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Design & Technology
AQA A-Level

Performance characteristics of 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 ferrous metal is commonly used for engine blocks and manhole covers due to its high compressive strength?

A Low carbon steel

B Stainless steel

C Cast iron

Q2. What property makes stainless steel suitable for cutlery and surgical instruments?

A High thermal conductivity

B Corrosion resistance

C Magnetic properties

Q3. Die steel (tool steel) is a ferrous alloy known for its:

A High hardness and wear resistance

B Electrical conductivity

C Flexibility

Q4. Pewter, a non-ferrous alloy, is often used for:

A Food packaging

B Decorative items and tableware

C Electrical components

Q5. Explain why high speed steel would be a suitable material for a metal drill bit **(6 marks)**

Q6. Complete the table below to show the appropriate classification for each of the four metals by putting a cross (x) in the correct box **(4 marks)**

Metal	Ferrous metal or ferrous alloy	Non-ferrous metal	Non-ferrous alloy
Stainless steel			
Copper			
Bronze			
Low carbon steel			

Answers

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

Q5.

- HSS is an extremely hard material that resists abrasion and wear, maintaining a sharp cutting edge on the drill bit.
- HSS is capable of withstanding the high temperatures caused by the friction of cutting, without losing its hardness.
- Its resistance to wear allows it to drill other metals at high speeds.
- HSS is an alloy containing chromium that is highly resistant to corrosion allowing HSS drill bits to be used with a variety of lubricants and cutting compounds.
- HSS can be coated to improve its performance. A titanium nitride coating can be used to further reduce friction and improve performance

Q6.

Metal	Ferrous metal or ferrous alloy	Non-ferrous metal	Non-ferrous alloy
Stainless steel	x		
Copper		x	
Bronze			x
Low carbon steel	x		