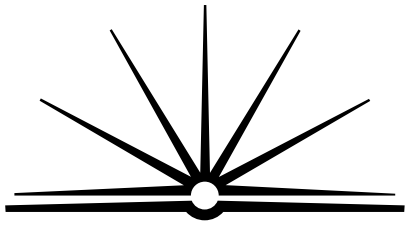

BOARD OF STUDIES
NEW SOUTH WALES

1998 HSC

# EXAMINATION REPORT

## Industrial Technology

Published by
Board of Studies NSW
GPO Box 5300
Sydney NSW 2001
Australia

Tel: (02) 9367 8111

Fax: (02) 9262 6270

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

April 1999



ISBN 0 7313 4251 8

*99042*

# 1998 Higher School Certificate Examination Report

# Industrial Technology

## General Comments

In 1998, 1960 candidates presented for the 2 Unit examination in Industrial Technology, representing a substantial increase in candidature since the re-introduction of the subject in 1997. As in 1997, no candidates entered for the Plastics or Ceramics Areas of Study. The total candidature for the 1998 examination was divided amongst the Syllabus Areas of Study as follows:

- Wood – 1499 candidates
- Metal – 187 candidates
- Drawing – 116 candidates
- Automotive – 64 candidates
- Electronics – 94 candidates

# Written Paper (40 Marks)

## Section I Multiple Choice Questions 1-10

Candidates need to be reminded to select the choice (A, B, C or D) that best answers the question. In some questions the choices will be similar, however, an aspect of one of them will provide the best solution to the question. A broad knowledge of the Industry Study section of the syllabus will assist candidates in answering these multiple-choice questions.

| Question | A | B | C | C |
|---|---|---|---|---|
| 1 | 72.93* | 24.44 | 0.82 | 0.71 |
| 2 | 17.70 | 9.74 | 55.51* | 15.92 |
| 3 | 19.74 | 5.00 | 3.72 | 70.20* |
| 4 | 7.76 | 32.81* | 38.16 | 19.95 |
| 5 | 26.84* | 30.92 | 3.88 | 36.89 |
| 6 | 2.24 | 23.01 | 17.65 | 55.92* |
| 7 | 11.79 | 32.50* | 34.85 | 19.80 |
| 8 | 41.68 | 6.53 | 44.54* | 6.17 |
| 9 | 40.26* | 2.55 | 8.01 | 47.70 |
| 10 | 18.47 | 15.97 | 18.27 | 45.97* |

## Section II Questions 11 and 12

### Marking Scale for Questions 11 and 12

Question 11 Marked out of 30 – scaled to a mark out of 10

Question 12 Marked out of 20 – scaled to a mark out of 5

### Question 11

Although this question was generally well answered, some candidates failed to maximise their marks because they did not relate their answers to the type of organisation specified in the question.

(a) (i) Candidates were unfamiliar with the requirements of an organisation structure and many answered the question with a floor plan.

(ii) This part was well answered, although many candidates failed to relate their answers to the diagram given and a realistic management position within a company of 15 employees.

(b) Many candidates did not understand the term ‘sociological changes’ and included economic, environmental or production-based factors in their answers.

(c) This part was well answered.

(d) Responses here were generally good, although candidates often struggled to produce three different advantageous uses of the Internet for Research and Development.

(e) Answers here were generally good.

(f) Since very few candidates understood the role of the Occupational Health and Safety Committee, this part was poorly answered.

(g) This part was also poorly answered since, in many cases, answers did not relate to workplace efficiency or company profitability.

(h) Although this part was generally well answered, some candidates did not understand the term ‘suburban location’.

(i) On the whole, answers here were good.

**Question 12**

Candidates had little concept of the technical terms in this question, and, consequently, answers were generally poor.

(a) Candidates did not understand the phrase ‘universal language’ when referring to graphical communication.

(b) Here very poor understanding was shown of the organisation Standards Australia or the role of this organisation.

(c) and (d) Candidates did not understand the difference between pictorial and orthogonal drawings nor the purpose of orthogonal drawings. They confused ‘purpose’ with ‘features’.

(e) Answers here were poor. Candidates did not refer back to the design brief and did not understand the term ‘progressive evaluation’.

(f) This part was well answered. Candidates were very knowledgeable about communication technology.

(g) Candidates obviously failed to realise the integrated nature of the design, planning, construction and evaluation process. They needed to recognise the fact that evaluation is ongoing and not just a final process.

## Section III Questions 13, 14 and 15

**Marking Scale for Questions 13, 14 and 15 (All Areas of Study)**

| | |
|---|---|
| Question 13 | Marked out of 20 – scaled to a mark out of 5 |
| Question 14 | Marked out of 20 – scaled to a mark out of 5 |
| Question 15 | Marked out of 20 – scaled to a mark out of 5 |

## Section III Area of Study: Automotive

### Question 13

(a) Shape, size and proportion were well drawn, although candidates had difficulty with hidden detail and dimensioning.

(b) This part was well answered.

(c) Answers here were good.

(d) Candidates answered this part well.

(e) Answers here were good.

(f) This part was handled well.

(g) Candidates had difficulty with this question about automotive concepts, consequently answers were generally poor.

### Question 14

(a) This section of the question was not attempted by a large number of candidates, indicating a lack of knowledge of the automotive concepts.

(b) Many candidates tended to answer the question in terms of extractor systems rather than scavenging.

(c) This question was also poorly answered, candidates showing poor knowledge of air cooling in engines.

(d) Answers here were good.

(e) This part was well answered.

(f) Responses here were very poor; most candidates obviously did not understand the question or had little concept of the purpose of the injector.

(g) This part was well answered.

(h) As there were many acceptable responses here, the question was well answered.

(i) and (j) Most candidates had a useful knowledge of wheel alignment problems and were able to answer both (i) and (j).

(k) This part was not well answered.

(l) The responses to this question showed that candidates had sound knowledge of this topic.

(m) Answers here were poor.

### Question 15

A majority of the candidates failed to finish this question.

(a) (i) The majority of candidates answered this part of the question with sketches which were of poor quality.

(ii) Most of the design sketches drawn would not work.

(iii) A large number of candidates did not attempt this part of the question.

(b) Candidates showed a lack of understanding of what was required in this question.

(c) Answers to this part were good.

## Section III Area of Study: Industrial Drawing

### Question 13

(a) This was satisfactorily attempted by most candidates. The bottom half of the drawing and the top centre (R20) of the drawing were completed well. Problems arose, however, when candidates had to plot the centres for the R35 and R120 arcs and the tangency points correctly. Very few candidates indicated the tangency points and used trial and error to complete their drawings.

(b) Most candidates had little concept of the operation of the cam and therefore put the locking device through the cam's 'working' face. The majority of candidates did not clearly understand how to represent a thread or locking device correctly.

(c) Many candidates did not attempt this part. Most of those who did so used the 'four centre' method. This was done well for the bottom and top arcs but the R35 and R120 arcs were difficult. Candidates showed a lack of understanding in plotting the curve and tried to 'fudge' the solution. No candidate tried to plot the solution using a grid.

### Question 14

(a) Most candidates lacked the skills to produce a mechanical perspective or a two point perspective of the required object. They had little idea of where to plot their measurements in order to get the 'perspective effect'. The majority understood the use of vanishing points. Features added to the drawings attempted were quite good, although the gutter was a feature which caused problems.

(b) Rendering of construction material was poorly attempted and most candidates did not attempt to render.

(c) Little knowledge of the names of building framing components was displayed by candidates.

(d) Limited understanding was evident of concrete slab construction in relationship to where the slab is placed in relation to the frame. Most candidates included steel reinforcing but failed to represent concrete symbols and add labels.

### Question 15

(a) This part was generally well answered. Three considerations were given but some candidates failed to read the question and did not address 'removal/replacement' of CD ROMs.

(b) Most candidates answered this part well, freehand sketches were of good quality but indications of construction methods and features were lacking. Greater detail was required on sketches, especially in the form of written notes; dimensions, however, were shown quite well by most candidates.

(c) Due to poor time management many candidates did not attempt this part of the question. Drawings were well done but labelling was poor. Most candidates did not use AS1100 Drawing Standards. They had a poor knowledge of how to use Standards and could not successfully apply them to a drawing.

## Section III Area of Study: Electronics

### Question 13

(a) Answers here were generally poor. Most candidates had little concept of orthogonal drawing and arrangement of views. Hidden detail was left out or incorrectly placed.

(b) Candidates generally understood the concept of freehand isometric drawing but did not have sufficient skills to assemble and place the components.

(c) Most candidates did not understand the question. Very few attempted it; those who did so answered the question poorly. Candidates showed a lack of knowledge of digital circuit symbols.

(d) Many candidates did not attempt this question. Those candidates who did, answered the question poorly. Candidates showed a lack of knowledge of digital circuit symbols.

### Question 14

(a) (i) Candidates had difficulty in identifying logic gates. Very few answered this part correctly.

(ii) Most candidates could not complete the truth table but guessed part of it.

(iii) The majority of candidates did not know how to correct an ammeter to measure current in a simple circuit.

(b) Candidates could identify colours from the ‘resistor chart’ on page 2 of the examination paper but could not use multiplicity to complete the table correctly. ‘Tolerance band’ was well answered.

(c) Most candidates completed this section very well. The only part not well handled was how to protect the PCB when complete.

(d) (i) and (ii) This section was well answered by most candidates, who showed a good knowledge of Ohm’s law. The majority obtained the correct answer but some failed to show their working.

(iii) Few candidates could explain how a solar cell works. Although they knew what a solar cell did, the majority could not explain how it functions.

(iv) Most candidates showed that they understood the function of primary and secondary coils in describing how a transformer works.

(e) Most candidates answered this section very well. Nearly all could find two protection devices to protect circuits from serious damage, but some had difficulty in suggesting a third.

**Question 15**

(a) (i) This was a difficult question which most candidates did not attempt; those who did showed little understanding of designing a circuit using a 555 timer.

(ii) This part was generally poorly done. Candidates could not relate how the components function in relation to circuit diagram 3 as most had not attempted part (i) or had completed it poorly.

(iii) As most candidates had not completed section (i) they could not describe how the temperature alarm worked.

(b) (i) The completion of component placement was well done by those who attempted the question.

(ii) The majority of candidates confused voltage output of the transformer with signal boost/impedance function. Answers here were generally poor.

(iii) Very few candidates understood this question and, thus, most attempts at answering were not flowcharts.

(c) (i) Many candidates did not read the question carefully and gave design problems, not assembly problems. Those who understood the question answered it very well.

(ii) This part was well answered.

(iii) Poor time management and poor drawing skills caused most candidates not to attempt this part of the question. Most of those who did so did not know what a pictorial sketch was or had difficulty in showing all major dimensions.

## Section III Area of Study: Metal

**Question 13**

(a) Here most candidates failed to include the taper. Knowledge of the methods of indicating a screw thread and a spring washer were poor.

(b) Diameter was indicated well, but the majority failed to dimension the taper (two dimensions) correctly and very few indicated surface finish correctly.

(c) Choice of material showed a lack of understanding of required properties.

(d) Many candidates showed a lack of understanding of properties and head treatment processes.

(e) (i) Terminology was poor, eg ‘springy’ was commonly used.

(ii) Most candidates described hardening but did not include tempering.

(f) This part was generally well answered. It is necessary to show the working.

(g) Many candidates did not know the function of the fillet at the joining of surfaces.

(h) This was poorly answered by most candidates. Calculation of angle caused many problems.

(i) Answers here were good.

(j) Most candidates found it difficult to indicate where to show the angle.

**Question 14**

(a) (i) R.H.S. was poorly explained by most candidates – many said Rectangular H.S. The better candidates explained the description 50 x 20 x 1.6.

(ii) Answers here were good.

(iii) This was also well answered.

(iv) This part was generally well answered. Candidates need, however, to be better prepared for sketching.

(b) Poor sketches and poor explanation were given here.

(c) Most candidates found it difficult to sketch the fault; the majority, however, succeeded in giving two ways of overcoming the problem.

**Question 15**

(a) 200 mm allowance was not always included, and many of the drawings were freehand.

(b) This part was generally well answered, but, again, sketches were poor.

(c) Answers here were good, although many included two seams.

(d) This part was poorly answered. Most candidates did not get the steps in the right order; generally they failed to provide depth in describing the procedures in each step in the production of the hood.

## Section III Area of Study: Wood

**Question 13**

(a) Many candidates did not have the necessary drawing equipment to answer this question satisfactorily, eg compass, rule. Most candidates had a good understanding of which view was required and of the positions for drawing the required view.

(b) (i) Some difficulty was experienced in the addition of 10 mm or 20 mm for the hole depth to the dimensioned dowel lengths.

(ii) This was generally well answered; some candidates, however, made simple calculation errors, providing the answer as 900 metres rather than 90 metres.

(c) Candidates experienced difficulty in sequencing the operational steps and providing diagrams to support their answers and in the concept of duplicating or transferring holes in paired members. Many did not indicate how to achieve the hole depth when drilling.

(d) A number of candidates provided diagrams which were not annotated. Many responded to the part of the question referring to the method of wheel spacing, but did not include details of wheel attachment to the axle.

**Question 14**

Candidates often failed to use correct terminology in attempting answers related to both workshop and industrial facilities.

Diagrams/sketches were often poor, lacking necessary detail and labelling.

Candidates need to answer in short concise terms ‘keywords with abbreviated explanation’,, eg cut to length, nail and glue, trim edges.

(a) (i) Many candidates could not outline the required steps, eg point form answer, e.g. draw diagonals, 190 diameter circle, cut excess, mount on face plate. Some candidates mentioned ‘planing corners off’ but did not relate this to the indicated sketch.

(ii) This part was not well answered. Knowledge of woodturning terminology and methods of woodturning were poor. Sketches varied, showing some understanding of method but lacking use of correct terminology or understanding of the sketch. Labelling of sketches is needed, sketches and descriptions often used incorrect terminology, eg centres were called clamps, points or plates.

(iii) This part was generally well answered, although some answers were too general, eg ‘check that all safety gear is on’. Answers needed to relate specifically to safety on a wood lathe.

(b) (i) Candidates needed to differentiate between workshop and industrial equipment. ‘Saw and chisel’ were not considered suitable answers. This question was an example of one in which the candidate needed to read both parts before answering. Some of the machinery mentioned could not perform the desired function, and confusion occurred between saw types and their functions.

(ii) Popular answers here were ‘drop saws, bench saws, circular saws’, etc.

(iii) This part was poorly answered as few named a gauge, fence or stop clamp as being able to do repeated cuts of slats to the same length. Some suggested methods gave cause for safety concerns.

(c) (i) This was generally well answered. Many candidates named a suitable ‘add on’ edge treatment but had difficulty in describing the process of application. Steps needed to be listed in order of application, eg cut to length, heat with iron, press in position, trim, sand.

(ii) Many candidates talked about butt/mitre joints but these were considered inappropriate. Candidates needed to refer to the drawing and answer accordingly. Sketches often lacked sufficient detail to gain full marks. Many candidates lacked knowledge of suitable joints. Labelling would be beneficial. Generic sketches and names of joints were used and did not show any relation to the door of the cabinet.

(iii) 1. Many candidates could name tools, but did not explain how they were used to check ‘squareness’. Key words included ‘measure diagonals to ensure same length’.

2. This was poorly answered. Very few candidates mentioned ‘winding sticks’, although many mentioned ‘straight edge, level or spirit level’. A number of candidates failed to mention ‘the need for a flat surface and accompanying checks’.

(iv) Candidates generally had difficulty in naming a suitable cabinet hinge – butt hinge was a very popular choice. Most candidates could not explain the method of fitting. Many used statements like ‘putting in screws’ or ‘recessing’. The steps in the fitting should have been given in sequence.

**Question 15**

(a) This part was generally quite well answered, although Radiata Pine and other indoor cabinet timbers were common responses, indicating a lack of understanding of species suitable for outdoor use.

(b) Suitable properties were given, but often they did not relate to the timber mentioned in (a).

(c) Sketching skills were poor. There was a lack of understanding of the meaning of a 'freehand pictorial sketch'. Candidates need to spend more time in completing freehand concept sketches and diagrams. The term 'overall sizes' was not fully understood. Many candidates indicated only sizes of individual components. Joints and fixtures were poorly answered, with many showing no understanding of the definition of a 'fixture'. Safety features were very poorly understood. The majority of candidates were able to name only one or two features.

(d) This part was generally well answered; marks were deducted for two similar defects or for defects that resulted in the same effect on the product.

# Major Work And Folio (60 Marks)

In general there was an improvement over that of last year in the standard of the Major Work and Folio presented by the candidates. A broad range of projects was attempted by the candidates, increasing their opportunities to display their design and practical skills.

## Folio

In the areas of research and development there was a lack of relevant information, as well as sequencing of procedures that showed little or no relationship to the project. Students need to follow a process which incorporates a progression from their initial ideas through research, critical analysis, modification and evaluation leading to the development of the practical project. They need to spend considerable time and effort in developing their initial ideas and to regard the folio as an integral and important component of the Major Work Marking Process. It was evident that many folios were superficial in their approach to key elements of the Subject Rules. Once again, many appeared to have been written after the projects were completed, with little thought being given to management of the project and the management of time. A number of folios, however, were of higher quality. These utilised appropriate technology in the preparation and presentation of the documentation.

## Planning And Construction

As was the case last year, the quality of workshop drawings presented by candidates was poor. Students need to use current drawing standards (AS1100). Dimensioning of workshop drawings was usually insufficient to enable the major work to be constructed. Justification and the selection and use of materials, components and processes showed some improvement this year, although candidates must provide sound reasoning for their choices. The majority were able to provide an adequate record of their production processes, and, in most cases, they were supported with excellent photographic records.

## Design

Candidates must document choices and provide sufficient details of any modifications made to their Major Work. Design modification should not be considered to consist of only a few sketches. Candidates generally used appropriate materials and processes to complete their projects, however, safety concerns and issues were raised in a number of instances in regard to a variety of projects. Candidates need to consider safety as being paramount in the production and presentation of their Major Works.

## Construction

Many Major Works were of poor quality. This was, in part, due to candidates' not planning their time effectively. Many selected inappropriate construction methods, and choice of project limited some candidates in their ability to display a range of technical skills. A number attempted projects that were beyond their ability to construct and manage, and, as a result, did not allow themselves to maximise the mark for their Major Work. Those who followed a systematic approach to project selection and development generally received enhanced results. The finishing of projects was generally poor, inappropriate use of timber finishes was prevalent. Students need to give more consideration to the finishing phase of their projects during the initial planning phase. Moreover, candidates need to be mindful of budget constraints in the selection of their Major Work.

## General Comments About Major Works

Once again, Major Works need to be completed and set up in an environment conducive to Higher School Certificate examining. The choice of a suitable location is extremely important. A venue which is well lit, noise-and disturbance-free needs to be provided for the examiners. Schools should ensure that all necessary documentation is completed and presented to the examiners at the time of their arrival. Work done by candidates outside the school should be documented in the folio and a log should be kept by the class teacher.

## Major Project Marking In 1999

In 1999, the Major Projects for Industrial Technology will be examined under the requirements in the new syllabus. To assist teachers in preparing students for marking, a sample checklist has been prepared which satisfies the requirements or the new syllabus.

# Industrial Technology

## Major Project Marking 1999

### Planning, Management and Design Folio – 25 marks

| | |
|---|---|
| Statement of Intent | Clear statement of the intent of the project.<br>What and Why? |
| Design Research | A range of research approaches and / or media. |
| • ideas / concepts | Evaluation of designs ideas / modification of ideas. |
| • calculations | Ordering, sizing, costings, materials / component lists and estimations. |
| • sketching / modification | Freehand drawings of overall project / layouts and components modifications to existing plans and / or sketches to indicate project rectification. |
| • working drawings | Drawings / sketches to enable construction of project/s. |
| Project timeline | Estimated / actual project time scale. Advance planning. |
| Project finance plan | Estimation of costings, establishment of project budget. |
| Record of project activities | Diary, logbook, photographic record, record of actual costs etc. |
| Selection and justification of<br>• materials<br>• processes<br>• components | Reasons for the selection of materials, components, and processes. Reason for use of a particular design.<br>I did …… because……..<br>My choice of ……. is due to ……. |
| Project resource management<br>• materials<br>• processes | Analyse and document the selected materials and processes to achieve desired project outcomes.<br>Safety is an important consideration. |
| Evidence of a range of communication techniques | Evidence of a range of computer applications, including graphics, word processing, etc. Sketching and drawing are essential. |

## Project Production – 25 marks

| | |
|---|---|
| Evidence of a range of skills | Level of mastery of skills, use of industrial processes, range of techniques, skills in overcoming problems. |
| Degree of difficulty | Related to other technologies in terms of time, quality, tasks involved, tasks achieved and skills developed. |
| Quality of production | Quality in all aspects of the production process. |
| Relationship / Link to planning and production | Evidence in project of planning, management and design. How successful have these processes been? |

## Project Industry Study – 5 marks

| | |
|---|---|
| Use of appropriate industrial process and equipment | Have industrial processes been utilised in the production of the project? Are they documented? Were they appropriate? |
| Evidence of safe working processes and OH& S issues | Photographic record and / or written evidence of safe working procedures. |

## Project Evaluation – 5 marks

| | |
|---|---|
| Relationship to project intent | Final product – does it achieve the project goals? Appropriateness to its intended function. |
| Evidence of consideration to<br>• ethics<br>• cultural appropriateness<br>• sustainability | Evidence in folio – conservation of materials, planning for economic use of materials and processes, recycling.<br>Ethics of copyright, ownership issues, modification versus original design / invention. |

ISBN 0 7313 4251 8