



NSW Education Standards Authority

2019 HIGHER SCHOOL CERTIFICATE EXAMINATION

Industrial Technology

Metal and Engineering Technologies

General Instructions

- Reading time – 5 minutes
- Working time – $1\frac{1}{2}$ hours
- Write using black pen
- Draw diagrams using pencil
- Calculators approved by NESA may be used
- Write your Centre Number and Student Number at the top of page 5

Total marks: 40

Section I – 10 marks (pages 2–4)

- Attempt Questions 1–10
- Allow about 20 minutes for this section

Section II – 15 marks (pages 5–7)

- Attempt Questions 11–15
- Allow about 35 minutes for this section

Section III – 15 marks (page 9)

- Attempt Question 16
- Allow about 35 minutes for this section

Section I

10 marks

Attempt Questions 1–10

Allow about 20 minutes for this section

Use the multiple-choice answer sheet for Questions 1–10.

- 1** What is the main purpose of centre punching a piece of metal prior to drilling a hole?

 - A. To prevent wandering
 - B. To create a pool for lubricant
 - C. To speed up the drilling process
 - D. To break the surface tension of the metal

- 2** Which combination of metals makes brass?

 - A. Copper and tin
 - B. Copper and zinc
 - C. Tin and manganese
 - D. Manganese and zinc

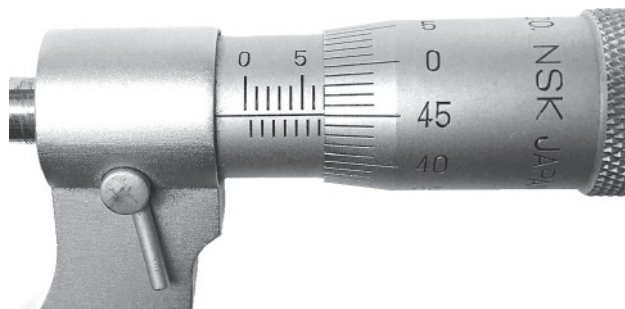
- 3** What is the main reason to anneal metals?

 - A. To increase hardness
 - B. To increase durability
 - C. To improve workability
 - D. To improve conductivity

- 4** How is cast iron different from bright steel?

 - A. It contains less carbon
 - B. It is more difficult to file
 - C. It shatters more easily on impact
 - D. It requires a lubricant when machining

- 5 Which of the following occurs in the Bessemer steel-making process?
- A. Air is forced through molten pig iron.
 - B. Pig iron ingots are cast in sand moulds.
 - C. Steel is produced in continuous lengths.
 - D. Silicon and manganese are added to the molten mix.
- 6 Which manufacturing process would NOT be used to produce bright steel rod?
- A. Drawing
 - B. Extrusion
 - C. Hot rolling
 - D. Cold rolling
- 7 In which situation would a spring washer be required?
- A. When a spacer is needed
 - B. When fastening dissimilar metals
 - C. When vibration may cause loosening
 - D. When soft surfaces need to be protected
- 8 A micrometer is shown.



What is the reading shown on the micrometer?

- A. 6.45
- B. 6.95
- C. 7.45
- D. 7.95

- 9 Which of the following lists the materials in order of increasing carbon content?
- A. Tool steel, mild steel, cast iron
 - B. Cast iron, mild steel, tool steel
 - C. Mild steel, cast iron, tool steel
 - D. Mild steel, tool steel, cast iron
- 10 Which set of characteristics best describes the process of water jet cutting?

	<i>Running cost</i>	<i>Heat distortion</i>	<i>Cutting process</i>	<i>Axis cutting</i>
A.	High	High	Only cut through	Two
B.	Low	Low	Usually cut through	Multi
C.	High	Low	Only cut through	Multi
D.	Low	High	Usually cut through	Two

--	--	--	--	--

Centre Number

Industrial Technology
Metal and Engineering Technologies

--	--	--	--	--	--	--	--	--	--

Student Number

Section II

15 marks

Attempt Questions 11–15

Allow about 35 minutes for this section

Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response.

Show all relevant working in questions involving calculations.

Question 11 (1 mark)

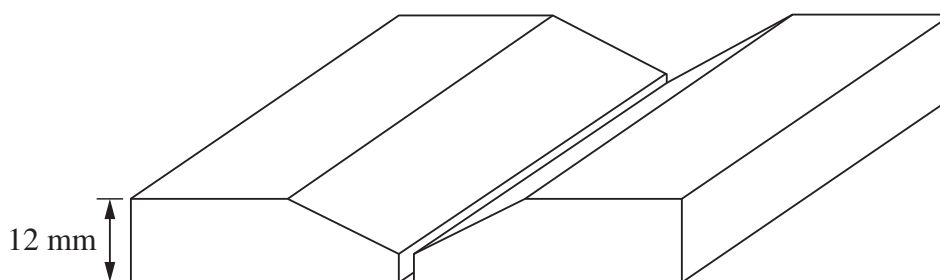
What is the purpose of a safe edge on a file?

.....

.....

Question 12 (2 marks)

The diagram shows two mild-steel plates to be joined.



Describe the procedure for arc welding a joint on the mild-steel plates. You may sketch on the diagram provided to support your answer.

.....

.....

.....

.....

.....

Question 13 (3 marks)

The materials list shows the galvanised sheet metal required to make a metal box.

<i>Part</i>	<i>L</i> (mm)	<i>W</i> (mm)	<i>T</i> (mm)	<i>Quantity</i>
Base	500	500	0.55	1
Sides	500	500	0.55	4

If the sheet metal costs \$20 per square metre, what will be the total cost of these parts? You may ignore waste.

.....

.....

.....

.....

.....

.....

Question 14 (4 marks)

Provide a procedure for centring a piece of bright round bar ($\text{Ø}30 \text{ mm} \times 50 \text{ mm}$ long) in a four-jaw chuck prior to machining the end.

.....

.....

.....

.....

.....

.....

.....



Question 15 (5 marks)

Compare the processes of hot rolling and cold rolling steel. Include the end result of each process in your answer.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....





BLANK PAGE



Industrial Technology

Metal and Engineering Technologies

Section III

15 marks

Attempt Question 16

Allow about 35 minutes for this section

Answer the question in the Section III Writing Booklet. Extra writing booklets are available.

Question 16 (15 marks)

Answer part (a) of the question on pages 2–4 of the Writing Booklet.

- (a) Describe how new and emerging technologies have benefited the metal and engineering industry. Provide examples to support your answer. **5**

Answer part (b) of the question on pages 5–8 of the Writing Booklet.

- (b) Discuss strategies an employer could adopt to overcome employee resistance to the implementation of new and emerging technologies in the metal and engineering industry. **10**

End of paper

BLANK PAGE