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	
8	
TOTAL	

General Certificate of Education
Advanced Subsidiary Examination
June 2012

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

Unit 1 Materials, Components and Application

Tuesday 22 May 2012 1.30 pm to 3.30 pm

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 only for drawing.
- Fill in the boxes at the top of this page.
- Answer **seven** questions.
- Answer **all** questions in Section A.
- Answer **one** question from Section B, **either** Question 6 **or** Question 7.
- Answer Question 8 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.
- There are 20 marks for Section A, 20 marks for Section B and 40 marks for 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 where 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** of the questions in this section.

1 (a) Define what is meant by the term *composite material.*

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(2 marks)

1 (b) Glass Reinforced Plastic is a fibre based composite material.
Name a product it is used in and explain why this material is suitable for the product you have named.

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(3 marks)

5

2 Styrofoam is a compliant material. Name an application it is used in and explain why this material is suitable for the application you have named.

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(3 marks)

3

3 Match the adhesives listed to the most appropriate application shown below.

A Epoxy Resin

B Solvent Cement (eg Tensol®)

C Contact adhesive

D PVA

In each case put the correct letter in the box on the right.
You should use each adhesive **once**.

Application	**Adhesive**
Joining pieces of acrylic sheet together	
Joining a melamine formaldehyde laminate to MDF sheet	
Joining 50 mm × 50 mm × 5 mm pieces of HDPE to a mild steel sheet	
Gluing a mortice and tenon joint made from oak	

(4 marks)

4

Turn over for the next question

4 (a) Name a product on which you might see the following symbol.

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(1 mark)

4 (b) Explain the meaning of the above symbol and why it is used on the product you have named in part (a).

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(3 marks)

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5 (a) (i) What is meant by the term *oxo-degradable polymer*?

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(1 mark)

5 (a) (ii) Name a product that might be made from oxo-degradable polymer and give **one** reason why it is a suitable material for this product.

Product .....

Reason .....

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(2 marks)

5 (b) State a disadvantage of using oxo-degradable polymers.

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(1 mark)

4

Turn over for the next question

Section B

Answer **either** Question 6 **or** Question 7.

6 (a) For each of the following materials, explain in detail why it is suitable for the application listed in the table below.

In your answer you should refer to:

- function
- aesthetics
- manufacture.

Material	Application
(i) Mild steel sheet	Car body panel
(ii) Carton board	Packaging
(iii) Kevlar Reinforced Plastic	Motorcycle helmet

6 (a) (i) Mild steel sheet (car body panel)

(6 marks)

Question 6 continues on the next page

6 (a) (ii) Carton board (packaging)

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(6 marks)

6 (a) (iii) Kevlar Reinforced Plastic (motorcycle helmet)

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(6 marks)

Question 6 continues on the next page

6 (b) Mild steel sheet is used in car body manufacture. Name an alternative material that could be used and give **one** reason to explain why this material would be suitable.

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(2 marks)

20

Do not answer this question if you have answered Question 6.

7 **Figure 1** on the Insert Sheet shows a school dining table.

Answer the following questions.

7 (a) The table top (**Part A**) is made from medium density fibreboard (MDF). It has been covered with a plastic laminate. Explain in detail why this combination is suitable for the table top.

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(6 marks)

Question 7 continues on the next page

7 (b) The legs and framework of the table (**Part B**) are made by fabricating solid beech.

Use notes and diagrams to explain the most appropriate way of batch producing the legs and framework.

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(10 marks)

Question 7 continues on the next page

7 (c) Describe the health and safety measures that might be taken by the manufacturer to protect employees when making the table.

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(4 marks)

20

Section C

You **must** answer this question.

8 **Figures 2** to **5** on the Insert Sheet show a chair.

8 (a) (i) The backrest of the chair has been made from polypropylene (PP). Explain in detail why polypropylene is suitable for this part of the chair.

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(6 marks)

Question 8 continues on the next page

8 (a) (ii) The backrest has been injection moulded. Use notes and diagrams to describe this process.

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(10 marks)

Question 8 continues on the next page

8 (b) **Figures 3**, **4** and **5** on the Insert Sheet show two common failings with this type of chair:

- a splitting of the backrest
- detachment of the seat pad.

Use notes and diagrams to suggest suitable modifications to the design of the chair to help resolve these failings.

The modifications should also take account of:

- aesthetics
- ergonomics
- product function
- material/technical feasibility.

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(12 marks)

Question 8 continues on the next page

8 (c) The frame and legs of the chair have been made from mild steel tube.

8 (c) (i) Explain in detail why mild steel tube is a suitable material from which to make the frame and legs.

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(6 marks)

8 (c) (ii) The frame and legs have been powder coated. Use notes and diagrams to describe this finishing process.

(6 marks)

40

END OF QUESTIONS

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