

Design & Technology

Edexcel GCSE

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 ferrous metal?

- A** Aluminium
- B** Cast iron
- C** Copper

Q2. What is the main element in all ferrous metals?

- A** Iron
- B** Zinc
- C** Tin

Q3. Which metal contains the most carbon?

- A** Mild steel
- B** High carbon steel
- C** Cast iron

Q4. Which element is added to steel to make stainless steel corrosion resistant?

- A** Chromium
- B** Carbon
- C** Lead

Q5. Which property describes a material that can be hammered into shape without cracking?

- A** Brittleness
- B** Malleability
- C** Hardness

Q6. Which ferrous metal is used for drill bits because it stays hard when hot?

- A** Mild steel
- B** Cast iron
- C** High speed steel

Q7. A frying pan is made from cast iron.

Q7a. Cast iron is hard, therefore it does not scratch easily. Explain one other advantage of using cast iron for the frying pan. **(2 marks)**

Q7b. Cast iron contains 2% carbon. The cast iron frying pan weighs 3 kg. Calculate how many grams of carbon are in the cast iron frying pan. **(2 marks)**

Q8. A workshop vice is made from cast iron.

Give a property of cast iron that makes it suitable for the workshop vice. **(1 mark)**

Q9. A solar powered garden light is held off the ground by a stainless steel support that is pushed into the ground.

Explain one reason for using stainless steel for the support. **(2 marks)**

Q10. A tool hook for hanging tools on a wall is made from mild steel. It is bent into a curve and then dip coated.

Give two different properties of mild steel that make it an appropriate choice of material for the tool hook. For each property, explain one advantage of using mild steel for the tool hook. **(6 marks)**

Property 1:

Property 2:

Q11. The chains that help attach the mast to a playground sailing ship are made from stainless steel, which is a ferrous metal.

Give two reasons for using stainless steel for the chains. **(2 marks)**

1

2

Answers

Q1. B

Q2. A

Q3. C

Q4. A

Q5. B

Q6. C

Q7a.

Any one advantage of using cast iron for the frying pan (1 mark) and a linked justification (1 mark). Do not accept anything related to melting:

- It is a good conductor of heat (1), therefore the pan surface gets hot quickly/transfers heat to the food to cook it (1)
- It is dense/heavy (1), therefore it will be stable on the oven top/unlikely to get knocked over (1)
- It has good dimensional stability when heated (1), therefore the pan will not distort/buckle (1)
- It holds the heat well (1), meaning it stays hot for longer (1)
- It has a high melting point (1), therefore it can withstand the temperatures involved in cooking (1)

Q7b.

- Correct conversion of units: 3 kg = 3000 grams (1)
- Correct answer: $3000 \times 2/100 = 60$ grams (1)
- If no conversion of units: $3 \times 2/100 = 0.06$ (worth 1 mark)

Q8.

Any one property (1 mark): hard/hardness/good resistance to wear/hard wearing; compressive strength; good fluidity/casts well. Do not accept unqualified "strong" or "strength". Do not accept brittle.

Q9.

Any one reason for using stainless steel (1 mark) and a linked justification (1 mark):

- Stainless steel is hard/has good compressive strength (1), therefore it can be pushed into the ground without bending/deforming (1)
- Stainless steel is resistant to corrosion (1), therefore it will not rust in the wet/damp ground/keeps its appearance (1)
- Stainless steel is tough (1), which means it can be knocked into the ground with a hammer/withstand bumps from a lawnmower (1)

Q10.

Any two explanations that include a property (1 mark), plus two linked justifications of that property (1 mark + 1 mark), up to 6 marks:

- It is tough (1), which means it can withstand knocks and bumps (1), therefore it will have a long service life (1)
- It is ductile/malleable (1), which means it will not fracture when bent to shape (1), therefore it can be formed into a curve (1)
- It has good tensile strength (1), which means the hook will not stretch/deform in use (1), therefore it can support heavy tools (1)
- It can withstand relatively high temperatures (1), which means it will not deform when heated (1), therefore it can be dip coated (1)

Q11.

Two from (2 marks). Answers must suit the context; do not accept one-word answers such as "strong" without qualification:

- Resistant to wear/hard wearing/durable
- Resistant to corrosion
- Resistant to heat and fire
- Low maintenance/easy to clean
- Impact resistant/high tensile strength
- It is aesthetically pleasing