Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

General Certificate of Education
Advanced Subsidiary Examination
June 2009

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

Unit 1 Materials, Components and Application

Tuesday 19 May 2009 9.00 am to 11.00 am

For this paper you must have:
- normal writing and drawing instruments
- a colour Insert Sheet (enclosed).

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 **six** questions.
  Answer **all** questions in Section A.
  Answer **either** Question 5 **or** Question 6 in Section B.
  Answer 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 you do not want to be marked.

Information
- The maximum mark for this paper is 80.
- There are 20 marks for each of Sections A and B and 40 marks for Section C.
- The marks for questions are shown in brackets.
- 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 where you feel it is appropriate.

SECTION A

Answer **all** questions in this section.

1 (a) (i) Explain what the term 'thermoset polymer' means.

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(2 marks)

1 (a) (ii) Name a thermoset polymer and a product that it is used in.

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(2 marks)

1 (a) (iii) State **one** reason why this polymer is used in the product named.

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(1 mark)

1 (b) State **one** reason why thermoset polymers are **not** used as widely as thermoplastics.

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(1 mark)

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2 (a) Explain what is meant by the term 'smart material'.

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(1 mark)

2 (b) (i) Name a smart material and a product that it is used in.

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(2 marks)

2 (b) (ii) State **one** reason why this smart material is used in the product named.

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(1 mark)

4

Turn over for the next question

3 Place the letter of each of the adhesives listed below in the correct box in the table.

A PVA **B** Tensol **C** Contact adhesive **D** Epoxy resin

Acrylic to acrylic	Thermoset laminate to chipboard	MDF to MDF	Nylon to aluminium

(4 marks)

4

4 (a) (i) Name the specific type of card used in the making of brown packing boxes.

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(1 mark)

4 (a) (ii) State **two** reasons why this card is used in brown packing boxes.

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(2 marks)

4 (b) (i) Name a thermoplastic film used in packaging.

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(1 mark)

4 (b) (ii) State **two** reasons why this film is used in packaging.

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(2 marks)

6

Turn over for the next question

SECTION B

Answer **either** Question 5 **or** Question 6.

5 For each of the following materials, explain in detail why they are suitable for the products listed. Your answers should make reference to

- product function
- product aesthetics
- product manufacture.

Material	**Product**
(a) Polycarbonate (PC)	Safety glasses
(b) Silver	Jewellery
(c) Holographic card	Gift boxes
(d) Degradable polymers	Detergent sachets
(e) Flexi-ply	Furniture

5 (a)

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(4 marks)

5 (b)

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(4 marks)

5 (c)

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(4 marks)

Question 5 continues on the next page

5 (d)

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(4 marks)

5 (e)

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(4 marks)

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Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

Do **not** answer Question 6 if you have answered Question 5.

6 Study the photograph of the Easter egg packaging (**Figures 1a** and **1b**) on the Insert Sheet and answer the following questions.

6 (a) Explain why a high quality card is needed to make the box (**Figure 1a**).

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(4 marks)

6 (b) (i) Name a suitable specific material for the polymer insert (**Figure 1b**).

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(1 mark)

6 (b) (ii) Explain why this polymer is suitable.

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(6 marks)

Question 6 continues on the next page

6 (b) (iii) Use notes and diagrams to explain how the insert (**Figure 1b**) could be manufactured from a clear polymer sheet.
You may use the space opposite for diagrams.

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(9 marks)

Turn over ▶

20

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ANSWER IN THE SPACES PROVIDED

SECTION C

Answer this question.

7 A student has made a **non-functioning** model of an MP3 player (**Figure 2** on the Insert Sheet).

Answer the following questions:

7 (a) (i) Name a material that could be used to model the body (Part A).

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(1 mark)

7 (a) (ii) Explain why this material is suitable for Part A.

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(4 marks)

Question 7 continues on the next page

7 (a) (iii) Use notes and diagrams to explain how Part A could be modelled using the material you have named.
You may use the space opposite for diagrams.

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(8 marks)

Turn over ▶

7 (a) (iv) Name a specific finish that could be used on the model. Explain in detail how this finish is applied.

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(6 marks)

7 (a) (v) Explain the health and safety precautions you would take when finishing the model.

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(4 marks)

Question 7 continues on the next page

7 (b) (i) The control buttons (Part B) are made from aluminium. Explain why this is a suitable material.

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(4 marks)

7 (b) (ii) The actual buttons have been turned on a Computer Numerically Controlled (CNC) lathe. Explain why this process is suitable.

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(4 marks)

Question 7 continues on the next page

7 (c) Using notes and diagrams, critically evaluate the ergonomic and aesthetic features of the model.
You may use the space opposite for diagrams.

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(9 marks)

40

END OF QUESTIONS

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Design and Technology: Product Design (3-D Design) Unit 1 Materials, Components and Application **PROD1**

Insert

For use with Question 6

Figure 1a Card box

Figure 1b Polymer insert

For use with Question 7

Figure 2 Non-functioning model of an MP3 player