

Design & Technology

AQA GCSE

Prototype development

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. What is the main purpose of a prototype in product design?

- A** To decorate a presentation board
- B** To fully replace the final manufactured product
- C** To test and communicate how a design works and looks

Q2. A good prototype should primarily be developed to:

- A** Impress examiners with expensive materials
- B** Meet the needs and wants of the client
- C** Copy existing market products exactly

Q3. When developing a prototype, what does it mean for it to be *fit for purpose*?

- A** It includes as many features as possible
- B** It performs its intended function reliably
- C** It looks complex and high-tech

Q4. Why should aesthetics be considered when developing a prototype?

- A** Because looks are more important than function
- B** Because appearance can affect user satisfaction and appeal
- C** So the product performs better in testing

Q5. Describe how prototypes help designers to ensure a product is fit for its intended purpose. Give examples in your answer. **(6 marks)**

Q6. Explain the importance of evaluation when developing prototypes. Give specific examples in your answer. **(4 marks)**

Q7. Describe how material can be formed when making a prototype. **(3 marks)**

Answers

Q1. C

Q2. B

Q3. B

Q4. B

Q5.

Indicative content

Response should focus on testing of the product to ensure it meets the original product brief, client needs and wants, functionality and marketability. Is it fit for purpose and does what it should? We are not looking for generic reference to development, i.e., modelling.

- Build and test a prototype to see if it does what the design brief wants.
- A prototype allows a design or iteration to become 'real' and allows both designers and potential clients to test parts and review and see how it matches the requirements of the brief.
- Will the prototype do what the customer wants?
- Allows for rapid realisation and visualisation for testing e.g., electrical system, a part or combined components.
- Allows for parts or elements to be prototype for testing against the design brief.
- They can help refine and inform changes that need to be made to create an effective product and make safe for sale.
- Test safety for the customer and meet safety requirements e.g., BSI, CE, PAT tested.
- Will the product be marketable (sell) in terms of aesthetics/looks?
- Does the product work/function as intended for sale?
- How does it compare to similar products sold on the market?
- Prototypes allow for material and manufacturing experimentation to check marketability in terms of cost, usability before scaling up to mass production etc.
- Allow for a prototype to be physically evaluated by focus groups and potential customers. Accept all other valid responses.

Q6.

Indicative content

QUESTION IS ABOUT WHY WE TEST AND NOT HOW.

The guidance provided is illustrative and not exhaustive. Credit any worthy points made in support of the band descriptors above.

- Identify what is working well and what needs improving.
- Promote improved quality in the design.
- Allow designers to make sure prototypes are suitable for their intended user(s).
- Review of tests against both the design specification and manufacturing specification.
- Evaluate materials to be used and check their suitability, cost function etc against their intended use.
- Opinions of customer and end user need to be evaluated before prototypes become commercial products. Note: Examples could be something other than products e.g public

Accept other valid responses

Q7.

Indicative content:

The guidance provided is illustrative and not exhaustive. Credit any worthy points made in support of the band descriptors above.

Note: responses may consider deforming or reforming. Both processes involve a change in material shape without adding or removing material.

Timber based materials

- Timber strips can be steamed to make them more pliable and easier to bend.
- The timber fibres are softened and bent without tearing or rupture eg stair hand rails, musical instruments.
- Thin strips of timber can be laminated using a suitable adhesive using a former.
- Pressure is applied until the adhesive cures/set and a change in shape is made.

Metal based materials

- Bars and tubes can be bent found a former to change shape from a linear length.
- Metals can be heated (annealed) to make them easier to bend.
- Metals can be forged. Heating until red hot and shaped on an anvil.
- Metals can be formed using casting processes where the metal is heated until molten and poured into a cavity or mould to make 3d products.
- Metals can be pressed using extreme pressure eg car body panels.

Papers and boards

- Accurate folds can be produced using creasing bar on a paper or board first.
- Scoring can be used to cut fibres weakening a piece of paper or card making it easier.
- Perforations 'push' material apart (creating small holes) making it easier to tear and separate material eg tissue box lid.
- Scoring, creasing and perforations are all forming processes making it easier to perform a shape or direction change in a piece of paper or card.

Polymers

- Simple bends can be created by heating a piece of thermoplastic polymer in a straight line (using a line bender) where a bend is needed.
- 3D shapes can be created using vacuum forming over a former by heating a polymer sheet and creating a permanent form when it cools.
- Plug and yoke method can be used to form a shape in polymer sheet.
- Injection moulding of polymers to create profiles and 3D products.
- 3D printing to create a 3D prototype

Textiles

- Drape forming of felt based products like hats.
- Gathering – uses a sewing technique to increase the 'fullness' of a material or prototype eg curtains.
- Pleating – similar to gathering, but where textiles are folded and held by stitching along an edge.

Accept other valid responses.