UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

DESIGN AND TECHNOLOGY **9705/31**

Paper 3 **October/November 2013**

3 hours

Additional Materials: Answer Booklet/Paper
A range of design drawing equipment
A3 Drawing Paper (5 sheets)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

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

Section B
Answer **one** 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.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

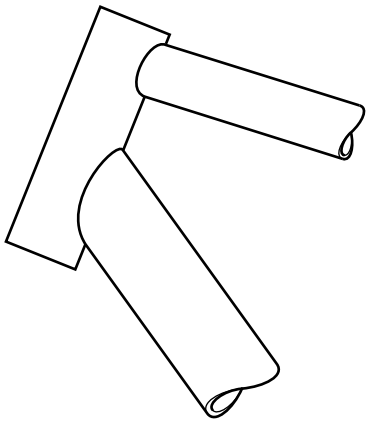
This document consists of **9** printed pages and **3** blank pages.

Section A

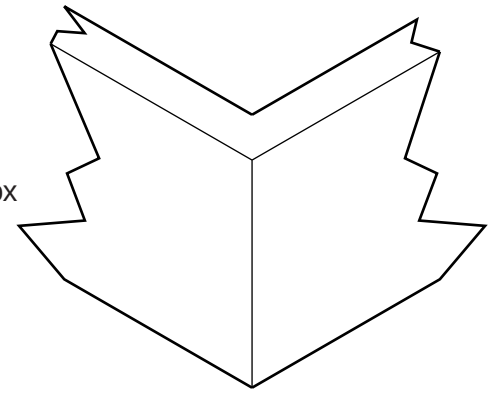
Answer **two** questions from Parts **A, B** or **C.**

Part A – **Product Design**

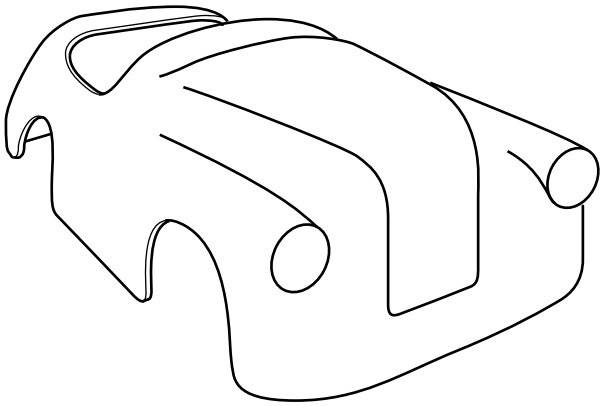
1



item: part of bicycle frame
process: welding



item: corner of wooden jewellery box
process: jointing



item: toy car body
process: layup with GRP

Fig. 1

Choose **two** of the items shown in Fig. 1 and for each:

(a) use notes and sketches to describe the manufacture of the item using the process given; [7 × 2]

(b) explain why the process is particularly suitable for the production of the item. [3 × 2]

2 Fig. 2 shows the frame of a micrometer.

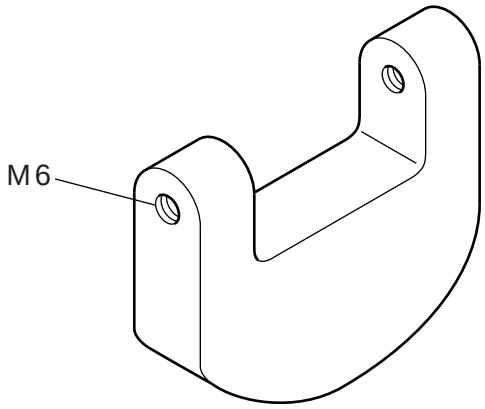


Fig. 2

(a) State a suitable material for the frame and give **two** reasons for your choice. [3]

(b) Describe, using notes and sketches, how you would make the frame. [9]

(c) Explain the changes which may be necessary to the design, the manufacturing method used and in the material selected, if 1000 were required.
Use notes and sketches to support your answer. [8]

3 Discuss how designers take into account variation in human sizes when designing products. [20]

Part B – **Practical Technology**

4 Computers have had a significant impact on the Product Design Industry.

(a) Describe **two** specific ways in which computers are used in the design of products. Explain the benefits to the designer of each. [10]

(b) Describe **two** specific ways in which computers are used in the manufacture of products. Explain the benefits to the manufacturer of each. [10]

5 Fig. 3 shows four electronic components.

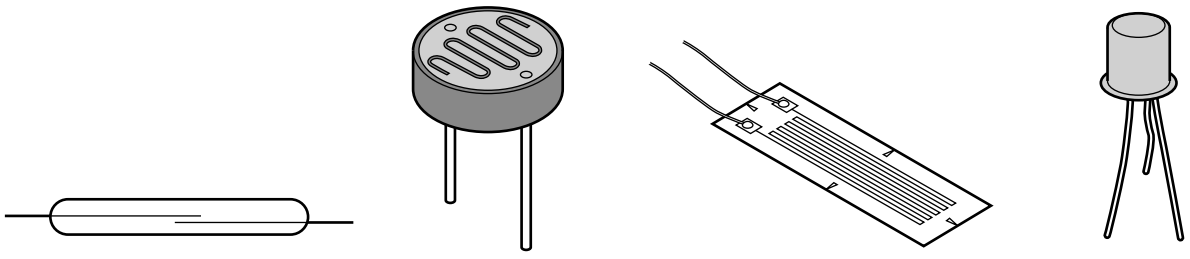


Fig. 3

(a) Name and describe the function of each of the components **A** – **D**. [8]

(b) Use notes, sketches and/or circuit diagrams to explain an appropriate application for each of the components. [12]

6 Fig. 4 shows the load/extension diagram for three different materials.

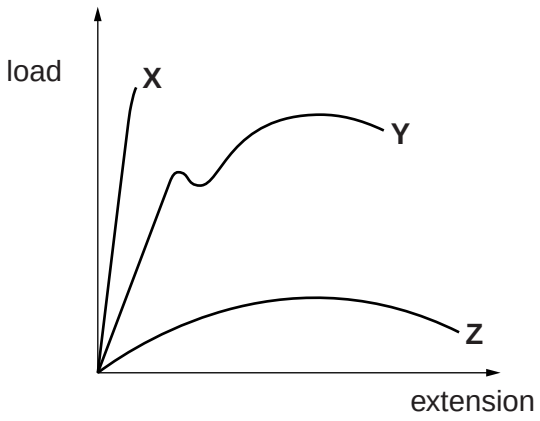


Fig. 4

(a) Describe the specific information that can be obtained from Fig. 4 about materials **X**, **Y** and **Z**. [6]

(b) The information shown in the diagram was obtained by tensile testing.
Use sketches and notes to describe a method of testing a material's resistance to impact. [6]

(c) Explain the importance of non-destructive testing. Use a specific test to support your answer. [8]

Part C – **Graphic Products**

7 Discuss the implications of the packaging of products to the manufacturer and the consumer. [20]

8 Fig. 5 shows an exploded pictorial drawing of a simple micrometer.

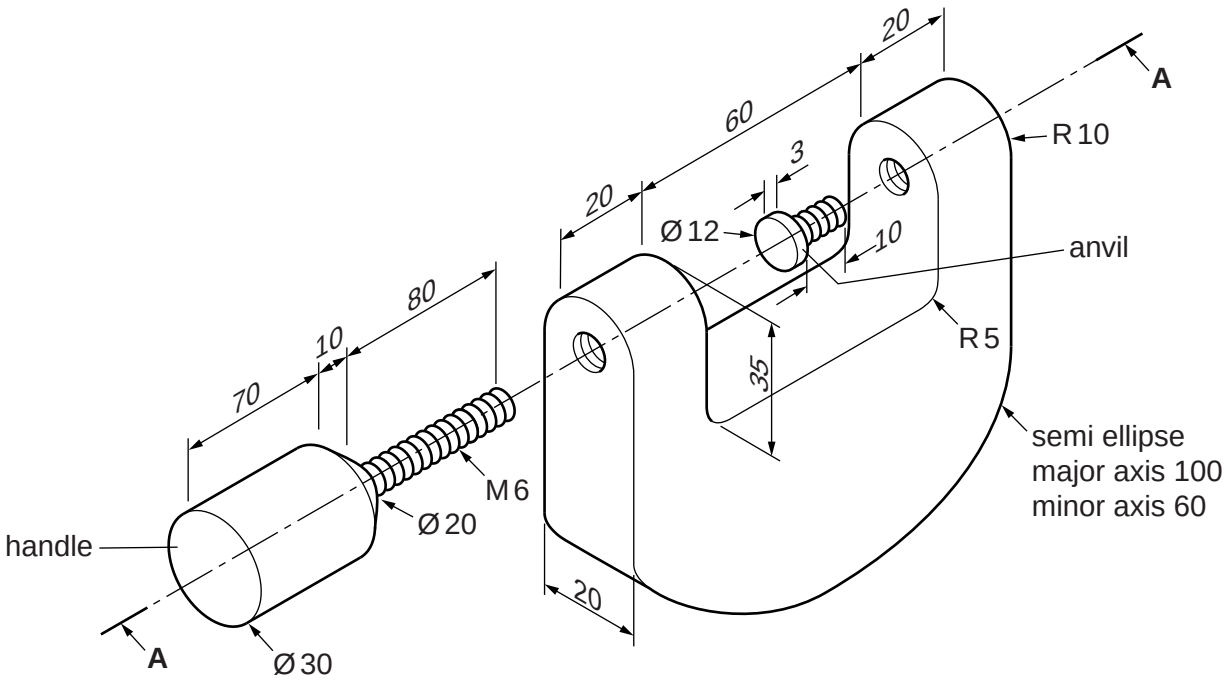


Fig. 5

(a) The micrometer should be assembled with the M6 threaded bar touching the anvil.
Draw full-size:
- a sectional elevation on **A** – **A**; [16]
- a plan.

(b) Sketch **two** different ways of improving the grip on the handle. [4]

9 Fig. 6 shows incomplete orthographic views of a paper recycling bin.

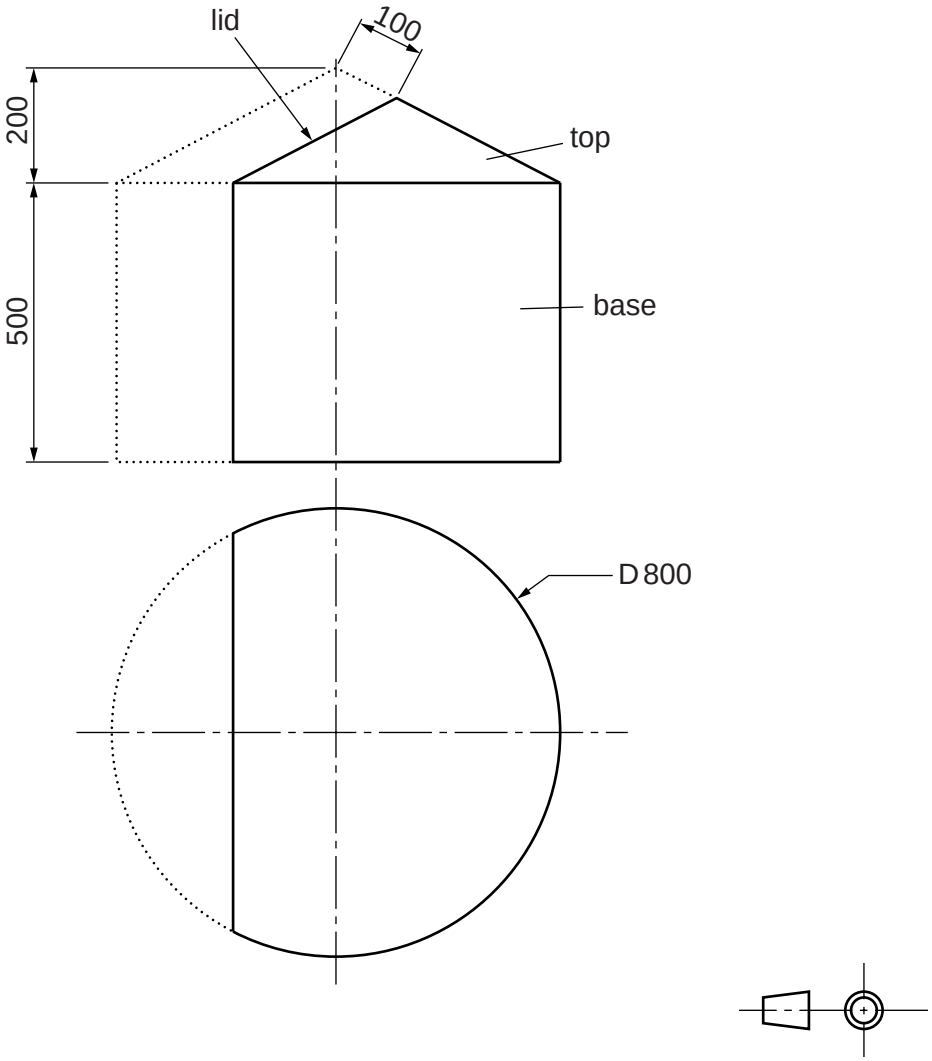


Fig. 6

(a) Draw, to an appropriate scale, the complete plan view. [5]

(b) Construct the true shape required for the lid. [5]

(c) The bin is made from corrugated card.
Use sketches and notes to show:

(i) how the top would be connected to the base so that it could be easily removed; [5]

(ii) how a lid could be attached to the top. [5]

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. Include at least five specification points other than those given in the question. [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]

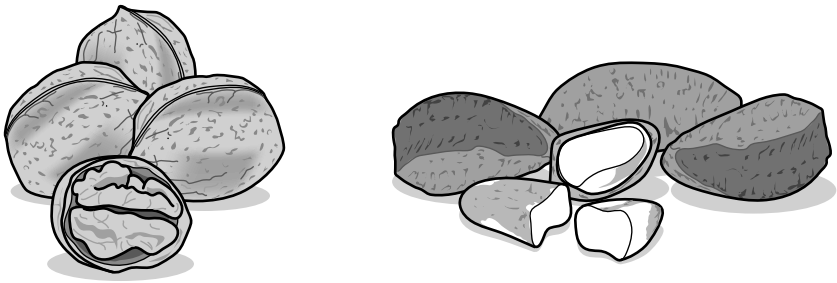
Evaluation

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

[Total: 80]

[Turn over

10



Brazil nuts and walnuts have hard shells and are very difficult to crack to obtain the edible part inside.

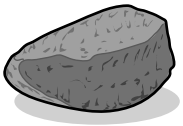
You are to design a product that will hold a variety of nuts and include a method of cracking them.

The product must:

- be able to be used effectively by a wide range of users from the age of 14 upwards;
- be suitable to be used on a dining table.

To assist you in your answer, details of the sizes of nuts are given in Fig. 7.

Brazil nut:
Max 40 × 25 × 20



Walnut:
Max 35 × 30 × 30

Fig. 7

11 A school's Design and Technology Department carries out a lot of practical electronics work.

You are to design a soldering unit for the Design and Technology Department to enable accurate soldering of components onto printed circuit boards (PCB).

The soldering unit must:
- hold the hot soldering iron safely;
- hold a PCB (max size 160 × 100) at a range of heights and angles.

Fig. 8 shows details of a soldering iron.

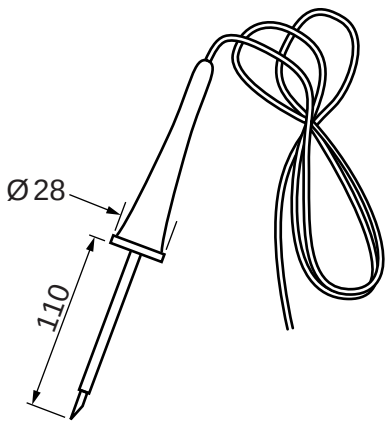


Fig. 8

12 A company wishes to increase its range of products after disappointing sales figures.

The current packaging is shown in Fig. 9.

A new chocolate shape is shown in Fig. 10. The shapes are to be sold in packs of 36.

You are to design a **new** innovative package for the chocolate shapes.

The packaging must:
- hold the shapes securely, to avoid damage in transportation;
- include a name for the product and suitable graphics to excite and interest consumers.

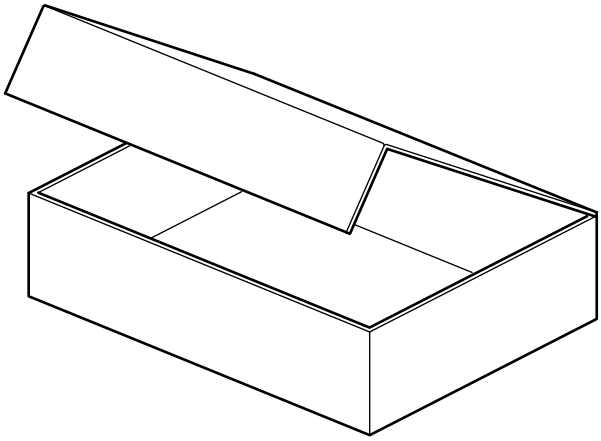


Fig. 9

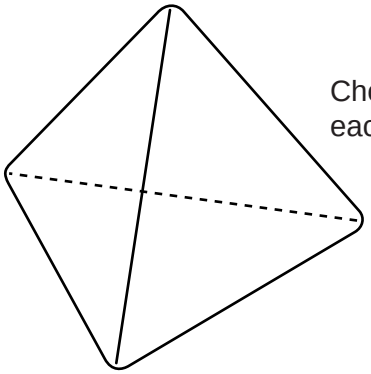


Fig. 10

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