

Design & Technology

AQA GCSE

Materials can be enhanced to resist and work with forces and stresses to improve functionality

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 process bonds layers of material together to add strength?

- A** Folding
- B** Lamination
- C** Webbing

Q2. What technique involves creating rigid angles or curves in materials like metal or cardboard?

- A** Fabric interfacing
- B** Bending
- C** Webbing

Q3. What is the purpose of fabric interfacing?

- A** To make materials more flexible
- B** To laminate plastic sheets
- C** To add stiffness or structure to fabrics

Q4. Which technique increases strength by creasing materials like paper or thin metal?

- A** Webbing
- B** Lamination
- C** Folding

Q5. Explain how materials can be improved by being reinforced. Give examples
(3 marks)

Q6. Describe two ways materials can be stiffened. You may use examples in
your answer **(2 x 2 marks)**

Answers

Q1. B

Q2. B

Q3. C

Q4. C

Q5.

Concrete

- Reinforced with steel bars/rods to improve resistance to tensile forces in modern architecture.

Fabrics

- Use of polymers/Vilene in shirt collars to prevent bending, creasing and stop collar from curling.
- Retain 'sharp' point on collar.
- Rivets in jeans • French seam
- Flat felled seam
- Hems
- Overlocking
- Interfacing to reinforce/stabilise/stiffen fabric.

Lamination

- Layer of timber (lamins) used in glulam construction to create longer wood beams for architecture better able to resist bending forces.
- Lamination of paper and card using a polymer wallet. This improves tear resistance and resistance to moisture preventing wood fibres from disintegrating.

Composite materials

- CRFP (Carbon reinforced polymer). Two or more dissimilar materials are joined together to create a material that is better than its constituent materials, ie best properties of both.

Ribbing/webbing/fillets/gussets

- Ribbing and webbing are used extensively in the manufacture of polymer products to reduce the quantity of material used and weight. These reinforcements increase stiffness eg polymer food packaging eg bakery, fruit

- Fillets are Intentional rounding of an internal corner to reinforce and provide additional structural support.
- Gusset/flitch plates used in engineering and textiles are a triangular shaped inset on a structural joint or seam.

Q6.

Bending

- Bending materials in a curve can stiffen and strengthen a structure, eg bridge or metal tube chair, reducing the need for too many joints.

Boss

- Additional raised or thickened metal feature used where a threaded part needs to be used. Provides additional material to accommodate a screw thread where needed rather than using a uniformly thicker piece of material adding weight and cost.

Fillets

- A curved radius on a formed polymer or metal structure or component, eg casting of injection moulding. The radius (fillet) strengthens the point of direction change in the material, eg where two sides meet. They reduce stress concentrations.

Folding

- Can add strength, impact resistance, eg corrugated cardboard as well as flexibility.

Interfacing or Vilene (brand name)

- Sewing or ironing additional layers of fabric where they are usually unseen to strengthen and add stiffness, eg shirt cuffs and collars, hats. Quilting would be another method of re-enforcing textiles as would piping.

Lamination

- Building up a material in layers forming a composite construction, eg plywood, CFRP. This increases strength, resistance to shock and impact, rigidity and moisture resistance in some cases, eg polymer cover to a cardboard/paper menu in a restaurant.

Webbing

- Additional material added (webs) to stiffen polymer chair underframes to resist excessive bending and deformation when loaded.