



Oxford Cambridge and RSA

**Tuesday 14 June 2022 – Afternoon**

**Level 1/2 Cambridge National In Engineering  
Manufacture**

**R109/01** Engineering materials, processes and production

**Time allowed: 1 hour**



No extra materials are needed.



Please write clearly in black ink. **Do not write in the barcodes.**

Centre number      Candidate number

First name(s) \_\_\_\_\_

Last name \_\_\_\_\_

**INSTRUCTIONS**

- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. You can use extra paper if you need to, but you must clearly show your candidate number, the centre number and the question numbers.
- Answer **all** the questions.

**INFORMATION**

- The total mark for this paper is **60**.
- The marks for each question are shown in brackets [ ].
- Dimensions are in millimetres unless the question says something different.
- Quality of written communication will be assessed in questions marked with an asterisk (\*).
- This document has **12** pages.

**ADVICE**

- Read each question carefully before you start your answer.

Answer **all** the questions.

- 1 (a) A list of different types of engineering materials is given below.

**brass**  
**lead**  
**polypropylene**  
**steel**  
**titanium**  
**urea-formaldehyde**

- (i) Select a material from the list above that is used in the production of each item shown in the table below.





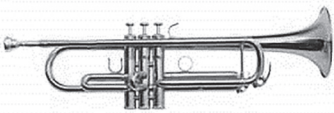
Write the name in the 'Material' column, next to the item.

[4]

- (ii) Place a tick (✓) to show which material group the selected material belongs to.

One has been completed for you.

[4]

Item	Material	Material group			
		Ferrous	Non ferrous	Thermoplastic	Thermosetting
Electrical socket 	urea-formaldehyde				✓
Food can 					
Glasses frame 					
Sports drink bottle 					
Trumpet 					

(b) (i) State which group of materials epoxy resin belongs to.

..... [1]

(ii) State **one** use for epoxy resin.

..... [1]

2 (a) Fig. 1 shows a toolbox made from mild sheet steel.

Fig. 1



(i) State **one** method that could be used to join the mild sheet steel at the corner of the toolbox where indicated, without using heat.

..... [1]

(ii) Explain why it would not be appropriate to put a continuous weld on the sides of the toolbox.

.....  
.....  
.....  
..... [2]

(iii) State **two** alternative appropriate materials that the toolbox could be made from.

1 .....  
2 ..... [2]

(iv) Give **one** property for **each** material in **part (a)(iii)**.

1 .....  
2 ..... [2]

(b) Fig. 2 shows a car door being assembled using spot welding.

Fig. 2



State why welding at small points along the corner joint is used instead of a continuous seam weld.

.....  
..... [1]

(c) State the meaning of ductility and conductivity:

ductility

.....  
.....

conductivity

.....  
..... [2]

3 (a) Complete the table by selecting an appropriate surface finish from the list below.

**electroplating      galvanising      finishing      polishing      powder coating**

Each surface finish may be selected once, or not at all.

Item	Surface finish
Alloy car wheel 	
Chrome mixer tap 	
Copper bracelet 	
Mild steel garden incinerator 	

[4]

(b) Explain what is meant by the term 'finishing'.

.....

.....

..... [2]

(c) Give **one** example when finishing may be used.

..... [1]

(d) State **one** use for each of the following smart materials.

(i) Quantum Tunnelling Composite (QTC)

..... [1]

(ii) Thermochromic material

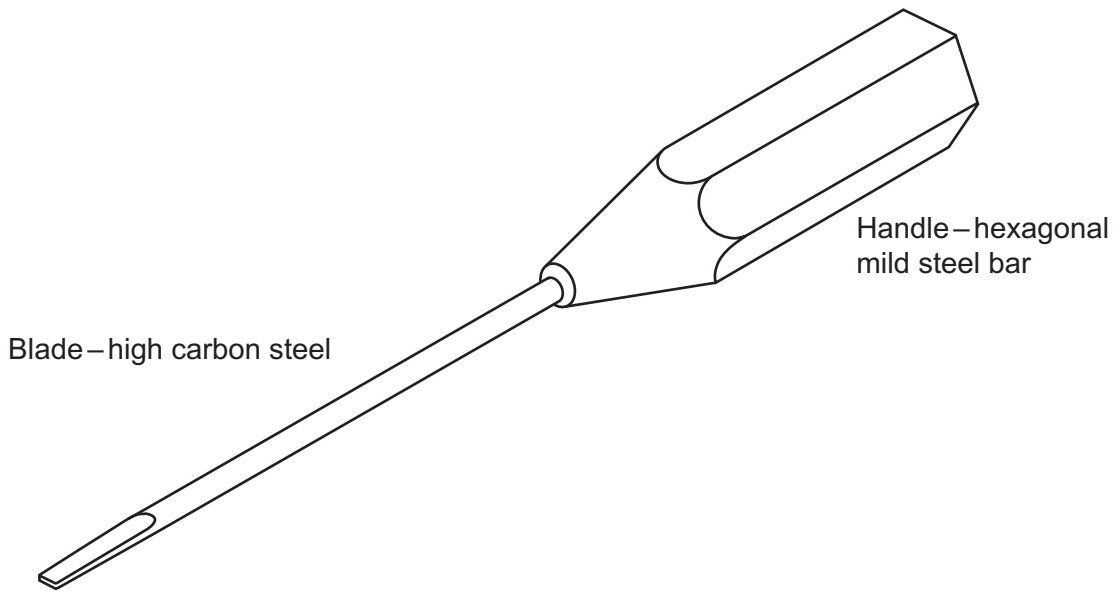
..... [1]

(iii) Shape-memory plastic

..... [1]

4 (a) Fig. 3 shows a screwdriver that has been made in a school workshop.

Fig. 3



(i) Name the machine that can be used to cut the taper on the screwdriver handle.  
..... [1]

(ii) State which heat process can be used to join the screwdriver blade to the handle.  
..... [1]

(iii) The blade has been hardened but needs to be tempered.  
Describe the process of tempering the screwdriver blade.  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
..... [4]





5 (a) Explain the benefits of using CNC machines rather than traditional production methods.

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
..... [4]

(b) Name **two** types of CNC machines used in engineering production.

1 .....

2 ..... [2]

(c) State **two** disadvantages of introducing CNC machines to a production line.

1 .....

2 ..... [2]

(d) State **two** advantages for the workforce of introducing CNC machines.

1 .....

2 ..... [2]

6 (a) Complete the following giving the meaning for **CAD**.

**C** ..... **A** ..... **D** ..... [1]

(b) Explain how CAD benefits product development.

.....

.....

.....

.....

.....

.....

.....

..... [3]

