DTBase©

Design & Technology
Eduqas GCSE

Selecting and working with materials and components

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 materials are best for quick modelling of the shape or scale of a prototype?

A Foam board or card

B Stainless steel

C Hardwood

Q2. Which of these is poor practice when selecting materials for a prototype?

A Choosing low-cost materials that match the test goals

B Using final materials too early and wasting resources

C Using what is available to save time and budget

Q3. Which plastic must never be laser cut?

A Acrylic

B MDF

C PVC

Q4. Why should you use standard stock sizes and standard components for a prototype?

A To save time

B To make the prototype heavier

C To make the prototype unique

Q5. Which of these is a sustainable material choice?

A Single-use plastic film

B FSC timber

C A rare imported hardwood

Q6. Why are modular components such as breadboards used when prototyping electronics?

A They are the final product

B They are waterproof

C They speed up testing

Q7. Prior to making, materials and components are selected for product function, cost and availability. Explain why each factor needs to be considered before choosing a material or component for use. (Product function, cost, availability: 2 marks each.) **(6 marks)**

Q8. Give two aesthetic considerations when selecting materials and/or components to make prototypes. **(4 marks)**

Q9. When selecting materials or components, the aesthetics and their source need to be considered by a designer.

Q9a. Explain why a designer would consider aesthetics when selecting a material or component. Give an example in your answer. **(3 marks)**

Q9b. Explain why a designer would need to consider the source of a material or component. Give an example in your answer. **(3 marks)**

Q10. A prototype play cube was made from calico. Explain one reason for using calico for the prototype play cube. **(2 marks)**

Q11. A set of new mugs has been designed with a glass container held in a separate coloured holder. When designing the new mug, the designer produced a number of 3D printed models using rapid prototyping.

Q11a. State the name of one suitable 3D printing material to make the coloured holders. **(1 mark)**

Q11b. Explain the advantages to the designer of using 3D printing when rapid prototyping the new mug. **(3 marks)**

Q12. A sweet dispenser will be made from 5 mm thick MDF with a clear plastic window. Give two reasons why it would be important to make a card model of the sweet dispenser before making it from MDF. **(2 marks)**

Q13. A storage unit with adjustable shelves is to be made from acrylic. State two important items of information that could be obtained by making either a card model or a computer-generated model of the storage unit. **(2 marks)**

Q14. Designers use a variety of modelling techniques to develop their ideas. This sometimes involves working directly with materials and components.

Q14a. Name a suitable material or system that designers might use to create a model of a design. **(1 mark)**

Q14b. Choose one of these modelling techniques: card modelling, toile or breadboard. Describe how your chosen modelling technique is used to develop products. **(6 marks)**

Answers

Q1. A
Q2. B
Q3. C
Q4. A
Q5. B
Q6. C

Q7. (6 marks)

Maximum of 2 marks for each factor (2 × 3 marks): 2 marks for two correct simple points, or one point in more detail, about how the factor is considered when choosing materials or components; 1 mark for one correct simple point. Answers must be about materials and components, not a product.

Product function

- What the material is required to do, e.g. support its own weight or the weight of something else
- What conditions it has to work under, e.g. withstand wear and tear
- What specific properties it needs, e.g. light or heavy
- Will it be fit for purpose, e.g. a simple mock-up of a non-working product, or one that has to work
- Will it be easy to work with, and can it be finished to the right quality for the prototype

Cost

- If the prototype is a mock-up, the designer will not want to spend a lot on materials
- If a lot of a material or many components are needed, can they be bought in bulk to reduce costs
- High-quality, expensive materials are not usually needed for a mock-up or prototype
- Materials that are easy to work avoid the extra cost of expensive tools or equipment
- Recycled or upcycled materials keep prototype costs down

Availability

- Can the material be easily sourced to make a mock-up or prototype quickly

- Time can be wasted ordering and waiting for materials or components to arrive
- Are they in stock with a retailer and quick to deliver; are they available in stock forms and sizes
- Readily available materials fit in with project time frames and deadlines

Q8.

Two marks maximum for each consideration: 2 marks for one consideration explained in detail, possibly with an example; 1 mark for one simple correct point. For example:

- Surface finish: does the surface need to be shiny or matt?
- Texture: the look and feel of the surface
- Colour: does the material or component need to be coloured in some way?
- Pattern: some materials have a pattern, e.g. wood grain or a fabric design, that enhances appearance
- Matching: does the material match or sit well with the other materials in the prototype?
- Will the material take a good finish? A material that will not stain, or is too flexible to be painted, may be rejected
- Will the aesthetics last, e.g. how long before it needs re-plating, painting or waxing?

Q9a.

3 marks: detailed explanation with an aesthetics-related example. 2 marks: good explanation, or basic explanation with an example. 1 mark: basic explanation or example. No mark for a named product that is not linked to aesthetics. For example:

- Can a brightly coloured finish be applied to enhance appearance, e.g. stain or paint
- Looking good makes people want to buy it
- Can the material be finished to a high quality, e.g. anodising, screen printing, embossing, varnishing
- A material that is hard to finish well may be rejected, e.g. timber with knots or interlocking grain; steel rusts in moist air
- Can a finish be applied to enhance its looks, e.g. can the fabric be dyed

Q9b.

3 marks: detailed considerations with a sourcing-related example. 2 marks: good considerations, or basic considerations with an example. 1 mark: basic consideration or example. For example:

- Is it easy to source? If not, production and deadlines are hard to meet
- Can enough be sourced for the scale of production, e.g. future lithium supply for electric vehicle batteries
- Does sourcing harm the environment, e.g. pollution or deforestation, which may put customers off
- If extraction (e.g. mining) makes it expensive, a cheaper alternative may be chosen
- Social responsibility and ethics: cheap labour, poor working conditions, harm to living creatures; fair trade materials
- Local supply compared with a global supply and its carbon footprint

Q10.

A reason (1) and a linked justification (1). For example:

- Calico is relatively cheap (1), so it keeps the cost of prototyping and developing the product down (1)
- Calico accepts a range of surface finishes (1), so colours and designs can also be tested out (1)
- Calico is rigid or stiff when sewn along a seam (1), so it holds its shape and can form a 3D shape (1)
- Calico is the same on both sides (1), so it does not matter which way round it is used (1)

Q11a.

PLA (polylactic acid) or ABS (acrylonitrile butadiene styrene) (1). Accept nylon.

Q11b.

1 mark: basic answer, e.g. 3D printing gives an accurate outcome of a CAD drawing. 2 marks: more detail, e.g. it produces a physical model of a CAD idea very quickly. 3 marks: detailed, e.g. it lets the designer turn a CAD idea into a

physical model quickly, which can then be tested and modified. Points may include:

- Ideas develop faster; concepts can be made physically the same day
- Time to market is reduced, keeping ahead of competitors
- It is additive manufacturing, so there is less waste than other methods
- It builds confidence in the product before production
- Clear communication of the product for testing and showing clients
- Shapes that are hard to make by traditional methods can be produced easily

Q12.

Any two reasons (1 mark each), e.g. it reduces costs if mistakes are made; to check the appearance; to check sizes; to test the mechanism. Accept any valid reason.

Q13.

Any two items of information (1 mark each), e.g. the right size or dimensions; whether products fit or there is enough space; appearance or aesthetics; CAD modelling allows on-screen edits including colour; how easily the shelves can be removed. Accept only one reference to dimensions.

Q14a.

Any one (1): corrugated card; grey board; foam core board; Styrofoam; MDF; calico toile; breadboarding; virtual modelling software; 3D printers. Accept any other valid answer.

Q14b. (6 marks)

Marks	Descriptor
5 to 6	A fully coherent and logical description with clear points fully explained as to how the chosen modelling technique is used to develop products.
3 to 4	Some good understanding, with points made about why the chosen modelling technique is used to develop products.
1 to 2	Limited understanding of why the chosen modelling technique is used to develop products.
0	Nothing worthy of credit.

Card modelling

- Test out parts of the design, or the whole design, in 3D and see how it might look in real life
- Check proportions and dimensions, and find fabrication problems that a 2D drawing does not show
- Saves expensive, high-quality material while mistakes and changes may still happen

Toile

- Shows how a garment might look full size (a mock-up) without spending money on expensive fabric; paper cannot do this as it does not handle like fabric
- Allows small alterations in a cheaper material, and tweaks to a sewing pattern to fit the body
- Tests construction and assembly techniques, and checks the item is right before using expensive final materials

Breadboard

- Tests whether an electronic circuit works using real components
- Confirms a circuit designed with PCB software on a computer
- Speeds up development, as no time is spent soldering components into place
- Sustainable: components can be reused and swapped while experimenting