

OCR A-Level

Material Forms, Costs & Suitability (5.3b)

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. A designer chooses 1.5mm thick sheet steel over 3mm thick steel for a product enclosure primarily to reduce material cost. What other property is **most likely** being sacrificed?

- A Corrosion resistance
- B Electrical conductivity
- C Structural rigidity

Q2. For a high-volume consumer product like a plastic toy, which factor often becomes the **primary constraint** in material selection?

- A Availability in a wide range of colours
- B Suitability for high-speed injection moulding
- C Ultimate tensile strength

Q3. Which combination is **most critical** when selecting a material for a load-bearing bracket in a budget-conscious project?

- A High aesthetic finish and unique colour
- B Adequate strength at the lowest cost per unit volume
- C Ease of hand fabrication

Q4. The decision to use **standard stock sizes** of materials (e.g., 8' x 4' sheets, 6m lengths) is mainly driven by:

- A Improving the material's mechanical properties
- B Reducing waste and cost compared to custom sizes
- C Enhancing the product's user experience

Q5. A designer chooses acrylic sheet over polycarbonate sheet for a display sign. State two likely reasons for this choice related to material properties, cost, or form. **(2 marks)**

Q6. Explain how the available form of a material (e.g., sheet, rod, powder, liquid resin) can influence both the design and the manufacturing process of a product. Use one specific example in your answer. **(4 marks)**

Answers

Q1. C

Q2. B

Q3. B

Q4. B

Q5.

- Acrylic is less expensive (lower material cost) than polycarbonate.
- Acrylic is easier to cut and shape (better machinability) for sign-making.
- Acrylic has better optical clarity/transparency for display purposes.
- Acrylic is available in a wider range of colours and finishes.

Q6.

- Form limits what shapes can be made (e.g., sheet metal can't make solid spheres).
- Form decides the manufacturing process (e.g., powder is for sintering, liquid resin is for casting).
- Example: Making a metal gear – requires rod/bar for machining, not sheet.

Good example linking form, design, and manufacturing gets 2 marks.

Q7.

- **Cost:** PP cheaper than ABS → better for low-cost helmets.
- **Impact resistance:** ABS tougher than PP → better for safety.
- **Weight:** PP lighter than ABS → better for lightweight helmets.
- **Ease of moulding:** Both easy, but PP shrinks more → ABS better for precise shells.
- **Surface finish:** ABS has better finish out of mould → better aesthetics.

1 mark for each clear comparison (max 3).

1 mark for each suitability judgement linked to helmet use (max 3).