

2015 HSC Industrial Technology Metal and Engineering Technologies Marking Guidelines

Section I

Multiple-choice Answer Key

Question	Answer
1	A
2	B
3	C
4	D
5	A
6	B
7	A
8	D
9	A
10	B

Section II

Question 11

Criteria	Marks
• Gives the correct answer	1

Sample answer:

Bronze

Question 12

Criteria	Marks
• Sketches in general terms the process of annealing steel	3
• Indicates some features of annealing steel	2
• Gives a feature of annealing steel	1

Sample answer:

Heating the steel to a temperature between 800–850 degrees and then letting it cool slowly in the furnace or packed in some insulating material.

Question 13

Criteria	Marks
• Sketches in general terms how copper is pickled, cleaned and polished	3
• Indicates some features of how copper is pickled, cleaned or polished	2
• Gives a feature of pickling or cleaning and polishing copper	1

Sample answer:

Copper and most copper alloys are pickled in dilute nitric acid, but brass is pickled in concentrated sulphuric and nitric acid mixed with sodium chloride and soot. Salt mixed with vinegar can also be used. After pickling copper it is cleaned with steel wool and polished using Brasso.

Pickling is typically performed to remove tightly adherent oxide films resulting from hot-forming, heat treating, welding and other high temperature operations. Welding or heat treatment often produce complex oxides that can vary in colour. All these oxides are generally referred to as 'scale' and must be removed.

Question 14

Criteria	Marks
• Provides characteristics and features of the advantages of MIG welding	3
• Sketches in general terms the advantage of MIG welding	2
• Gives an advantage of MIG welding	1

Sample answer:

- Simplicity – MIG welding is quick and easy to learn compared to TIG welding
- Versatility – can be used to weld a wide variety of metals
- Speed – MIG welding is quick compared to TIG welding
- Automation – easy to adapt for robotic automation.

Question 15

Criteria	Marks
• Provides characteristics and features of manufacturing the centre punch	5
• Sketches in general terms how the centre punch is manufactured	3–4
• Identifies steps in manufacturing the centre punch	1–2

Answers could include:

- Marking out and cutting the blank
- Centre drilling
- Parallel turning and knurling
- Taper turning
- Filing and sanding
- Heat treatment (optional).

Section III

Question 16 (a)

Criteria	Marks
<ul style="list-style-type: none"> Detailed understanding of the causes and effects of restructuring a business on quality control 	5
<ul style="list-style-type: none"> Provides characteristics and features of the causes and effects of restructuring a business on quality control 	3–4
<ul style="list-style-type: none"> Indicates the main features of restructuring and/or quality control 	1–2

Answers could include:

- Restructuring can involve personnel, systems, processes, physical environment
- Effects can be positive and negative
- Restructuring can cause stress/anxiety on workers, causing a lowering of the quality of the product/services
- Workers moved during a restructure may initially lack the skills to perform new tasks, retraining must be under taken to provide knowledge to overcome lack of experience. This can lead to a short drop in quality of the product/services.
- New workers can provide a fresh attitude and show less complacency, possibly improving the quality of product/services
- The introduction of new machinery can improve the quality of products through increased accuracy, precision and output
- Restructuring personnel into specific teams with designated roles can help to improve product quality through skill specialisation

Question 16 (b)

Criteria	Marks
• Provides a detailed judgement of the value of new technology with an explanation of its effects on production and efficiency in the industry	10
• Provides an effective judgement of the value of new technology with a description of its effects on production and efficiency in the industry	8–9
• Provides some measure of the value of new technology with features of its effects on production and efficiency in the industry	5–7
• Attempts to provide an assessment of the effect of new technology on production and/or efficiency in the industry	3–4
• Lists aspects of new technology or production or efficiency in the industry	1–2

Sample answer:

There are ways to determine the value of new technology improving production and efficiency. CAD drawings have allowed faster production due to reduced time in planning and drawing. These drawings are able to have elements such as a library of parts, which can be reused and save time for the business, therefore increasing efficiency in the production of drawings. For example, if you consistently use one component of a drawing, eg a particular cog, then you can save complex drawings and reuse and edit them. CAD drawings allow for electronic distribution of drawings around the world via the internet (even attached to emails). This could previously not have been done with hand drawings, as the drawings would have to be physically sent. This fast method of distribution is a significant cost saving, which is more efficient due to the time and cost saved by not having down time when waiting for delivery. With electronic distribution, there are no postal costs and no flying workers around the world with drawings/plans to attend meetings. In addition, if you were sending physical drawings, these may be lost. CAD allows for multiple backups to be made so the work will be able to be sent again reducing duplication of effort. As this globalisation has been made so much easier by the introduction of new technologies, you also have access to a global work force, and companies can get more qualified and experienced staff which are then likely to work more efficiently, thus increasing the amount of drawings produced in a set time.

3D printing allows rapid prototyping in the early stages of production. It allows concept sketches to be produced quickly, and then tested as a physical prototype to scale. This physical prototype is faster to generate than previous methods such as creating cardboard models thus reducing money the company may have spent on labour costs and freeing up this capital for re-investment. This model can then be shown to clients and feedback given which is then applied to the model. The time within the design process in preparing for production is then minimised, as changes can be made quickly and easily to the model based on feedback. This is a more efficient process, as previously, feedback would be received, drawing would have to be modified then new drawings printed, or perhaps new models created. This can all be done in the one process now with the model that is used for the prototype can then be repurposed and sent out for production, thus saving time in making a separate prototype and product, therefore being more efficient. Some 3D printers also print in different resins that can be used for things such as moulding and casting of multiple copies of objects. This is time and cost efficient and allows smaller businesses that do not have access to large budgets to be competitive in the market.

2015 HSC Industrial Technology Metal and Engineering Technologies Mapping Grid

Section I

Question	Marks	Content	Syllabus outcomes
1	1	Tools and machinery	H1.2
2	1	Materials	H1.2, H4.2
3	1	Materials	H2.1
4	1	Tools and machinery	H1.2
5	1	Materials	H2.1
6	1	Processes, tools and machinery	H2.1
7	1	Processes	H2.1
8	1	Tools and machinery	H2.1
9	1	Processes	H3.2
10	1	Processes	H1.2, H3.2

Section II

Question	Marks	Content	Syllabus outcomes
11	1	Materials	H1.2, H4.1
12	3	Processes, tools and machinery	H1.2, H2.1
13	3	Materials and processes	H1.2
14	3	Processes, tools and machinery	H1.2, H7.2
15	5	Processes, tools and machinery	H1.2, H3.1, H4.1, H4.2, H4.3

Section III

Question	Marks	Content	Syllabus outcomes
16 (a)	5	Structural considerations	H1.1, H2.1, H6.1, H6.2
16 (b)	10	Structural considerations	H1.1, H2.1, H7.2