

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education  
Advanced Subsidiary Level and Advanced Level

**DESIGN AND TECHNOLOGY**

**9705/03**

Paper 3

October/November 2004

**2 hours 30 minutes**

Additional Materials: Answer paper/answer booklet  
A3 Drawing paper (5 sheets)  
A range of design drawing equipment

**READ THESE INSTRUCTIONS FIRST**

Write your name, Centre number and candidate number in the spaces provided on the answer paper/answer booklet.

**Section A**

Answer any **two** questions from **one** of the Parts **A**, **B** or **C**.

**Section B**

Answer **one** question.

Write your answers on the separate answer paper provided.

If you use more than one sheet of paper, fasten the sheets together.

The number of marks is given in brackets [ ] at the end of each question or part question.

All dimensions are in millimetres.

The instruction 'discuss' denotes that you should:

- examine critically the issues raised by the question;
- explain and interpret these issues as appropriate;
- introduce evidence wherever possible to support conclusions of arguments.

This document consists of **9** printed pages and **3** blank pages.



**Section A**

Answer **two** questions from **one** of the Parts **A**, **B** or **C**.

**Part A – Product Design**

**1** The following materials are all used in the manufacture of products used in a kitchen.

Beech      Stainless steel      Chipboard      Polypropylene  
High carbon steel      Pine      Melamine      Aluminium      Polythene

Select **five** materials from the list given and for each:

**(a)** give an example of its use; [1 x 5]

**(b)** explain how its properties make it appropriate for the example selected. [3 x 5]

**2** Discuss how aesthetic qualities, unit costs and manufacturing processes available influence a designer when selecting materials for **one** of the following:

- a mass produced desk tidy;
- a hand-made item of jewellery;
- a set of six dining chairs. [20]

**3** Alloying, reinforcement and lamination are three methods used to modify the working characteristics of materials.

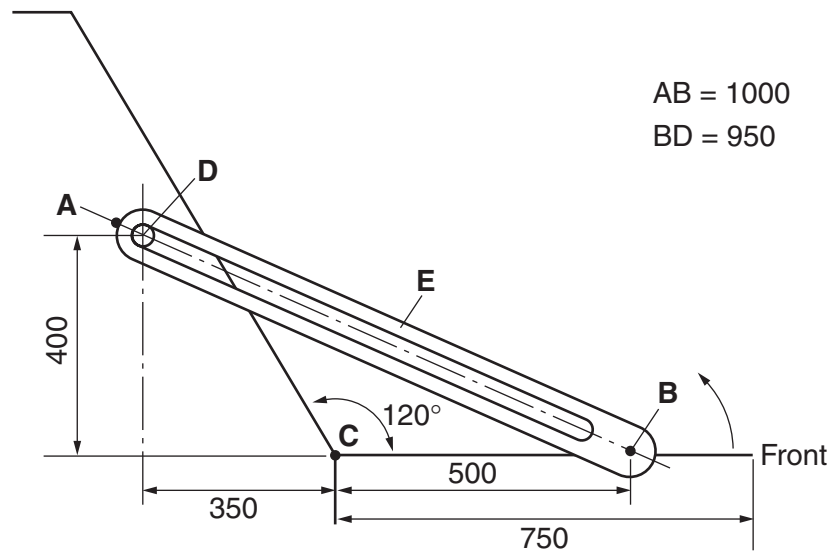
Select **two** of the methods stated and, for each, select an appropriate material to describe how its working characteristics can be improved and used to good effect. [2 x 10]

## Part B – Practical Technology

- 4 Designers often use information regarding the specific performance of materials under certain conditions.
- (a) Define the terms:
- ductility; [4]  
elasticity.
- (b) (i) Give an example of a material that is ductile and state an appropriate product application.
- (ii) Give an example of a material that is elastic and state an appropriate product application. [4]
- (c) Use sketches and notes to describe:
- (i) a test to ascertain the impact resistance of a material;
- (ii) a test to ascertain the torsional strength of a material. [12]
- 5 Select **four** products from the list below and, for each, use labelled sketches to describe a mechanism used in the function of the product.
- bicycle
  - coping saw
  - camera tripod
  - umbrella
  - folding ironing board
  - car jack
  - hand drill
- [4 x 5]
- 6 (a) Name an electronic sensor that will detect changes in:
- (i) temperature; [1]  
(ii) light. [1]
- (b) Describe an appropriate application for each sensor. [2 x 2]
- (c) Draw a circuit diagram for each application. [4 x 2]
- (d) Explain the purpose of **three** components in the circuit diagrams. [3 x 2]

## Part C – Graphic Products

- 7 Fig. 1 shows a schematic line diagram of a sliding support for a cabinet hinged front.



**Fig. 1**

Plot the locus of point **A** as the front closes. You should choose an appropriate scale.

**B** is a pin joint.

**C** is a hinge point.

**D** is a fixed pin located in the slot of the sliding support **E**.

[20]

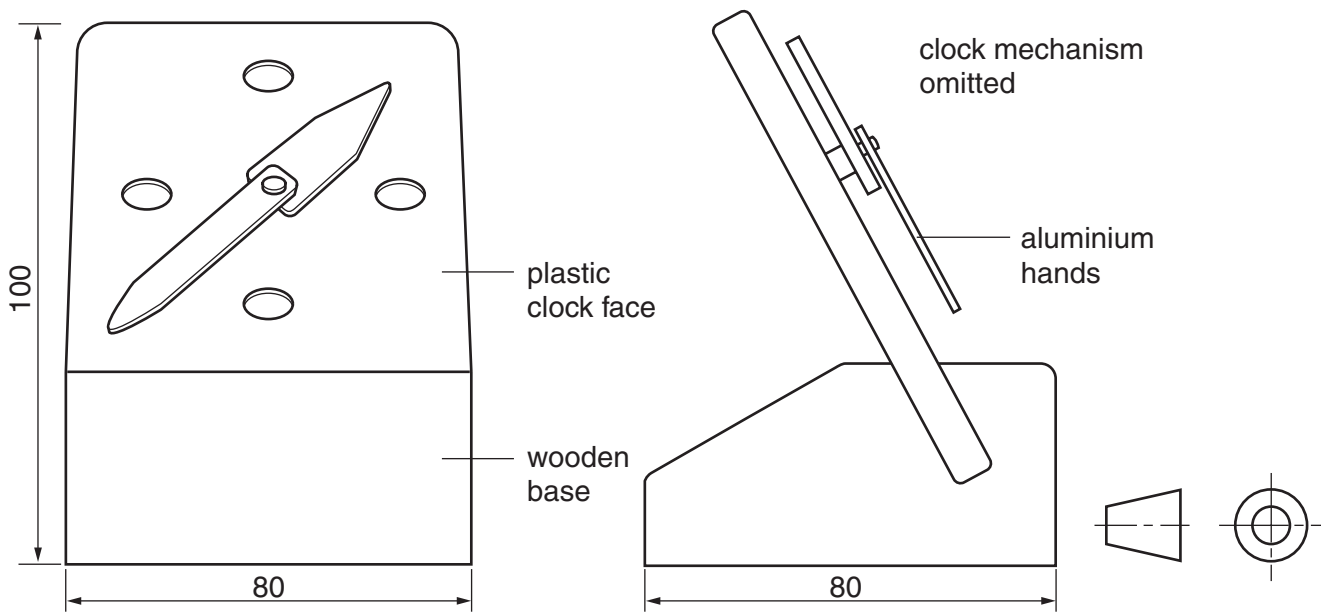
- 8 Discuss how and why a designer would use two and three-dimensional models in the design of:

(a) an aeroplane;

(b) a torch.

[10 x 2]

9 Fig. 2 shows orthographic drawings of a clock.



**Fig. 2**

- (a) Draw, approximately full size, a pictorial presentation drawing of the clock. Render the drawing to show that the base is made from wood, the clock face from polished plastic and the hands from aluminium. [12]
- (b) Produce a full size development of a card box to package the clock. It must:
- include a transparent window to view the clock face;
  - open from the top of the box;
  - include all gluing tabs.
- [8]

**Section B**

Answer **one** question on the A3 paper provided.

You should approach the design question of your choice in the following manner:

**Analysis**

Produce an analysis of the given situation/problem, which may be in written or graphical form. [5]

**Specification**

From the analysis produce a detailed written specification of the design requirements. [5]

**Exploration**

Use bold sketches and brief notes to show your exploration of ideas for a design solution, with reasons for selection. [25]

**Development**

Show using bold sketches and notes, the development, reasoning and composition of ideas into a single design proposal. Give details of materials, constructional and other relevant technical details. [25]

**Proposed solution**

Produce drawings of an appropriate kind to show the complete solution. [15]

**Evaluation**

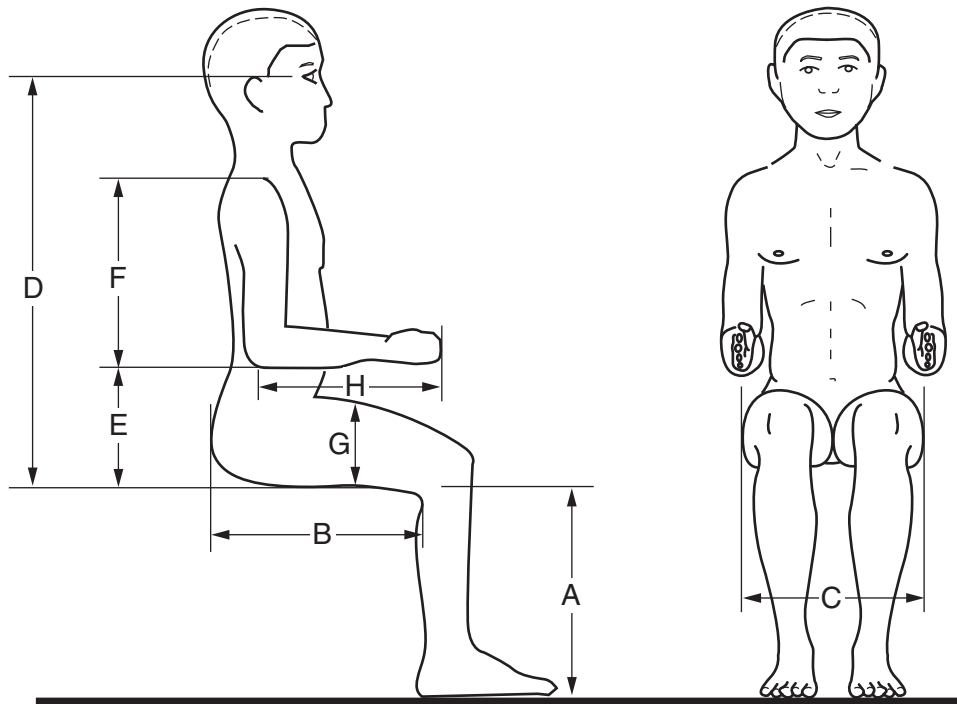
Give a written evaluation of the final design solution. [5]

[Total: 80]

- 10** A school for students from 11 – 18 years of age requires new examination desks. The desk surface must measure 650 x 550. Design a desk that is capable of:

- accommodating one student;
- being folded away for storage;
- being quickly erected and locked into a safe position for use.

To assist you in your design work, anthropometric data is given in Fig. 3.



| Age | Ht   | Wt(kg) | A   | B   | C   | D   | E   | F   | G   | H   |
|-----|------|--------|-----|-----|-----|-----|-----|-----|-----|-----|
| 11  | 1430 | 36.5   | 375 | 395 | 265 | 620 | 200 | 300 | 120 | 385 |
|     | 1440 | 38.0   | 375 | 410 | 280 | 635 | 200 | 300 | 125 | 385 |
| 13  | 1550 | 45.5   | 405 | 435 | 290 | 680 | 210 | 325 | 130 | 420 |
|     | 1550 | 47.5   | 390 | 445 | 315 | 695 | 210 | 325 | 135 | 410 |
| 15  | 1690 | 57.0   | 430 | 480 | 320 | 755 | 225 | 355 | 140 | 460 |
|     | 1610 | 54.5   | 400 | 470 | 335 | 735 | 225 | 335 | 140 | 425 |
| 18  | 1760 | 67.0   | 445 | 500 | 340 | 800 | 245 | 370 | 160 | 480 |
|     | 1620 | 56.5   | 405 | 480 | 345 | 745 | 230 | 335 | 145 | 425 |

Upper numbers are for boys. Lower numbers are for girls.

**Fig. 3**

- 11 Many families enjoy quizzes. Some quizzes do not provide a timer to indicate how long a player can take on a question.

Design a timer that is capable of:

- giving a visual and audible signal every 60 seconds;
- having easily changeable batteries;
- being easily reset.

Include details of the circuit diagram required for your proposed solution.

To assist you in your answer, the dimensions of common batteries are given in Fig. 4.

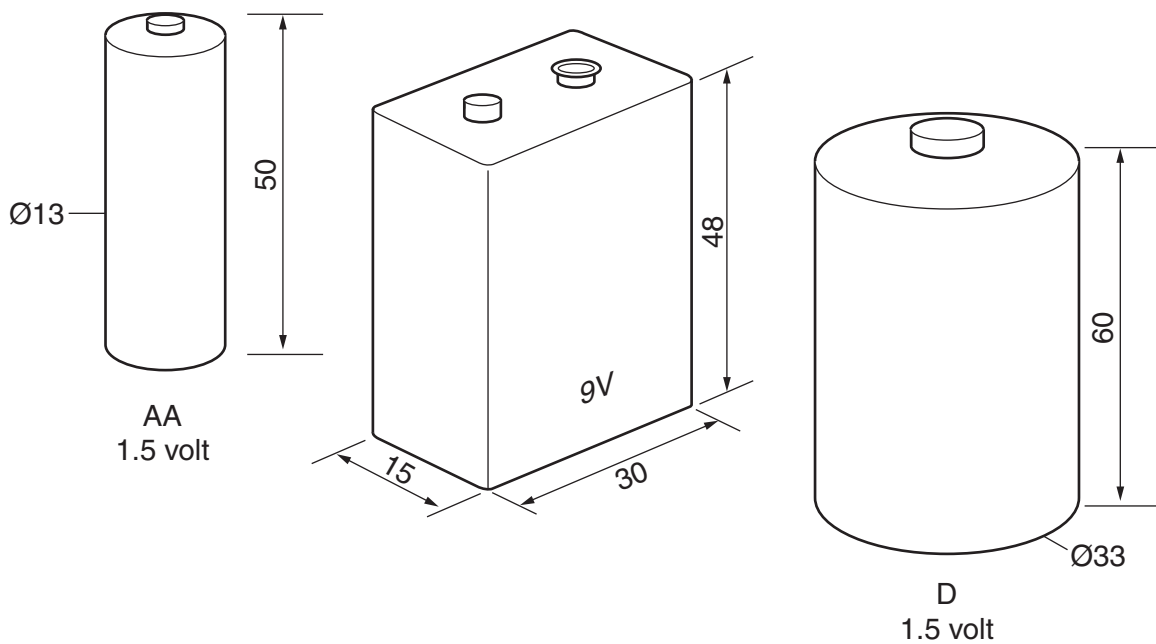


Fig. 4

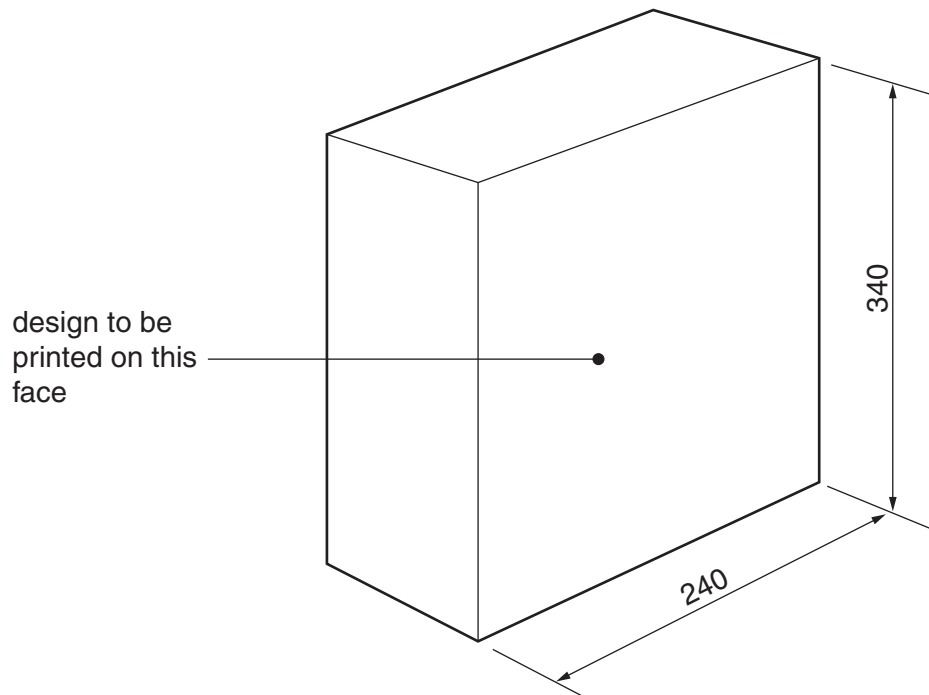


- 12** A breakfast cereal manufacturer wishes to encourage sales by including a series of designs for motor vehicles on the card packaging that can be cut out to make 3D models. The designs are to be printed in colour on the back of the packaging for customers to cut out when the cereal has been eaten.

Design a 3D model of a vehicle that would be suitable for this purpose and would be easy to cut out. Consideration should be given to the use of colour and to the appeal of the model to children.

Your proposed solution should be in the form of a development (net) of the design that:

- fits on the back of the box shown in Fig. 5;
- includes all glue tabs and fixing details to enable the forming of a 3D shape;
- includes clear instructions to cut out and assemble the vehicle.



**Fig. 5**





