2018 HSC Metal and Engineering Marking Guidelines

Section I

Multiple-choice Answer Key

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

Section II

Question 16 (a)

Criteria	Marks
• Correctly identifies the tool shown	1

Sample answer:

Spring dividers

Question 16 (b)

Criteria	Marks
• Lists two uses of the tool	2
• Lists one use of the tool	1

Sample answer:

Spring dividers are used for scribing circles and arcs and for dividing lines and circles.

Answers could include:

Transferring dimensions from a rule to the work piece.

Question 16 (c)

Criteria	Marks
• Identifies what is required to maintain the accuracy of the tool	3
• Lists some requirements to maintain the tool	2
• Provides some relevant information	1

Sample answer:

Spring dividers should be kept sharp and ground to equal length. They should be easily adjusted and kept well lubricated and stored in a clean dry environment.

Question 17 (a)

Criteria	Marks
• Provides a description of the term *duty of care*	2
• Provides some relevant information	1

Sample answer:

Duty of care is the moral and legal obligation everyone has to ensure the safety and wellbeing of all workers and visitors to a site.

Question 17 (b)

Criteria	Marks
• Demonstrates a sound understanding of why good housekeeping practices are important	3
• Describes what good housekeeping is	2
• Provides some relevant information	1

Sample answer:

A workplace must always be maintained in a safe and clean condition. Good housekeeping practices will prevent hazards from occurring and will minimise and reduce risk. By keeping workshops organised, tidy and free from obstructions, tripping and slip hazards can be prevented.

Question 17 (c)

Criteria	Marks
• Demonstrates a comprehensive understanding of why reporting all accidents is important in relation to both the workplace and employee	3
• Demonstrates some understanding of why reporting accidents is important in relation to both the workplace and employee OR • Describes accidents which may need to be reported in relation to the workplace and/or employee	2
• Provides some relevant information	1

Sample answer:

All accidents are to be reported and logged. Accident reports are used for the allocation of resources, for the planning of strategies and for the prevention of future accidents. This data is used to minimise, prevent and eliminate hazards so they do not reoccur. This will lead to less downtime for the employer and minimise the psychological effect on the employees.

Question 18 (a)

Criteria	Marks
• Identifies a detailed set of pre-operational checks that should be performed	3
• Lists some of the pre-operational checks that should be performed	2
• Provides some relevant information	1

Sample answer:

The pre-operational checks that should be carried out before using the pedestal drill include: to read the safe operating procedure attached to the machine; check tagging and that all guards are fitted correctly; and check that the drill table is at the correct height and secure.

Question 18 (b)

Criteria	Marks
• Explains the use of a pilot drill prior to drilling larger holes	4
• Describes the use of a pilot drill prior to drilling larger holes	3
• Outlines the use of a pilot drill	2
• Provides some relevant information	1

Sample answer:

A pilot drill is used to locate a hole when drilling for accuracy. When using a pilot drill the drilling machine will use less power and operate more efficiently. It preserves the drill bit from overheating and becoming worn. Using a pilot drill will be safer as less pressure is applied on the drill bit and there will be less chance of it breaking and drifting off centre.

Question 18 (c)

Criteria	Marks
• Compares a SOP and SWMS demonstrating an understanding of their purpose and use	4
• Explains the use and purpose of both a SOP and a SWMS with limited comparison of them	3
• Describes both a SOP and a SWMS OR • Provides an explanation of either a SOP or a SWMS	2
• Provides some relevant information about either a SOP or a SWMS	1

Sample answer:

Safe operating procedures (SOP) and safe work method statements (SWMS) although written for different purposes are similar in their development. Both documents have similar elements within them.

A SOP is a quality system document which has a set of instructions that describes the correct and safe use of a tool or piece of equipment. These instructions standardise the activity and provide an assurance that the work is completed safely and consistently.

A SWMS is a safety document that breaks down a particular task into steps so that possible hazards can be identified and relevant safety precautions put in place to minimise the hazard.

Both documents have WHS considerations embedded within them. Referring to a SOP can be part of a safety precaution outlined in a SWMS.

Question 19 (a)

Criteria	Marks
• Correctly identifies the information on the drawing	1

Sample answer:

Radius

Question 19 (b)

Criteria	Marks
• Identifies correct value for each dimension	3
• Identifies the three relevant values, with one correct dimension OR • Identifies two correct dimensions	2
• Provides some relevant information	1

Sample answer:

Item	*Description*	*Length*	*Width*	*Thickness*	*Quantity*
1	External gauge	***64***	***50***	***12***	1

Question 19 (c)

Criteria	Marks
• Provides the steps required, in a logical sequence, to mark out and manufacture ITEM 2 • Provides all of the tools required	6
• Provides most of the steps required to mark out and manufacture ITEM 2 • Provides most of the tools required	5
• Provides some appropriate steps to mark out and/or manufacture the item • Provides some of the tools required	4
• Lists some steps to mark out and/or to manufacture the item and/or some of the tools required	2–3
• Provides some relevant information	1

Sample answer:

Sequence of steps – marking out	*Tools required*
1. Calculate length of flat bar $62 + 12.5 = 74.5$ 2. Find and mark the centre of the flat bar $25 \div 2 = 12.5$ 3. Measure in from one end to centre of the radius 12.5 4. Centre punch where lines intersect 5. Using dividers set at 12.5 mm scribe radii	• Scribe • Engineer's square • Steel rule • Jenny callipers • Engineer's hammer • Centre punch • Spring dividers
Sequence of steps – manufacturing	*Tools required*
1. Cut material to length 2. Drill 5 mm hole 3. Tap M6 $\times$ 1 thread 4. Produce radii 5. De-burr all edges	• Hacksaw • Files • Machine vice • Pedestal drill • 5 mm twist drill • 6 mm taper tap • Tap wrench • Personal protective equipment

Section III

Question 20

Criteria	Marks
• Demonstrates a comprehensive understanding of the links between new and emerging technologies and production and efficiency • Provides a logical and cohesive response, using relevant workplace examples and precise industry terminology	13–15
• Demonstrates a sound understanding of the links between new and emerging technologies and production and efficiency • Provides a clear and organised response, using relevant workplace examples and specific industry terminology	10–12
• Demonstrates an understanding of new and emerging technologies and/or production and efficiency • Uses general industry terminology and/or relevant workplace examples	7–9
• Demonstrates a basic understanding of new and emerging technologies and/or production and efficiency	4–6
• Provides limited information relating to technologies and/or production/efficiency	1–3

Sample answer:

Due to the use of mobile phones, tablets and other portable electronic devices, people can now work more efficiently and have more direct and immediate communication from a range of locations including home. This could include sending messages, drawings, orders, teleconferencing.

Computers and programs such as spreadsheets allow for quicker and more efficient tracking of orders and deliveries. This is also the case for invoicing clients and monitoring account payments. They also allow for better financial monitoring and planning for the organisation, better tracking of materials and inventory, as well as better management of products, ordering and reordering and shipping.

Computer-aided design (CAD) programs have made it easier and quicker to create drawings that are more accurate. It is easier to store and retrieve engineering drawings and have more efficient filing systems. It is easier and cheaper to use email to send information and to ship goods directly to markets in other parts of the country or overseas.

The use of 3D printers allows for quicker, cheaper and more realistic and accurate prototypes compared to paper and cardboard models. Models can now be made at early stages of production. Sketches and engineering drawings can be produced quickly and then tested as a physical prototype to scale. Realistic models can be shown to clients for analysis and feedback.

Computer numeric control (CNC) technology has vastly improved traditional machines. It has improved machines such as lathes, mills, laser cutters and led to much faster, more accurate and better production of products. It maintains much better quality control during production and also leads to a better finished product, meeting customer needs and quality assurance.

Better tooling also helps produce a better product. Improvements in technology and materials allow for a better finish. Reductions in production time and tooling costs result in a cheaper product.

Technology allows manufacturers to use global markets and workforces. This can be for the production of complete products or for the specialised production of various components in countries that have different skills. Components can then be transported and assembled in other countries.

However, other implications of emerging technologies relate to redundancy and a reduction of staff on the work floor. These changes to the workforce and skills might temporarily affect production and efficiency. Employees need to change their skill sets to more technology-based work. There is a loss of low skilled, semi-skilled and unskilled labour. Some workers could be retrained in certain skills and stay on in their employment while others would have to leave the industry.

New and emerging technologies allow the metal and engineering industry to become far more competitive, efficient and accurate and produce a better quality product. This will allow the industry to stay viable in a dynamic and demanding market. This will maintain and improve a company's reputation and lead to repeat business.

Section IV

Question 21 (a)

Criteria	Marks
• Identifies two safety breaches shown	2
• Identifies one safety breach	1

Sample answer:

The worker is not wearing safety glasses or ear muffs.

Question 21 (b)

Criteria	Marks
• Demonstrates a comprehensive understanding of the steps the employer should take to help control the risk of injury	4
• Demonstrates a sound understanding of the steps the employer should take to help control the risk of injury	3
• Demonstrates some understanding of the steps or the risks	2
• Provides some relevant information	1

Sample answer:

To control the risk of injuries, the employer should supply all required personal protective equipment (PPE). The PPE should be easily accessible to all workers near the machines and working areas where it will be required.

All mandatory/regulatory signage should be clearly and prominently displayed in a position directly where it will be required to be worn. All standard operating procedures (SOPs) should also be clearly visible near all machines and safe working method statements (SWMS) should be accessible for all staff.

Materials should be safely stored or pre-cut off site so that this operation can be eliminated. All machine safety zones should be prominently marked.

All workers should be constantly vigilant about safety procedures and should be active in maintaining good housekeeping procedures.

Workers should also be regularly trained in the use of all PPE, the use of machines and fire control and evacuation procedures.

Question 21 (c)

Criteria	Marks
• Explains the implications for both the worker and the business when safety procedures are not followed	9
• Explains some implications for both the worker and the business when safety procedures are not followed	7–8
• Describes some implications for both the worker and the business when safety procedures are not followed	5–6
• Outlines some implications for the worker and/or the business when safety procedures are not followed	3–4
• Provides some information relevant to safety and the worker and/or the business	1–2

Sample answer:

If safety procedures are not properly followed there is a much higher risk that hazards will lead to workers being unable to complete tasks. They may incur permanent injury and loss of function of body parts. This has a major effect on future work, family and career opportunities.

Consequences of this will lead to downtime of workers and a decrease in production. Fewer workers will be available to complete the required tasks. This will put pressure on the remaining workers to cover production and could create fatigue and burnout.

The injured worker may be skilled and their skills could be unique to this workplace. This will lead to not being able to complete work. The employer would then have to outsource the work, replace the worker or retrain existing staff. This will lead to additional costs to the business, may affect the quality of the finished product as well as perhaps more overtime costs.

The business could lose or slow down production. This will lead to a loss of income and profits.

There will be ongoing medical issues and costs for the employee and employer. This will affect the workers physical and even possibly their emotional and psychological condition. Furthermore it could affect their quality of life including any out of work hobbies, interests and pasttimes. This will incur a cost not only to the individual but their family and the community as a whole.

Safe Work NSW will visit the site and could impound or seize equipment for testing. They could also issue breach notices and fines. Equipment and machines could also be damaged during a worker's injury. This would again lead to additional costs, as equipment would have to be repaired or replaced.

Insurance premiums will increase due to medical and workers compensation costs.

2018 HSC Metal and Engineering
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	MEM09002B Interpret technical drawing — element 1 – page 19							X	
2	1	MEM18002B Use power tools hand held operations — element 1 – page 89							X	
3	1	MEM18001C Use hand tools — element 1 – page 83							X	
4	1	MEM09002B Interpret technical drawing — element 2 – page 20							X	
5	1	MEM12024A Perform computations — element 1 – page 33			X					
6	1	MEM12023A Perform engineering measurements — element 1 – page 24							X	
7	1	MEM18002B Use power tools hand held operations — element 1 – page 90			X					
8	1	MEM15002A Apply quality systems — element 1 – page 60					X			
9	1	MEM13014A Apply principles of occupational health and safety in the work environment — element 2 – page 46					X			
10	1	MEM09002B Interpret technical drawing — element 1 – page 18							X	
11	1	MEM13014A Apply principles of occupational health and safety in the work environment — element 1 – page 39							X	
12	1	MEM12024A Perform computations — element 1 – page 33			X					
13	1	Induction Manufacturing, engineering and related industries induction — element 3 – page 13							X	
14	1	MEM09002B Interpret technical drawing — element 1 – page 18			X					
15	1	Induction Manufacturing, engineering and related industries induction — element 3 – page 13							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	MEM18001C Use hand tools — element 1 – page 83							X	
16 (b)	2	MEM18001C Use hand tools — element 1 – page 83							X	
16 (c)	3	MEM18001C Use hand tools — element 1 – page 86							X	
17 (a)	2	MEM16007A Work with others in a manufacturing, engineering or related environment — element 3 – page 77				X		X		
17 (b)	3	MEM15024A Apply quality procedures — element 1 – page 67		X				X		
17 (c)	3	MEM13014A Apply principles of occupational health and safety in the work environment — element 2 – page 48		X						
18 (a)	3	MEM14004A Plan to undertake a routine task — element 2 – page 55					X			
18 (b)	4	MEM14004A Plan to undertake a routine task — element 2 – page 55			X					
18 (c)	4	MEM15002A Apply quality systems — element 1 – page 61					X			
19 (a)	1	MEM09002B Interpret technical drawing — element 1 – page 18							X	
19 (b)	3	MEM09002B Interpret technical drawing — element 1 – page 18							X	
19 (c)	6	MEM14004A Plan to undertake a routine task — element 2 – page 55			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	Induction Manufacturing, engineering and related industries induction — element 1 – pages 11 and 12								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	MEM13014A Apply principles of occupational health and safety in the work environment — element 1 – page 42							X	
21 (b)	4	MEM13014A Apply principles of occupational health and safety in the work environment — element 2 – page 46			X					
21 (c)	9	MEM13014A Apply principles of occupational health and safety in the work environment — element 2 – page 50	X			X	X			