| Centre Number       |  |  | Candidate Number |  |  |
|---------------------|--|--|------------------|--|--|
| Surname             |  |  |                  |  |  |
| Other Names         |  |  |                  |  |  |
| Candidate Signature |  |  |                  |  |  |



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.



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

# **SECTION A**

|   |     |       | Answer all questions in this section.  |
|---|-----|-------|--|
| 1 | (a) | (i)   | Explain what the term 'thermoset polymer' means.                                       |
| 1 | (a) | (ii)  | (2 marks)  Name a thermoset polymer and a product that it is used in.                  |
| 1 | (a) | (iii) | State <b>one</b> reason why this polymer is used in the product named.                 |
| 1 | (b) | State | (1 mark)  cone reason why thermoset polymers are not used as widely as thermoplastics. |
|   |     |       | (1 mark)   |

6



| 2 | (a) | Expl | lain 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 <b>one</b> reason why this smart material is used in the product named. |           |
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|   |     |      |   | (1 mark)  |

Turn over for the next question



|   | A P    | VA      |          | <b>B</b> Tensol                 | C Contact adhesive            | <b>D</b> Epoxy resin |
|---|--------|---------|----------|---------------------------------|-------------------------------|----------------------|
| A | crylic | e to ac | erylic   | Thermoset laminate to chipboard | MDF to MDF                    | Nylon to aluminium   |
|   |        |         |          |                                 |                               | (4 marks)            |
| 1 | (a)    | (i)     | Name t   | the specific type of c          | card used in the making of br | own packing boxes.   |
| 1 | (a)    | (ii)    | State tv | <b>wo</b> reasons why this      | card is used in brown packing | (1 mark)             |
|   |        |         |          |                                 |                               |                      |
|   |        |         |          |                                 |                               |                      |
| 1 | (b)    | (i)     | Name a   | a thermoplastic film            | used in packaging.            | (2 marks             |
|   |        |         |          |                                 |                               | (1 mark              |
|   |        |         |          |                                 |                               | (                    |



| 4 | (b) | (ii) | State <b>two</b> reasons why this film is used in packaging. |
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|   |     |      | (2 marks)  |

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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.

| Mat | erial               | 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) |

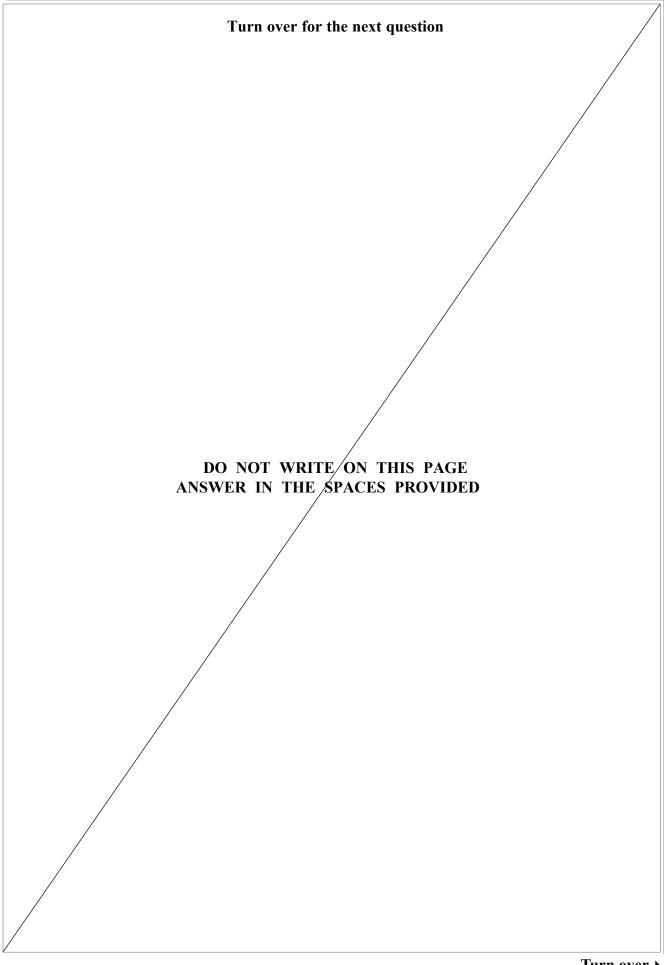


| 5 | (b) |           |
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| 5 | (c) |           |
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| 5 | (d) |           |
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|   |     | (4 marks) |
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|   |  | Do <b>not</b> answer Question 6 if you have answered Question 5.                   |           |  |  |  |
|---|--|--|-----------|--|--|--|
| 6 | 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 ( <b>Figure 1b</b> ). |           |  |  |  |
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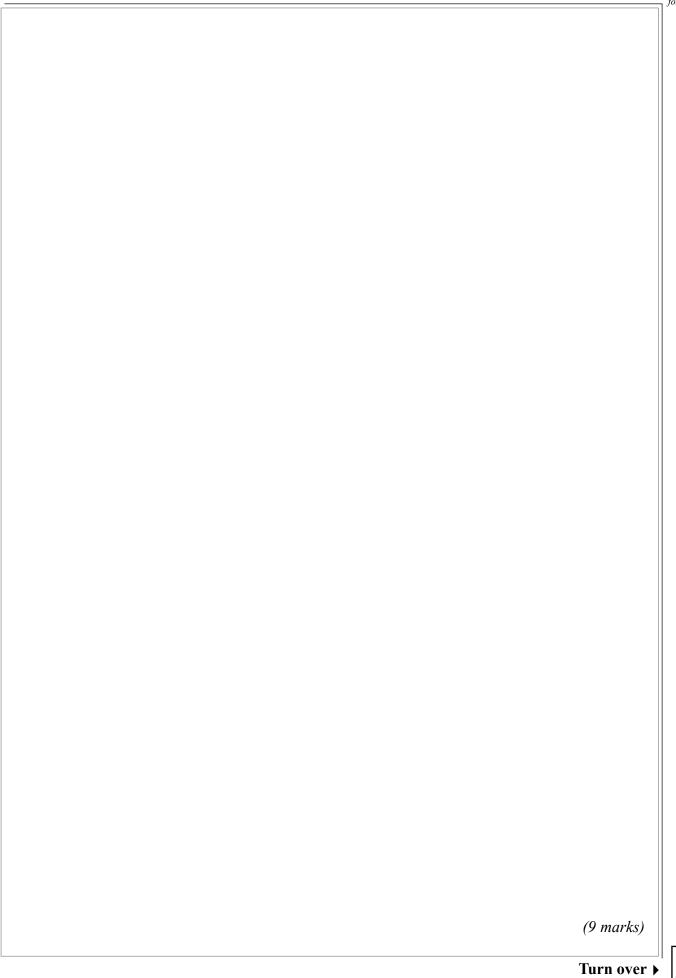


| 6 | (b) | (ii) | Explain why this polymer is suitable. |
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|   |     |      | (6 marks)                             |
|   |     |      | Question 6 continues on the next page |
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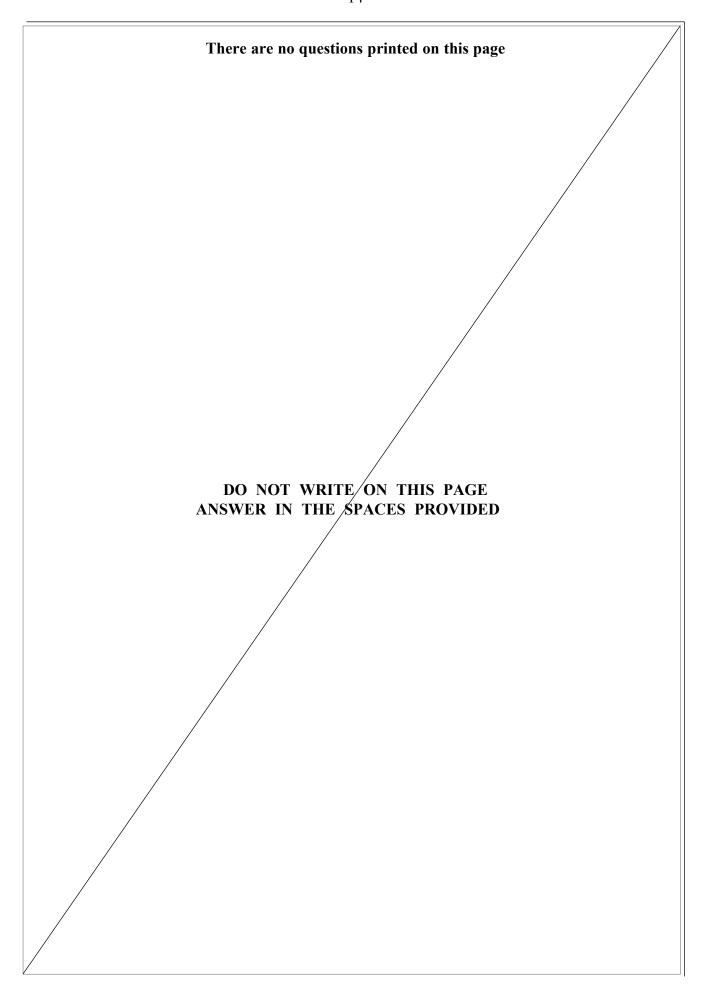
| 6 | (b) | (iii) | Use notes and diagrams to explain how the insert ( <b>Figure 1b</b> ) could be manufactured from a clear polymer sheet. You may use the space opposite for diagrams. |
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# **SECTION C**

# Answer this question.

|   |  |        | Answer tins question.  |  |
|---|--|--------|--|--|
| 7 | A student has made a <b>non-functioning</b> model of an MP3 player ( <b>Figure 2</b> on the Insert Sheet). |        |  |  |
|   | Ansv   | ver th | e following questions:   |  |
| 7 | (a)  | (i)    | Name a material that could be used to model the body (Part A). |  |
|   |  |        |  |  |
|   |  |        | (1 mark)   |  |
| 7 | (a)  | (ii)   | Explain why this material is suitable for Part A.              |  |
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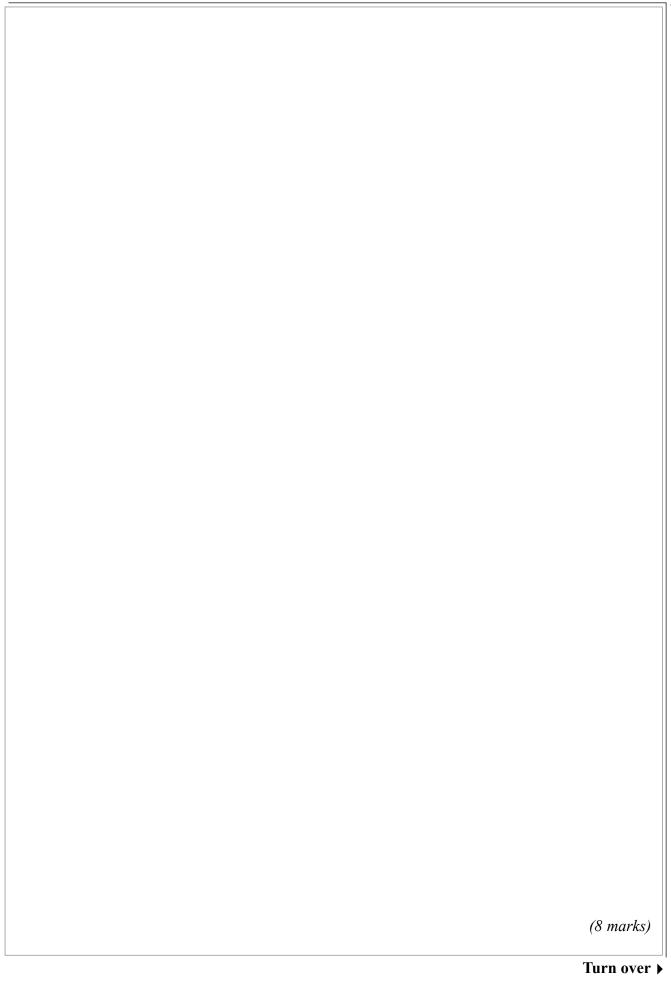
Question 7 continues on the next page





| 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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| 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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| 7 | (a) | (v) | Explain the health and safety precautions you would take when finishing the model. |
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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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| 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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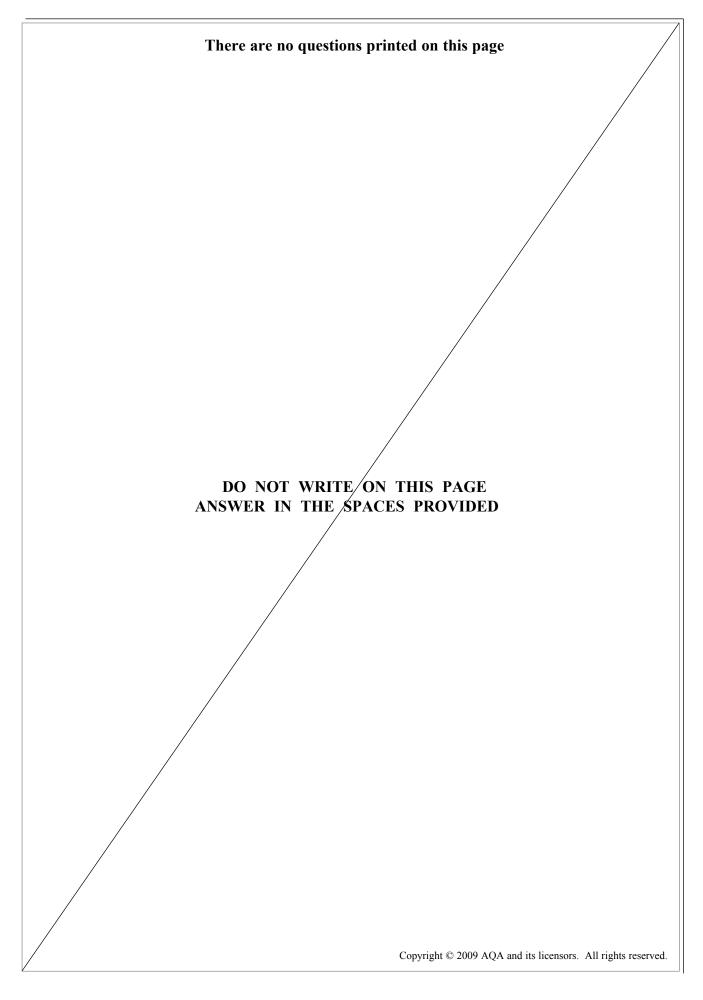
Question 7 continues on the next page



| 7 (0 | <ul> <li>Using notes and diagrams, critically evaluate the ergonomic and aesthetic features of<br/>the model.</li> <li>You may use the space opposite for diagrams.</li> </ul> |
|------|--|
|      | Tou may use the space opposite for diagrams.   |
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(9 marks) 40 END OF QUESTIONS







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

# Insert

### For use with Question 6

Figure 1a Card box

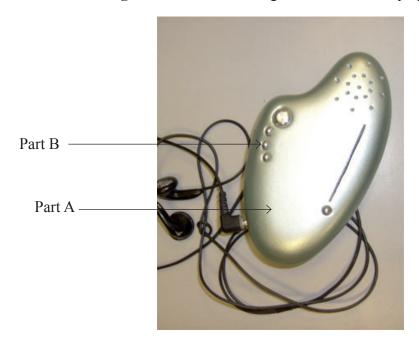


Figure 1b Polymer insert



For use with Question 7

Figure 2 Non-functioning model of an MP3 player



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