BOSTES | BOARD OF STUDIES TEACHING & EDUCATIONAL STANDARDS NSW

2014 HSC Metal and Engineering Marking Guidelines

Section I

Multiple-choice Answer Key

Question	Answer
1	D
2	A
3	C
4	D
5	C
6	A
7	C
8	D
9	B
10	B
11	C
12	D
13	B
14	B
15	A

Section II

Question 16 (a)

Criteria	Marks
• Correctly identifies the finish required	1

Sample answer:

Surface filed flat and square.

Question 16 (b)

Criteria	Marks
• Provides correct answer with relevant working	2
• Incorrect answer with correct data from drawing OR correct answer only	1

Sample answer:

6 – 1 = 5
Tapping diameter minus thread pitch equals tapping drill size.

Question 16 (c)

Criteria	Marks
• Fully explains how the symbol relates to the placement AND/OR alignment of views	2
• Outlines one way the symbol relates to the placement or the alignment of views OR names the symbol	1

Sample answer:

The symbol indicates how the views are aligned and placed on the drawing ie right side view on right side and aligned with front view.

Question 16 (d)

Criteria	Marks
• Provides an appropriate explanation for using different line types	3
• Lists several reasons for using different line types OR describes several line types	2
• Identifies a reason for using different line types OR describes a line type	1

Sample answer:

Drawings use different line types to represent different features on a drawing such as outlines or centre lines to mark centres etc. These features can then be easily distinguished one from another on a drawing. Lines are drawn to conform to Australian Standard AS1100. The clear reading of a drawing and common understanding of line types means manufacture should be consistent.

Question 17 (a)

Criteria	Marks
• Explains the reasons for using method *B*	2
• Identifies a reason for using method *B*	1

Answers could include:

Correct amount of teeth in contact with material
Prevents blade from overheating
Cuts more efficiently

Question 17 (b)

Criteria	Marks
• Describes how to safely and effectively set up the 8 m length for cutting	3
• Lists some safe and/or effective steps for setting up the 8 m length for cutting OR outlines a safe and effective method for setting up the 8m length for cutting	2
• Names a safe or effective step in setting up the 8 m length for cutting	1

Sample answer:

The area around the saw should be clear of obstructions so the length of bar can be placed in the cold saw using a safe lifting method. Both ends of the bar must be supported for cutting to stop the bar from falling when the cold saw clamp is released after cutting. The supports need to be level with the height of the cold saw clamp. The bar should be securely clamped in the cold saw vice before commencing cutting. Cutting fluid should be used when cutting and precautions taken to stop any fluid running along the bar and dripping onto the floor.

Question 17 (c)

Criteria	Marks
• Recommends a range of appropriate strategies to minimise related environmental effects of using the cold saw	4
• Proposes a limited range of strategies to minimise the environmental effects of using the cold saw	3
• Lists a range of adverse environmental effects of using the cold saw OR • Proposes a strategy to minimise the environmental effects of using the cold saw	2
• Names an adverse environmental effect of using the cold saw	1

Sample answer:

To minimise the amount of electricity used the cold saw should be regularly serviced and maintained so the cold saw is working efficiently. A biodegradable cutting fluid should be used, if possible. Cutting fluid run off should be collected and disposed of in accordance with environmental waste disposal guidelines. Planning should go into how you will use the cold saw to cut the material to ensure that any scrap metal is kept to a minimum. Collection of cutting swarf and scrap metal should be recycled where possible. Ensure the clamping mechanism is properly adjusted to limit vibration noise. A sharp cutting blade will also minimise noise and power usage.

Question 18 (a)

Criteria	Marks
• Correctly states the measurement	1

Sample answer:

37.74

Question 18 (b)

Criteria	Marks
• Outlines procedures for packing away vernier calipers after use	2
• Outlines a procedure for packing away vernier calipers after use	1

Sample answer:

Wipe clean to remove dirt or fluids. Check for damage and for zero. Replace in a case box or protective cover. Store in a safe place away from harm in a dry non-corrosive environment.

Question 18 (c)

Criteria	Marks
• Describes the steps required in a logical sequence to correctly determine dimension (a)	3
• Proposes some steps for determining dimension (a)	2
• Lists a step for determining the dimension (a)	1

Sample answer:

Determine the distance from the outside of one locating hole to the outside of the second locating hole using the inside measuring jaws of the vernier calipers. Determine the measurement $Ød_2$ using the inside measuring jaws of the vernier calipers. The measurement, (a), is calculated by subtracting $Ød_2$ from the first measurement.

Question 18 (d)

Criteria	Marks
• Explains the advantages of digital vernier calipers compared to analogue calipers	3
• Lists some advantages of digital calipers, or explains one advantage of digital calipers compared to analogue calipers	2
• Names an advantage of digital vernier calipers	1

Sample answer:

The digital display provides a reading which does not require any calculation. This means that there is less chance of error occurring other than misreading the display. Less training is required for the user as no interpretation of the vernier scale is required. The display has larger numbers that are easier to see than the small numbers on the analogue scale.

Question 19 (a)

Criteria	Marks
• Correctly identifies category of sign	1

Sample answer:

Mandatory signage

Question 19 (b)

Criteria	Marks
• Explains some aspects of how cleaning up relates to workplace safety	3
• Outlines some aspects of cleaning up as related to workplace safety OR explains one aspect of cleaning up and lists others	2
• Lists an aspect of safety as related to cleaning up	1

Sample answer:

It is an important personal responsibility to maintain a clean and tidy work area. Tools and equipment not being used should be returned to tool racks or stores to reduce clutter and for others to use. Swarf, shavings or waste should be placed in appropriate rubbish or recycling bins. Re-useable off-cuts should be placed in racks for future use. This will reduce the risk of material falling from benches or causing trip hazards.

Question 19 (c)

Criteria	Marks
• Recommends a range of managerial strategies to improve the effectiveness of workplace signage	5
• Recommends several strategies to improve the effectiveness of workplace signage	4
• Outlines several strategies to improve the effectiveness of workplace signage	3
• Names several strategies OR outlines one strategy to improve workplace signage effectiveness	2
• Names a strategy to improve workplace signage effectiveness	1

Sample answer:

Workplace signage is often effective when new. After a while workers might not notice the signs any more. Companies should support the display of signage with training and with regular updates through formal and informal team or group meetings. Signage must be kept up-to-date as legislation or work practices change. Some signs may be fixed such as mandatory WHS signs on machines but others could be changed and recycled later. An awareness of signage should be included for all new workers or workers new to an area. Workers' noticeboards in lunch areas etc could have the latest information about contemporary issues changed regularly. Workers should be encouraged through meetings and through the WHS committee to suggest where additional signage may be effective in the workplace.

Section III

Question 20

Criteria	Marks
• Demonstrates, in a well-reasoned and cohesive response, using relevant workplace examples and industry terminology, a thorough understanding of the reasons that these skills are required by a worker to be an effective team member and the impact this has on productivity and efficiency in the workplace	13–15
• Demonstrates, in a clear and organised response, using some industry terminology, a sound understanding of the skills required by a worker to be an effective team member and the impact this has on productivity and efficiency in the workplace	10–12
• Demonstrates a sound understanding of the skills required by a worker to be an effective team member and the impact this has on productivity and efficiency in the workplace	7–9
• Outlines some of the skills required by a worker to be an effective team member OR • Demonstrates an understanding of some of the impacts that sound teamwork has on productivity and efficiency	4–6
• Identifies some workers' skills that contribute to sound teamwork OR • Displays a minimal understanding of how teamwork impacts upon productivity and efficiency	1–3

Sample answer:

There are many skills necessary to be an effective team member. As part of a team you must be able to work effectively with others; the success of the team's activities and tasks relies on all members' individual activities and responsibilities being interdependent.
Possession of a broad range of skills in a wide variety of contexts is important and constantly striving to improve your skills in working as part of a team will make you a more effective team member. These skills can be grouped as personal skills (skills that you possess and demonstrate and for which you are solely responsible), interpersonal skills (skills that require you to interact with others to improve the efficiency in a team setting), and communication skills (skills where obtaining information then interpreting this information and communicating effectively with other team members will make the team activities more efficient).

Personal skills and attributes that make you a good team member are such things as being punctual. You must be ready to start work at the required time or you will delay all other members of your team, and as there are multiple members in your team this means multiples of lost production time. You must also attend work regularly. Because others are relying on you to complete some of the team's tasks, if you are absent from work you may stop others from completing their work or other team members may have to complete your work therefore slowing the whole team down. You must also come to work with the correct attitude and be willing to strive to meet the work performance goals held by the team. It is important that you do this consistently so that other team members know that they can trust your work

output. Perhaps most important is taking responsibility to work safely and to have regard for all members of your team so that they feel confident working around you knowing that you will not place them in danger and that you will look out for them. You must also always behave honestly and must be trusted in the work environment.

Interpersonal skills are all about co-operating with others and developing good working relationships with others. You must be able to take part in formal and informal group or team meetings and to receive information and provide effective feedback. This may involve being sensitive to others' points of view and being able to tolerate and respect differences in other workers in your group. It is quite possible that the experience of other team members will lead them to suggest alternative ways of approaching work tasks and you should always listen to the experience of others if their approach in the past has been successful. If you have an idea of your own you must have, or must develop, the ability to constructively put forward your suggestion. This is particularly relevant in the area of safety where all workers must be able to speak up and ensure that work completed by all members of the team is done safely. It is important to have a clear understanding of the responsibilities and duties of all members of the team. This will help you to know who to approach if a problem arises. If a conflict does develop over some work issue being able to solve the problem, perhaps with the assistance of other team members, is vital if the team is going to continue to work co-operatively and cohesively. Workers being unhappy with each other can lead to a loss of production and perhaps even some workplace harassment if the workers do not possess sound conflict resolution skills. When part of a team it is important to be discreet and not to spread personal information about other team members. It is important to be courteous and to maintain confidentiality. You must not allow personal prejudices to influence your work performance but rather you have to be very aware of the personalities of your other team members and exhibit empathy for them. You should have a sound understanding of the legislation relating to fellow workers and also what the company policies are relating to anti-discrimination etc.

Being able to effectively communicate is vital in any team setting. Being able to obtain, clarify and follow instructions will allow you to complete your work tasks as part of the whole team. Information may come to you in many ways. It may be written, in which case being able to read technical work instructions or SWMS documents or SOPs or job specifications is essential to working effectively and safely. If you do not understand something seeking clarification from the right source and being able to discuss the issue will let you complete your work and give other team members confidence. You need to develop an ever-expanding technical vocabulary in order to follow many instructions written and verbal. Misunderstanding of a technical term you are not familiar with and being too nervous or embarrassed to ask could lead to big problems. You need to be able to read technical drawings and to be able to communicate this information to others. This is often the start of many work tasks. Information may be communicated to you in the workplace in the form of signage. Knowing the meaning and importance of signage and symbols may keep you safe and also those around you. Reading a warning sign might cause you to seek further information from a MSDS or similar. In general having good communication skills means that you will understand the job you have to do and be able to meet the needs of the whole team in the completion of the whole team project.

Being an effective team member is about playing your part successfully in meeting team goals. This means completing work according to specifications and according to timeframes and work schedules. You have to be able to maintain your own work standards as the whole team reputation relies upon each member doing their job well. You have to be well presented, reliable and trustworthy. You have to be able to get on with others and be willing to accept others' differences. You have to be able to communicate well using all forms of communication (written, drawings, diagrams), and be able to communicate verbally and understand specialist workplace language. All these characteristics must be constantly developed and improved to keep you as a good team member.

Section IV

Question 21 (a)

Criteria	Marks
• Lists at least two pieces of information needed to select appropriate marking-out tools	2
• Names a piece of information needed to select appropriate marking-out tools	1

Answers could include:

- Type of material
- Size of material
- Quantities
- Operations required
- Accuracy
- Shape of article

Question 21 (b)

Criteria	Marks
• Proposes the steps required, in a logical sequence, to successfully mark out the Pivot Bracket	4
• Proposes most of the steps required, in a logical sequence, to mark out the Pivot Bracket	3
• Proposes some of the steps, in a logical sequence, to mark out the Pivot Bracket	2
• Lists some steps in the marking out of the Pivot Bracket	1

Sample answer:

1. Collect $40 \times 40 \times 5$ equal angle
2. Scribe line for Datum F square onto two faces of angle
3. File Datums E, F and G flat and square
4. Measure 60 mm from Datum F and scribe line onto two faces of angle
5. From Datum F measure 11 mm and scribe line onto Datum G
6. From Datum F measure 49 mm and scribe line onto Datum G
7. From Datum E measure 20 mm and scribe line onto Datum G parallel to Datum E using marking gauge or odd leg caliper
8. Centre punch where Step 5, 6 & 7 intersect using centre punch and ball pein hammer
9. Using dividers set at 3 mm radius scribe Diameter 6 circle using the centre point indent (Step 8)
10. Witness mark the quadrant intersections (Steps 8 & 9)
11. On face of angle not marked Datum G measure and scribe line 47.5 mm from Datum F
12. On face of angle not marked Datum G measure and scribe line 27.5 mm from Datum G
13. Centre punch where Step 11 & 12 intersect
14. Using dividers set at 5 mm radius scribe Diameter 10 circle using the centre punch indent (from Step 13)
15. Witness mark the quadrant intersections (Steps 13 & 14)
16. Again using the dividers now set at 12.5 mm and using the indent at Step 13 scribe an arc from top centre leftwards (anti-clockwise) for approx 60 deg
17. Scribe line tangent to R12.5 mm arc to a point 5 mm above Datum G on Datum F
18. Witness mark this line
19. On corner of angle furthest from Datums F & E measure and scribe 3 mm horizontal and 3 mm vertical lines and centre punch the intersection
20. Using dividers set at 1.5 mm radius scribe Diameter 3 arc using the centre punch indent (Step 19)

Question 21 (c)

Criteria	Marks
• Provides a comprehensive description of the processes in developing a work plan	9
• Provides a description of the processes in developing a work plan	7–8
• Provides a brief description of the processes in developing a work plan	5–6
• Provides an outline of some of the processes in developing a work plan	3–4
• Lists some features of the development of a work plan	1–2

Sample answer:

Before beginning any routine manufacturing task it is important to develop a work plan that will allow the work to be completed according to specifications and finished safely. A worker must first source all the relevant information from a range of places such as job cards, plans, supervisors and colleagues. It may be necessary to clarify information regarding the tasks to be completed and the required outcomes of the job. The specifications of the work must be determined and confirmed before any work commences to ensure a strong likelihood that the work will be completed successfully. Things such as the quantity to produce and the time frame for completion are all important to know.

Having obtained, clarified and confirmed the work requirements a strategic approach must be taken to completing the individual tasks. Job materials must be located and sourced to enable work to proceed. Similarly, task-specific tools and equipment must be located and made available to start work.

The larger task must now be broken down into a sequence of smaller activities. These should be carefully thought through to make best use of material and tool resources to avoid having to reset tools etc or obtain the same material on repeated occasions. Workers must be aware of the quality measures that must be followed to meet specifications and how to implement these.

The worker must make themself aware of the WHS requirements of the work by consulting the relevant documentation such as SOPs and MSDSs and must follow the procedures including the use of appropriate PPE.

It may be required that the plan, now created, is checked to ensure it complies with the job requirements. It is now the worker's personal responsibility to ensure their own work performance brings about success.

Metal and Engineering

2014 HSC Examination Mapping Grid

Section I

Question	Marks	Unit of competency / Element of competency	Employability skills (Please put an X where appropriate)							
			Communication	Teamwork	Problem–solving	Initiative and enterprise	Planning and organising	Self–management	Learning	Technology
1	1	MEM18001C Use hand tools								X
2	1	MEM18001C Use hand tools							X	
3	1	MEM18001C Use hand tools							X	
4	1	MEM18001C Use hand tools							X	
5	1	MEM12024A Perform computations			X					
6	1	MEM18002B Power tools hand held				X				
7	1	MEM09002B Interpret technical drawing	X							
8	1	Manufacturing Engineering and related industry induction	X							
9	1	MEM12024A Perform computations			X					
10	1	MEM14004A Plan a routine task					X			
11	1	MEM12023A Perform engineering measurements								X
12	1	MEM 15024 Apply quality procedures	X							
13	1	MEM16007A Work with others in manufacturing, engineering or related environment		X						
14	1	MEM15002A Apply quality systems					X			
15	1	MEM13014A Apply principles of occupational health and safety in the work environment						X		

Section II

Question	Marks	Unit of competency / Element of competency	Employability skills (Please put an X where appropriate)							
			Communication	Teamwork	Problem–solving	Initiative and enterprise	Planning and organising	Self–management	Learning	Technology
16 (a)	1	MEM09002B Interpret technical drawing	X							
16 (b)	2	MEM09002B Interpret technical drawing MEM12024A Perform computations	X		X					
16 (c)	2	MEM09002B Interpret technical drawing	X							
16 (d)	3	MEM09002B Interpret technical drawing							X	
17 (a)	2	MEM18002B Use power tools hand held operations				X			X	
17 (b)	3	MEM18002B Use power tools hand held operations			X					
17 (c)	4	MEM18002B Use power tools hand held operations Manufacturing Engineering and related industry induction			X					
18 (a)	1	MEM12023A Perform engineering measurements			X					X
18 (b)	2	MEM12023A Perform engineering measurements					X	X		
18 (c)	3	MEM12023A Perform engineering measurements					X		X	
18 (d)	3	MEM12023A Perform engineering measurements							X	X
19 (a)	1	MEM13014A Apply principles of occupational health and safety in the work environment	X							
19 (b)	3	MEM13014A Apply principles of occupational health and safety in the work environment	X					X		
19 (c)	5	MEM13014A Apply principles of occupational health and safety in the work environment	X				X		X	

Section III

Question	Marks	Unit of competency / Element of competency	Employability skills (Please put an X where appropriate)							
			Communication	Teamwork	Problem–solving	Initiative and enterprise	Planning and organising	Self–management	Learning	Technology
20	15	MEM16007A Work with others in a manufacturing engineering or related environment	X	X				X		

Section IV

Question	Marks	Unit of competency / Element of competency	Employability skills (Please put an X where appropriate)							
			Communication	Teamwork	Problem–solving	Initiative and enterprise	Planning and organising	Self–management	Learning	Technology
21 (a)	2	MEM14004A Plan to undertake a routine task	X							
21 (b)	4	MEM14004A Plan to undertake a routine task			X			X	X	
21 (c)	9	MEM14004A Plan to undertake a routine task			X		X	X		