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 2011

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

Unit 1 Materials, Components and Application

Wednesday 18 May 2011 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** the questions in this section.

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

.....

.....

.....

.....

(2 marks)

1 (b) Give an example of a specific alloy and an application for it.

Alloy .....

(1 mark)

Application .....

(1 mark)

4

2 Match the following fabrication methods to the applications in the table below.

- Soldering
- Metal Inert Gas (MIG) Welding
- Electric Arc Welding

You should use each fabrication method **once** only.

Application	Fabrication method
Joining aluminium tube to aluminium tube to make a cycle frame	
Joining copper to copper to make jewellery	
Joining mild steel angle to mild steel angle to make a workbench frame	

(3 marks)

3

3 (a) Name **two** different stock forms of timber.

1 .....

.....

2 .....

.....

(2 x 1 mark)

3 (b) Oak is a specific natural wood used in furniture making. Give **two** reasons why it is suitable.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

(4 marks)

6

4 (a) Define what is meant by the term *thermoplastic* material.

.....

.....

(2 marks)

4 (b) Name a thermoplastic material and an application it is used in.

Thermoplastic material .....

(1 mark)

Application .....

.....

(1 mark)

4

5 Match the following Computer Numerical Control (CNC) equipment to the applications in the table below.

- CNC Laser cutter
- CNC Router
- CNC Plotter-cutter

You should use each piece of equipment **once** only.

Application	CNC equipment
Cutting vinyl lettering	
3-D machining of a block of MDF	
Cutting and engraving acrylic sheet	

(3 marks)

3

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

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 product listed in the table below. Your answer should make reference to:

- product function
- product aesthetics
- product manufacture.

	Material	Product
(i)	Shape memory alloy	Dental braces
(ii)	Photo quality cartridge paper	Point of sale display
(iii)	Polymorph	Modelling a prototype toothbrush handle

6 (a) (i) Shape Memory Alloy (dental braces)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(6 marks)

6 (a) (ii) Photo quality cartridge paper (point of sale display)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(6 marks)

6 (a) (iii) Polymorph (modelling a prototype toothbrush handle)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(6 marks)

Question 6 continues on the next page

6 (b) Polymorph is a suitable material for modelling a toothbrush handle. Name an alternative modelling material and state **one** reason why this is suitable.

.....

.....

.....

.....

(2 marks)

20

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

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

7 (a) Name a specific metal for the bench.

.....

(1 mark)

7 (b) Explain in detail why the metal you have named in part (a) is suitable.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(6 marks)

Question 7 continues on the next page

7 (c) Describe an economical way of batch producing the bench.
You should use notes and diagrams in your answer.
You can use the space opposite for diagrams.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 7 continues on the next page

(9 marks)

7 (d) Explain the safety precautions that would be taken during the manufacture of the bench.

.....

.....

.....

.....

.....

.....

.....

.....

.....

(4 marks)

20

Section C

You **must** answer this question.

8 (a) Study the photographs of the sports drink bottle (**Figures 2** and **3** on the Insert Sheet) and answer the following questions.

8 (a) (i) Name a suitable specific polymer for Part A of the sports drink bottle.

.....

(1 mark)

8 (a) (ii) Explain in detail why the polymer you have named in part (a)(i) is suitable.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(6 marks)

8 (a) (iii) The sports drink bottle is manufactured using the extrusion blow moulding process. Use notes and diagrams to describe this process.

.....

.....

.....

.....

.....

.....

(9 marks)

8 (b) Study the photographs of the sports drink bottle (**Figures 2** and **3** on the Insert Sheet). Use notes and diagrams to identify and critically analyse the ergonomic and anthropometric features of this sports drink bottle.

.....

.....

.....

.....

.....

.....

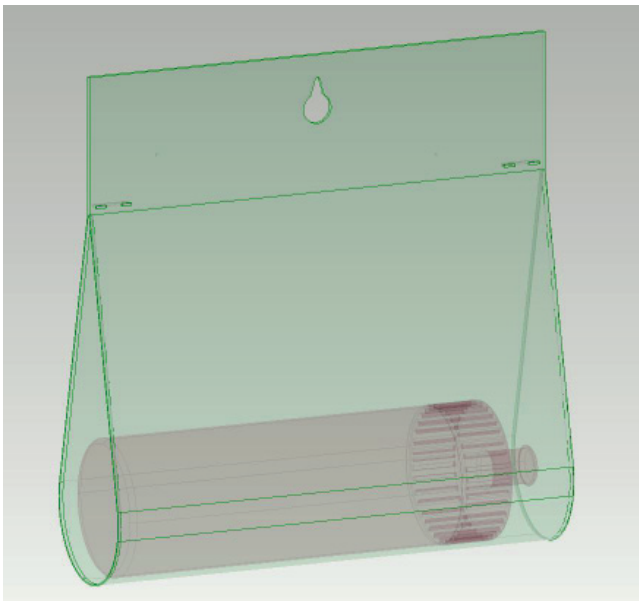
.....

.....

.....

(10 marks)

8 (c) Study the drawing of the basic packaging for the sports drink bottle shown below.



Use notes and diagrams to develop the design of the package.

Your notes and diagrams should include details of:

- how the package would attract customers
- shape and form of the pack including how it will hold the bottle
- how the package will be made
- how the package might be environmentally friendly.

Note: You should **not** use coloured pencils or pens in your diagrams.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(14 marks)

40

END OF QUESTIONS

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED