

BOARD OF STUDIES
NEW SOUTH WALES

2001 HSC Specimen Paper

Metal and Engineering

ACKNOWLEDGEMENTS

Question 16 (d) Figure 3 – Bosch Power Tool Manual

Question 16 (d) Figure 4 – Bosch Power Tool Manual

Question 16 (d) Figure 5 – Makita Trade Catalogue

Question 18 Figure 7 – ‘Programmed and Technical Drawing’, Mullins and Cooper. Reproduced with the permission of Pearson Education Australia. Copyright © 1982

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Metal and Engineering (240 indicative hours)

(Metal and Engineering Curriculum Framework)

This booklet contains the specimen examination paper for the 2001 Higher School Certificate examination in the 240-hour VET course in Metal and Engineering.

The specimen paper shows the format of the New HSC examination. It has been printed on A4 paper and side-stapled, to make it convenient for use in schools. Actual examination papers will be produced as A4 booklets. All New HSC papers will be printed on white paper.

The 2001 HSC specimen papers have been produced in accordance with the Board's *Principles for Setting HSC Examinations in a Standards-Referenced Framework*, published in Board Bulletin Volume 8 Number 9 (Nov/Dec 99).

The specimen paper as a whole is structured to allow for appropriate differentiation of student performance. The format of the paper allows students to gain a clear understanding of what they are required to do in each question, and in working through the paper. Instructions have been standardised and the demands of the questions have been made explicit. Key words in questions, such as 'discuss', 'analyse', and 'explain', have been used consistently in accordance with the glossary published in the Board's *Assessment Support Document*.

The examinations in the 240-hour VET courses are optional, but required of students who wish this subject to contribute towards a University Admission Index. Students who sit for the examination will receive a statement of HSC outcomes in the same form as for other Board determined HSC courses.

This specimen paper is an example of the type of examination that could be prepared within the examination specifications for the 240-hour VET course in Metal and Engineering. The range and balance of outcomes tested in the HSC examinations in 2001 and subsequent years may differ from those addressed in this specimen paper. Questions are based on:

- the units of competency identified for examination;
- the minimum prescribed learning contained in the Higher School Certificate requirements for each specified unit of competency;
- the associated key competencies.

There are a number of points to note in considering the Metal and Engineering specimen examination paper:

- All VET examination papers conform to a common examination framework:
 - Section I – multiple-choice items (15 marks)

- Section II – short response items (35 marks)
- Section III – extended response items (30 marks)

The examination is a 2-hour written paper. A total of 80 marks is shown on the examination paper. The total marks gained by a student on the paper are then converted to a mark out of 100.

- The number of questions in Section II may vary from year to year, however marks in this section will always total 35.
- A rubric indicating general criteria for judging performance has been placed at the beginning of Section III to clearly indicate the factors that will be used to assess responses to the question(s). These criteria are in addition to criteria specific to each question.
- For the purposes of the specimen papers only, there are some questions that appear in more than one of the VET specimen examinations. For the 2001 and subsequent HSC examinations, the papers will have no questions in common.



Sample marking guidelines for Metal and Engineering

The following marking guidelines have been developed for selected questions from the 2001 HSC Specimen Examination in Metal and Engineering. These guidelines indicate the approach that would be taken to marking questions.

For each question, the following are typically included:

1. The units of competency that are targeted by the question.
2. The assessment rubric from the specimen paper, where there is one, listing the set of general criteria that are used to assess responses.
3. The marking guidelines, which show the criteria to be applied to responses along with the marks to be awarded in line with the quality of the responses. For extended-response questions, performance is described at a number of levels of performance, each covering a range of marks.
4. A sample answer or some points that answers might include. Sample answers indicate the scope and depth of treatment expected, and are not intended to be prescriptive. Similarly, the points that could be included in answers are not intended to be an exhaustive list, but rather an indication of the considerations that students could include in their responses.

Marking guidelines will generally require some refinement at the Marking Centre to take account of unanticipated responses that students present. For essay-type questions, the standard described at each mark range will be made clear during pilot-marking by the selection of sample scripts.

In a standards-referenced framework, examination questions are closely linked to syllabus content and outcomes. Expectations of the question are to be clear in the wording of the question. Marking guidelines will be developed at the same time as the examination questions, by examination committees. The development of marking guidelines will be guided by the Board's *Principles for Developing Marking Guidelines Examinations in a Standards-Referenced Framework*, published in Board Bulletin Volume 9 Number 3 (May 2000).

Sample Marking Guidelines – Metal and Engineering

Question 18 (15 marks)

Marks

Refer to the drawing of the buffing arbor on page 14 of the Specimen Paper.

(a) State the type of drawing shown in Figure 7.

1

Related Units of Competency: MEM 9.2AA, MEM 18.1AA

MARKING GUIDELINES

Criteria	Marks
• Exploded isometric	1

(b) State the type of section used on the flange and the shaft.

1

Related Units of Competency: MEM 9.2AA, MEM 18.1AA

MARKING GUIDELINES

Criteria	Marks
• Half-section	1

(c) Why are no detailed dimensions given for the hexagonal nut?

1

Related Units of Competency: MEM 9.2AA, MEM 18.1AA

MARKING GUIDELINES

Criteria	Marks
• Correct reason explained	1

Sample answer:

Items that are defined by an industry standard do not require dimensions.

(d) Determine the sizes of the following features.

7

- (i) Diameter of the drill used to produce the hole through the flange
- (ii) Overall length of the grub screw
- (iii) Pitch of the grub screw thread
- (iv) Depth of counterbore in the end of the shaft
- (v) Chamfer on the flange
- (vi) Length of the Ø32 section of the shaft
- (vii) Diameter indicated as A

Related Units of Competency: MEM 9.2AA, MEM 18.1AA

MARKING GUIDELINES

Criteria	Marks
• Correct size for each feature determined	7

Sample answer:

- (i) 18 mm
- (ii) 10 mm
- (iii) 1 mm
- (iv) 26 mm
- (v) $8 \times 45^\circ$
- (vi) 26 mm
- (vii) 34 mm

- (e) Complete the table, giving the meaning for each of these symbols shown in the drawing. 5

Related Units of Competency: MEM 9.2AA, MEM 18.1AA

MARKING GUIDELINES

Criteria	Marks
• Correct meaning for each symbol given	5

Sample answer:

- MS – mild steel
- Ø – diameter
- M – metric
- LH – left hand thread
- R – radius

Question 21 (15 marks)

Discuss a range of strategies that could be used by employers in the manufacturing and engineering industry to raise employee awareness of issues relating to occupational health and safety.

In this section you will be assessed on how well you:

- demonstrate relevant knowledge and understanding
 - communicate ideas and information, using precise industry terminology and appropriate workplace examples
 - organise information in a well-reasoned and cohesive response
 - solve proposed issues or problems
-

Related Units of Competency: WRRER.1A, WRRCS.1A

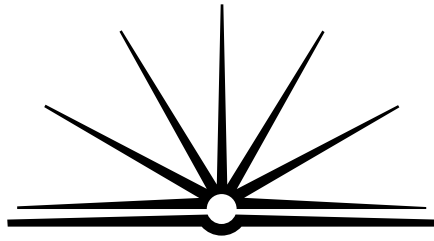
MARKING GUIDELINES

Criteria	Marks
<ul style="list-style-type: none"> • Demonstrates an extensive knowledge and understanding of occupational health and safety issues for employers and employees within the manufacturing and engineering industry • Proposes a comprehensive and detailed range of relevant strategies to raise employee awareness of occupational health and safety within the manufacturing and engineering industry, justifying or providing points for and/or against the strategies chosen • Communicates ideas and information by integrating correct industry terminology in a well-reasoned, cohesive discussion, using appropriate workplace examples 	13 – 15
<ul style="list-style-type: none"> • Demonstrates a sound knowledge and understanding of occupational health and safety issues for employers and employees within the manufacturing and engineering industry • Proposes a range of relevant strategies to raise employee awareness of occupational health and safety within the manufacturing and engineering industry, and provides some justification for the strategies chosen • Communicates ideas and information by using correct industry terminology in a discussion, and using appropriate workplace examples 	10 – 12
<ul style="list-style-type: none"> • Demonstrates a good knowledge and understanding of occupational health and safety issues for employers and employees within the manufacturing and engineering industry • Proposes some relevant strategies to raise employee awareness of occupational health and safety within the manufacturing and engineering industry • Communicates ideas and information with a limited use of industry terminology in a discussion, using one or two workplace examples 	7 – 9
<ul style="list-style-type: none"> • Demonstrates a basic knowledge of occupational health and safety issues for employers or employees within the manufacturing and engineering industry • Lists some strategies to raise employee awareness of occupational health and safety within the manufacturing and engineering industry • Communicates ideas and information with a limited use of industry terminology and one workplace example 	4 – 6
<ul style="list-style-type: none"> • Demonstrates a limited knowledge of occupational health and safety issues for either employers and employees within the manufacturing and engineering industry • Makes some reference to strategies to raise employee awareness of occupational health and safety within the manufacturing and engineering industry • Communicates ideas using some basic industry terminology 	1 – 3

Answers could include:

Strategies and their associated issues include:

- Formation of an OH & S Committee and the appointment of OH & S Officers
- Company policy and procedures and legislative requirements relating to workplace activities could be explained in written reports and discussed
- The specific nature of the Metal and Engineering industry could be discussed with employees
- Oral presentations and posters can indicate the reasons for a safe, clean workplace, following company procedures
- Internal and external training programs can indicate the responsibilities and duties of employees, including working safely, not endangering others, handling dangerous substances
- The use, and reasons for use, of personal protective clothing can be practically demonstrated
- Safety signs/symbols can be identified by posters, and the correct procedures for manual handling can be explained in oral or written presentations
- Workplace hazards can be listed, and the procedures for reporting hazards can be incorporated in a training program
- All safety requirements in using tools need to be demonstrated
- Emergency and evacuation procedures need to be listed, signed and practised



B O A R D O F S T U D I E S
NEW SOUTH WALES

2001
HIGHER SCHOOL CERTIFICATE
SPECIMEN EXAMINATION

Metal and Engineering

General Instructions

- Reading time – 5 minutes
- Working time – 2 hours
- Board-approved calculators may be used
- Write using blue or black pen
- Write your Centre Number and Student Number at the top of page 9

Section I Pages 2 – 7

Total marks **(15)**

- Attempt Questions 1 – 15
- Allow about 15 minutes for this section

Section II Pages 9 – 16

Total marks **(35)**

- Attempt Questions 16 – 19
- Allow about 45 minutes for this section

Section III Pages 17 – 18

Total marks **(30)**

- Attempt TWO questions from Questions 20 – 22
- Allow about 1 hour for this section

Section I

Total marks (15)

Attempt Questions 1 – 15

Allow about 15 minutes for this section

Use the multiple-choice answer sheet.

Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

Sample $2 + 4 =$ (A) 2 (B) 6 (C) 8 (D) 9
 A B C D

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

A B C D

If you change your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word *correct* and drawing an arrow as follows:

A B ^{*correct*} ← C D

- 1 Which of these graduated measuring devices is best suited to measure the diameter of a machined shaft?
- (A) Dial indicator
 - (B) Feeler gauge
 - (C) Micrometer
 - (D) Steel rule
- 2 A client of a metal-fabricating workshop complains to the owner that an emergency exit is blocked by garbage bins. Who has the responsibility for ensuring that the exit is clear?
- (A) The owner
 - (B) The client
 - (C) A WorkCover representative
 - (D) An Occupational Health and Safety Officer
- 3 Tom has returned to his job in the engineering industry following a year's leave taken to care for his children. Tom fails to gain a promotion for a job he wants. He is informed that the firm prefers to promote single people as they are more committed to their work.
- Tom may have experienced which form of discrimination?
- (A) Indirect discrimination on the basis of gender
 - (B) Indirect discrimination on the basis of marital status
 - (C) Direct discrimination on the basis of gender
 - (D) Direct discrimination on the basis of marital status
- 4 An employer's 'duty of care' most accurately applies to which of the following groups of people?
- (A) Employers and contractors only
 - (B) Employees and visitors only
 - (C) Employees, visitors and contractors
 - (D) Employees, visitors and manufacturers

- 5 Which of the following best describes workers compensation?
- (A) A reimbursement of wages or salary paid to a worker injured at work
 - (B) A reimbursement of sick leave and superannuation paid to an injured worker
 - (C) A fixed amount paid to an injured worker while performing light duties
 - (D) A fixed amount paid to an injured worker as a compulsory saving
- 6 Which of these tools is best suited for removing a wheel nut?
- (A) Engineering hammer
 - (B) Open-ended spanner
 - (C) Screw driver
 - (D) Socket and wrench
- 7 Which of the following groups of people do enterprise agreements cover?
- (A) Union members only
 - (B) Salaried officers
 - (C) Contractors and part-time wage earners
 - (D) Both wage and salary earners
- 8 It is the employer's responsibility to provide full-time employees with which of the following?
- (A) A safe workplace and superannuation
 - (B) A safe workplace and casual employment
 - (C) Superannuation and union representation
 - (D) A works committee and superannuation
- 9 Correct lifting technique includes which of the following steps?
- (A) Feet together, hold load close to body, and lift from back
 - (B) Feet apart, hold load close to body, and lift from back
 - (C) Feet apart, hold load close to body, and lift from knees
 - (D) Feet apart, hold load away from body, and lift from knees

10 Which of the following best describes an organisational chart?

- (A) A graphic representation of the organisation's employees
- (B) A diagram depicting the long-term goals of the organisation
- (C) A structural representation of the departments within the organisation
- (D) A flowchart that outlines operational procedures within the organisation

11 A small fabrication workshop has a drill press located immediately adjacent to a work area that is constantly used for angle grinding. Which of the following signs should be displayed next to the drill press?

Sign P



Sign Q



Sign R



Sign S



Sign T



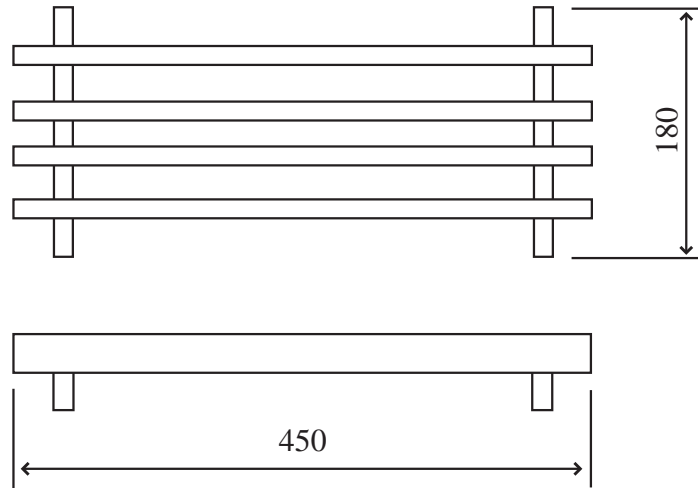
Sign U



- (A) P and R
- (B) P and T
- (C) P, Q and S
- (D) P, R and U

Use the following information to answer Questions 12 to 15.

An enterprise manufactures grates for fireplaces from mild steel that is 30×6 mm in section. A simple plan is shown.



- 12** What is the total length of material required to manufacture a single grate?
- (A) 450 mm
(B) 630 mm
(C) 1800 mm
(D) 2160 mm
- 13** A protective finish is applied to each grate. Each grate requires 0.16 m^2 of finish. What is the total coverage required for 2250 grates?
- (A) 2.25 m^2
(B) 16 m^2
(C) 360 m^2
(D) 2250 m^2
- 14** The protective finish may be purchased in containers that provide coverage of 63 m^2 . How many containers are required to coat 2250 grates?
- (A) 1 container
(B) 5 containers
(C) 6 containers
(D) 16 containers

15 The grates are packaged in cardboard cartons for shipping. Each carton is 470 mm long, 200 mm wide and 80 mm high. What is the total volume of the 2250 grates when packaged?

(A) 0.00752 m^3

(B) 2.250 m^3

(C) 16.92 m^3

(D) 2250 m^3

Please turn over

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Centre Number

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Student Number

Section II

Total marks (35)

Attempt Questions 16 – 19

Allow about 45 minutes for this section

Answer the questions in the spaces provided.

Marks

Question 16 (7 marks)

(a) Determine the reading on the vernier scale, as indicated by the arrows.

1

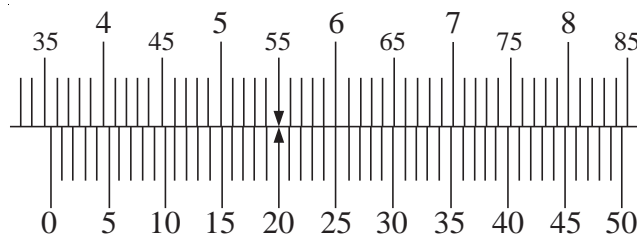


Fig. 1

Reading mm

Question 16 continues on page 10

Question 16 (continued)

- (b) (i) A hacksaw is shown in Figure 2. Circle the arrow that shows the correct direction the teeth should face on the blade of the hacksaw. **1**

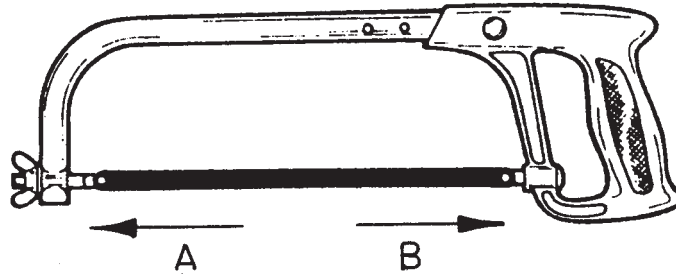


Fig. 2

- (ii) Coarse and fine-pitch hacksaw blades are available. State which blade is most suited to cut $\varnothing 30$ aluminium, and give a reason for your selection. **1**

.....
.....
.....

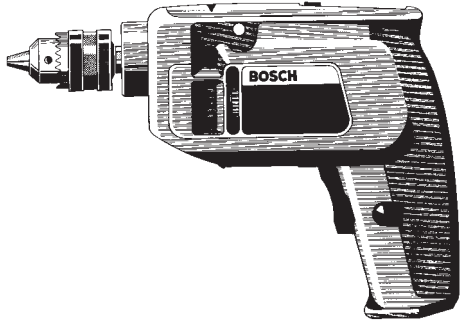
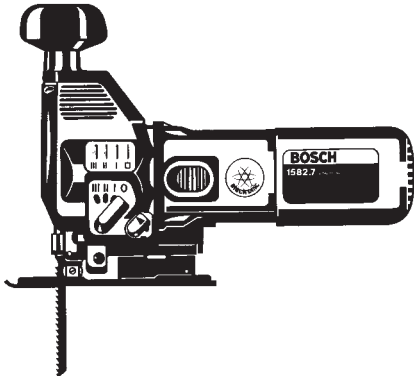

- (c) Name a portable power tool that may be used to cut a 100 mm \times 100 mm square hole in sheet aluminium, and give a reason for your selection. **1**

.....
.....
.....

Question 16 continues on page 11

Question 16 (continued)

- (d) Complete the table by naming the portable power tools, listing ONE application for EACH power tool, and stating one safety precaution that must be observed when using the specific tool.

<i>Portable power tool</i>	<i>Name, application and safety precaution</i>
 <p>Fig. 3</p>	<p>1</p>
 <p>Fig. 4</p>	<p>1</p>
 <p>Fig. 5</p>	<p>1</p>

End of Question 16

Question 17 (7 marks)

Figure 6 shows a detailed drawing of a false jaw.

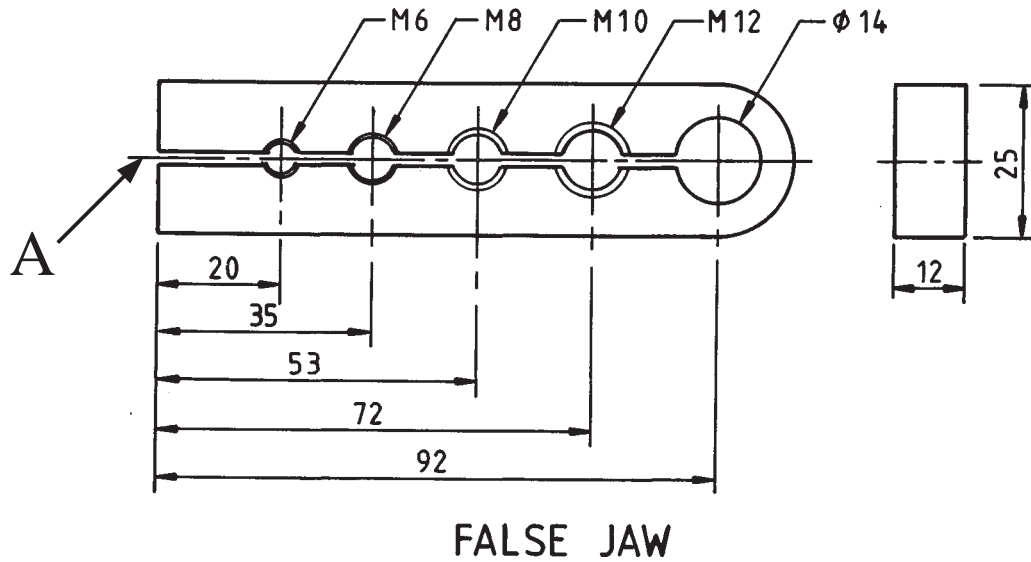


Fig. 6

- (a) Determine the minimum dimensions of the mild steel required to make this item. 1

.....

- (b) State the procedure to be followed to accurately mark the centre line indicated as A. 1

.....

Question 17 continues on page 13

Question 17 (continued)

- (c) Outline FIVE steps to mark out and produce the M12 threaded hole, and name the tool(s) required for EACH step.

5

<i>Procedure</i>	<i>Tool(s) required</i>
Step 1
.....
.....
Step 2
.....
.....
Step 3
.....
.....
Step 4
.....
.....
Step 5
.....
.....

End of Question 17

Question 18 (15 marks)

BUFFING ARBOR

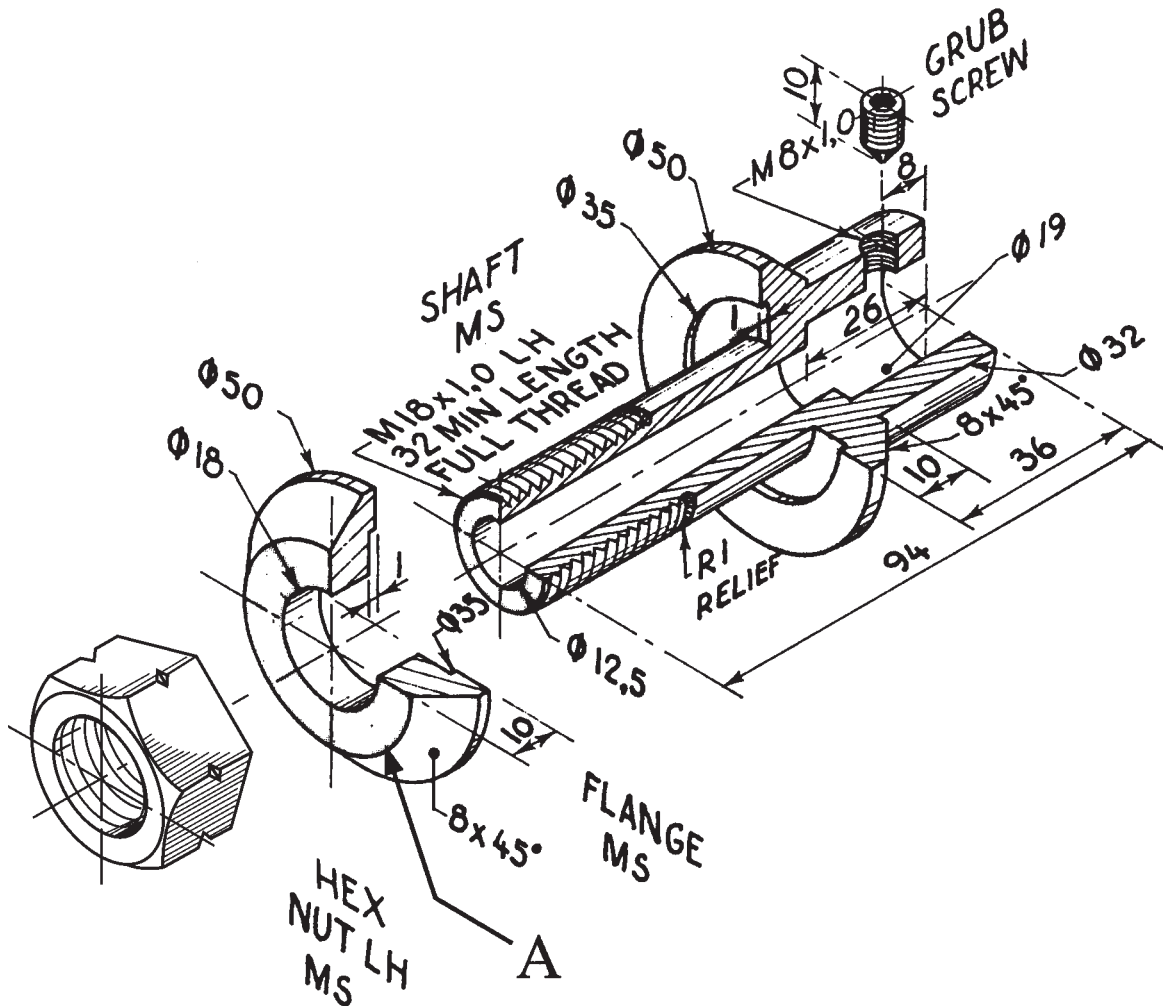


Fig. 7

Refer to the drawing of the buffing arbor shown in Figure 7.

- (a) State the type of drawing shown in Figure 7. 1

.....

- (b) State the type of section used on the flange and the shaft. 1

.....

Question 18 continues on page 15

Question 18 (continued)

(c) Why are no detailed dimensions given for the hexagonal nut? **1**

.....
.....

(d) Determine the sizes of the following features. **7**

- (i) Diameter of the drill used to produce the hole through the flange
- (ii) Overall length of the grub screw
- (iii) Pitch of the grub screw thread
- (iv) Depth of counterbore in the end of the shaft
- (v) Chamfer on the flange
- (vi) Length of the Ø32 section of the shaft
- (vii) Diameter indicated as A

(e) Complete the table, by giving the meaning for each of these symbols shown in the drawing. **5**

<i>Symbol</i>	<i>Meaning</i>
MS	
Ø	
M	
LH	
R	

End of Question 18

Question 19 (6 marks)

A shaft and hole are shown in Figure 8.

6

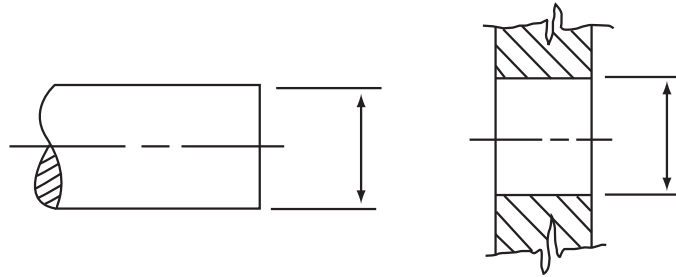


Fig. 8

The specifications are as follows:

Shaft $\varnothing 16.000$	-0.033 -0.075
Hole $\varnothing 16.000$	+0.043 -0.075

Use this information to complete the table.

	Shaft	Hole
Nominal size		
Basic size		
Upper limit		
Lower limit		
Tolerance		
Type of fit between components		

Section III

Total marks (30)

Attempt TWO questions from Questions 20 – 22

Allow about 1 hour for this section

Answer each question in a SEPARATE writing booklet. Extra writing booklets are available.

In this section you will be assessed on how well you:

- demonstrate relevant knowledge and understanding
 - communicate ideas and information, using precise industry terminology and appropriate workplace examples
 - organise information in a well-reasoned and cohesive response
 - solve proposed issues or problems
-

Question 20 (15 marks)

Before the 1960s, many workers in the manufacturing and engineering industry were limited to performing one type of task in the workplace. Since that time, changes in technology have greatly affected the nature of the jobs, training, and work practices within the industry.

Discuss the impact of changes in technology on traditional career pathways within one of the following industry streams:

- Production
- Mechanical
- Fabrication
- Electrical.

Question 21 (15 marks)

Discuss a range of strategies that could be used by employers in the manufacturing and engineering industry to raise employee awareness of issues relating to occupational health and safety.

Question 22 (15 marks)

A team of workers has been assigned to take delivery of 50 lengths of 100 mm × 100 mm × 10 mm mild steel angle. Each length of steel angle is 6 metres. This duty requires the team to manually unload the lengths of steel and carry them into the workshop. The material is to be stored on racks that can safely accommodate material up to 3.5 metres in length.

Propose a safe-work-method statement for this work activity and assess the effectiveness of the procedures that will reduce or eliminate risk.

End of paper