Please write clearly, in block capitals

Centre number _____ **Candidate number** _____

Surname _____

Forenames(s) _____

Candidate's signature _____

A-Level - Design & Technology (Product Design)

Date of Exam _____ **Time allowed: 1 hours 30 minutes**

Materials

For this paper you must have:

- normal writing and drawing instruments
- a scientific calculator

Instructions

- Use black ink or black ball-point pen. Use pencil only for drawing.
- Fill in the information at the top of this page
- Answer all questions
- You must answer the questions in the spaces provided. Do not write on blank pages.
- Do all rough work in this paper. Cross through any work that you do not want to be marked.

Information

- The marks for questions are shown in brackets
- The maximum mark for this paper is 80

SECTION A

1. **Figure 1** and **Figure 2** show two different toothbrushes.

Figure 1	Figure 2
	
Electric toothbrush	Manual toothbrush

Compare the materials and components used in their manufacture and their suitability for intended function; cleaning teeth. **[8 marks]**

2. Explain how the major developments in technology listed below have led to improvements in the design of electronic products. **[6 marks]**

Micro-electronics

Advancements in CAD/CAM

3. Product packaging is an essential way in which the manufacturer communicates with the consumer.

   Study the packaging for a vacuum cleaner below.

Image: © Verbaska / Shutterstock.com

Discuss the type of information a manufacturer can convey to the customer through product packaging. Use examples to support your answer. **[12 marks]**

4. The symbols below are used to convey important information about products during their lifecycle.

   For each symbol explain its meaning and give a specific example of where it would be found. **[9 marks]**

Symbol	Meaning and example
	
	
	

SECTION B

5. Match the **three** examples of Computer Aided Manufacture (CAM) equipment to the appropriate applications in the table below. **[3 marks]**

   - CNC lathe
   - Laser cutter
   - Plotter cutter
   - CNC router

   Each piece of equipment can be used only **once**.

Application	CAM equipment
Cutting vinyl lettering for a van	
Machining and shaping an MDF wardrobe door	
Cutting and engraving acrylic sheet for a shop sign	

6. Explain the term 'non-destructive testing' and give **one** example of where or when it would be used. **[4 marks]**

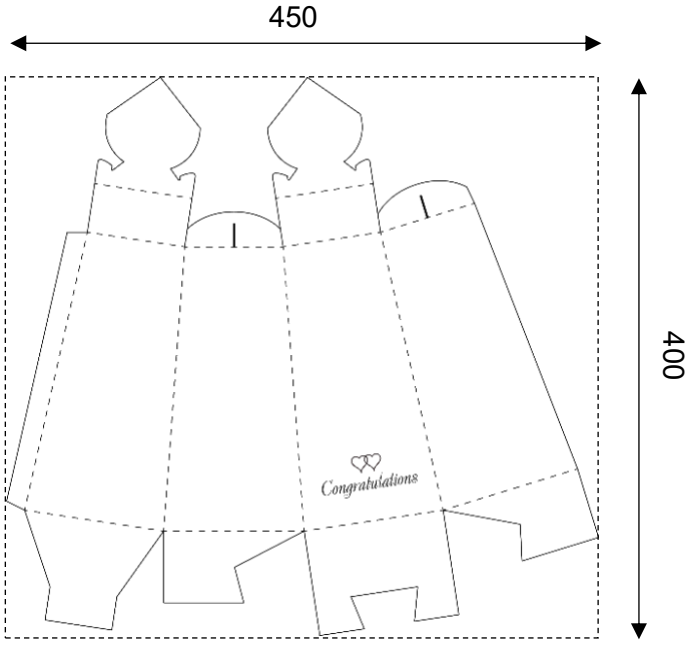
7. Define what is meant by the term 'Total Quality management (TQM)'. **[3 marks]**

8. Explain the impact of global manufacturing on product miles and how this affects responsible design. **[6 marks]**

9. A design house uses collaborative design and iterative design to generate fresh ideas. Evaluate the advantages and disadvantages of these methodologies. **[8 marks]**

10. A manufacturer of packaging is considering the net design shown below and wants to establish how much material will be wasted from an A0 sheet of card (1189mm x 841 mm).

    The overall dimensions of a rectangular piece of card needed to make each net is 450mm x 400mm. Assume each net will use 70% of each rectangle.



(a) Calculate the area of card wasted making each net from the pre-cut rectangle in m^2 to two decimal places. **[2 marks]**

(b) If each net uses one rectangular piece of card, what is the maximum number of complete nets that can be made from **one** A0 sheet of card? **[2 marks]**

(c) Calculate the total waste generated when making the maximum number of packaging nets from an A0 sheet. Give your answer to **3** significant figures. **[4 marks]**

(d) What is the total percentage wasted? **[1 mark]**

11. Many socio-economic influences have shaped product design and manufacture over the last 100 years. Using specific examples of socio-economic factors, discuss the following: **[12 marks]**

    (a) Post World War One and how it has influenced the development of mass production techniques.

    (b) World War Two and how it has influenced the development of utility products.

END OF QUESTIONS