

# **2000 HSC Notes from the Examination Centre Applied Studies**

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GPO Box 5300  
Sydney NSW 2001  
Australia

Tel: (02) 9367 8111

Fax: (02) 9262 6270

Internet: <http://www.boardofstudies.nsw.edu.au>

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# Applied Studies

## Introduction

The 2000 Applied Studies HSC examination tested a representative sample of the outcomes from the syllabus document. The questions covered encompassed:

- knowing and understanding scientific facts, concepts, principles, models, laws and theories
- the ability to use scientific method and to reason scientifically
- the ability to use information to make personal decisions and to take positions on societal issues
- the ability to communicate effectively about science
- a variety of context areas.

## Question 1

### Applications of Computer-controlled Systems

- Candidates correctly listed components of a working computer-controlled system.
- Candidates were able to identify sensors and actuators in computer-controlled systems, but in most instances, failed to describe in any detail how they worked.
- Candidates correctly listed ‘real world’ applications of their (computer-controlled system) working models that they had assembled.
- Candidates were able to discuss both the social and ethical issues linked to their working models.
- Candidates easily identified the advantages and disadvantages of computer-controlled systems.

Candidates clearly understood what this question required. The majority of candidates made a genuine attempt to respond to each part of the question. All candidates had either assembled or investigated a computer-controlled system in their studies.

Candidates found the level of language for presenting the questions appropriate. The stems to the questions were clear and easy to understand. Thought had been given to setting out and candidates could show what they knew – demonstrate their level of achievement.

Concepts that were well understood:

- closed loop systems versus open loop systems
- the relationship between theoretical models and real life applications of computer-controlled systems.

Concepts that were poorly understood:

- the technical aspects of how sensors work.

## **Question 2**

### **Applied Mathematical Skills**

This question was well developed. It examined a variety of syllabus outcomes and required candidates to use an assortment of problem solving skills. It addressed the application of knowledge using interesting and realistic examples. Candidates had the opportunity to state what information they had acquired and explain, evaluate and predict what outcomes would occur and why.

#### **Industry – Elementary Linear Programming**

Candidates understood the basic concept of linear programming. Candidates understood the graphical instructions associated with a programming problem related to industry and responded with a range of answers. In finding the maximum profit, candidates could use a form of simultaneous equation or to draw the line  $y = \frac{2x}{3}$ .

#### **Service Industries – Queuing Theory**

This question was answered reasonably well. Candidates solved the problem using a variety of problem-solving skills – most candidates used trial and error.

#### **Economy – Effects of Inflation**

Candidates understood and could interpret and apply the compound interest formula. Compound interest questions were answered reasonably well. The substitution into a formula was well understood by candidates.

#### **Population models**

The population question was well done but candidates needed more practice with the calculation of the average rate of population growth. Some candidates confused ‘features’ with ‘factors’ in this question.

## **Question 3**

### **Mathematical Ideas**

This question covered a broad range of learning outcomes. Candidates who had prepared all syllabus outcomes had the opportunity to demonstrate high level performance.

#### **Views of the Solar System**

Candidates found Galileo’s discoveries and ideas difficult to explain and critique.

#### **The Development of $\pi$**

This part was answered well. A high percentage of candidates could describe the method Archimedes used to estimate the value of  $\pi$ . Candidates knew that he found the perimeter of inscribed and circumscribed polygons to obtain his range for  $\pi$ .

#### **Geometrical Perspectives**

The question on the turning wheels and belts was answered very well by a high percentage of candidates. The candidates could easily work out the direction each wheel turned. Candidates could also give and describe two valid features of a mobius

strip. Candidates had a good understanding of a geostationary orbit and could discuss the common functions of satellites in communication and weather monitoring.

The fractal question caused problems for candidates who didn't realise that the new triangles formed were equilateral, which meant that 36 new triangles were formed, rather than 9.

## **Question 4**

### **Science and Medicine**

This question tested a representative sample of the varied outcomes for this topic. Candidates generally understood the questions. Some candidates experienced problems understanding part (a)(v) – many candidates simply repeated nature or nurture without linking them to the incidence of the disease. Candidates could give historical details of a medical condition but were not familiar with its current status. If a candidate had studied smallpox they were limited in the responses they could make for parts (a)(v), (vi) and (vii).

In part (b)(iii), some candidates confused health hazard with limitations of the diagnostic imaging technique. In part (c)(ii), some candidates found it difficult to comment on the ethical implications of a scientific trial.

There were several prepared page length responses to questions (a), (b) and (c). Candidates wrote most of the facts required by the questions but did not answer the specific question part.

Concepts that were well understood:

- symptoms of a disease and how it disrupts healthy functioning
- the relationship between cause and effect in the development of pharmaceuticals
- the scientific principles underlying the development of imaging techniques
- controlled scientific trials.

Concepts that were poorly understood:

- how detailed observation and/or careful experimentation identified the major factor(s) contributing to a medical condition
- the current incidence of the medical condition
- the nature/nurture debate
- the ethical implications of an issue.

## **Question 5**

### **Scientific Research**

**Case Studies**

- (a) This question was answered reasonably well. All candidates had researched a project from the prescribed list. However, it was clear that some candidates

- had not investigated all the relevant criteria associated with the project/case study. Other candidates provided incorrect information/results for the project.
- (b) The quality of the candidates' own research projects were of a high standard. There was some confusion/lack of understanding of scientific terms such as 'control' and 'reliability'.
  - (c) It was evident from his question that candidates had difficulty stating an hypothesis and listing a variable in an experiment.

## **Question 6**

### **Significant Technological Achievements**

Most candidates answered the question in terms of two significant technological achievements from the prescribed list. Candidates explained the principles underlying the technological achievement but had difficulty with the implications of the achievement and its advantages and disadvantages.

- (c)(ii) Most candidates described practical activities that included excursions, literature searches, library visits or Internet searches.
- (d) This question ensured that all candidates had the opportunity to demonstrate their level of achievement. They were able to correctly make personal decisions and/or to take positions on the social implications of technological achievements.

## **Question 7**

### **Statistical Methods**

This question was well developed and covered a variety of outcomes. Candidates who had prepared all learning outcomes were able to perform well and could show the depth/level of their understanding.

#### **Statistical Testing of Experimental Results**

The normal distribution question on trains was well answered for parts (a)(i) 1 and 2. Candidates could interpret and apply the  $z$  values very well.

- (a)(ii) Candidates found this question difficult and could not work backwards to obtain the total number of trains. Candidates did not find the table useful for this purpose.
- (b) The research project was answered very well by those candidates who had undertaken the project. Some candidates did not attempt this question.

#### **Summary Statistics**

A large percentage of candidates successfully calculated the old mean, mode and median and then recalculated the new measurements including the extra data. They confidently stated which measure changed. Candidates found it difficult to describe the term positively skewed.

The interpretation of the temperature graph was also well answered. Most candidates correctly stated the mean temperature. A high percentage of candidates were able to answer when the greatest rate of change in the temperature occurred.

### **Research Applications**

Candidates on the whole were able to create a set of axes and plot the two lines. Some candidates did not use an appropriate scale and could not match up the lines correctly. A large percentage of candidates were able to write a comparison statement on the life expectancy of males and females during 1946-1956 and 1986-1996.

## **Question 8 Technology and the Consumer**

This question was well answered by a high percentage of candidates. All candidates were able to identify and discuss in detail two consumer products from the prescribed list.

- (a)(iv) Candidates had difficulty explaining the environmental effects of the product. Candidates responded with a societal issue/effect.
- (a)(v) Candidates found it difficult to confirm the existence of the environmental effect.
- (b) Consistent with responses from previous years, candidates had difficulty explaining the operation of the product.
- (c) This question was poorly answered because most candidates did not relate aesthetics or function of a product to its marketing.

### **Product Analysis and Comparative Report**

- (d) This question was very well answered by a high percentage of candidates. This year in particular the responses were well structured and gave an excellent range of promotion strategies after analysis of the issues.
- (d)(iv) This question posed a problem for some candidates. They rarely discussed or identified a target group to whom they would promote the product.

## **Question 9 Technology of Communication Systems**

- Most candidates correctly described the fundamental principles of communication: encoding \_ transmission \_ decoding.
- Candidates were able to describe in detail the encoding, decoding and transmissional processes for their selected communication system.
- Candidates had studied a variety of communication systems.
- Most candidates were able to identify the limitations of the system. However, some candidates identified dangers/hazards of use as a limitation.
- Candidates sometimes misinterpreted limitations for sources of noise.
- Many candidates correctly identified two main parts of the communication system but needed to elaborate on how they worked.

- Candidates successfully explained the benefits the communication system provides for the society.
- Candidates who understood ‘noise’ were able to answer those questions very well.
- The majority of candidates were able to apply their knowledge of communication processes to different communication systems, eg Braille, Smoke signals.

## **Question 10**

### **The Environment**

#### Part (a)

- A significant number of candidates used a global problem as a local environment issue, eg greenhouse gas emissions, ozone layer depletion.
- Many candidates had difficulty discussing special techniques used for observation and measurement during their investigation. Because part (iii) read ... *you may have used*... some candidates mentioned tests, observations and measurements that they would use in the future.
- Candidates were able to discuss an economic advantage of ecological management but did not relate it to their local economy.

#### Part (b)

- The use of ‘compare and contrast’ confused some candidates. They did not understand what the question required them to do.

#### Part (c)

- This question was answered very well by a high percentage of candidates.

#### Concepts that were well understood:

- management of a local environmental issue
- raising awareness of a local environmental issue and applying pressure to cause change
- greenhouse gases – production and reduction
- ozone layer depletion and repair.

#### Concepts that were poorly understood:

- how to distinguish between observation and measurement
- greenhouse gases and ozone depletion are still confused by candidates.