of the scientific process.

(ii)   Answers here were also poor since candidates failed to show why a balanced approach, which takes into account the ideas of other people and groups, is required for the management of resources.

Question 24   **Marine And River Studies** (913 candidates)

(a)   Most candidates answered this question well, although those who submitted poorer answers simply repeated parts of the stimulus material.

(b)   (i)   This question was well answered.

(ii)   The majority of candidates answered with a survey.

(c)   (i)   Most answers did not give a specific reason to explain why access to clean, fresh water is important to an organism. Candidates tended to focus on the word *clean* rather than *water*.

(ii)   Many candidates did not know what was meant by *water-based waste.*

(d)   (i)   Candidates successfully named a recreational activity that uses water.

(ii)   Answers here were too general. The better answers focussed on specific effects for the recreational activity chosen in part (i) if the water becomes dangerously polluted.

(iii) Many candidates simply restated or expanded on the answer to part (ii), or gave the opposing view, and did not appreciate the significance of the word *pure* as opposed to *clean*.

(e) (i) Answers here were generally good.

(ii) Most candidates drew satisfactory graphs. Attention needs to be paid, however, to correct drawing of linear axes, elimination of inappropriate extrapolation and correct labelling of axes.

(iii) Many candidates did not link their explanation for the success of the given regulations to the data provided.

Question 25   **Biotechnology** (55 candidates)

This module was well answered, with the better candidates giving clear explanations and scientifically correct examples in support of their answers. Students who study this elective are not disadvantaged by less likelihood of scoring well; candidates' scores were comparable with those of other modules, as they have been in the past.

(a) (i) The better answers identified the absence of algae around the eelgrass and interpreted this accordingly.

(ii) This was poorly answered; most candidates were unable either to state any clear advantage that laboratory work may give a scientist or to identify when fieldwork would give an operator a clear advantage in investigations of a similar nature.

(b) This part was well answered, with excellent supporting examples being given.

(c) Most candidates answered this question well. Some candidates plotted all the information included in the pie chart, rather than selecting the five types of research mentioned in the pie chart.

(i) On the whole answers here were good.

(ii) Some candidates found difficulty in producing clear statements on how biotechnology has contributed to an increase in life expectancy.

(iii) Candidates showed that they had examined a wide range of biotechnological research and this is commendable. Areas such as surrogacy, IVF, genetic engineering and biological warfare were discussed well. Ethical issues associated with cloning, organ/tissue donation and animal experimentation were also examined.

(iv) This question was answered by most candidates in a clear and concise manner.

Question 26   **Communications** (909 candidates)

(a) (i) This question was generally answered well.

(ii) Although most candidates answered this part well, the poorer answers did not tabulate the information. Skill in tabulating was an integral part of the question.

(b) (i) Most candidates provided a suitable method of communication.

(ii) The majority of candidates answered this part well.

(iii) Most candidates selected a suitable method of investigation, but many were unable to provide a means of determining the effectiveness of their specific method of communication.

(c) (i) Answers here were generally good; some candidates however, named transmitting or decoding devices instead of forms of communication.

(ii) Many candidates were unable to identify a source of *noise* for a method of communication they selected since a number misinterpreted the term *noise* as it applies to communication. This continues to be a problem as it has been in past years and students would do well to attempt to understand the correct meaning of the term in this context. Mis-matching the five steps of communication was common.

(d) (i) Candidates generally were able to convey a suitable message given by the picture, but many failed to support this with an explanation as required by the question.

(ii) This question was generally well answered, with reasons that were consistent with the nature of the article being given.

Question 27 Consumer Science (909 Candidates)

(a) Most candidates had difficulty in discussing two separate advantages for each section. The better answers were given by those who could discuss the advertisement objectively.

(i) Without undue exaggeration, the better answers linked the dentist to the image conveyed by a professional.

(ii) Poorer candidates based their answers on their own feelings with regard to the model as a person, rather than upon the significance of using models in an advertisement.

(b) A number of candidates failed to examine the fundamental purpose of the survey. Many quoted the use of different brands of Cola as a good feature of the survey; this, however, was not what the survey was really about. In part (i) (good feature), many candidates did not explain their answers, whereas in part (ii) (weakness), explanations were generally given.

(c) (i) The majority of candidates answered this question. Common mistakes included:

• drawing a line graph rather than a histogram;

• failing to identify the correct quantities which belong on each axis.

(ii) Less than half the candidates reached the correct answer of 5 cents; many, however, made mistakes in basic arithmetic and a number confused cents and dollars.

(d) Many candidates did not choose an appropriate product or service which would enable them to fulfil all the requirements of the question adequately. The majority used clichés, slogans, and catch–phrases and showed no understanding of *environmental consequences*. A step-wise series of causes resulting in a consequence was put forward by very few candidates.

In part (iii), candidates failed to provide a reasonable alternative, or an alternative to match part (i).

(e) (i) A small proportion of candidates failed to recognise what constitutes a *technological advance.*

(ii) Many of the advantages to the consumer given were not considered in terms of the advance mentioned in part (i). A number did not explain the precise advantage to the consumer but used general terms such as *economy, less pollution* and *better for the environment.*

Question 28 Space Science (413 candidates)

(a) (i) Most candidates gave good answers and referred to *wide, open, remote* places as being reasons why Australia is a good place for launching space vehicles. Some also referred to the significance of the proximity to the Equator and lift-off into space.

(ii) Few responses were given here since many candidates did not attempt this section of the question at all.

(b) (i) Most candidates drew a column graph; they interpreted the dates as separate entities **not** as a continuum over a period of time.

(ii) Most candidates were able to draw a crescent but had difficulty in drawing 47% of the full disc.

(c) (i)
and Candidates were generally familiar with a range of spin-offs from space
(ii) exploration and their common applications.

(iii) Candidates were less familiar with the solutions to problems of space travel and science's involvement in the solutions to these problems.

(d) (i) This question was well answered, with candidates successfully extracting the necessary information from the textual material.

(ii) Candidates had a poor understanding of the role of satellites in radio communication, failing to recognise that *signals* were, in fact, *waves.*

(iii) Candidates had a good understanding of the variety of ways in which satellites have increased our knowledge of the Earth.

(iv) Discussion of the value of using surveys as a means of gathering opinions or the random selection of 4000 people, was not good.

(v) Candidates were very conversant with the fact that shuttles are reusable as compared to rockets and, therefore, cheaper. A sizeable proportion of candidates were able to make comparisons relating to the accuracy of satellites by using the space shuttle rather than conventional rockets.