



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

2011 Metal and Engineering HSC Examination 'Sample Answers'

When examination committees develop questions for the examination, they may write 'sample answers' or, in the case of some questions, 'answers could include'. The committees do this to ensure that the questions will effectively assess students' knowledge and skills.

This material is also provided to the Supervisor of Marking, to give some guidance about the nature and scope of the responses the committee expected students would produce. How sample answers are used at marking centres varies. Sample answers may be used extensively and even modified at the marking centre OR they may be considered only briefly at the beginning of marking. In a few cases, the sample answers may not be used at all at marking.

The Board publishes this information to assist in understanding how the marking guidelines were implemented.

The 'sample answers' or similar advice contained in this document are not intended to be exemplary or even complete answers or responses. As they are part of the examination committee's 'working document', they may contain typographical errors, omissions, or only some of the possible correct answers.

Section II

Question 16 (a)

Sample answer:

25.02 mm

Question 16 (b)

Sample answer:

- Surface finish
- Surface characteristics

Question 16 (c)

Sample answer:

A = 17 mm

B = 7 mm

Question 16 (d)

Sample answer:

These drawings are techniques used to show hidden detail and/or to clarify details/assembly of components. In this particular drawing it shows:

- the position of the angle from the edge
- the orientation of the angle
- the position of the weld.

Question 16 (e)

Sample answer:

- Isometric drawing. In an isometric sketch, the object is rotated and drawn such that all visible sides have equal distortion. All lengths are drawn full size and parallel, and all edges reside at 30 degrees from the horizontal.

Answers could include:

- Oblique drawing. In an oblique sketch, one face is shown as a true horizontal, non-distorted front view. The other face/surface resides at 45 degrees and is drawn at half length.
- Perspective drawing. A perspective sketch shows objects in a natural view with one or two vanishing points. This sketch shows the finished object, but cannot be used for construction due to distortion.

Question 17 (a)
Sample answer:

<i>Sequence of steps – marking out</i>	<i>Tools</i>
<ul style="list-style-type: none"> • Coat 25 x 25 mm angle with marking medium • File end square to make datum end • Measure 40 mm from datum end and square across • Set Jenny calipers to 16 mm and mark parallel line to heel of angle • Measure and scribe line 5 mm on either side of the 40 mm line 	<ul style="list-style-type: none"> • Lay out dye • Texta marker • Engineers' square • File • Rule • Scriber • Centre punch • Engineers' hammer • Jenny calipers

<i>Sequence of steps – manufacture</i>	<i>Tools</i>
<ul style="list-style-type: none"> • Use centre punch to locate centre of 7 mm hole where lines intersect • Secure job for drilling • Drill out two (2) 7 mm holes as centre punched • Secure job in vice to remove excess waste • Deburr slot • Use appropriate personal protective equipment (PPE) 	<ul style="list-style-type: none"> • Drill press/hand • 7 mm drill bit • Round file • Warding file • Vice • Jaw guards • PPE

Question 17 (b)
Answers could include:

- While drilling the hole, swarf could get in your eyes if they are not protected. Placing a clear screen between the job and your eyes is an engineering control to stop this happening. Alternatively, you could wear safety glasses, which is a form of PPE.
- The job could spin around while drilling and hit or cut you. The job should be clamped in some way. This would be a form of engineering control.
- If the speed and feed of the drill bit is too quick, the drill bit could break. Engineering controls to stop this happening are to use a lubricant and to adjust the speed accordingly.
- Using a file without a handle can cause injury to your hands. Substitute the file with one that has a handle.
- Eliminate the burrs on the material so you do not cut your hands. This can be done by filing away the burrs.

Question 18 (a)

Answers could include:

Micrometer OR outside micrometer

Question 18 (b)

Sample answer:

6.07 mm

Question 18 (c)

Sample answer:

A ratchet helps to give a constant pressure and ensures there is consistency across different measurements.

Question 18 (d)

Sample answer:

- Measuring faces should be cleaned before testing and measuring.
- Work instruments should be clean and dry.
- Do not use pressure that exceeds good work practice.
- Never place instruments in grit, filings or cutting fluids.
- Instruments should not be exposed to extremes in temperature.
- Instruments should be handled appropriately.
- Instruments should be stored correctly.
- Instruments should be correctly calibrated as required.

Question 19 (a)

Sample answer:

- The battery runs out.
- There is a considerable waiting time while recharging the battery.
- They are not as consistently powerful as a mains power drill.
- Their usage time is limited.

Question 19 (b)

Sample answer:

The reason that safety tags are fitted to hand-held power drills is to clearly identify a fault on a tool and to prevent workers from using it. The tags are brightly coloured to make them highly visible and require a signature on them to verify that the fault has been fixed, as well as to authorise the removal of the tag.

Question 19 (c)

Sample answer:

- The type of hand-held power drill and the forces applied in the operation
- The size, shape and weight of the work piece
- The type of material being used and its properties
- Available work-holding or clamping devices.

Section III

Question 20

Answers could include:

Many manufacturing and engineering companies today develop strategies in order to make products that satisfy customers' specifications and expectations. Quality is often described as the capability of a product or service to satisfy the requirements of the user(s).

Many discussions of quality refer to both the finished product as well as the process by which it was made. The best way to produce items that exhibit minimal variation and are free of defects is to ensure that the manufacturing process is well planned and controlled.

Central to the concept of controlling the manufacturing process is the adherence by workers to work instructions, workplace policies and standard operating procedures. Below are a range of sources for these instructions, policies and procedures that ensure the manufacture of quality products:

- **Work schedules** involve managing to bring about the successful completion of specific project goals and objectives within a specified time frame. Schedules are at the heart of quality procedures and involve planning, organising, securing and managing resources. The quality outcomes of successful work schedules include the timely provision of products and services – this leads to increased customer satisfaction and repeat business.
- **Engineering drawings, diagrams and sketches** provide graphic representations of customers' requirements. They aid in explaining important details and the standards and specifications that must be reached and maintained. Sketches and diagrams assist workers in interpreting engineering drawings and reducing variation.
- In addition to plans and drawings, many engineering companies use **job cards or job sheets** to outline the requirements of the tasks in the production process. Job sheets typically contain detailed drawings of component parts, materials lists and special manufacturing instructions.
- **Standard operating procedures (SOP)** are used in conjunction with the engineering drawings and job sheets. A SOP is a written document or instruction that details all the steps and activities of a process or procedure, and is used in any manufacturing process that could affect the quality of the product. Following SOPs and job sheets allows workers to follow procedures that lay out the optimal methods for production. This not only aids reduces variation and satisfies customers' needs, but also enhances companies' reputations and the job satisfaction of workers.

In addition to the above (which are mainly developed internally), there are a number of other policies that affect the quality of processing. These information sources are largely external, and can include the following:

- **Regulations/legislation** – for example, OHS is highly integrated into the management of processing by way of making safe working environments and procedures.
- Policies emanating from **Standards Australia and associated bodies** comprise Australia's standards and conformance infrastructure. They provide external quality assurance for customers and manufacturers.
- **Material Safety Data Sheets (MSDS)** are forms that contain data regarding the properties of particular substances. They are an important component of production and workplace safety, and are intended to provide workers with standardised procedures for handling or working with those substances.

Adherence to these internal and external work instructions, procedures, policies and standards assist companies in producing quality goods. In doing so, they enhance customer confidence, satisfaction and loyalty. Improved employee job satisfaction and reduced costs make conformance to specifications an integral part of a quality engineering company.

Section IV

Question 21 (a)

Sample answer:

All employees, contractors and visitors to a workplace have the right to a safe and healthy workplace that is free from the chance of injury.

This will reduce costs that could arise to insurers and employers, eg legal and rehabilitation costs and higher premiums.

There are also costs to society, such as loss of skills.

Question 21 (b)

Sample answer:

An OHS committee is established for the purposes of consultation if an employer employs 20 or more persons and a majority of those employees request the establishment of the committee, or if WorkCover so directs. More than one committee is established if a majority of those employees requests their establishment and the employer agrees, or if WorkCover so directs.

An OHS representative is to be elected for the purposes of consultation if at least one of the persons employed by the employer requests the election of the representative or if WorkCover so directs. The employees may elect more than one OHS representative if the employer agrees or if WorkCover so directs.

Question 21 (c)***Answers could include:***

Good housekeeping is a vital factor in preventing accidents. The great majority of all work accidents are caused during the handling of goods or materials, and by people falling, being hit by falling objects, or striking against objects in the workplace. All these causes can be reduced by good housekeeping practices – in fact, good housekeeping is the only means of prevention for the hundreds of accidents that can occur.

A sound method to ensure good housekeeping is for management to prepare guidelines. The following checklist can serve as a guide for nearly all industries and could be expanded on by adding particular details to suit the requirements of the workplace:

Machinery and equipment

- should be clean and free from unnecessary material
- should be free of unnecessary oil or grease
- areas around machines should be clean and free of rags, paper, etc
- proper guards should be provided and in good condition.

Stock and material

- should be properly piled and arranged
- should be kept in storage areas.

Tools

- should be properly in place
- should be free of oil and grease
- should be inspected and maintained in good order
- tool rooms and racks should be kept in a clean and orderly condition.

Work environment

- benches and seats should be clean and in a good condition
- first-aid facilities and equipment should be fully stocked and in a clean condition
- floors should be kept clean and free of loose material
- scrap should be placed in appropriate bins
- there should be safe and free passage to fire-fighting equipment and fire exits.