Modified Enlarged 24pt

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

# Tuesday 14 June 2022 – Afternoon

# Level 1/2 Cambridge National In Engineering Manufacture

# R109/01 Engineering materials, processes and production

**Time allowed: 1 hour**
**plus your additional time allowance**

**No extra materials are needed.**

**Please write clearly in black ink.**

**Centre number** | | | | | |

**Candidate number** | | | | |

**First name(s)** _____

**Last name** _____

# READ INSTRUCTIONS OVERLEAF

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DC (EF/SG) 319761

*1153202750*

## 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 (*).**

## ADVICE

**Read each question carefully before you start your answer.**

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**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]

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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
LINISHING
POLISHING
POWDER COATING

Each surface finish may be selected once, or not at all. [4]

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

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

_____

_____

_____ [2]

(c) Give ONE example when linishing 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]**

(b) **Just-in-Time (JIT) delivery is used in industry for material supply.**

**Explain the advantages of JIT.**

_____

_____

_____

_____

_____

_____

_____

_____ **[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]

(c)* Modern technologies used in engineering production have led to increased use of automation. Discuss the impact of automation on engineering production output. [6]

# END OF QUESTION PAPER

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