

2001 HSC Notes from
the Examination Centre
Metal and Engineering

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

Tel: (02) 9367 8111

Fax: (02) 9367 8484

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

ISBN 1 74099 048 X

200256

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2001 HSC NOTES FROM THE EXAMINATION CENTRE METAL AND ENGINEERING

Introduction

This document has been produced for the teachers and candidates of the Stage 6 course in Metal and Engineering. It provides comments with regard to responses to the 2001 Higher School Certificate Examination, indicating the quality of candidate responses and highlighting the relative strengths and weaknesses of the candidature in each section and each question.

It is essential for this document to be read in conjunction with the relevant syllabus, the 2001 Higher School Certificate Examination, the Marking Guidelines and other support documents which have been developed by the Board of Studies to assist in the teaching and learning of Metal and Engineering.

In 2001 a total of 487 candidates presented the examination in Metal and Engineering.

Section I – Multiple Choice Questions

Answers to the multiple choice questions are as follows:

Question	Correct Response
1	B
2	B
3	B
4	D
5	C
6	C
7	D
8	A

Question	Correct Response
9	C
10	D
11	D
12	A
13	A
14	D
15	C

Section II

Question 16

- (a) Many candidates misread the marks indicating the measurement on the vernier scale.
- (b) Most of the candidates could identify the tools shown, and give an appropriate use.

Question 17

The majority of candidates could not identify the drawing type, and questions relating to symbols were poorly answered.

Many candidates also had difficulty applying the formulae in the calculation for correct length.

Question 18

- (a) Given the measurements in a workshop drawing candidates were required to outline a procedure for producing a brace, stating tools used and methods required.

In most instances the candidates outlined the necessary procedures to produce the brace. However there was a failure by many candidates to relate the brace to the workshop drawing 2001-7. As a consequence the overall length nominated by many candidates was 300mm instead of 240mm. Candidates frequently splayed both ends at 45 degrees or 60 degrees. Some candidates were confused about the difference between the brace and the bracket.

- (b) Candidates were asked to list two tools used to produce the brace and an associated safety inspection for each tool.

Most candidates answered this part well, demonstrating their sound knowledge of workshop safety requirements and routines.

Question 19

In this question candidates were asked to outline the Personal Protective Equipment (PPE) used, and safety checks appropriate to a portable power tool.

Most candidates demonstrated a good understanding of PPE, however some had difficulty with power tool safety.

Section III

Question 20

General Comments

Candidates were asked to examine an engineering workplace situation and assist in a Safety Audit. They were to identify unsafe practices and discuss how a workplace Occupational Health and Safety Committee could reduce or eliminate unsafe practices. Candidates were also required to evaluate implications for employers and employees if unsafe practices were to continue.

Specific Comments

The vast majority of candidates was able to identify correctly the unsafe practices exhibited in the cartoon. It was common for candidates to identify correctly a wide range of unsafe work practices. A significant number of candidates incorrectly selected the workplace Occupational Health and Safety Committee as the group with the responsibility to take action to correct the breaches of safety. The better responses indicated that the role of the Occupational Health and Safety Committee was to make recommendations to the employer regarding the correct action to take to address the issue of safety.

The better responses proposed strategies that the Occupational Health and Safety Committee could implement to improve the work environment and increase employee awareness. Some candidates simply proposed a range of actions rather than strategies.

Many candidates expressed the incorrect view that the Occupational Health and Safety Committee was responsible for safety within a workshop and could enforce compliance, or fine employees who worked in an unsafe manner or did not use appropriate PPE and work practices. Some candidates were able to link the consequences of unsafe work practices to the overall function of the company and were able to discuss the implications for the future viability of the company if safety issues were not addressed.

Few candidates included the Occupational Health and Safety Act and the statutory role of WorkCover in their response. A significant number of candidates confused the Occupational Health and Safety Committee with WorkCover.

Question 21

General Comments

Candidates were asked to identify recently introduced technologies to the Metal and Engineering Industry. They were asked to analyse the impact of these technologies on the supply of goods and services, reduction in costs, improvement in production techniques and the quality of life. The effect of new technology on pollution was also to be addressed.

Specific Comments

The quality of candidates' responses varied considerably. There was great variety in candidates' definition of modern technology. Many candidates chose computers and associated technologies. However, there was a significant number of responses where candidates viewed electricity, steam, electric welding and drilling machines as modern technology.

A significant number of candidates was able to describe accurately the application of CAD, CAM, Plasma Cutting and Robotics.

The range of 'modern technologies' varied from EDM to battery-operated drills.

The better responses included discussion of the implications of modern technology, both positive and negative, and demonstrated a clear understanding of the issues associated with technology in the engineering industry. Some candidates discussed technology that was totally unrelated to the question and the engineering industry.

Many candidates made minimal use of industry terminology.

Question 22

General Comments

This question required candidates to read an engineering drawing and propose a correct process for the manufacture of one of the illustrated components. Candidates were also required to outline and justify a Quality Assurance system to ensure that the component, once manufactured, would fit the other component parts of the assembly.

Specific Comments

Many candidates misinterpreted the question and provided a detailed sequence of activities to produce the complete assembly. The result of this was that many candidates only briefly covered the production sequence for the component – the bracket. Many candidates misinterpreted the bracket as being the complete assembly.

A significant number of candidates was able to propose an acceptable process for the production of this component. However, some included a list of tools, which was not relevant to the question.

It was evident that many candidates related the process to how the production of this component would be carried out in a school workshop, rather than a small engineering firm. Better responses demonstrated an understanding of how production would differ between the two settings and proposed a sequence appropriate to an engineering environment.

A small number of candidates related a Quality Assurance system to the manufacture of the component. Many candidates confused Quality Assurance with quality control and inspection. Candidates who understood the production process that would be adopted in industry and were aware of the need for jigs and gauges, templates and guides generally had a better idea of the application of a Quality Assurance system that addressed each stage of manufacture.

A small number of candidates responded to the question by providing a sequence of activities that covered such stages as: drawing and design, production of a prototype, confirming with customer, ordering material, setting up equipment and training workers.

Generally, the use of industry-specific terminology was poor.

Metal and Engineering

2001 HSC Examination Mapping Grid

Question	Marks	Units of Competency
1	1	Manufacturing and engineering industry induction
2	1	MEM1.2FA Apply principles of Occupational Health and Safety in work environment
3	1	MEM1.2FA Undertake interactive workplace communication
4	1	MEM1.2FA Apply principles of Occupational Health and Safety in work environment
5	1	MEM2.8C10A Perform computations
6	1	MEM2.5C11A Measure with graduated devices
7	1	Manufacturing and engineering industry induction
8	1	MEM2.8C10A Perform computations
9	1	MEM2.8C10A Perform computations
10	1	MEM1.1FA Undertake interactive workplace communication
11	1	Manufacturing and engineering industry induction
12	1	MEM1.1FA Undertake interactive workplace communication
13	1	MEM2.5C11A Measure with graduated devices
14	1	MEM2.5C11A Measure with graduated devices
15	1	Manufacturing and engineering industry induction
16 (a)	1	MEM2.5C11A Measure with graduated devices
16 (b) (i)	2	MEM2.5C11A Measure with graduated devices
16 (b) (ii)	2	MEM2.5C11A Measure with graduated devices
17(a)	1	MEM9.2AA Interpret technical drawing
17(b)	1	MEM9.2AA Interpret technical drawing
17(c)	1	MEM9.2AA Interpret technical drawing
17(d)	1	MEM9.2AA Interpret technical drawing
17(e)	1	MEM9.2AA Interpret technical drawing
17(f)	1	MEM9.2AA Interpret technical drawing
17(g)	1	MEM9.2AA Interpret technical drawing
17(h)	2	MEM9.2AA Interpret technical drawing
17(i)	2	MEM9.2AA Interpret technical drawing
17(j)	2	MEM9.2AA Interpret technical drawing
17(k)	1	MEM9.2AA Interpret technical drawing
17(l)	3	MEM2.8C10A Perform computations MEM9.2AA Interpret technical drawing
18 (a)	5	MEM1.4FA Plan to undertake a routine task MEM18.1AA Use hand tools
18(b)	2	MEM18.1AA Use hand tools
19	6	MEM1.2FA Apply principles of Occupational Health and Safety in work environment MEM18.2AA Use power tools/hand held operations

Question	Marks	Units of Competency
20	15	MEM1.1FA Undertake interactive workplace communication MEM1.2FA Apply principles of Occupational Health and Safety in work environment MEM1.3FA Apply quality procedures MEM1.4FA Plan to undertake a routine task MEM2.1C12A Apply quality systems MEM18.1AA Use hand tools MEM18.2AA Use power tools/hand held operations Manufacturing and engineering industry induction
21	15	Manufacturing and engineering industry induction
22	15	MEM1.1FA Undertake interactive workplace communication MEM1.2FA Apply principles of Occupational Health and Safety in work environment MEM1.3FA Apply quality procedures MEM1.4FA Plan to undertake a routine task MEM2.1C12A Apply quality systems MEM9.2AA Interpret technical drawing MEM18.1AA Use hand tools MEM18.2AA Use power tools/hand held operations

2001 HSC Metal and Engineering Marking Guidelines

Question 16 (a) (1 mark)

Units of competency assessed: MEM2.5C11A

MARKING GUIDELINES

Criteria	Marks
• 33.14 mm	1

Question 16 (b) (i) (2 marks)

Units of competency assessed: MEM2.5C11A

MARKING GUIDELINES

Criteria	Marks
• Name and use of gauge	2
• Name OR use of the gauge	1

Question 16 (b) (ii) (2 marks)*Units of competency assessed: MEM2.5C11A***MARKING GUIDELINES**

Criteria	Marks
• Name and use of gauge	2
• Name OR use of the gauge	1

Question 17 (a) (1 mark)*Units of competency assessed: MEM9.2AA***MARKING GUIDELINES**

Criteria	Marks
Isometric	1

Question 17 (b) (1 mark)*Units of competency assessed: MEM9.2AA***MARKING GUIDELINES**

Criteria	Marks
Three dimensional concept of the article	1

Question 17 (c) (1 mark)*Units of competency assessed: MEM9.2AA***MARKING GUIDELINES**

Criteria	Marks
Orthogonal / Orthographic	1

Question 17 (d) (1 mark)*Units of competency assessed: MEM9.2AA***MARKING GUIDELINES**

Criteria	Marks
3rd angle projection	1

Question 17 (e) (1 mark)*Units of competency assessed: MEM9.2AA***MARKING GUIDELINES**

Criteria	Marks
AS 1100	1

Question 17 (f) (1 mark)*Units of competency assessed: MEM9.2AA***MARKING GUIDELINES**

Criteria	Marks
The original drawing (A) was changed, then re-issued	1

Question 17 (g) (1 mark)*Units of competency assessed: MEM9.2AA***MARKING GUIDELINES**

Criteria	Marks
NTS = Not To Scale	1

Question 17 (h) (2 marks)*Units of competency assessed: MEM9.2AA***MARKING GUIDELINES**

Criteria	Marks
<ul style="list-style-type: none">• Radius is a minimum 3 mm bend;• TYP means throughout the drawing	2
<ul style="list-style-type: none">• Radius = 3 mm, or TYP = typical	1

Question 17 (i) (2 marks)*Units of competency assessed: MEM9.2AA***MARKING GUIDELINES**

Criteria	Marks
• An understanding of the distinction between unilateral and bilateral tolerances including the concepts of the + and – notation	2
• Mention of unilateral tolerances and/or similar notation	1

Question 17 (j) (2 marks)*Units of competency assessed: MEM9.2AA***MARKING GUIDELINES**

Criteria	Marks
• Applies the correct welding symbol and position (Fillet weld – both sides)	2
• Applies a welding symbol or indicates the correct position	1

Question 17 (k) (1 mark)*Units of competency assessed: MEM9.2AA***MARKING GUIDELINES**

Criteria	Marks
The material requires machining from 10 mm to 8 mm	1

Question 17 (l) (3 marks)*Units of competency assessed: MEM2.8C10A, MEM9.2AA***MARKING GUIDELINES**

Criteria	Marks
• Calculation of the correct length	3
• Follows a correct method – mathematical error	2
• Displays some attempt at the correct method	1

Question 18 (a) (5 marks)
Units of competency assessed: MEM1.4FA, MEM18.1AA
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Candidates demonstrate a knowledge of the logical sequence of operation required to mark out and then make the brace Appropriate tools are identified for each operation 	4–5
<ul style="list-style-type: none"> Lists the sequence (or part thereof) for marking out and making the brace Names some of the tools required 	2–3
<ul style="list-style-type: none"> Demonstrates a limited understanding of how to produce the brace Names some aspects of marking out and/or names some marking out tools 	1

Question 18 (b) (2 marks)
Units of competency assessed: MEM18.1AA
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Names two tools and an appropriate and related safety inspection to be carried out on each tool 	2
<ul style="list-style-type: none"> Lists some safety inspection techniques for hand tool(s) 	1

Question 19 (6 marks)
Units of competency assessed: MEM1.2FA, MEM18.2AA
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> Demonstrates a high degree of understanding relating to personal safety and the use of hand-held angle grinder Outlines all appropriate personal safety requirements to be followed when using a hand-held angle grinder Identifies a range of faults associated with hand-held power tools 	5–6
<ul style="list-style-type: none"> Demonstrates an of understanding of personal safety when using hand-held power tools by outlining some personal safety requirements Identifies a fault associated with hand-held power tools 	3–4
<ul style="list-style-type: none"> Shows a limited understanding of safety when working with hand-held power tools Lists one or two personal safety requirements 	1–2

Question 20 (15 marks)

Units of competency assessed: MEM1.1FA, MEM1.2FA, MEM1.3FA, MEM1.4FA, MEM2.1C12A, MEM18.1AA, MEM18.2AA, Manufacturing and engineering industry induction

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> • Lists a range of breaches of safety in the workplace shown • Identifies strategies an OH&S committee might consider appropriate to reduce or eliminate these breaches of safety, and provides points for or against • Makes a judgement about the consequences for both employers and employees in not addressing unsafe work practices • Communicates ideas and information by integrating precise industry terminology in a full discussion using appropriate examples 	13–15
<ul style="list-style-type: none"> • Lists a range of breaches of safety shown • Describes some appropriate actions an OH&S committee may implement to reduce some of these breaches of safety • General description of some implications for employers and/or employees not addressing unsafe work practices • Communicates ideas and information by using correct industry terminology in a logical statement, using appropriate workplace examples 	10–12
<ul style="list-style-type: none"> • Lists a range of breaches of safety shown • Describes a breach of safety with an appropriate OH&S committee action to reduce or eliminate this breach of safety • General statement about OH&S requirements of employers and/or employees • Communicates ideas and information by using basic industry terminology, giving one or two workplace examples 	7–9
<ul style="list-style-type: none"> • Lists some breaches of safety shown • Describes a breach of safety with an appropriate OH&S committee action to reduce or eliminate this breach of safety • Communicates ideas and information using limited industry terminology 	4–6
<ul style="list-style-type: none"> • Lists at least one breach of safety shown 	1–3

Question 21 (15 marks)

Units of competency assessed: Manufacturing and engineering industry induction
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> • Identifies a wide and comprehensive range of recently introduced technologies • Relates the impact of recently introduced technologies to the supply of quality goods and services, reduced costs and improved production techniques, using appropriate workplace examples • Relates the effect of recently introduced technologies to society and the environment • Communicates ideas and information by integrating precise industry terminology in a well-reasoned cohesive discussion, using appropriate examples 	13–15
<ul style="list-style-type: none"> • Identifies a wide range of recently introduced technologies • Basic analysis of recently introduced technologies and their impact on the supply of quality goods and services, reduced costs or improved production techniques • Notes general connection between introduced technologies and effects on environment and society • Communicates ideas and information by using industry terminology, using examples 	10–12
<ul style="list-style-type: none"> • Identifies some recently introduced technologies • Outlines some links between recently introduced technologies and supply of quality goods and services, reduced costs or improved production techniques • Communicates ideas and information by using basic industry terminology 	7–9
<ul style="list-style-type: none"> • Identifies a recently introduced technology • States how a recently introduced technology effects either supply of quality goods and services, reduced costs or improved production techniques • Communicates ideas and information with a limited use of industry terminology 	4–6
<ul style="list-style-type: none"> • Lists some recently introduced technologies OR <ul style="list-style-type: none"> • Describes a recently introduced technology 	1–3

Question 22 (15 marks)

Units of competency assessed: MEM1.1FA, MEM1.2FA, MEM1.3FA, MEM1.4FA, MEM2.1C12A, MEM9.2AA, MEM18.1AA, MEM18.2AA

MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> • Well sequenced, workable plan developed • Appropriate selection of tools for each of the processes • Appropriate quality systems are outlined and justified with supporting reasons to ensure fit with other components • Communicates ideas and information by integrating precise industry terminology in a well-reasoned, cohesive discussion related to the engineering drawing 	13–15
<ul style="list-style-type: none"> • Well sequenced, workable plan developed • Appropriate selection of tools for most of the processes • Appropriate quality systems proposed to ensure fit with other components • Communicates ideas and information by using industry terminology related to the engineering drawing 	10–12
<ul style="list-style-type: none"> • Elementary plan developed • Minimal list of tools provided • General statement about quality systems outlined • Communicates ideas and information by using basic industry terminology 	7–9
<ul style="list-style-type: none"> • Elementary plan developed • General statement about quality systems • Communicates ideas and information with a limited use of industry terminology 	4–6
<ul style="list-style-type: none"> • Lists some appropriate steps to produce the bracket 	1–3