2020 HSC Metal and Engineering Marking Guidelines

Section I

Multiple-choice Answer Key

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

Section II

Question 16 (a)

Criteria	Marks
• Provides TWO filing processes that can be performed using a half-round file	2
• Provides ONE relevant filing process using a half-round file	1

Sample answer:

- Filing flat surfaces
- Filing large concave surfaces.

Answers could include:

- Filing out large holes.

Question 16 (b)

Criteria	Marks
• Outlines safety precautions that must be observed when using files	3
• Lists safety precautions that must be observed when using files	2
• Provides some relevant information	1

Sample answer:

Appropriate PPE should be worn when using files, such as eye goggles to avoid metal splinters flying into the operator's eyes. Files should always be fitted with a handle to avoid injuries to the operator's hands. Hold work piece in a vice securely before commencing the filing process to ensure that the operator is not injured if the work moves.

Answers could include:

- Discard chipped or cracked files.
- Keep them away from the edge of the bench so they don't fall off and shatter.
- Regularly clean the teeth of the file with a file card or apply chalk to the surface of the file to avoid pinning (clogging of the teeth).

Question 16 (c)

Criteria	Marks
• Demonstrates sound understanding of the use of relevant grades of files	3
• Demonstrates some understanding of the use of grades of files	2
• Provides some relevant information	1

Sample answer:

- Bastard file – used to remove waste material quickly and form the shape of the radius
- Second Cut file – used to produce a smoother finish after roughing down with a bastard file
- Smooth file – used to finish the surface. They produce a smoother finish after the second cut file.

Question 17 (a)

Criteria	Marks
• Outlines the benefits of using job cards	3
• Outlines a benefit of using job cards OR • Identifies some benefits of using job cards	2
• Provides some relevant information	1

Sample answer:

By using job cards, a company can track labour and material costs. The information contained can be used as part of the material ordering process as well as to produce a customer invoice.

Answers could include:

- They are a form of quality control that a company can use.
- They can be used to schedule and allocate labour and resources.

Question 17 (b)

Criteria	Marks
• Demonstrates comprehensive understanding of how apprenticeships and traineeships differ	4
• Outlines aspects of apprenticeships and traineeships	3
• Outlines apprenticeships and/or traineeships	2
• Provides some relevant information	1

Sample answer:

Traineeships are offered to new employees for a period of 3 to 12 months. A traineeship can be either full-time or part-time employment but are most likely to be part time and in some cases there may not be any payment.

An apprenticeship is an entry-level employment and training program. It is for a period of four years. An apprentice is considered a full-time employee and entitled to all award conditions. Apprentices are paid under rates described in a special award. An indenture is required to be signed for an apprenticeship.

Question 18 (a)

Criteria	Marks
• Provides the correct unit of measurement	1

Sample answer:

Millimetres or mm

Question 18 (b)

Criteria	Marks
• Correctly identifies what M and 18 represent	2
• Provides some relevant information	1

Sample answer:

(The symbol M18 represents M18 thread.)

M = Metric
18 = 18 mm diameter

Question 18 (c)

Criteria	Marks
• Provides the correct length showing relevant working	2
• Provides the correct length OR • Provides inaccurate length with some correct working	1

Sample answer:

$150 + 90 + 140 + 140 = 520$ mm

Question 18 (d)

Criteria	Marks
• Describes in detail the process of producing the tapped hole • Provides the relevant tools required	5
• Describes most of the process of producing the tapped hole • Provides most of the tools required	4
• Describes some of the process of producing the tapped hole • Provides some of the tools required	3
• Outlines some of the process of producing the tapped hole	2
• Provides some relevant information	1

Sample answer:

Use correct personal protective equipment (PPE) at all times.

1. Measure and mark out centre of hole of Item 3.
2. Measure up 50 mm from bottom (40 mm from the top) of Item 3 and 50 mm from either side.
3. Centre punch where the lines intersect.
4. Use a scriber, ruler, engineer's square, centre punch and ball pein hammer.
5. Place Item 3 in machine vice and use drill press to drill pilot hole.
6. Then drill to final diameter of 15.5 mm. Deburr hole.
7. Place Item 3 in engineer's vice.
8. Start to tap hole using tap wrench and taper tap M18 $\times$ 2.5. Use an engineer's square to make sure the tap starts square to the job piece.
9. Use cutting compound.
10. Use correct technique to produce thread.
11. Turn tap wrench one turn clockwise and half a turn anti-clockwise so that thread swarf is broken.
12. Then replace tap with intermediate tap (plug tap can be used.)
13. Deburr Item 3.

Question 19

Criteria	Marks
• Identifies THREE relevant pieces of information provided on a MSDS	3
• Identifies TWO relevant pieces of information provided on a MSDS	2
• Provides some relevant information	1

Sample answer:

A material safety data sheet provides information such as:

- PPE required
- Potential hazards such as health, fire, reactivity and environmental
- Safe handling and storage procedures.

Answers could include:

- Emergency procedures
- Disposal considerations.

Question 20 (a)

Criteria	Marks
• Correctly identifies value	1

Sample answer:

–0.035

Question 20 (b)

Criteria	Marks
• Identifies and justifies a suitable measuring device	2
• Provides some relevant information	1

Sample answer:

0–25 mm micrometer

The tolerance of the shaft requires an accurate measuring tool. The 0–25 mm micrometer's tolerance is 0.01 which makes this the most appropriate measuring device.

Question 20 (c)

Criteria	Marks
• Demonstrates a comprehensive understanding of the factors that could, during production, affect the quality of the shaft	4
• Demonstrates a sound understanding of the factors that could, during production, affect the quality of the shaft	3
• Identifies a factor(s) that could, during production, affect the quality of the shaft	2
• Provides some relevant information	1

Sample answer:

Many factors may influence, during its production, the quality of the shaft.

One factor is the correct selection of tools and equipment to suit the material. For example, if the shaft is to be made from brass the correct tool with the correct rake angle must be chosen to obtain the required finish.

The ability of the operator and their skill set will also determine the quality of the shaft. If the operator has limited skills in using measuring devices accurately then they may make the shaft too small and then the product would need to be made again therefore increasing the cost.

Answers could include:

- Frequency of quality checking
- Time constraints placed on the worker.

Section III

Question 21

Criteria	Marks
• Demonstrates a comprehensive understanding of housekeeping practices and their relationship to the workplace • Provides a logical and cohesive response, using relevant workplace examples and precise industry terminology	13–15
• Demonstrates a sound understanding of housekeeping practices and their relationship to the workplace • Provides an organised response, using relevant workplace examples and specific industry terminology	10–12
• Demonstrates an understanding of housekeeping practices • Uses general industry terminology and/or relevant workplace examples	7–9
• Demonstrates a basic understanding of housekeeping practices	4–6
• Provides limited information relating to housekeeping practices	1–3

Answers could include:

Housekeeping is the orderly and safe maintenance of a workplace so that accidents and injury can be prevented. This will also lead to a clean, comfortable and healthy workplace with efficient productivity.

This is an ongoing process which is everyone's responsibility and involves routine cleaning, functional organisation and the identification of risks and hazards. Good housekeeping reduces risks and eliminates hazards. Injuries are kept to a minimum and all workplace processes can be completed safely and optimum productivity is maintained. All work is carried out efficiently and downtime is reduced or eliminated.

All of these practices will lead to a safer working environment for all workers, and potentially maximise production output and contribute to a positive outcome for the environment.

Examples of good housekeeping practices include:

- Keeping buildings, fixtures and infrastructure well maintained. Planning the layout of all workplaces, so that work areas are neat, tidy and orderly. Keeping all fixtures, machines and work areas clean.
- Keeping halls, floors and corridors clean and safe and free from debris and slip hazards. Replacing all damaged or rippled flooring. Installing anti-slip flooring mats in areas that are slippery and need constant cleaning. Reporting and cleaning up all spills and leaks.
- Eliminating all fire hazards. Ensuring all fire exits and emergency doors are clear of obstruction and easily accessible. Regularly checking all safety equipment such as fire extinguishers and fire blankets are in good working order. Keeping first aid kits fully stocked.
- Marking all designated safe work zones and machine zones. Keeping enough space between machines and work areas.
- Ensuring adequate storage facilities for all tools and materials. Ensuring storage racks are strong enough to safely store lengths of bar and sheet metal to prevent objects from falling.
- Positioning all signage appropriately to inform people of danger, and mirrors and warning lights in all blindspots.
- Keeping all hand tools in good working order and stored safely. Informing supervisor of faulty tools so that they can be repaired and replaced.
- Disposing of all waste material responsibly and safely. Providing suitable waste and recycling bins to separate and store such material.

Section IV

Question 22 (a)

Criteria	Marks
• Demonstrates a comprehensive understanding of the personal attributes that help employees work effectively in the metal and engineering industry	5
• Demonstrates a good understanding of some of the personal attributes that help employees work effectively in the metal and engineering industry	4
• Demonstrates a sound understanding of some of the personal attributes that help employees work effectively in the metal and engineering industry	3
• Provides some understanding of the personal attributes that help employees work effectively in the metal and engineering industry	2
• Provides some relevant information	1

Sample answer:

There are many different personal attributes that an employee can display in the workplace to help them work effectively. Arriving for work on time and attending work every day that they are fit for work will assist them work effectively because they will be seen to be reliable and so be trusted by team members/co-workers and supervisors.

Employees, by being ready for work, including wearing the correct personal protective equipment, will be able to work effectively, with reduced potential to be injured while working.

Taking directives from the employer and being honest and not trying to cover up any errors will help employees to improve their skills, minimise errors and be able to better meet deadlines. This will also help them to effectively and consistently produce work to the required quality standard in a timely manner.

By having a positive attitude and providing consistency of work performance/service, an employee will be able to be an effective team member, not causing conflict with co-workers and supervisors.

Answers could include:

- Working safely and following practices and procedures
- Maintaining confidentiality regarding the work being conducted
- Working in an ethical manner from both a safe perspective as well as from an environmental standpoint.

Question 22 (b)

Criteria	Marks
• Demonstrates a comprehensive understanding of the effectiveness of different forms of communication in the metal and engineering industry • Supports answer with relevant and specific examples from the metal and engineering industry	9–10
• Demonstrates sound understanding of different forms of communication and their effectiveness in the metal and engineering industry • Supports answer with some specific examples from the metal and engineering industry	7–8
• Demonstrates some understanding of forms of communication and their effectiveness in the metal and engineering industry • Provides some general examples from the metal and engineering industry	5–6
• Outlines some forms of communication and provides limited information on their effectiveness • Provides some general examples	3–4
• Provides some relevant information on forms of communication methods	1–2

Answers could include:

There are many different forms of communication in the metal and engineering industry. It is important that employees are able to use a varied range of communication types, which are suitable for each situation. These could include verbal, non-verbal and written.

- Verbal communication is using the spoken word to transfer instructions from one person to another. The advantage of this type of communication is that the information can be given directly and quickly to specific people. However, it may not be very effective if there are language barriers or if a person has a hearing impairment, as information may be misinterpreted.

  The effectiveness of this form of communication will depend on both the person giving the instructions and the audience receiving the information. The person giving the information must use the correct industry terminology and speak clearly and succinctly to minimise the chance of miscommunication. The audience receiving the information must use effective listening skills to ensure that they receive the instructions. This could include not talking when the supervisor is giving the instruction or not being distracted by electronic devices or other employees. Employees must also ask questions at the appropriate times in order to clarify instructions given.
- Metal and engineering workshops tend to be noisy environments so it may be very effective to use industry specific signage. This will assist everyone in the workplace to quickly see the correct safety requirements and ensure that employees are working in a manner that protects them from potential hazards.
- Standard Operating Procedures (SOPs) and Safe Work Method Statements (SWMSs) are written using terminology specific to the metal and engineering industry. Employees must be able to understand and correctly interpret the information contained within these documents in order to carry out work safely.
- Another form of communication is written instructions that can be hand written or typed. This communication method would be preferred over verbal instructions as it gives the audience something to refer back to later to clarify what is required. A typed instruction can be emailed to employees, which is useful if the supervisor is off-site and urgent changes need to be made to a particular product. The effectiveness of hand written instructions is dependent on the interpretation of the reader and is significantly reduced if the handwriting is not neat and if language is a barrier.
- Drawings and sketches are another form of communication in the workplace and should be the source of most instructions in order to make products in the metal and engineering industry.

2020 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	MEM18001C Use hand tools — element 1 – page 83	X							X
2	1	MEM13014A Apply principles of occupational health and safety in the work environment — element 1 – page 44					X	X		
3	1	MEM09002B Interpret technical drawing — element 2.4 – page 20	X							X
4	1	MEM18001C Use hand tools — element 1 – page 83			X	X				
5	1	MEM09002B Interpret technical drawing — element 1 – page 18	X							
6	1	MEM12023A Perform engineering measurements — element 1 – page 24	X		X				X	X
7	1	MEM12024A Perform computations — element 1 – page 32	X		X					
8	1	MEM18002B Use power tools/hand-held operations — element 1.1 – page 89			X	X			X	
9	1	Manufacturing, engineering and related services industry induction — element 2 – page 12					X	X		
10	1	MEM18001C Use hand tools — element 1 – page 83	X							X
11	1	MEM09002B Interpret technical drawing — element 2 – page 20	X		X					
12	1	MEM12024A Perform computations — element 1 – page 32			X				X	
13	1	MEM13014A Apply principles of occupational health and safety in the work environment — element 1 – page 42	X						X	
14	1	MEM15024A Apply quality procedures — element 1 – page 66					X			

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
15	1	Manufacturing, engineering and related services industry 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)	2	MEM18001C Use hand tools — element 1 – page 83					X		X	
16 (b)	3	MEM18001C Use hand tools — element 1 – page 83						X	X	
16 (c)	3	MEM14004A Plan to undertake a routine task — element 2 – page 55	X		X					X
17 (a)	3	MEM14004A Plan to undertake a routine task — element 1 – page 53	X				X			
17 (b)	4	Manufacturing, engineering and related services industry induction — element 2 – page 12	X						X	
18 (a)	1	MEM09002B Interpret technical drawing — element 2 – page 19	X							
18 (b)	2	MEM09002B Interpret technical drawing — element 1 – page 18	X							
18 (c)	2	MEM12024A Perform computations — element 1 – page 32			X		X			
18 (d)	5	MEM14004A Plan to undertake a routine task — element 2 – page 55	X		X		X			
19	3	MEM13014A Apply principles of occupational health and safety in the work environment — element 1 – page 44	X						X	
20 (a)	1	MEM09002B Interpret technical drawing — element 2 – page 20	X		X					
20 (b)	2	MEM12023A Perform engineering measurements — element 1 – page 24			X					X

Question	Marks	Unit of competency / Element of competency	Employability skills (Please put an X where appropriate)							
			Communica-tion	Teamwork	Problem-solving	Initiative and enterprise	Planning and organising	Self-management	Learning	Technology
20 (c)	4	MEM15002A Apply quality systems — element 1 – page 60					X			

Section III

Question	Marks	Unit of competency / Element of competency	Employability skills (Please put an X where appropriate)							
			Communica-tion	Teamwork	Problem-solving	Initiative and enterprise	Planning and organising	Self-management	Learning	Technology
21	15	MEM13014A Apply principles of occupational health and safety in the work environment — element 1.2 – page 40	X	X	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
22 (a)	5	Manufacturing, engineering and related services industry induction — element 3 – page 13	X			X		X		
22 (b)	10	MEM16007A Work with others in a manufacturing, engineering or related environment — element 2 – page 73	X	X		X				