

2015 HSC Metal and Engineering Marking Guidelines

Section I

Multiple-choice Answer Key

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

Section II

Question 16 (a)

Criteria	Marks
<ul style="list-style-type: none"> Correct thickness identified 	1

Sample answer:

60mm

Question 16 (b)

Criteria	Marks
<ul style="list-style-type: none"> Correct answer and working out 	2
<ul style="list-style-type: none"> Correct answer with incorrect working out OR correct working out with incorrect answer OR just provides the correct answer 	1

Sample answer:

$8560 - 60 - 10 = 8490$ mm

Question 16 (c)

Criteria	Marks
<ul style="list-style-type: none"> Provides a comprehensive explanation of the symbol and reasons for its inclusion 	4
<ul style="list-style-type: none"> Provides a sound explanation of the symbol and some reasons for its inclusion 	3
<ul style="list-style-type: none"> Provide a basic explanation of the symbol and gives limited reasons for its inclusion OR <ul style="list-style-type: none"> Provides a list of details from the section drawing 	2
<ul style="list-style-type: none"> Identifies the view as a sectional view AND / OR may give a detail for its inclusion 	1

Sample answer:

The symbol in question identifies that there is a sectional view for that component of the product. A specific cutting plane is identified by letters placed near the tail of the arrows in this case Z–Z. The reason for the addition of a section view is to give a clear view of the internal features and distinguish individual parts of a fabrication or assembly, where hidden detail would make the drawing too complicated to interpret.

When showing adjacent components, the 45° hatching lines on one part are at right angles to the hatching on the other.

Question 17 (a)

Criteria	Marks
• Proposes the steps required in a logical sequence to successfully mark out the component	3
• Proposes most of the steps required in a logical sequence to successfully mark out the component	2
• Lists some steps in the marking out of the part	1

Sample answer:

- Find the centre of 810 and mark a 90° line
- Measure 60 mm either side of centre
- From the datum/base edge mark parallel lines 110 mm
- Mark 45 mm either side of previous line
- Centre punch the 4 points of intersection

Question 17 (b)

Criteria	Marks
• Proposes the steps required in a logical sequence to successfully manufacture the component	4
• Proposes most of the steps required in a logical sequence to successfully manufacture the component	3
• Lists some steps in the manufacturing of the component	2
• Identifies a correct step in the manufacturing of the component	1

Sample answer:

- Calculate the tapping drill size = $M6 \times 1 (6 - 1) = 5\text{mm}$
- Insert bit into pedestal drill
- Clamp plate on pedestal drill
- Calculate and set correct drilling speed
- Wear all required PPE for task
- Drill the 4 holes @ 5 mm, use lubrication to prevent excessive heat
- Countersink or chamfer holes using countersinking tool
- Create the thread using $M6 \times 1.0$ using appropriate taps, wrench and cutting compound ensuring squareness

Question 17 (c)

Criteria	Marks
• Provides a comprehensive description of quality system procedures that minimise variation in mass production of the gusset	3
• Provides a sound description of quality system procedures that minimise variation in mass production of the gusset	2
• Lists different methods of quality system procedures	1

Sample answer:

- Check machinery cutting tools regularly.
- Take samples at regular intervals and check for accuracy. A template could be used here.
- CNC machinery used therefore human error minimised if set up correctly.

Question 18 (a)

Criteria	Marks
• Provides SIX correct responses	6
• Provides FIVE correct responses	5
• Provides FOUR correct responses	4
• Provides THREE correct responses	3
• Provides TWO correct responses	2
• Provides ONE correct response	1

Sample answer:

- A Name = Stillson Wrench
Application = designed for gripping and turning threaded pipes
- B Name = Adjustable Spanner or Wrench
Application = moveable jaws to tighten and loosen multiple sized, or irregular shaped fasteners
- C Name = Tension or Torque Wrench
Application = tighten screwed parts to a desired tension

Question 18 (b)

Criteria	Marks
<ul style="list-style-type: none"> Fully describes a range of considerations in the selection and use of a spanner or wrench 	3
<ul style="list-style-type: none"> Identifies a basic range of considerations OR <ul style="list-style-type: none"> Describes fully ONE consideration in the selection and use of a spanner or wrench 	2
<ul style="list-style-type: none"> Provides a consideration for a selection of a spanner or wrench OR <ul style="list-style-type: none"> Provides a use of a spanner or wrench 	1

Answers could include:

- Correct size for job
- Location of the nut/bolt/pipe
- Space available to operate the tool determines the size of tool
- Tension required on the thread determines the tool choice
- Available tools at the worksite
- Condition of the tool (ie worn out threads on adjustable tools)
- Direction of turn (push/pull)
- Shape of the fastener (square, allen, hex)
- Length of the thread

Question 19 (a)

Criteria	Marks
<ul style="list-style-type: none"> Explains the reasons for the movement in the hook 	2
<ul style="list-style-type: none"> Makes a valid point regarding the position of the hook 	1

Sample answer:

The movement of the component is designed to compensate for the thickness of the hook. By sliding the distance equal to the hook thickness the user can accurately measure both inside and outside measurements.

Question 19 (b)

Criteria	Marks
• Outlines the uses for all THREE stocks	3
• Outlines the uses for TWO stocks	2
• Outlines the uses for ONE stock	1

Sample answer:

The square stock can be used to test and mark 90 and 45 degree angles. It can also measure depth and be used as a spirit level. The protractor stock can be set at angles between 0 and 180 degrees and is used for both marking out and setting work. The centre stock is used for locating centres on round work and can also mark out diameters on round stock.

Question 19 (c)

Criteria	Marks
• Describes an extensive range of consequences resulting from not checking and calibrating graduated measuring devices	4
• Describes some consequences resulting from not checking and calibrating graduated measuring devices	3
• Outlines some consequences resulting from not checking and calibrating graduated measuring devices OR • Fully describes ONE consequence	2
• Provides an example of a consequence of not checking and calibrating graduated measuring devices	1

Answers could include:

- Not keeping within tolerances
- Inaccuracy in measurement and marking
- Poor quality control of production
- Not keeping within standards
- Inconsistency of workmanship
- Error in measurements, marking and manufacture
- Decreased productivity
- Increased waste
- Increased cost/reduced profit

Section III

Question 20

Criteria	Marks
<ul style="list-style-type: none"> Demonstrates, in a well-reasoned and cohesive response, using relevant workplace examples and precise industry terminology, a detailed range of work practices that should be introduced in order to select, use and maintain power tools 	13–15
<ul style="list-style-type: none"> Demonstrates, in a clear and organised response, using relevant workplace examples and specific industry terminology, a well developed understanding of work practices that should be introduced in order to select, use and maintain power tools 	10–12
<ul style="list-style-type: none"> Demonstrates a sound understanding using general industry terminology of some work practices that should be introduced in order to select, use and maintain power tools 	7–9
<ul style="list-style-type: none"> Outlines a basic understanding using some industry terminology of the work practices that should be introduced in order to select, use and maintain power tools 	4–6
<ul style="list-style-type: none"> Displays a minimal understanding of work practices that should be introduced in order to select, use and maintain power tools <p>OR</p> <ul style="list-style-type: none"> Provides a list of different reasons to choose a power tool 	1–3

Sample answer:

Power tools make projects and small repairs much easier and quicker than doing the same task with hand tools alone. Modern power tools are extremely efficient and often give better results than hand tools. There is a vast assortment of power tools available. Some are special purpose tools while others can perform multiple tasks.

In addition most power tools are available in a range of power and weight often corresponding to light, medium or heavy applications. Selecting the correct power tool is a process of analysing what the tool will be used for and under what conditions, as well as considering what is a reasonable price to pay for the tool required.

When operating a power tool, it should be in a safe working condition and correctly tagged and should be used with an emphasis on safety. It is up to the operator to develop an effective conscientious attitude. This will reduce the risk of injury to the operator and those around the area. It will also assist in assuring that the power tool is not damaged. A clean, tidy and well lit work environment provides safety. Material being used should be securely clamped to enable the operator to use both hands and it is important to work on an even and steady surface, especially when using cutting tools with sharp edges. It is also important to use power tools away from the presence of flammable liquids or gases and away from wet areas.

Wear comfortable protective and firmly fitting footwear so you don't trip and fall into operating equipment. Loose clothing, jewellery or long hair can present hazards when blades are spinning. Make sure your mind is on your work with all relevant personal protective equipment on and maintain concentration to perform the task. When others are present and seeking your attention, stop what you are doing to prevent mistakes.

Remove the electrical cord from the power point before changing blades, bits or abrasive discs and while making depth or angle adjustments. To avoid accidental starting when you plug in the power tool, make sure the starting switch is in the off position and remove all adjusting spanners, chuck keys, allen keys and screwdrivers before reconnecting the power source.

Whatever tools you use, keep them clean. This may require wiping them down, blowing them off or brushing them out to keep them in a good working order. If any part is damaged, ensure that it is repaired and will perform its proper function before continuing to use it. If necessary, have the tool repaired by an authorised repairer or replaced. If a power tool starts to smoke, immediately turn it off and disconnect it from the power source and have it checked by an authorised repairer. When the tool is not in use, the tool should be stored back in its case, in a dry and lockable cabinet.

Section IV

Question 21 (a)

Criteria	Marks
<ul style="list-style-type: none"> Provides a detailed range of work practices that should be introduced in order to provide a safe working environment for this workshop 	5
<ul style="list-style-type: none"> Provides some work practices that should be introduced in order to provide a safe working environment for this workshop 	3–4
<ul style="list-style-type: none"> Provides limited examples of work practices that should be introduced in order to provide a safe working environment 	1–2

Sample answer:

A range of work practices should be introduced to provide a safe working environment. An induction should be delivered to staff including all necessary training required prior to commencement of work. Training such as wearing correct clothing for various environments, correct practices in using hand tools and machinery following standard operating procedures can also be included.

PPE should be supplied by the employer for all people entering the workplace. Good housekeeping practices should be developed and adhered to. Signage should be erected in all the appropriate places throughout the workshop. Different work areas should be easily identified for specific tasks eg welding in welding bays. Roles and responsibilities of employer and employees should be well defined with active supervision.

Question 21 (b)

Criteria	Marks
• Demonstrates a comprehensive understanding of how better work practices could affect the profitability of the company and service to the clients	9–10
• Demonstrates a detailed understanding of how better work practices could affect the profitability of the company and service to the clients	7–8
• Demonstrates a general understanding of how better work practices could affect the profitability of the company and service to the clients	5–6
• Provides a basic understanding of how work practices affect the profitability of the company and service to the clients	3–4
• Makes a limited statement regarding the effect work practices have on the company	1–2

Sample answer:

Formal inductions should be delivered before the employees enter the workplace. This will inform the employees of such things as housekeeping policies, evacuation procedures and the necessary PPE specific to certain areas. This will generate more profitability to the business due to less downtime from continual cleaning up and moving materials, and lost time due to injury. Housekeeping, including the racking of tools, easily identifies missing, worn and broken tools. This gives the supervisor the opportunity to organise the maintenance, repair or replacement of tools and reduce the time spent looking for tools. This could improve the quality of the work produced by having correctly operating equipment. In turn the product would be of a higher standard which could provide higher returns.

Further housekeeping would include maintaining a clear and clean workspace, including marked walkways, by ensuring all material is racked and off-cuts placed in a scrap bin ready for environmentally friendly recycling. This would minimise accidents including sick leave and downtime allowing quicker production times in turn offering better services to the client. The workshop should be organised into zoned areas eg welding bays and grinding areas with appropriate screening and ventilation with filters to reduce toxins released into the atmosphere and provide safe work areas. Signage should be displayed around the workplace to remind employees and inform visitors of the dangers and the appropriate PPE necessary to enter these areas. The understanding of the roles and responsibilities of employees including supervisors will help with seamless production and provide an environmentally friendly workplace. This offers the client better services and improves the profitability for the business.

2015 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	MEM16.007A / Work with others in a manufacturing, engineering or related environment / 2. Plan activities / Page 73	X							
2	1	MEM18.002B / Use power tools/hand held operations / 1 Use power tools / Page 89					X			X
3	1	MEM13.14A / Apply principles of Worker Health & Safety in the work environment / 1 Follow safe work practices / Page 39			X					
4	1	MEM13.14A / Apply principles of Worker Health & Safety in the work environment / Page 37	X							
5	1	Induction - Manufacturing, engineering and related services industries induction / 3 Employment conditions, responsibilities and obligations / Page 13					X		X	
6	1	MEM9.2B Interpret technical drawing / 2.5 symbols recognised as required / Page 20	X		X					
7	1	MEM12.24A Perform computations / 1.2 Data is obtained and interpreted correctly / Page 32-33	X		X					
8	1	MEM12.24A Perform computations / 1.3 required calculations / Page 32-33			X					
9	1	MEM12023A Perform engineering measurements 4 / Communicate measurements as required / Interpret technical drawing / 2.5 symbols recognised as required / Page 27	X						X	
10	1	MEM16.7A Work with others in a manufacturing, engineering or related environment / 3 work with others / Page 74	X						X	
11	1	MEM12.24A Perform computations / 1.4 Expected results are estimated, including rounding off / Page 33-34	X		X				X	
12	1	MEM15.2A Apply quality systems / 1.1 Work within quality systems / Page 60	X				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
13	1	MEM13.14A / Apply principles of Worker Health & Safety in the work environment / 2 Workplace management / Page 46	X	X	X				X	
14	1	MEM13.14A / Apply principles of Worker Health & Safety in the work environment / 1.3 Responsibilities and duties / Page 41 & 42	X						X	
15	1	Manufacturing, engineering and related services industries induction / 3 Employment conditions, responsibilities and obligations / 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	MEM9.2B Interpret technical drawing / 2.2 Dimensions are identified as appropriate to field of employment / Page 19			X				X	
16 (b)	2	MEM12.24A Perform computations / 1.2 Data is obtained and interpreted correctly / Page 32			X					
16 (c)	4	MEM9.2B Interpret technical drawing / 1.1 Drawing is checked and validated against job requirements or equivalent / Page 18	X						X	
17 (a)	3	MEM12.23A Perform engineering measurements / 1.2 Appropriate device selected according to SOP / Page 24 & 4 communicate measurements as required / Page 27	X		X		X		X	
17 (b)	4	MEM18.1C Use hand tools / 1.1 & 1.2 Use hand tools / Pages 83, 84 MEM18.2C Use power tools/hand held operations / 1.1 & 1.2 Use power tools	X		X				X	X
17 (c)	3	MEM15.24A Apply quality procedures / 2.1 & 2.2 Apply standard procedures of workplace quality to own job / Page 67, 68			X	X	X		X	
18 (a)	6	MEM18.1C Use hand tools / 1.1 Hand tools are selected appropriate to the task requirements / Page 83							X	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
18 (b)	3	MEM18.1C Use hand tools 1.1 Hand tools are selected appropriate to the task requirements / Page 83					X		X	X
19 (a)	2	MEM12.23A Perform engineering measurements / 1.2 Appropriate devices or equipment selected according to standard operating procedure to achieve required outcome / Page 24	X		X					
19 (b)	3	MEM12.23A Perform engineering measurements / 1.2 Appropriate devices or equipment selected according to standard operating procedure to achieve required outcome / Page 24	X		X					
19 (c)	4	MEM12.23A Perform engineering measurements / 2.2 Measurements are accurately attained / Page 25 MEM15.24A Apply quality procedures / 1.1 Concept of supplying product or service to meet the customers' requirements / Page 66	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	MEM18.2B / Use power tool/handheld operations / 1.1 power tools selected appropriate for the task requirement / Page 89 MEM13.14A / Apply principles of Worker Health & Safety in the work environment / 1.1 Work is carried out safely in accordance with company policy & procedures & legislative requirements / Page 39	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	
21 (a)	5	MEM13.14A / Apply principles of Worker Health & Safety in the work environment / 2.1 Actual and foreseeable workplace hazards are identified during course of work and reported to appropriate person according to standard operating procedures / Page 45 / 1.1 Work is carried out safely in accordance with company policy & procedures & legislative requirements / Page 39	X		X					X	
21 (b)	10	MEM16.7A / Work with others in a manufacturing, engineering or related environment / 3.1 Effective interpersonal skills are applied to interact with others and to contribute to activities and objectives / Page 74					X				