Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	

General Certificate of Education
Advanced Subsidiary Examination
January 2009

Design and Technology: Product Design (3-D Design) PROD1

Unit 1 Materials, Components and Application

Thursday 8 January 2009 9.00 am to 11.00 am

For this paper you must have:
- normal writing and drawing instruments
- an Insert Sheet.

Time allowed
- 2 hours

Instructions
- Use black ink or black ball-point pen.
- Use pencil and coloured pencils only for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in Section A.
- Answer **one** question from Section B, **either** Question 4 **or** Question 5
- Answer **all** questions in Section C.
- You must answer the questions in the spaces provided. Answers written in margins or on blank pages will not be marked.
- Do all rough work in this book. 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.
- 20 marks are allocated to each of Sections A and B and 40 marks to Section C.
- You will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

Advice
- Illustrate your answers with sketches and/or diagrams wherever you feel it is appropriate.
- You are advised to spend approximately 30 minutes on Section A, 30 minutes on Section B and one hour on Section C.

SECTION A

Answer **all** the questions in this section.

1 (a) (i) Name a thermoplastic used to manufacture plastic carrier bags.

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(1 mark)

1 (a) (ii) State **two** reasons why thermoplastics are used to make carrier bags.

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(2 × 1 mark)

1 (b) (i) A bio-batch additive is often added to polymers. State why this is done.

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(1 mark)

1 (b) (ii) State **two** problems associated with using bio-batch additives in polymers.

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2 .....

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(2 × 1 mark)

6

2 (a) (i) Name a timber-based composite.

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(1 mark)

2 (a) (ii) State **two** advantages of timber-based composites in preference to natural timber.

Advantage 1 .....

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Advantage 2 .....

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(2 × 1 mark)

2 (b) (i) Name a polymer composite used to manufacture racing car components.

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(1 mark)

2 (b) (ii) State **two** reasons why this polymer composite might be used in racing car components.

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2 .....

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(2 × 1 mark)

6

Turn over for the next question

3 (a) Explain the difference between ferrous and non-ferrous metals.

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(2 marks)

3 (b) Name **two** different stock forms of metal.

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2 .....

(2 × 1 mark)

3 (c) (i) Explain what is meant by the term 'alloy'.

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(1 mark)

3 (c) (ii) Name an alloy and a product that it is used in.

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(2 marks)

3 (c) (iii) State **one** reason why it is used in the product named.

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(1 mark)

8

SECTION B

Answer **either** Question 4 **or** Question 5.

4 For each of the following materials, explain in detail why they are suitable for the products listed. Where relevant, your answers should make reference to:

- product function
- product aesthetics
- product manufacture.

Material	**Product**
(a) High Density Polyethylene (HDPE)	Tool handles
(b) Forest Stewardship Council (FSC) certified timber	Timber furniture
(c) Multi-sheet card	Food packaging
(d) Fluted polypropylene sheet	Point of sale displays
(e) Shape memory alloy	Surgical bone fixings

You should answer each part of this question in the correct space which follows.

4 (a) .....

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(4 marks)

Question 4 continues on the next page

4 (b) .....

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(4 marks)

4 (c) .....

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(4 marks)

4 (d) .....

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(4 marks)

4 (e) .....

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(4 marks)

Turn over ▶

20

5 Study the photograph of the toaster (**Figure 1** on the Insert Sheet) and answer the following questions.

5 (a) Name a suitable specific metal for the toaster body (part A).

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(1 mark)

5 (b) Explain why this metal is suitable for the toaster body.

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(6 marks)

5 (c) Use notes and diagrams to explain how the toaster body (part A) could be manufactured. There is space below which can be used for diagrams.

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(9 marks)

Question 5 continues on the next page

5 (d) Explain why the toaster control (part B) is made from a thermoset polymer.

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(4 marks)

20

SECTION C

You must answer this question.

6 Study the photograph (**Figure 2** on the Insert Sheet) which shows a child's toothbrush made from several parts.

Answer the following questions.

6 (a) (i) Name a polymer which could be used in the manufacture of the part labelled A.

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(1 mark)

6 (a) (ii) Explain why this polymer is suitable for the part labelled A.

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(4 marks)

Question 6 continues on the next page

6 (a) (iii) Name a different polymer which could be used in the manufacture of the part labelled B.

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(1 mark)

6 (a) (iv) Explain why this polymer is suitable for the part labelled B.

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(4 marks)

6 (a) (v) Use notes and diagrams to explain how the toothbrush handle could be made. There is space below which can be used for diagrams.

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(6 marks)

Question 6 continues on the next page

6 (b) Describe how the designer and manufacturer of the toothbrush pictured in **Figure 2** have ensured it is safe to use.

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(4 marks)

6 (c) Critically evaluate the ergonomic features of the toothbrush. Use diagrams to support your answer. You may use the space on the next page for diagrams.

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(12 marks)

6 (d) Explain how the aesthetic and functional features of the toothbrush could be enhanced by using smart materials. You may use diagrams to support your answer. There is space below which can be used for diagrams.

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(8 marks)

40

END OF QUESTIONS

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Design and Technology PROD1
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Unit 1 Materials, Components and Application

Insert

Figure 1 Toaster

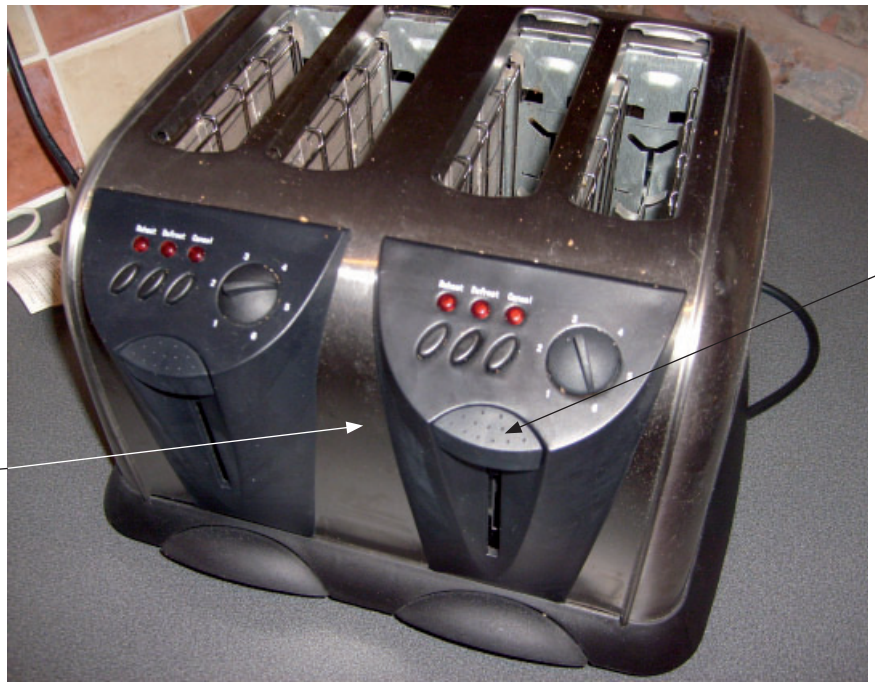

Figure 2 Child's toothbrush