2019 HSC Industrial Technology
Metal and Engineering Technologies
Marking Guidelines

Section I

Multiple-choice Answer Key

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

Section II

Question 11

Criteria	Marks
• Correctly identifies purpose of a safe edge on a file	1

Sample answer:

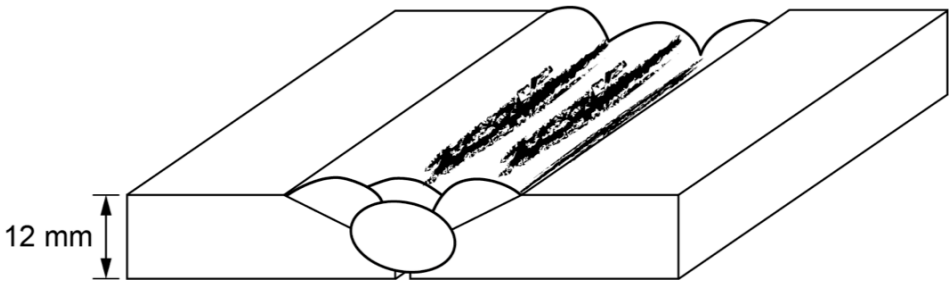
Used to protect the adjacent perpendicular surface.

Question 12

Criteria	Marks
• Provides the correct procedure for arc welding the mild steel plates • (Note: it requires more than one run)	2
• Provides some relevant information	1

Sample answer:

1. Lay first weld in middle using an arc welder
2. Lay further welds on top of both sides due to the thickness of the plates.



Question 13

Criteria	Marks
• Correctly calculates the cost of the sheet metal required	3
• Provides some sequencing in the calculation cost of the sheet metal	2
• Provides a basic understanding in the calculation cost of the sheet metal	1

Sample answer:

Area of base = 0.25m Area of sides = 1.0m Total area = 1.25m
Cost = $1.25 \times \$20 = \$25$

Question 14

Criteria	Marks
• Provides a logical and sequential procedure for centring the round bar in the jaw chuck prior to machining the end	4
• Provides sequencing towards centring the round bar in the jaw chuck prior to machining the end	3
• Provides some actions in centring the round bar in the jaw chuck prior to machining the end	2
• Provides some relevant information	1

Sample answer:

1. Place the stock in the chuck.
2. Roughly align on centre using guide rings on chuck and loosely tighten it.
3. Using a dial indicator, take a high and a low reading.
4. Slightly loosen the jaw (or jaws) nearest the low reading.
5. Slightly tighten the jaw (or jaws nearest the high reading.
6. Hand turn the chuck and check the dial indicator readings.
7. Repeat steps 3 and 4 until there is very little or no movement of the dial indicator.

Question 15

Criteria	Marks
• Provides similarities or differences of the processes of hot rolling and cold rolling including the end result for each	5
• Provides characteristics and features of the processes of hot and cold rolling	3–4
• Sketch in general terms the processes of hot rolling and/or cold rolling	2
• Provides some relevant information	1

Sample answer:

In hot rolling, red hot (above recrystallisation temperature steel) is passed through rollers with shrinkage on cooling, whereas in cold rolling, steel is passed through rollers at room temperature or slightly above room temperature with no shrinkage on cooling.

The end result for hot rolling is a steel with a blackish finish due to the scale forming on the outside, whereas the end result for cold rolling is a steel with a bright finish.

Section III

Question 16 (a)

Criteria	Marks
• Provides a detailed description of how new or emerging technologies have benefited the metal and engineering technologies industry	5
• Shows a sound understanding of how new or emerging technologies have benefited the metal and engineering technologies industry	4
• Shows some understanding of how new or emerging technologies have benefited the metal and engineering technologies industry	2–3
• Provides some relevant information	1

Sample answer:

Examples of new and emerging technologies could include: 3D printing, battery development, mobile phone accessories and robots.

3D printing provides a visual graphical model that can aid the design process and the development of realistic simulations and the production of individual units. The development of recent battery technology allows for the extended off-line use of technical equipment. Mobile phone accessories have enhanced communication across the work force as well as providing a means for using more sophisticated apps to carry out on-site data collection. Robots support and provide access to flexible manufacturing systems (FMS) because they can be relatively easily reprogrammed and positioned as necessary to carry out specific and repetitive tasks.

New and emerging technologies have greatly benefitted the multimedia industry. New technology has allowed the multimedia industry to be highly innovative, whilst also improving the efficiency and quality of products and services. It has enabled more comprehensive communication between managers and employees, as well as provide customers with a diverse and engaging customer experience. The efficiency and quality of multimedia products has greatly improved as a result of emerging technology. Manual labour and old mechanised processes can be replaced to improve efficiency.

New and emerging technologies can have multiple benefits to the timber industry, such as increases in productivity, accuracy and quality of work and/or products. With the increase in the quality of a product, the industry benefits from increased revenue and profit, and increase in customer satisfaction, leading to a better image for the company within the general public, leading to increased sales.

The introduction of computer numerical control (CNC) machines to an industry can have many benefits. A decrease in worker injury due to the fact that tedious processes are being done by a machine 24/7. CNC removes the issue of human error, as it can reproduce the same product, repeatedly with accuracy. Adaptability is another benefit, as CNC machines can be easily set to run different ‘part’ programs with the addition of a change in code. All of these improves the use of time in a business, which in turn can increase the profit margin for a business.

Regenerative braking is used in vehicles to recharge the battery when the brakes are applied. The kinetic energy from the movement of the car is turned into electric energy and stored in the battery. This means the engine has turned into a generator, converting energy so that it can be stored and reused. This is beneficial to the environment because it is recycling energy, which in turn boosts the image of the car manufacturer which is beneficial to the industry.

Question 16 (b)

Criteria	Marks
• Provides a detailed discussion of strategies to overcome employee resistance providing points for and/or against	10
• Provides a sound discussion of strategies to overcome employee resistance providing points for and/or against	8–9
• Provides some discussion of a strategy(ies) to overcome employee resistance providing points for and/or against	5–7
• Sketches in general terms a strategy(ies) to overcome resistance to emerging technologies	3–4
• Provides some relevant information	1–2

Answers could include:

Employers: • Conduct a cost/benefit analysis • Investigate government support • Need to develop a sound business plan • Benefits of possible staff reduction costs • Benefits of increased productivity/efficiency • Reduction in use of raw materials • Waste reduction • Improved WHS • Consultation with employees • Offer of voluntary redundancies	Employees: • Opportunity for upskilling • Reluctance to learn new ideas • Possibility of loss of employment • Possible increased remuneration • Increased opportunities for overtime • Cleaner work environment • Opportunity for more interesting work • Improved WHS

2019 HSC Industrial Technology Metal and Engineering Technologies Mapping Grid

Section I

Question	Marks	Content	Syllabus outcomes
1	1	Processing/marking out	H4.1
2	1	Materials — properties – brass	H4.3
3	1	Materials — modifications – annealing	H4.1, 4.3
4	1	Materials — properties – cast iron	H4.3
5	1	Materials — producing metals – Bessemer	H1.3
6	1	Materials — properties – steel manufacture	H1.2, 4.3
7	1	Processing — processes – joining	H4.3
8	1	Tools and machinery — micrometer	H4.1
9	1	Materials — properties – carbon	H4.3
10	1	Tools and machinery — water jet cutting	H1.2

Section II

Question	Marks	Content	Syllabus outcomes
11	1	Tools — files	H2.1, 4.1
12	2	Processes — welding – arc	H3.1, 4.1
13	3	Processes — marking out	H3.2, 5.1
14	4	Tools and machinery	H1.2, 4.1
15	5	Shaping metal	H1.2, 4.3

Section III

Question	Marks	Content	Syllabus outcomes
16 (a)	5	Emerging technology — technical personnel p19	H1.2, H7.2
16 (b)	10	Emerging technology — personnel p19, p20	H1.2, H7.2