

**OCR A-Level**

**Selecting Materials  
and Components in  
Design (5.1a)**

**Materials required for questions**

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- Pencil
- Rubber
- Calculator

**Instructions**

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- 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**

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- 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.** When selecting a polymer for a high-stress automotive component, which pair of factors is likely to be in the greatest conflict?

- A Aesthetics and functional performance
- B Cost and environmental considerations
- C Functional performance and cost

**Q2.** A design team chooses a carbon fiber composite for a professional racing bicycle frame. Which of the following is the **least** influential factor in this decision?

- A High strength-to-weight ratio (functional performance)
- B The prestigious, high-tech aesthetic it conveys
- C Its low embodied energy and ease of recycling

**Q3.** The decision to use Fairtrade-certified cotton in a clothing line, despite higher cost, is most directly driven by:

- A Superior functional performance (e.g., durability)
- B Enhanced aesthetic qualities
- C Ethical and social factors

**Q4.** In material selection, "cradle-to-cradle" analysis is primarily a tool for evaluating which factor?

- A Functional performance over the product lifecycle
- B Long-term environmental impact and circularity
- C Initial material cost and supply chain availability

**Q5.** The image below shows a hearing aid.



Identify a suitable specific material for the ear mould. Justify your answer. **(2 marks)**

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**Q6.** The image below shows a drawing compass.



**Q6a.** Identify a suitable metal alloy for the needle of the drawing compass (**1 mark**)

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**Q6b.** Identify two properties of the metal alloy you have identified in **6a.** that make it suitable for the needle of the drawing compass.

Justify each of your answers. (**4 marks**)

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**Q7.** The image below shows an electric iron.



Identify a suitable thermopolymer for the body of the iron. **(1 mark)**

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**Q8.** The image below shows a basketball hoop in use.



**Q8ai.** Identify a suitable ferrous metal for the ring. **(1 mark)**

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**Q8aii.** Explain why a ferrous metal has been used. **(2 marks)**

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**Q8bi.** Identify a suitable synthetic fibre for the net. **(1 mark)**

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**Q8bii.** Explain why a synthetic fibre has been used. **(2 marks)**

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## Answers

**Q1.** C

**Q2.** C

**Q3.** C

**Q4.** B

**Q5.**

Possible materials may include:

- Acrylic (1).
- Silicone (1).
- PVC (1).

Any other valid suggestion.

Justification for Silicone as an example:

- Flexible so it can fit into the ear comfortably (1).
- Transparent so that it can be discretely fitted (1).
- Malleable/ can be moulded to shape so it can be formed into the shape of ear (1).

Any other valid suggestion. Accept reference to flexibility if PP, LDPE, PVC or LSR (silicone rubber).

**Q6a.**

Possible metal alloys could include:

- High Carbon Steel (1).
- Stainless Steel (1).
- Aluminium alloy (1).
- Any other valid suggestion.

**Q6b.**

Justification could include:

High Carbon Steel:

- The carbon in the steel could be heat treated which would enable the tip to be hardened (1) so that it would not wear over time or break with the force exerted on it in use (1).
- High carbon steel has good hardness (1) and the tip will not damage easily over time (1).

- The toughness of the material would mean that it would withstand being knocked around in the school bag or pencil case (1) without snapping and increase the product life (1).

Stainless Steel:

- Resists corrosion, through the addition of alloyed elements (1) so would last longer and would not mark the paper being drawn on (1).

Any other valid justified suggestion.

**Q7.**

Possible materials may include:

- **ABS (1)**
- **PP (1)**

Any other suitable response LDPE, acrylic, PVC and PET are unsuitable due to the casing needing to be rigid.

**Q8ai.**

Possible ferrous metals may include:

- Stainless Steel (1)
- Mild steel (1)

Accept Iron/cast iron.

Steel can be accepted; high carbon steel and tool steel are unsuitable

**Q8aii.**

Possible responses may include:

- Tough/ toughness (1) so can withstand impact of being hit by ball/ there will constant impact from the ball over time (1).
- Relatively low weight of material/ good strength to weight ratio (1) so can be hung from the wall more easily (1)
- Good tensile strength/ durability of material (1) so will not break easily over time/ to last a long time in use/ or not break when hit by the ball (1).
- Malleable so it can be shaped or easily moulded (1) so it can be formed into the shape of the ring and brackets (1).
- Any other suitable response. Material properties that suit the product and situation such as toughness, durability, tensile strength are

acceptable but must be related to use of the product or its context for full marks to be awarded.

**Q8bi.**

Possible synthetic fibre may include:

- Nylon (1)
- Polyester (1)
- Polypropylene (1)
- Any other suitable response.

**Q8bii.**

Possible responses may include:

- Durable/ hardwearing over time/ long lasting (1) so it will withstand the constant impact of the ball (1).
- Will not degrade in UV light/ moisture/ water (1) as the hoop is likely to be used outside (1).
- Will be able to withstand rain wind/changes in temperature (1) without corroding/ degrading over time (1).
- Can be coloured in the manufacture to different colours (1) so could be coloured for a specific target market or team brand (1).
- The colour is in the pigment added to the material in manufacture (1) so will not fade or run if wet over time (1).
- Good elasticity (1) so if pulled will return to its original shape without warping (1)
- Resists attacks from moths/mildew/mould (1) unlike natural fibres (1).
- Any other suitable response. Material properties that suit the product and situation are acceptable but must be related to the use of the net or its context for full marks to be awarded.