

DESIGN AND TECHNOLOGY

9705/33

Paper 3

October/November 2015

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 an HB pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, 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.

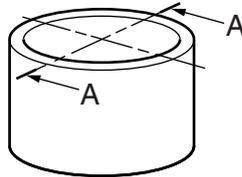
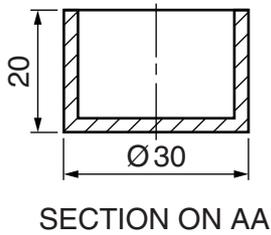
This document consists of **9** printed pages and **3** blank pages.

Section A

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

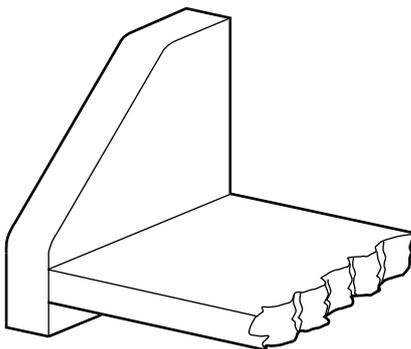
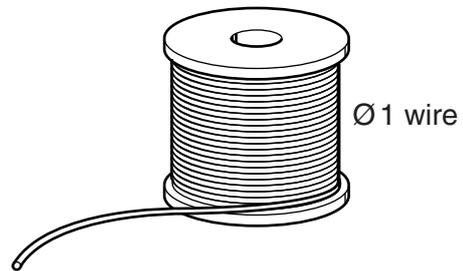
Part A – Product Design

1



item: glue stick lid
process: injection moulding

item: copper wire
process: drawing



item: bookcase
process: cutting housing joint

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 a spoon.

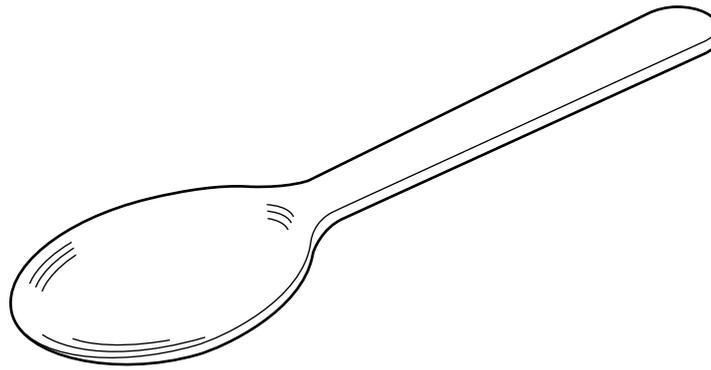


Fig. 2

- (a) State a suitable material for a spoon of the type shown in Fig. 2 and give **two** reasons for your choice. [3]
- (b) Describe, using notes and sketches, how you would make the spoon in a school workshop. [9]
- (c) Explain the changes which may be necessary to the design, the manufacturing method used and the material selected, if 100 spoons were required. Use notes and sketches to support your answer. [8]
- 3 Discuss the implications of producer-led design on the design and manufacture of products. [20]

Part B – Practical Technology

- 4 (a) Describe the function of a digital-analogue converter. [4]
- (b) Identify **two** input devices and **two** output devices for computers that are commonly used by designers and/or manufacturers.
For each device, explain in detail their function and benefit to the process of designing and/or making. [4 × 4]
- 5 Fig. 3 shows part of the input circuit for a room thermostat.

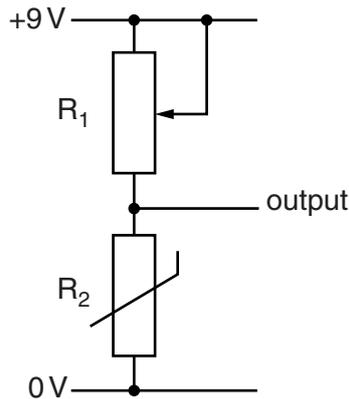


Fig. 3

- (a) Describe how the circuit works. [4]
- (b) Fig. 4 shows the symbol for a logic gate.

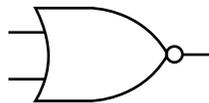


Fig. 4

- (i) Name the type of logic gate shown in Fig. 4. [1]
- (ii) Draw the truth table for the logic gate shown in Fig. 4. [3]
- (iii) Logic gates can be used in combination to provide different logic functions.
Show how two 2 input NAND gates can be connected to make an AND Gate. [2]
- (c) Discuss the implications of the rapid advances in technology for designers of products. [10]

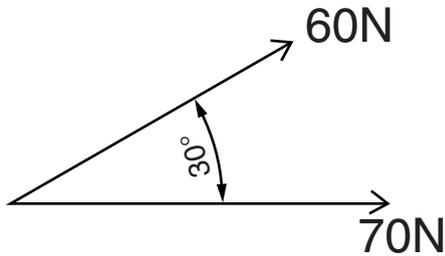
6 (a) Describe the following structural terms. Give an example of each.

- Frame structure
- Monocoque structure

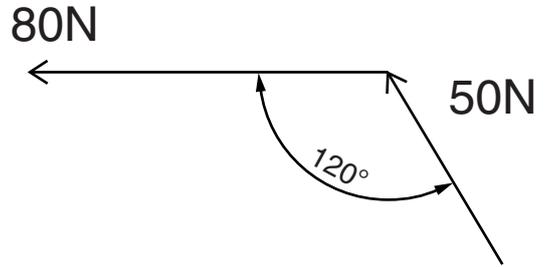
[6]

(b) Determine the direction and magnitude of the equilibrant force in each of the examples given.

(i)



(ii)



[4]

(c) Discuss the effect of changes in temperature on structures. Include details of how these effects can be minimised.

[10]

Part C – Graphic Products

7 Construct a cam profile and displacement diagram from the following information.

- (a) Cam shaft diameter 25
- (b) In line wedge follower
- (c) Minimum distance of 35 from in line wedge follower to camshaft centre
- (d) Clockwise direction
- (e) $0^\circ - 90^\circ$ rise 20 with simple harmonic motion
- (f) $90^\circ - 150^\circ$ dwell
- (g) $150^\circ - 330^\circ$ fall uniform velocity
- (h) $330^\circ - 360^\circ$ dwell

[20]

8 Graphic designers use a range of reprographic techniques.

(a) Use notes and sketches to describe the reprographic techniques used in the production of:

(i) a batch of 10 A3 Health and Safety posters using 3 colours; [7]

(ii) a batch of 5000 full colour 16 page, A4 school magazines. [7]

(b) Compare and contrast the reprographic techniques with respect to cost and quality of print. [6]

9 Fig. 5 shows an elevation of a chair made from 10mm thick corrugated cardboard.

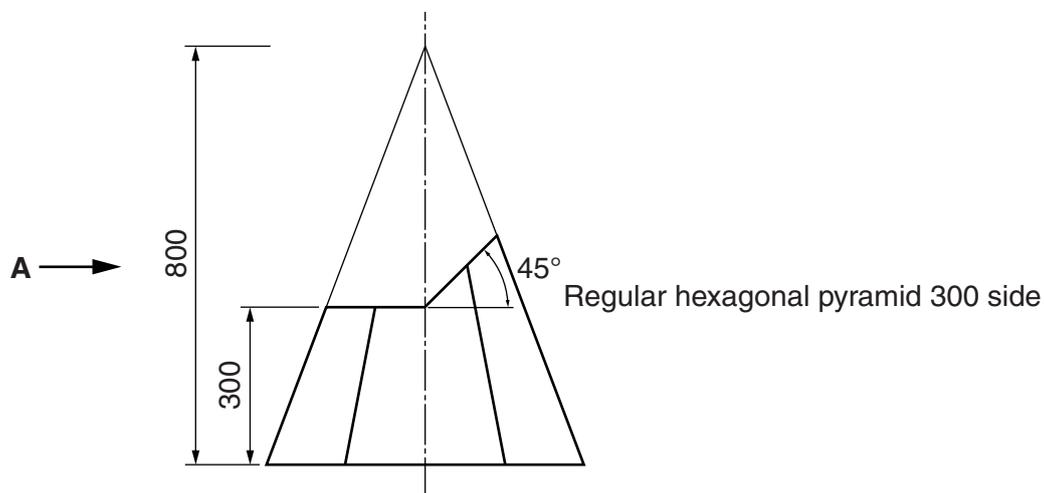


Fig. 5

(a) Draw, to a scale of 1:10, the given front view, a plan and an end view in the direction of arrow A. [8]

(b) Draw a full development (net) of the chair. [6]

(c) Use notes and sketches to show how the chair would be assembled for use without the need for glue. [6]

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]

- 10** The school caretaker carries out a range of maintenance tasks in and around the school buildings and grounds. Some tasks, e.g. window repairs or fixing lights, require the caretaker to work at height.

Design a product that would provide a working platform (2 m × 1 m) for the caretaker at a height of up to 1.5 m above floor level.

The product must:

- be easy to transport and set up in different parts of the school;
- be able to be erected on uneven ground.

- 11** A fuse is used in an electric plug to protect circuits and devices. When an electronic device fails, the fuse must be tested.

Design a hand-held product that would test if a fuse is working.

The product must:

- indicate visually and audibly whether a fuse passes or fails the test;
- operate using a 9V battery.

Details of a fuse and battery are shown in Fig. 6.

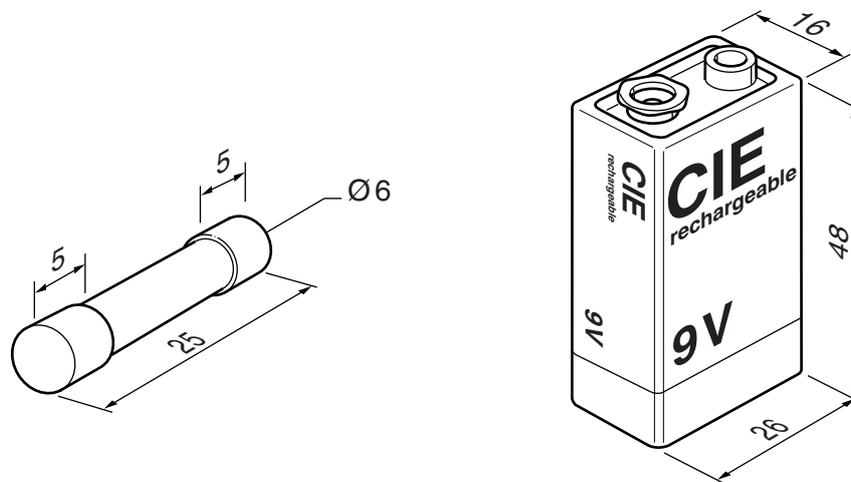


Fig. 6

- 12** A company wishes to promote a new range of energy saving light bulbs. The bulbs are to be called the ECO BULB.

Design the packaging and a desktop point of sale display to promote the ECO BULB.

The packaging must hold 5 ECO BULBS.

The packaging and point of sale display must reflect energy saving and conservation of resources.

Details of a bulb are shown in Fig. 7.

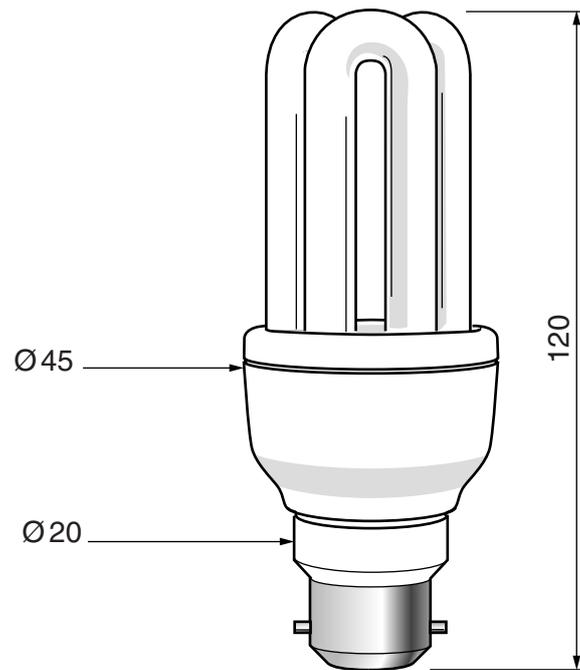


Fig. 7

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