Design & Technology
(Product Design)

DTBase©

OCR A-Level

3D Iterative Models and Prototyping (7.1a)

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 primary purpose of creating a **block model** early in the design process?

A To test the structural integrity under extreme loads

B To communicate form, size, and basic proportions of a design idea

C To create a fully functional, market-ready prototype

Q2. Which material would be most suitable for creating a **quick, low-cost block model** to test the overall size and ergonomics of a handheld device?

A High-density foam

B PLA

C Titanium foam

Q3. A "working prototype" differs from a "block model" because it:

A Is always made from the final production materials

B Tests functionality, movement, or specific features

C Is used only for aesthetic presentation to clients

Q4. The iterative nature of prototyping means that:

A Only one prototype is ever made before manufacture

B Each prototype version is used to make improvements before the next is built

C Prototypes are only used at the end of the design process

Q5. The image below shows a video selfie stick.

Explain three advantages to the designer of the selfie stick of using modelling during the iterative design process. **(6 marks)**

Q6. Give three reasons why polymorph may be used in the modelling of an ergonomic grip. **(3 marks)**

Q7. Explain why modelling is an important tool used by designers to develop prototypes. Give specific examples in your answer. **(4 marks)**

Answers

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

Q5.
Possible advantages to the designer may include:

- The initial design can be modelled very quickly and initial feedback from stakeholders given (1) to give the designer confidence in the direction of the design and saving time and money (1).
- Increases reliability of the selfie stick as the design or parts of the design can be repeatedly tested and improved (1) to make sure that they function correctly and safely e.g. the optimum length of the telescopic pole (1).
- The designer can set up focus groups/user testing and allow hands on testing in context (1) to get feedback about aesthetics/ergonomics/ usability/how to improve the design (1).
- The designer can experiment in CAD models on screen to explore different finishes and materials for the handle (1) with minimal cost and material waste (1).
- Using inexpensive modelling materials saves money/time (1) rather than making final fully working prototypes (1)
- The designer can test the comfort and ergonomics of handle design with different users with a range of block models (1) to ensure that they can comfortably reach the capture button and help to decide on the most successful design (1).
- Any other valid suggestion for given context

Q6.
Indicative content:

- Polymorph is a thermoplastic that can be easily shaped and formed when softened by heating in water to 62oC. The low temperature allows it to be moulded by hand.
- It can be reheated and remoulded enabling the shape of the grip to be refined. • It can be machined and shaped with hand tools when cooled. • It can be formed around an existing handle.

- It comes in a range of colours or can be painted in order to enhance the aesthetics of the grip.

This list is not exhaustive. Accept any other valid responses.

Q7.
Indicative content:

Examples could be – products or modelling techniques e.g. card, foam board, Toile, Circuit wizard

- Expect lots of reference to modelling used to develop a 3D impression/part or all of a prototype; visualisation
- Reduce product development times e.g. rapid prototyping
- Modelling can be undertaken using physical models made from clay, paper, card, prototyping boards, cheaper less durable easier sourced materials
- Allows the interaction of moving components to be viewed
- Non-destructive testing of materials virtually to avoid wasting real materials and components unnecessarily e.g. testing electronic circuits virtually
- Sharing of design concepts electronically via the internet (file sharing) allowing multiple persons to work on a proposal at once (collaborative design)
- Allows testing for stress under load.