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

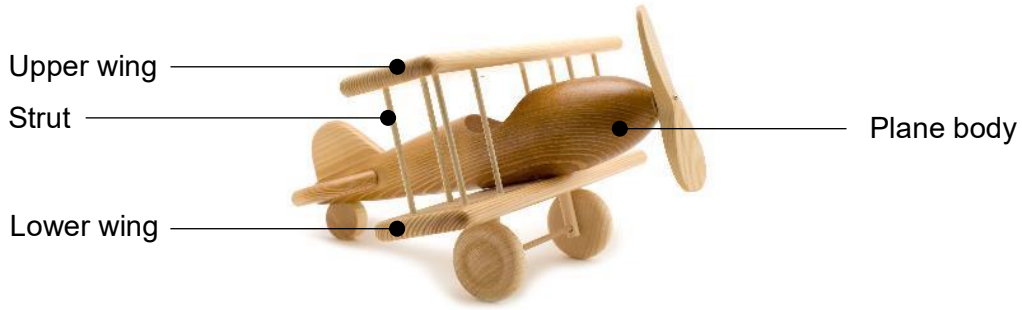
SECTION A

1. **Figure 1** and **Figure 2** show two alternative craft knives.

Figure 1	Figure 2
	
Nylon and elastomer craft knife	Stainless steel craft knife

Compare how each craft knife has been designed and manufactured to meet the needs of the end user. **[8 marks]**

2. It is common practice to use handmade measuring, marking or cutting aids to increase efficiency in the manufacture of batch produced, handmade wooden toys such as the toy plane shown below.



Explain how the **two** following operations could be made more efficient with the use of handmade aids.

(a) Marking and cutting aid for the locating the positions of the struts between the upper and lower wings. **[3 marks]**

(b) Measuring and marking the shape of the plane body. **[3 marks]**

3. Marianne Brandt is one of the most famous designers to have studied at the Bauhaus school.

   Analyse and explain the key principles of the Bauhaus movement with reference to the work of Marianne Brandt. **[8 marks]**

4. **Figure 3** and **Figure 4** show two kettles.

Figure 3	Figure 4
	
Metal hob-top kettle	Multi-material docking electric kettle

Discuss how technological developments have shaped the design and manufacture of the kettles. Refer to the product examples above to support your answer. **[8 marks]**

SECTION B

5. Explain what is meant by the term 'go no go' gauges. Use examples where appropriate to explain your answer. **[3 marks]**

6. Explain how electronic products are designed to conserve energy, materials and components during their manufacture and in use, giving examples of products. **[6 marks]**

7. Evaluate how national and international standards would be applied and used in the design and manufacture of the garden light pictured below. Refer to specific standards on the following factors in your answer:

    - Quality
    - Safety
    - Disposal

[8 marks]

8. Environmental issues must be considered in the design and manufacture of modern products. The image below shows a hardback children's book that plays music as the pages are turned.

The book has been constructed from laminated paper and board with a minature surface mount printed circuit board (PCB) integrated into the cover. It runs on a non-replaceable, built-in coin cell battery.

Discuss how the environmental impact of the musical book mentioned could be reduced with reference to the following areas: **[9 marks]**

(a) Raw material extraction

(b) Manufacturing

(c) Ease of recycling

9. Match the **three** most suitable modelling materials to the correct application in the table below. **[3 marks]**

    - Foam board
    - Chipboard
    - Polylactic acid (PLA)
    - Polymorph

    You may use each material **once** only.

Application	Modelling material
Architectural scale model	
Ergonomic handle for a product	
3D printed model	

10. High density modelling foam (HDMF) is a popular modelling material to produce concept models, such as the prototype of the hairdryer shown below.

Discuss the advantages and disadvantages of using HDMF to model a hairdryer. **[8 marks]**

11. **Figure 5** shows an architectural model of a new residential building created for a client and **Figure 6** gives details of the overall dimensions.

Figure 5

Figure 6

Dimensions of original model (cm)		
Length	**Width**	**Height**
30	**35**	**120**

(a) A box has been made to fit snugly around the model and protect it during transit. Based on the dimensions of the model in **Figure 6**, calculate the volume of the box. Give your answer to the nearest cm^3. **[2 marks]**

(b) Following a meeting, the client has requested that the architect produce a second model and reduce its by 35% so it can fit in a display cabinet in their office. Calculate the new height of the second architectural model. **[2 marks]**

(c) The original model was constructed in a ratio of 1:50. Calculate the overall dimensions of the building when constructed in the real world. Give your answer in metres.

[3 marks]

12. Smart watches have been introduced to the market in the last ten years. Describe how a company producing a smart watch would refine and redevelop it during the product life cycle.

[6 marks]

END OF QUESTIONS