DTBase©

Design & Technology
Edexcel GCSE

Non-ferrous Metals

Materials required for questions

- Pencil
- Rubber
- Calculator

Instructions

- Use black ink or ball-point pen
- Try answer all questions
- Use the space provided to answer questions
- Calculators can be used if necessary
- For the multiple choice questions, circle your answer

Advice

- Marks for each question are in brackets
- Read each question fully
- Try to answer every question
- Don’t spend too much time on one question

Good luck!

Q1. Which one of the following is a non-ferrous metal?

A Mild steel

B Aluminium

C Cast iron

Q2. Brass is an alloy of which two metals?

A Copper and zinc

B Copper and tin

C Aluminium and copper

Q3. Which non-ferrous metal is the best conductor of electricity, so is used for electrical wires?

A Tin

B Zinc

C Copper

Q4. Which property describes a metal that can be drawn out into thin wire without breaking?

A Hardness

B Ductility

C Malleability

Q5. Which property describes a material that resists scratching, wear and denting?

A Hardness

B Ductility

C Flexibility

Q6. Why do non-ferrous metals not rust?

A They contain no iron

B They are always painted

C They are magnetic

Q7. A storage box for a bathroom is made from brass and polyvinyl chloride (PVC).

Q7a. Brass is an alloy. Identify the two primary metals that brass contains. **(2 marks)**

Metal 1:

Metal 2:

Q7b. Give one property of brass that makes it suitable for the storage box. **(1 mark)**

Q8. The pins of a 3-pin plug are made from brass. Brass is an alloy of copper and zinc in the ratio of 13:7 (13 parts copper to 7 parts zinc).

Calculate how much copper is required to make 50 kg of brass. **(2 marks)**

Q9. Three wire flowers for some jewellery are made by wrapping copper wire around different-sized circles on a bending jig.

Explain one reason why copper wire was used to make the flowers. **(2 marks)**

Q10. A model boat drive system uses a motor, a pulley and a pulley belt. The pulley is made from aluminium.

Explain one reason for manufacturing the pulley from aluminium rather than mild steel. **(2 marks)**

Q11. A desk lamp is powered by a USB lead connected to a laptop. The USB lead has copper wires inside.

Explain two working properties of copper that make it an ideal material for the wires inside the USB lead. **(4 marks)**

1

2

Q12. A cuff bracelet is made from aluminium with a decorative finish applied.

Identify two properties that make aluminium a suitable metal for the cuff bracelet. **(2 marks)**

1

2

Q13. Parts of a children's construction kit are made from aluminium.

Explain two reasons why aluminium could be considered a sustainable material. **(4 marks)**

1

2

Answers

Q1. B
Q2. A
Q3. C
Q4. B
Q5. A
Q6. A

Q7a.

One mark for each correct answer. Only these answers are acceptable:

- Copper (1)
- Zinc (1)

Q7b.

Any one property suited to the bathroom (1 mark): corrosion resistant; tarnish resistant; malleable/ductile; durable; tough; can be polished for shine.

Q8.

- Correct calculation of ratios: 50 / (13 + 7) = 2.5 (1)
- Correct answer: 2.5 × 13 = 32.5 kg (1)
- Award full marks for the correct answer without working.

Q9.

Any one reason for using copper for the flowers (1 mark) and a linked justification (1 mark):

- It is malleable/easily bent/formed (1), which means it will hold its shape once formed/stay in that shape without any other treatment (1)
- It is a ductile material (1), which means it can be drawn out into the long thin wires needed (1)
- It is a nice colour (1) and can be left without any additional surface finish/natural finish (1)
- It will not rust (1), which would make the jewellery change colour/leave a mark or stain on clothing (1)

Q10.

Any one reason for using aluminium rather than mild steel (1 mark) and a linked justification (1 mark):

- Aluminium is a non-ferrous metal (1), therefore it will not rust if it comes into contact with water (1)
- Mild steel is a ferrous metal/contains iron (1), therefore it is likely to rust/corrode (1)
- Aluminium is lighter/less dense than mild steel (1), therefore it will add less weight to the boat/it gets up to speed quicker (1)
- Aluminium has a lower melting point than mild steel (1), which makes it easier/cheaper to cast (1)
- Aluminium is softer than mild steel (1), which means it is easier to machine/turn on a lathe (1)

Q11.

Any two working properties of copper explained (1 mark each) plus a linked justification of each property (1 mark each), up to 4 marks:

- Copper is an electrical conductor/has low electrical resistance (1), which means a current can flow through it to power/light the LEDs (1)
- Copper is ductile (1), which means it can be drawn down into very thin/fine wires (1)
- Copper is malleable (1), which means it can be bent/flexed around corners without breaking (1)

Q12.

One mark for each property, up to two marks: malleable; lightweight/low density; corrosion resistant; non-toxic; durable; high strength to weight ratio. Credit any other appropriate response.

Q13.

Any two explanations that include a reason (1 mark) and a linked justification (1 mark), up to 4 marks:

- Recycled aluminium is readily available (1), therefore reducing the need for raw materials/ore to be extracted from the ground (1)

- Recycling aluminium uses lower levels of energy compared to alternative metals (1), therefore the overall impact on the environment is reduced (1)
- Aluminium is a relatively lightweight material (1), which means less energy is used/fewer emissions are created during transportation (1)
- Aluminium is easily recycled at the end of its useful life (1), so once discarded the parts can be easily sorted and recycled (1)