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Sample Assessment Materials
September 2007

GCE Design and Technology:
Product Design

Edexcel Advanced Subsidiary GCE in Design and Technology: Product Design (8RM01/8GR01)
First examination 2009

Edexcel Advanced GCE in Design and Technology: Product Design (9RM01/9GR01)
First examination 2010

A PEARSON COMPANY

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A Introduction

These sample assessment materials have been prepared to support the specification.

Their aim is to provide the candidates and centres with a general impression and flavour of the actual question papers and mark schemes in advance of the first operational examinations.

B Sample question papers

Product Design: Resistant Materials Technology
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Unit 3: Designing for the Future 27
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Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						6	R	M	0	2	/	1	Signature	

Paper Reference(s)

6RM02/1

Examiner's use only

Team Leader's use only

Edexcel GCE

Design and Technology

Product Design: Resistant Materials Technology

Advanced Subsidiary

Unit 2: Design and Technology in Practice

Sample Assessment Material

Time: 1 hour 30 minutes

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
Total	

Materials required for examination
Nil

Items included with question papers
Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature.
Check that you have the correct question paper.
Answer ALL the questions. Write your answers in the spaces provided in this question paper.
Do not use pencil. Use blue or black ink.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 7 questions in this question paper. The total mark for this paper is 70.
There are 20 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

Quality of written communication will be taken into account in the marking of your responses to parts of questions in Questions 2, 4, 5, 6 and 7. These questions are indicated with an asterisk. Quality of written communication includes clarity of expression, the structure and presentation of ideas and grammar, punctuation and spelling.

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Leave blank

Answer ALL the questions. Write your answers in the spaces provided.

1. (a) 25 park benches are to be manufactured using hardwood rather than softwood.

(i) Give **two** advantages of using hardwood.

1 .....

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2 .....

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(2)

(ii) Give **one** disadvantage of using hardwood.

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(1)

(b) Outline **three** health and safety risks that must be considered when manufacturing the park benches and outline how each could be minimised.

1 .....

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2 .....

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3 .....

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(6) **Q1**

(Total 9 marks)

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***2.** (a) Using notes and/or sketches illustrate the structural differences between a thermoplastic and a thermosetting plastic.

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(2)

(b) Explain the different working properties of a thermoplastic and a thermosetting plastic.

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(2)

Leave blank

(c) The properties of metals can be changed by either work hardening or annealing.

(i) Describe how a piece of metal would be work hardened.

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(2)

(ii) Describe how a piece of copper would be annealed.

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(4)

Q2

(Total 10 marks)

Leave blank

3. Figure 1 below shows a jigsaw puzzle which has been manufactured from acrylic in a school workshop.

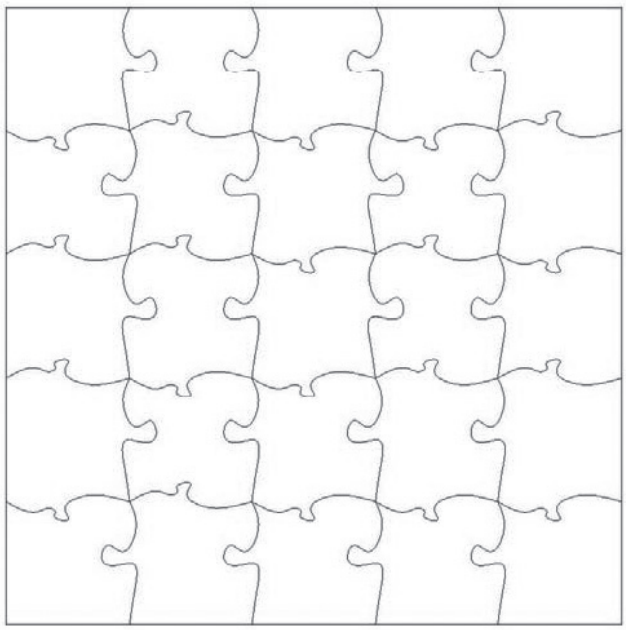

Figure 1

(a) Give **four** advantages of using a laser cutter to produce the jigsaw.

1 .....

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2 .....

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3 .....

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4 .....

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(4)

Leave blank

(b) The jigsaw is to be manufactured by a company in large quantities. The company must have quality assurance systems in place.

(i) Describe what is meant by "quality assurance".

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(2)

(ii) Explain **two** ways in which quality assurance is used to ensure the product is suitable for its intended market.

1 .....

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2 .....

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(4)

Q3

(Total 10 marks)

Leave blank

***4.** (a) Figure 2 and Figure 3 below show a camshaft used in an engine. The camshaft will be operating at high speed and the lobe will be subjected to high levels of friction when opening and closing valves.

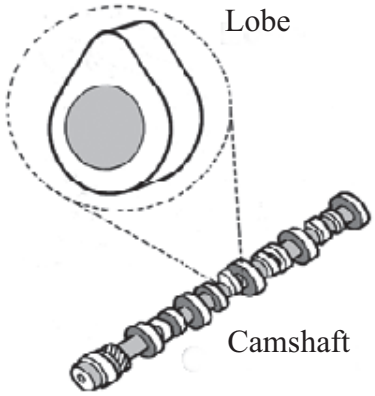

Figure 2

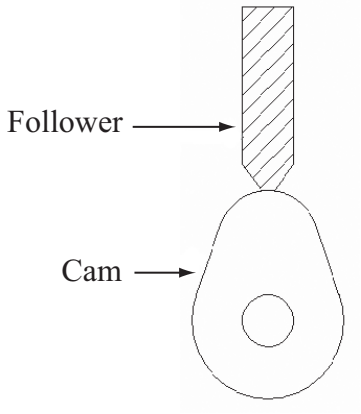

Figure 3

Consider why cast iron is used to manufacture the camshaft.

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(6)

Leave blank

(b) Quality control is an important process by which companies are able to maintain standards.

Explain **two** advantages of using computer aided inspection methods for testing the quality of each camshaft produced.

1 .....

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2 .....

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(4)

Q4

(Total 10 marks)

Leave blank

***5.** Figure 4 below shows part of a desk suitable for use in a school classroom.

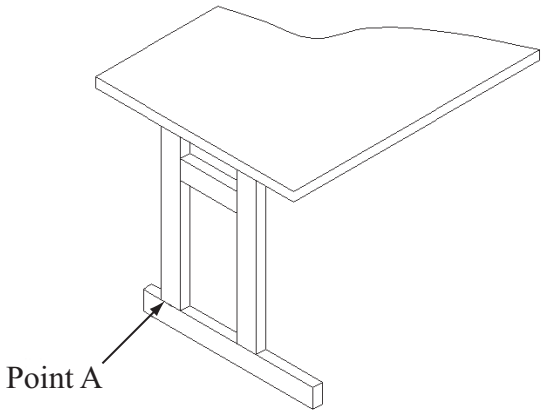

Figure 4

(a) Outline **three** reasons why plywood is preferred to a wide piece of solid timber when manufacturing the top for the desk.

1 .....

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2 .....

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3 .....

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(3)

Leave blank

(b) Using notes and/or annotated sketches illustrate the structure of plywood.

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(4)

Leave blank

(c) Figure 5 below shows part of the tubular steel frame of the desk. The tubes are bolted together so that the desk can be flat-packed.

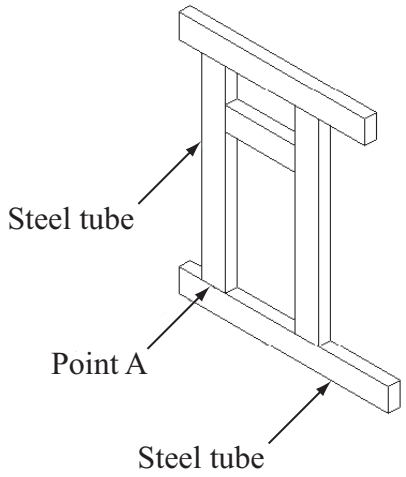

Figure 5

Using notes and/or annotated sketches illustrate how the two tubes at Point A could be bolted together.

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(4)

Q5

(Total 11 marks)

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***6.** Figure 6 below shows a piece of children's playground equipment. The slide has been manufactured from glass reinforced plastic (GRP).

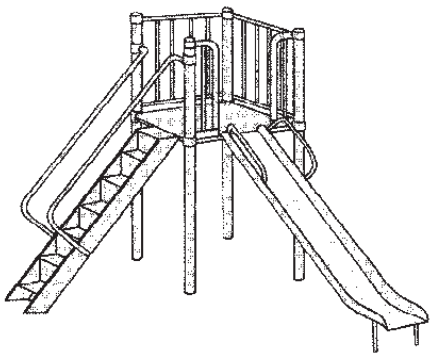

Figure 6

(a) Give **one** reason why GRP is a suitable material for the slide.

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(1)

(b) Describe how the slide would be manufactured from a mould using GRP.

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(5)

Leave blank

(c) Consider why the slide would be batch produced.

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(4)

Q6

(Total 10 marks)

Leave blank

***7.** Figure 7 below shows two extruded components made from aluminium.

Figure 7

(a) Using notes and/or annotated sketches, illustrate the process of extruding aluminium sections.

Leave blank

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(6)

(b) Assess why extrusion is a suitable process for producing these sections.

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(4) **Q7**

(Total 10 marks)

TOTAL FOR PAPER: 70 MARKS

END

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Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						6	R	M	0	3	/	1	Signature	

Paper Reference(s)

6RM03/1

Edexcel GCE

Design and Technology

Product Design: Resistant Materials Technology

Advanced

Unit 3: Designing for the Future

Sample Assessment Material

Time: 2 hours

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
Total	

Materials required for examination
Nil

Items included with question papers
Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature.
Check that you have the correct question paper.
Answer ALL the questions. Write your answers in the spaces provided in this question paper.
Do not use pencil. Use blue or black ink.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 7 questions in this question paper. The total mark for this paper is 70.
There are 16 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

Quality of written communication will be taken into account in the marking of your responses to parts of questions in Questions 1, 3, 5, 6 and 7. These questions are indicated with an asterisk. Quality of written communication includes clarity of expression, the structure and presentation of ideas and grammar, punctuation and spelling.

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Leave blank

Answer ALL the questions. Write your answers in the spaces provided.

***1.** (a) In the context of electronic communication, give **two** advantages and **two** disadvantages for video conferencing:

Advantages .....

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(2)

Disadvantages .....

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(2)

Leave blank

(b) Explain **three** ways in which Computer-Integrated Manufacturing benefits a manufacturer mass producing a product.

1 .....

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2 .....

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3 .....

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(6)

Q1

(Total 10 marks)

Leave blank

2. (a) Explain **two** advantages to the environment of recycling used materials.

1 .....

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2 .....

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(4)

(b) Explain **two** ways Computer Aided Manufacture helps reduce wastage.

1 .....

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2 .....

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(4)

Leave blank

(c) Explain **two** sustainable development issues a designer must take into consideration when designing products.

1 .....

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2 .....

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(4) **Q2**

(Total 12 marks)

Leave blank

***3.** (a) Biopol® is an 'environmentally friendly' polymer.

Explain **one** advantage of using Biopol® for producing plastic products.

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(2)

(b) Solar energy is currently used in the UK to generate electricity.

Explain **two** advantages and **two** disadvantages of using solar energy.

Advantages .....

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(4)

Leave blank

Disadvantages .....

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(4)

Q3

(Total 10 marks)

Leave blank

4. (a) Explain **two** advantages to the manufacturer of manufacturing products which have 'built-in obsolescence'.

1 .....

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2 .....

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(4)

(b) Describe the impact of the development of industrial mass production on:

(i) workers

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(3)

Leave blank

(ii) consumers

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(3)

Q4

(Total 10 marks)

Leave blank

***5.** (a) Just in time (JIT) is a production management system that is often used in business.

Consider the advantages of a JIT system.

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(4)

Leave blank

(b) Evaluate the factors a manufacturer should consider when setting up a flexible manufacturing system.

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(6) **Q5**

(Total 10 marks)

Leave blank

***6.** (a) Additives can be combined with a base material in order to create a material with new and improved properties.

Consider why the following are used to enhance the properties of polymers.

(i) Plasticisers

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.....

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.....

(2)

(ii) Fibres

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(2)

Leave blank

(b) Biotechnology, using genetic engineering, is at the forefront of the development of new methods of timber production.

Assess the impact of biotechnology on timber production.

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(6) **Q6**

(Total 10 marks)

Leave blank

***7.** Figures 1 and 2 below show two hand-held games controllers.

The hand-held games controller in Figure 1 is an early example in comparison to the hand-held games controller in Figure 2.

Figure 1

Figure 2

Using the two examples of hand-held games controllers above, evaluate how the designers have considered **functionality** and **aesthetics** as part of their design criteria.

Hand-held games controller in Figure 1.

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(4)

Leave blank

Hand-held games controller in Figure 2.

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(4) **Q7**

(Total 8 marks)

TOTAL FOR PAPER: 70 MARKS

END

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Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						6	G	R	0	2	/	1	Signature	

Paper Reference(s)

6GR02/1

Edexcel GCE

Design and Technology

Product Design: Graphic Products

Advanced Subsidiary

Unit 2: Design and Technology in Practice

Sample Assessment Material

Time: 1 hour 30 minutes

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
Total	

Materials required for examination
Nil

Items included with question papers
Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature.
Check that you have the correct question paper.
Answer ALL the questions. Write your answers in the spaces provided in this question paper.
Do not use pencil. Use blue or black ink.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 5 questions in this question paper. The total mark for this paper is 70.
There are 12 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

Quality of written communication will be taken into account in the marking of parts of questions in ALL the questions.
Quality of written communication includes clarity of expression, the structure and presentation of ideas and grammar, punctuation and spelling.

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Leave blank

Answer ALL the questions. Write your answers in the spaces provided.

1. Figure 1 below shows a mass produced multi-pack of metal drinks cans.

Figure 1

(a) (i) Name **one** ferrous and **one** non-ferrous metal that are used to make drinks cans.

Ferrous metal

.....

Non-ferrous metal

.....

(2)

(ii) A thin layer of tin is added to the surface of the ferrous metal in a drinks can to prevent corrosion.

Give **two** reasons why preventing corrosion is important for a drinks can.

1 .....

.....

2 .....

.....

(2)

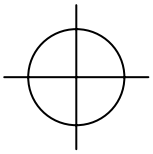
Leave blank

(b) Multi-packs of six drinks cans are shrink-wrapped in PVC with full colour graphics for sale in supermarkets.

(i) Printer's marks are used in quality control in a full colour print run.

Complete the table below by:

- naming the specific printer's mark.
- explaining its specific use.

Printer's mark	Name of printer's mark	Specific use
 **CMYK**	**(1)**	**(2)**
	**(1)**	**(2)**

(ii) Explain **two** properties of PVC that make it suitable for shrink-wrapping.

1 .....

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2 .....

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(4)

(Total 14 marks)

Q1

Leave blank

2. Figure 2 below shows a block model of a new MP3 player.

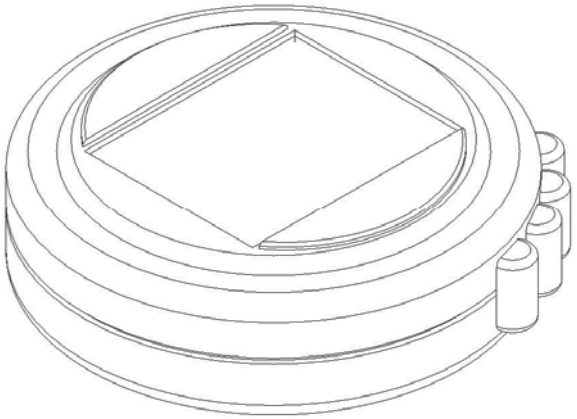

Figure 2

(a) Complete the table below by naming the most suitable adhesive used to join materials in the production of the block model.

Application	Suitable adhesive
Joining an aluminium component to the MDF component.	
Joining two vacuum formed components together.	

(2)

(b) Explain **two** properties of medium density fibreboard (MDF) that make it suitable for producing the main body of the block model.

1 .....

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2 .....

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(4)

Leave blank

(c) Explain **two** reasons why a block model of the MP3 player is made during the development stage.

1 .....

.....

.....

2 .....

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(4)

(d) Consider the benefits to the designer for using rapid prototyping at the development stage.

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(4)

Q2

(Total 14 marks)

Leave blank

3. Figure 3 shows an isometric drawing of a mass produced hand-held games console.

The front and end elevations are labelled for you.

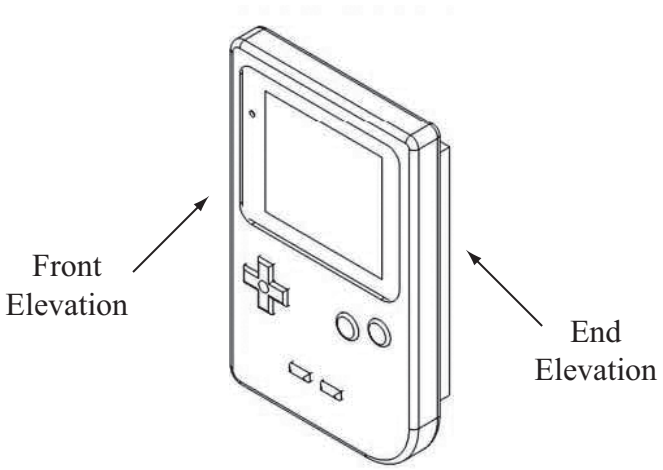

Figure 3

(a) In the space below, translate the isometric drawing shown above into a 3rd angle orthographic **sketch**. The correct BS symbol for such a drawing must be shown.

(6)

Leave blank

(b) (i) Consider the reasons why the hand-held games console should be mass produced.

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(4)

(ii) Explain **two** reasons why polystyrene (PS) was used for the casing of the hand-held games console.

1 .....

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2 .....

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(4)

Q3

(Total 14 marks)

Leave blank

4. Figure 4 shows a glossy monthly music magazine that has been commercially printed and bound.

Figure 4

(a) (i) Name **one** of the health and safety regulations that the commercial printers would have to adhere to when producing the magazine.

.....

(1)

(ii) Complete the following risk assessment table by explaining **two** suitable control measures when using a computer to design the magazine.

Hazard	Risk	People at risk	Control measure
Using a computer	Repetitive strain injury (RSI)	User	**(2)**
	Eye strain	User	**(2)**

(b) Explain **two** reasons why the magazine was designed using desktop publishing (DTP) software.

1 .....

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2 .....

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(4)

Leave blank

(c) (i) The magazine has been bound using perfect binding.

Give **one** reason why the magazine is not hard bound.

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(1)

(ii) Explain **two** advantages of using perfect binding for the magazine compared to stitching methods using staples.

1 .....

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2 .....

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(4)

Q4

(Total 14 marks)

Leave blank

5. Figure 5 shows a forehead thermometer commonly used for young children. This type of thermometer uses thermochromic film in its manufacture.

Figure 5

(a) Apart from forehead thermometers, name **one** other use for thermochromic film.

.....

(1)

(b) Discuss the reasons for using this type of forehead thermometer on young children.

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(4)

Leave blank

(c) Describe how the thermochromic film works in this type of forehead thermometer.

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(5)

Leave blank

(d) The forehead thermometer would have been designed and manufactured using a quality assurance (QA) system.

Outline the key concepts associated with a quality assurance system.

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(4) **Q5**

(Total 14 marks)

TOTAL FOR PAPER: 70 MARKS

END

Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						6	G	R	0	3	/	1	Signature	

Paper Reference(s)

6GR03/1

Edexcel GCE

Design and Technology

Product Design: Graphic Products

Advanced

Unit 3: Designing for the Future

Sample Assessment Material

Time: 2 hours

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
Total	

Materials required for examination
Nil

Items included with question papers
Nil

Instructions to Candidates

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Check that you have the correct question paper.
Answer ALL the questions. Write your answers in the spaces provided in this question paper.
Do not use pencil. Use blue or black ink.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 5 questions in this question paper. The total mark for this paper is 70.
There are 12 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

Quality of written communication will be taken into account in the marking of your responses to parts of questions in Questions 3 and 5. These questions are indicated with an asterisk. Quality of written communication includes clarity of expression, the structure and presentation of ideas and grammar, punctuation and spelling.

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Leave blank

Answer ALL the questions. Write your answers in the spaces provided.

1. Figure 1 shows a luxury box of chocolates.

Figure 1

(a) Information and communication technology (ICT) was used in the marketing and sales of the luxury box of chocolates.

(i) Give **two** advantages, to the **consumer**, of using the internet to shop for the luxury box of chocolates.

1 .....

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2 .....

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(2)

(ii) Explain **two** advantages, to the **manufacturer**, of using an electronic point of sale (EPOS) system to gather sales information.

1 .....

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2 .....

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(4)

Leave blank

(b) With specific reference to the following, explain how this type of chocolate box could be redesigned and manufactured to minimise waste production.

(i) Reduce

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(4)

(ii) Recycle

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(4)

Q1

(Total 14 marks)

Leave blank

2. Figure 2 shows a mobile phone.

Figure 2

(a) The mobile phone was designed in one country and manufactured in another.

(i) Outline the benefits of using ICT when designing and manufacturing a product in **two** different countries.

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(5)

Leave blank

(ii) The mobile phone was designed in a developed country in Europe and manufactured 'off shore' in a developing country in Asia.

Discuss the impact 'off-shore' manufacturing has upon the local community in a developing country.

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(5) **Q2**

(Total 10 marks)

Leave blank

***3.** Nuclear energy is currently used in the UK to generate electricity for the national grid.

(a) Explain **two** advantages and **two** disadvantages of using nuclear energy.

Advantages .....

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(4)

Disadvantages .....

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(4)

Leave blank

(b) Biotechnology is concerned with the modification of existing materials and production of new materials.

(i) Explain how Biopol® (a biodegradable polymer) is manufactured.

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(3)

(ii) Discuss the benefits of using genetic engineering in the production of paper and board.

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(3)

Q3

(Total 14 marks)

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4. Figures 3 and 4 below show two different kettles.

The kettle in Figure 3 is called 'Hot Bertaa' and was designed by Philippe Starck. Figure 4 shows a widely available kettle from an electrical retailer.

Figure 3

Figure 4

(a) Using the two examples in Figure 3 and Figure 4, evaluate how the designers have considered **form** and **function** as part of their design criteria.

Philippe Starck kettle (Figure 3)

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(4)

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Widely available kettle (Figure 4)

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(4)

(b) The kettle in Figure 4 was mass produced using a computer integrated manufacturing (CIM) system.

(i) Explain **two** ways in which CIM enables the efficient manufacture of products.

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(4)

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(ii) Explain **two** ways in which CIM provides a safer working environment.

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(4)

Q4

(Total 16 marks)

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***5.** (a) Consider how advances in technology have led to the miniaturisation of electronic products.

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(6)

(b) Evaluate the use of fully automated production and assembly lines incorporating robots when manufacturing products compared to labour intensive methods.

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(10) **Q5**

(Total 16 marks)

TOTAL FOR PAPER: 70 MARKS

END

C Sample mark schemes

General marking guidance 69
Product Design: Resistant Materials Technology
Unit 2: Design and Technology in Practice 71
Unit 3: Designing for the Future 81
Product Design: Graphic Products
Unit 2: Design and Technology in Practice 93
Unit 3: Designing for the Future 105

General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
- Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

  i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear
  ii) select and use a form and style of writing appropriate to purpose and to complex subject matter
  iii) organise information clearly and coherently, using specialist vocabulary when appropriate

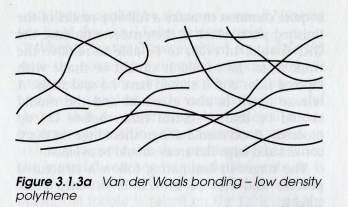
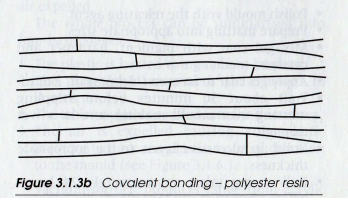
Resistant Materials Technology

Unit 2: Design and Technology in Practice

Question Number	Question	
1. (a) (i)	Give **two** advantages of using hardwood.	
	Answer	Mark
	Any **two** of the following examples from: **Advantages** • Hardwood is more durable than softwood (1) • Better tensile strength than soft wood (1) • Less likely to rot/resists weathering better than soft wood (1) • Resists insect/fungal attack better than softwood (1)	**(2)**

Question Number	Question	
1. (a) (ii)	Give **one** disadvantage of using hardwood.	
	Answer	Mark
	Any **one** of the following examples from: **Disadvantages** • Hardwood is generally more expensive than softwood (1) • Hardwood is generally harder to work (due to its density) than softwood (1) • Hardwood is slower growing therefore takes longer to replace (1)	**(1)**

Question Number	Question	
1. (b)	Outline **three** health and safety risks that must be considered when manufacturing the park benches and outline how each could be minimised.	
	Answer	Mark
	Any **three** of the following examples from: **Safety considerations / *Prevention measures*** • Dust in lungs (1) so wear a mask or have dust extraction system (1) • Particles in eyes (1) so wear safety goggles or mask (1) • Splinters (1) so wear gloves (1) • Cuts (1) so keep hands behind cutting edge of all tools/machinery (1) • Electrocution (1) so ensure cables are away from intended cutting area (1)	**(6)**

Question Number	Question	
2. (a)	Using notes and/or sketches illustrate the structural differences between a thermoplastic and a thermosetting plastic.	
	Answer	Mark
QWC (ii)	 *Figure 3.1.3a* Van der Waals bonding – low density polythene (1)  *Figure 3.1.3b* Covalent bonding – polyester resin (1) **OR** • **Thermoplastics** are made up of long chains of molecules with very few cross-linkages (1) • **Thermosetting plastics** are made up of molecules which link both side to side and end to end (1) Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(2)**

Question Number	Question	
2. (b)	Explain the different working properties of a thermoplastic and a thermosetting plastic.	
	Answer	Mark
QWC (iii)	An explanation that makes reference to: • **Thermoplastics** can be reheated and reshaped numerous times (1) • **Thermosetting plastics** have very little plasticity once they are set (1)	**(2)**

Question Number	Question	
2. (c) (i)	Describe how a piece of metal would be work hardened.	
	Answer	Mark
QWC (iii)	A description that makes reference to: • This is done by hammering/bending/rolling (1). The work is done cold (1)	**(2)**

Question Number	Question	
2. (c) (ii)	Describe how a piece of copper would be annealed.	
	Answer	Mark
QWC (iii)	A description that makes reference to: • The copper is heated (1) to dull red (1). It is left to 'soak' in the heat (1). It is cooled/quenched/left to cool naturally (1)	**(4)**

Question Number	Question	
3. (a)	Give **four** advantages of using a laser cutter to produce the jigsaw.	
	Answer	Mark
	Any **four** of the following examples from: • The speed at which the jigsaw can be cut out (1) • The accuracy of the cuts (1) • The ability to make very fine/intricate cuts in a brittle material (1) • The ability to repeat the process easily (1) • The efficient use of material as the laser removes 'virtually no' material (1)	**(4)**

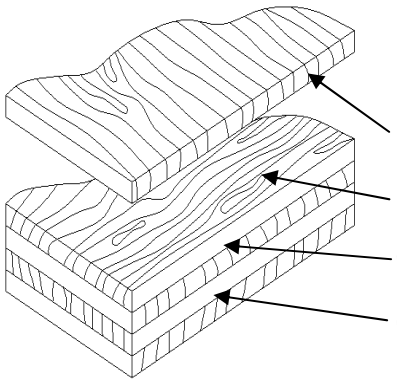
Question Number	Question	
3. (b) (i)	Describe what is meant by "quality assurance".	
	Answer	Mark
	A description that makes reference to **two** of the following: • The monitoring of the quality of a product (1) from its design and development stage, through manufacturing, to its end use(1) and customer satisfaction. (1) *Only 1 mark for 'monitored from start to finish'.* Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(2)**

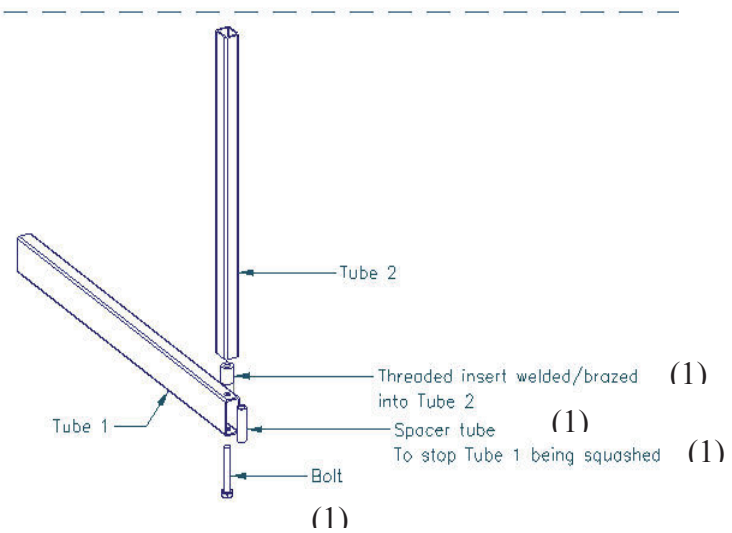
Question Number	Question	
3. (b) (ii)	Explain **two** ways in which quality assurance is used to ensure the product is suitable for its intended market.	
	Answer	Mark
	Any **two** of the following examples from: • The manufacture of the product is checked regularly (1) therefore ensuring high build quality/safety/life expectancy (1) • Performance is checked regularly (1) therefore ensuring the item functions as expected (1) • Customer satisfaction is monitored (1) therefore the company can see if they are happy with the product or respond accordingly (1) Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(4)**

Question Number	Question	
4. (a)	Consider why cast iron is used to manufacture the camshaft.	
	Answer	Mark
QWC (iii)	A consideration that makes reference to three of the following examples from: • It can be hardened and tempered (1) therefore resists wear (1) • It is a tough material (1) therefore can withstand the loads imparted on it during use (1) • It can easily be cast to a suitable shape (1) therefore less machining is required (1) • It has low co-efficient of friction compared to many metals (1) therefore creating less drag/heat/wear (1) Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(6)**

Question Number	Question	
4. (b)	Explain **two** advantages of using computer aided inspection methods for testing the quality of each camshaft produced.	
	Answer	Mark
	Any **two** of the following examples from: • Ongoing quality control is possible throughout manufacture (1) therefore inspection time is optimised (1) • Errors are identified and analysed early (1) therefore reducing waste (1) • 3D inspection is much easier (1) and more accurate (1) • Software can generate reports (1) that are compliant with 'standards' being used (1) Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(4)**

Question Number	Question	
5. (a)	Outline **three** reasons why plywood is preferred to a wide piece of solid timber when manufacturing the top for the desk.	
	Answer	Mark
	Any **three** of the following examples from: • It is more stable (1) • It is a more uniform thickness (1) • It is available in larger sizes (1) • It is equally strong in both directions (1) • It is cheaper (1)	**(3)**

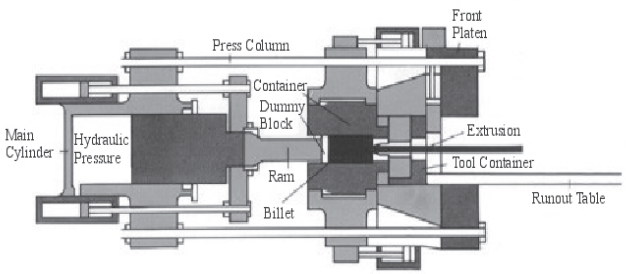
Question Number	Question	
5. (b)	Using notes and/or annotated sketches illustrate the structure of plywood.	
	Answer	Mark
QWC (ii)	Annotated sketch or wording acceptable An annotated sketch that makes reference to **four** of the following:  **OR** Any **four** of the following examples from: • Layers of thin cut wood (1) • Arranged so that grain goes at 90° on alternative layers (1) • Odd number of layers (1) • Bonded with waterproof resin or standard glues (1) Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(4)**

Question Number	Question	
5. (c)	Using notes and/or annotated sketches illustrate how the two tubes at Point A could be bolted together.	
	Answer	Mark
QWC (ii - iii)	Annotated sketch or wording acceptable An annotated sketch that makes reference to **four** of the following:  (1) (1) (1) (1) **OR** Any **four** of the following examples from: • The threaded insert is welded/brazed into Tube 2 (1) • The Spacer tube is inserted into Tube 1 (1) • The spacer is used to stop the tube squashing as the bolt is tightened (1) • The bolt is passed through Tube 1 and screwed into the threaded inset in Tube 2 (1) Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(4)**

Question Number	Question	
6. (a)	Give **one** reason why GRP is a suitable material for the slide.	
	Answer	Mark
	Any **one** of the following examples from: • Good strength to weight ratio (1) • Can be self-coloured as required (1) • Good weather resistant properties (1) • A very smooth surface can be achieved (1)	**(1)**

Question Number	Question	
6. (b)	Describe how the slide would be manufactured from a mould using GRP.	
	Answer	Mark
QWC (iii)	A description that makes reference to **five** of the following: • A release agent is applied to the mould (1). A coloured gel coat is mixed and applied to the mould (1). Resin and hardener are mixed (coloured resin can be used to increase colour intensity) (1). Glass matting and resin are applied to the gel coat until the required thickness is achieved (1). This is allowed to cure and is then removed from the mould (1). The moulding is then trimmed to remove sharp edges (1) Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(5)**

Question Number	Question	
6. (c)	Consider why the slide would be batch produced.	
	Answer	Mark
	A consideration that makes reference to two of the following examples from: • Once the mould has been produced, any number of mouldings can be taken from it (1) This means that the manufacturer can respond to demand (1) • The range of colours can be varied easily (1) This allows the manufacturer to be more flexible, thus suiting the client's specific requirements (1) • The slide is unlikely to be produced in very large numbers (1) therefore the cost of setting up a mass production system would be uneconomical (1) Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(4)**

Question Number	Question	
7. (a)	Using notes and/or annotated sketches, illustrate the process of extruding aluminium sections.	
	Answer	Mark
QWC (ii - iii)	Annotated sketch or wording acceptable An annotated sketch that makes reference to **six** of the following:  **OR** Any **six** of the following examples from: • The aluminium billet must be softened (1) by heat prior to extrusion (1). The heated billet is placed into the extrusion press. A powerful hydraulic ram pushes a dummy block (1) that forces the softened metal through a precision opening (1) known as a die (1), to produce the desired shape (1). The extrusion is supported on a runout table (1) Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(6)**

Question Number	Question	
7. (b)	Assess why extrusion is a suitable process for producing these sections.	
	Answer	Mark
	Any **two** of the following examples from: • The sections can be produced in 'endless' lengths (1) which allow the user to cut them up into the required lengths (1) • The sections produced require no finishing (1) therefore reducing cost of production (1) • They are complex sections (1) which would require a very complex mould to produce in any other way (1) • Once the set up process is complete (1) production is rapid (1) Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(4)**

Resistant Materials Technology

Unit 3: Designing for the Future

Question Number	Question	
1. (a)	In the context of electronic communication, give **two** advantages and **two** disadvantages for video conferencing.	
	Answer	Mark
QWC (iii)	**Advantages** Any **two** of the following examples from: • Enhances electronic communication – face to face (1) • Corporate training (global) becomes quick and relatively low cost (1) • Helps speed up decision making (1) • Experts can problem solve remotely (1) • Reduces the need to travel (cost implications) (1) **Disadvantages** Any **two** of the following examples from: • Requires large initial capital outlay (1) • Pictures can be 'jerky' if the technology is not very high specification (1) • Needs compatibility between user's technology (1) • Body language can be missed so not as good as being present with the person (1)	**(2)** **(2)**

Question Number	Question	
1. (b)	Explain **three** ways in which Computer-Integrated Manufacturing benefits a manufacturer mass producing a product.	
	Answer	Mark
	Any **three** of the following examples from: • Ordering of stock and materials as they are required (1), which negates the need for large storage facilities (1) • Planning of the production sequences and workflow (1) therefore ensuring optimum manufacturing efficiency (1) • Electronic customer invoicing ensures accurate and rapid distribution of invoices (1) therefore increasing the speed of payment (1) • Controlling the accurate operation of the machines (1) therefore ensuring the quality of production is reliably high (1) • CIM is flexible (1) so manufacturer can update product without having to invest in new machinery (1) • Manufacturing can be exported and done remotely (1) therefore making use of cheaper economic conditions (1) *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.*	**(6)**

Question Number	Question	
2. (a)	Explain **two** advantages to the environment of recycling used materials.	
	Answer	Mark
	Any **two** of the following examples from: • Reduces the need for landfill sites (1) which in turn reduces visual pollution of the environment (1) • Reduces dependency upon raw materials (1), which helps to conserve non-renewable resources/the sites from which they are extracted (1) • Reduces the amount of processing necessary to produce new materials (1) thereby reducing energy consumption/greenhouse gas emission that result from processing (1) • Reduces the need to incinerate rubbish (1) so reducing harmful emissions (1) *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.*	**(4)**

Question Number	Question	
2. (b)	Explain **two** ways Computer Aided Manufacture helps reduce wastage.	
	Answer	Mark
	Any **two** of the following examples from: • The accuracy of CNC machines is relatively high (1) leading to fewer rejected parts/which therefore reduces wasted material (1) • Computer planning of 'layout' means efficient production (1) therefore the optimum use of material (1) • Reduced human error (both planning and manufacturing) (1) means that less time and materials are consumed in the production of components (1) • Less need to update machinery when product is updated due to its flexible nature (1), therefore machinery has a longer useful life, reducing waste (1) *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.*	**(4)**

Question Number	Question	
2. (c)	Explain **two** sustainable development issues a designer must take into consideration when designing products.	
	Answer	Mark
	Any **two** of the following examples from: • Development that meets the needs of the present (1) **but** doesn't compromise the ability of future generations to meet their own needs (1) • Ensuring a sustainable level of population (1) with priority given to the essential needs of the world's poor/so that they can generate a sustainable economic base (1) • Bringing together environment and economics in decision making (1) in order to conserve and enhance the resource base/so that over-use of resources and the environment is avoided (1) • The type of materials used must be considered (1) so that recycling at the end of the lifespan of the product is made easier (1) • Designers should consider replacement of faulty or worn out components (1) to avoid having to scrap the whole item (1) *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.* Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(4)**

Question Number	Question	
3. (a)	Explain **one** advantage of using Biopol® for producing plastic products.	
	Answer	Mark
QWC (iii)	Any **one** of the following examples from: • It is biodegradable (1) therefore it can be disposed easily/cleanly without the need for long-term landfill sites (1) • It can be produced in bulk (1) therefore being able to be produced to meet the increasing consumer needs (1) • The raw materials are readily available (1) therefore reducing the need to consume non-renewable resources (1) *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.*	**(2)**

Question Number	Question	
3. (b)	Explain **two** advantages and **two** disadvantages of using solar energy.	
	Answer	Mark
	Advantages Any **two o**f the following examples from: • Freely available source of energy (1) therefore reducing the need to use non-renewable resources (1) • Requires little maintenance (1) therefore keeping the cost of running the system to a minimum (1) *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.*	**(4)**
	Disadvantages Any **two** of the following examples from: • Expensive to install (1) therefore not available to all households (1) • Generally at their most efficient in summer (1) therefore best when demand is at its lowest (1) • Less viable in some parts of the world (1) due to inappropriate climate (1). *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.*	**(4)**

Question Number	Question	
4. (a)	Explain **two** advantages to the manufacturer of manufacturing products which have 'built-in obsolescence'.	
	Answer	Mark
	Any **two** of the following examples from: • The product will have a pre-defined lifespan (1) therefore the manufacturer can plan more accurately when new products will be required (1) • The consumer will buy 'fashionable' products knowing that they will become unfashionable (1), therefore the manufacturer will be able to introduce/sell new products on a regular basis (1) • Modern technology is advancing at an ever increasing rate, (1) therefore items such as computers are very quickly superseded by the next generation/consumers want the 'latest' technology. (1) *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.* Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(4)**

Question Number	Question	
4. (b) (i)	Describe the impact of the development of industrial mass production on: (i) Workers	
	Answer	Mark
	A description that makes reference to **three** of the following: • Craftspeople became 'redundant' (1) • Provided employment in factories for low skilled workers (1) • Workers performed simple repetitive tasks (1) • Low wages paid due to low skill requirement (1) • Led to low morale as result of low skill requirement (1) • Low wages led to poverty for some workers (1) • Women/children employed in 'sweatshops' (1) • Poverty of workers led to uprisings/development of trade unions (1) • Trade unions demanded improved wages/conditions for workers (1) • Specialist jobs developed eg time & motion, engineer (1) • Team based strategies now being used to improve worker motivation (1) Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(3)**

Question Number	Question	
4. (b) (ii)	Describe the impact of the development of industrial mass production on: (ii) Consumers	
	Answer	Mark
	A description that makes reference to **three** of the following: • Ordinary people could afford products for first time (1) • Availability of products increased consumers' standard of living (1) • As standard of living improved, consumers able to afford more products (1) • Consumers had access to wider range of low cost products (1) • Improving standard of living led to the consumer society (1) • Led to development of consumer-led product design (1) • Consumers are encouraged to throw away and buy new rather than repair (1) Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(3)**

Question Number	Question	
5. (a)	Consider the advantages of a JIT system.	
	Answer	Mark
QWC (iii)	A consideration that makes reference to **two** of the following examples from: • It is a system which produces minimum waste – time, materials and resources (1) therefore is more environmentally friendly (1) • Minimises work in progress (WIP) (1) therefore reduces the amount of factory floor space needed/reduced amount of capital tied up in stock (1) • Enables quick response manufacturing (QRM) (1) therefore the manufacturer can respond to customer demand (1) *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.* Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(4)**

Question Number	Question	
5. (b)	Evaluate the factors a manufacturer should consider when setting up a flexible manufacturing system.	
	Answer	Mark
QWC (iii)	Answer must include both advantages and disadvantages for maximum marks. Maximum 4 marks if only advantages or only disadvantages addressed. **Advantages** (up to 4 marks): • The manufacturer can produce a set number (batch) to order (1) therefore planning and subsequent material storage is made more efficient (1) • The manufacturer can produce more than one product with the machines (1) therefore they can respond to seasonal/consumer demands (1) • The processes can be linked to automated materials handling systems (1) therefore making the manufacturing process faster and more efficient (1) • Manufacturing data can be stored electronically (1) therefore making it possible to reproduce subsequent batches far more quickly (1) **Disadvantages** (up to 4 marks): • The cost of initial setup is high (1) therefore the manufacturer must ensure sufficient work is available to make the setup viable (1) • There is a need for specialist workers (1) therefore the manufacturer must consider the financial implications for wages/availability of suitable employees/training implications (1)	

	*For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.* Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(6)**

Question Number	Question	
6. (a) (i)	Consider why the following are used to enhance the properties of polymers: (i) Plasticisers	
	Answer	Mark
QWC (iii)	A consideration that makes reference to **two** of the following: • Are used to mix with the base polymer to reduce rigidity, (1) therefore making the new polymer more flexible/pliable and less likely to crack under impact (1)/therefore increasing the flow characteristics of the plastics making complex mouldings easier to produce (1) *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing linked points.*	**(2)**

Question Number	Question	
6. (a) (ii)	Consider why the following are used to enhance the properties of polymers: (ii) Fibres	
	Answer	Mark
QWC (iii)	A consideration that makes reference to the following: • E.g. glass and carbon are used in conjunction with polyester resins to improve the strength (1) therefore making the new material able to withstand greater forces/shock (1) *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.*	**(2)**

Question Number	Question	
6. (b)	Biotechnology, using genetic engineering, is at the forefront of the development of new methods of timber production. Assess the impact of biotechnology on timber production.	
	Answer	Mark
QWC (iii)	Answer must include both advantages and disadvantages for maximum marks. Maximum 4 marks if only advantages or only disadvantages addressed. **Advantages** (up to 4 marks): • Altering genes which subsequently provide quicker growing trees (1) therefore supply of timber is faster (1) • Supply of timber that is rot resistant (1) therefore reducing the need to use toxic preservatives (1) • Supply timber of particular colour (1) therefore no need to use harmful dies and colorants (1) • Supply timber of particular texture (1) therefore making the working of the timber easier (1) • Better timber management (1) therefore less deforestation (1) • Resistant to wear (1) therefore increasing the life expectancy of a product (1) • Resistant to animal infestation (1) therefore reducing the need to use toxic pesticides (1) • Reduced lignin content of the timber (1) so paper making process is less harmful to environment (1) **Disadvantages** (up to 4 marks): • Long-term side effects not yet apparent (1) from 'escape' of modified genes into natural ecosystems (1) • Development of tolerance to the modified trait by insects or disease organisms (1) therefore susceptible to attack again (1) • Rapid growth could cause shorter, more intensive rotations (1) resulting in greater water demand / and reduced opportunity for nutrient recycling (1) *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.* Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(6)**

Question Number	Question	
7.	Using the two examples of hand-held controllers above, evaluate how the designers have considered **functionality** and **aesthetics** as part of their design criteria.	
	Answer	Mark
QWC (iii)	Answer must include both functionality and aesthetics for maximum marks. Maximum **four** marks in total for each controller. **Figure 1** **Functionality (up to 2 marks)** • Simple game-play of early consoles did not require complex operations/integrated circuits and were large with very limited processing power (1) therefore controllers have limited buttons and functions (1) **Aesthetics (up to 2 marks)** • Size of components available often determined the basic size and shape of the controller (1) therefore limiting the ergonomic design of the controller/ black box design (1) • Early games were very simple black and white images on screen so little thought would be given to the appearance of the controllers (1) so the controllers played a minor role in the popularity or appeal of the games (1) **Figure 2** **Functionality (up to 2 marks)** • Multi-function controllers became necessary (1) as the complexity of the software allowed for more and more options within the games (1) • More advanced manufacturing techniques has resulted in the ability to manufacture more complex ergonomic shapes (1) at a competitive cost due to mass production (1) **Aesthetics (up to 2 marks)** • Competition between games companies gave rise to the need to enhance the aesthetics of the controllers (1) therefore product styling and branding became an important factor in customer appeal (1) • The increased development of polymers has resulted in an ability to manufacture in a range of colours at a competitive cost (1) therefore increasing product range and appeal to fashion conscious markets (1) *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.* Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(4)** **(4)**

Graphics Products

Unit 2: Design and Technology in Practice

Question Number	Question	
1.(a) (i)	Name **one** ferrous and **one** non-ferrous metal that are used to make drinks cans.	
	Answer	Mark
	The following examples: • Ferrous metal: Steel (1) • Non-ferrous metal: Aluminium (1) • *accept* Tin (1)	**(2)**

Question Number	Question	
1.(a) (ii)	Give **two** reasons why preventing corrosion is important for a drinks can.	
	Answer	Mark
	Any **two** of the following examples from: • Corrosion would contaminate/spoil the contents of the can (1) • Limited shelf life/ shorten the lifespan of the product (1) • Corrosion aesthetically displeasing to consumer (1)	**(2)**

Question Number	Question	
1.(b) (i) 1	Naming the specific printer's mark.	
	Answer	Mark
QWC (iii)	Specific printer's mark: • Colour bars (1) *do not accept* greyscale	**(1)**

Question Number	Question	
1.(b) (i) 2	Naming the specific printer's mark.	
	Answer	Mark
QWC (iii)	Specific printer's mark: • Registration marks (1) *do not accept* target marks	**(1)**

Question Number	Question	
1.(b) (i) 1	Explaining its specific use.	
	Answer	Mark
QWC (iii)	An explanation that makes reference to **two** of the following: • Colour bars colour strips around the multiple printed sheet (1) indicating process colours and tones (1) to take densitometer readings from (1) density of ink on printed page (1) for colour consistency (1)	**(2)**

Question Number	Question	
1.(b) (i) 2	Explaining its specific use.	
	Answer	Mark
QWC (iii)	An explanation that makes reference to **two** of the following: • Registration marks 'target marks' around the multiple printed sheet (1) to line up the four colour separations (CYMK) exactly (1) so they do not print out of line (1) causing blurring (1)	**(2)**

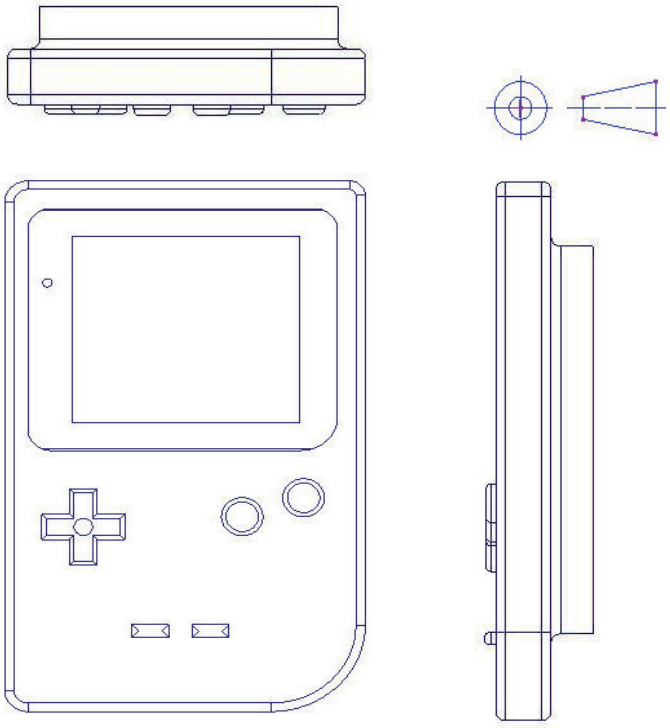
Question Number	Question	
1.(b) (ii)	Explain **two** properties of PVC that make it suitable for shrink-wrapping.	
	Answer	Mark
	Any **two** of the following examples from: • Thermoplastic (1) so it shrinks around can when heat applied/so it can be calendered or extruded to make a plastic film (1) • Strong, abrasive resistant and tough (1) so it can be shrink-wrapped around cans without splitting or tearing (1) • Good printing surface (1) so it can provide total graphic coverage of the multi-pack/excellent advertising (1)	**(4)**

Question Number	Question	
2. (a)	Complete the table below by naming the most suitable adhesive used to join materials in the production of the block model.	
	Answer	Mark
QWC (iii)	<table><tr><th>Application</th><th>Suitable adhesive</th></tr><tr><td>**Joining an aluminium component to the MDF block model**</td><td>Epoxy resin (1)</td></tr><tr><td>**Joining two vacuum formed components together**</td><td>Polystyrene cement (1)</td></tr></table> *Do not accept trade names for adhesives e.g. Araldite for epoxy resin*	**(2)**

Question Number	Question	
2.(b)	Explain **two** properties of medium density fibreboard (MDF) that make it suitable for producing the main body of the block model.	
	Answer	Mark
	Any **two** of the following examples from: • Can be shaped easily (1) as it has no grain (1) • Excellent surface finish (1) can be sanded extremely smooth/takes a range of aesthetic surface finishes well (1) • Easy to laminate layers using PVA glue (1) to create required block dimensions (1)	**(4)**

Question Number	Question	
2. (c)	Explain **two** reasons why a block model of the MP3 player is made during the development stage.	
	Answer	Mark
	Any **two** of the following examples from: • Aesthetic considerations (1) a 'feel' for the product to determine shape, style and form/surface finishes, colours and textures (1) • Ergonomic considerations to determine human interaction (1) /size of buttons or screen/size of casing –palm sized or pocket sized (1) Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(4)**

Question Number	Question	
2. (d)	Consider the benefits to the designer for using rapid prototyping at the development stage.	
	Answer	Mark
	A consideration that makes reference to two of the following examples from: • Fast entry to market place (1) due to reduced lead-time between design concept and the reality of components reaching market or approval/therefore saving time and money (1) • Accurate prototyping (1) as computer design data replicated in detail/therefore complex shapes easily produced/therefore more accurate testing as materials are more representative of final product (1) Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(4)**

Question Number	Question	
3. (a)	In the space below translate the isometric drawing shown above into a 3rd angle orthographic **sketch**. The correct BS symbol for such a drawing must be shown.	
	Answer	Mark
QWC (ii)	3rd angle orthographic of games console from isometric: Plan  Front elevation elevation End *Diagram shown is indicative of marking points only – marks to be awarded for sketched response only.* Any **five** of the following examples from: • Elevations in correct positions (1) (End elevation to the right and plan above front elevation) • Front, end and plan line up (1) • Correct proportions of elevations (1) • Curved edge in bottom right corner of front elevation (1) • Buttons and cross controller placed correctly (1) • Button 'stick out' shown on end elevation and plan (1) • Two layers of console shown on plan and end elevations (1) Correct BS symbol **must be shown** to be awarded full marks (1)	**(6)**

Question Number	Question	
3. (b) (i)	Consider the reasons why the hand-held games console should be mass produced.	
	Answer	Mark
	A consideration that makes reference to four of the following examples from: • Demand for product necessitates scale of manufacture (1) • Accuracy of manufacture (1) • Consistent high quality (1) • Relatively inexpensive to buy materials/components in bulk (1) • Low unit costs (1) • High productivity through efficient manufacture (1) • High set-up costs are quickly recovered by increased production (1) Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(4)**

Question Number	Question	
3. (b) (ii)	Explain **two** reasons why polystyrene (PS) was used for the casing of the hand-held games console.	
	Answer	Mark
	Any **two** of the following examples from: • Thermoplastic (1) therefore can easily be thermoformed using injection moulding (1) • Self finishing (1) high gloss finish does not require additional surface finishes (1) • Available in a wide range of colours (1) fashionable colours or various colours in product range (1) • Lightweight (1) for portability (1) • Good impact resistance/low water absorption (1) to protect internal electronic components (1)	**(4)**

Question Number	Question	
4. (a) (i)	Name **one** of the health and safety regulations that the commercial printers would have to adhere to when producing the magazine.	
	Answer	Mark
QWC (iii)	Any **one** of the following examples from: • The Health and Safety at Work Act (1974) (1) • The control of substances hazardous to health/COSHH (1)	**(1)**

Question Number	Question	
4. (a) (ii)	Complete the following risk assessment table by explaining **two** suitable control measures when using a computer to design the magazine.	
	Answer	Mark
	Any **two** of the following examples for each risk from:	**(2)**

Hazard	Risk	People at risk	Control measure
Using a computer	**Repetitive strain injury (RSI)**	**User**	• Keyboard should tilt (1) to provide a comfortable typing position (1) • Use an ergonomic keyboard (1) with wrist support (1) • Take regular breaks (1) to rest hands (1)
	Eye strain	**User**	• Adjust glare from monitor (1) using brightness and contrast controls (1) • Use of an anti-glare screen (1) fitted to monitor to reduce screen flicker (1) • Tilt or swivel monitor (1) to reduce reflections (1) • Take regular breaks (1) to rest eyes (1)

(2)

Question Number	Question	
4. (b)	Explain **two** reasons why the magazine was designed using desktop publishing (DTP) software.	
	Answer	Mark
	Any **two** of the following examples from: • Text and images easily manipulated (1) easy to rectify mistakes (1) • Page layout grids and guides easily included to aid design process (1) to ensure that elements are aligned (1) • Magazine design data e.g. mastheads, logos and typefaces easily stored and retrieved (1) therefore do not have to be re-designed/easily edited/therefore saving time (1) • Data stored electronically (1) therefore can be sent electronically (e-mail/ISDN) to printers to make printing plates (1) • Data sent electronically to printers in another country (1) for cheaper production (1)	**(4)**

Question Number	Question	
4. (c) (i)	Give **one** reason why the magazine is not hard bound.	
	Answer	Mark
	Any **one** of the following examples from: • Cost/hard binding is more expensive (1) • Fitness for purpose/hard binding only necessary for printed products where longevity is a key factor e.g. books (1)	**(1)**

Question Number	Question	
4. (c) (ii)	Explain **two** advantages of using perfect binding for the magazine compared to stitching methods using staples.	
	Answer	Mark
	Any **two** of the following examples from: • Better overall look and visual appeal (1) printable spine rather than staples (1) • Better quality (1) puts all the pages or signatures together, roughens and flattens the edge, then a flexible adhesive attaches the paper cover to the spine (1) • Durable (1) longevity of magazine (1) • Versatile (1) can be used with publications that are several inches thick (1)	**(4)**

Question Number	Question	
5. (a)	Apart from forehead thermometers, name **one** other use for thermochromic film.	
	Answer	Mark
	Any **one** of the following examples from: *Application should involve reaction to temperature including:* • Battery test panels (1) • Fish tank/aquarium thermometers (1) • Temperature gauge on electronic components (1) • Promotional panels on packaging (1) e.g. competitions that reveal a code when product is chilled • Reveals on mugs that show a picture when hot liquid is added (1)	**(1)**

Question Number	Question	
5. (b)	Discuss the reasons for using this type of forehead thermometer on young children.	
	Answer	Mark
	A discussion that makes reference to two of the following examples from: • Safer than traditional glass mercury filled thermometers (1) will not crack and cause poisoning (1) • Quicker to take temperature (1) externally rather than internally (1) • Easier to read (1) with large temperature gauge (1) • Much less stressful on the child (1) to hold the reader on their head rather than internally (1) • Easier to hold the reader on their head whilst holding the child comfortably (1) rather than trying to hold it internally in the ear or mouth (1) Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(4)**

Question Number	Question	
5. (c)	Describe how the thermochromic film works in this type of forehead thermometer.	
	Answer	Mark
QWC (iii)	A description that makes reference to any **five** of the following: *The layered structure of the thermometer strip:* • A layer of conductive ink is screen printed onto the reverse of the PVC thermometer strip (1) • This area makes contact with the child's forehead (1) • On top of the PVC strip is a layer of normal ink that conveys the temperature gauge colour bars (1) • On top of the colour printing is the thermochromic layer which is black when cool (1) *How it works:* • By pressing the thermometer to the forehead, the temperature generated will turn the thermochromic ink translucent (1) • This reveals the temperature colour bars that are printed underneath in normal ink (1) • Depending upon inner body temperature, most or all of the thermochromic ink will heat to the temperature needed to become translucent (1) Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(5)**

Question Number	Question	
5. (d)	Outline the key concepts associated with a quality assurance system.	
	Answer	Mark
QWC (iii)	An answer that makes reference to any **four** of the following: • Monitoring the quality from its design and development stage, through its manufacture, to its end-use performance and degree of customer satisfaction (1) • Use of quality control (QC) as part of the achievement of QA (1) • monitoring and achieving of high standards by inspection and testing (1) • ensuring continuous feedback and control (1) • Meeting agreed tolerances in order to function in accordance with its specification (1) • Testing against criteria set out in design and/or manufacturing specifications to ensure a consistently high quality product (1) Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(4)**

Graphics Products

Unit 3: Designing for the Future

Question Number	Question	
1. (a) (i)	Give **two** advantages, to the **consumer**, of using the internet to shop for the luxury box of chocolates.	
	Answer	Mark
	Any **two** of the following examples from: • easier/faster access to product information/data (1) • easier/faster access to a wider range of products (1) • range of search engines to locate specific products (1) • facility for custom-made/ personalised products (1) • ease of use for the customer (from home) (1) • secure ordering and payment facility for credit/ debit card transactions (1) • reduced cost of products due to fewer overheads (1)	**(2)**

Question Number	Question	
1. (a) (ii)	Explain **two** advantages, to the **manufacturer**, of using an electronic point of sale (EPOS) system to gather sales information.	
	Answer	Mark
	Any **two** of the following examples from: • Easier/faster collection of sales information (1) through EPOS tills therefore, speed and/or accuracy of communication (1) • Enables JIT manufacture (1), reduces need for stock and cost of storage (1) • Use of EPOS distribution to record (1), sort and store sales information in database (1) • Enables manufacturing to meet consumer demand (1) by calculating stock levels faster / order fast selling products electronically (1) • reduced lead times/faster time to market (1) – as JIT manufacturing can occur (1) *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.*	**(4)**

Question Number	Question	
1. (b) (i)	With specific reference to the following, explain how this type of chocolate box could be redesigned and manufactured to minimise waste production. (i) Reduce	
	Answer	Mark
	Any **two** of the following examples from: • Reduce the quantities of materials used (1) therefore, diverting waste from landfill/reducing environmental impact/and disposal costs (1) • Optimise packaging (1) by matching packaging to the level of protection required (1) *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.*	**(4)**

Question Number	Question	
1. (b) (ii)	With specific reference to the following, explain how this type of chocolate box could be redesigned and manufactured to minimise waste production. (ii) Recycle	
	Answer	Mark
	Any **two** of the following examples from: • Use of recycled materials e.g. card (1) to minimise extraction and processing of new materials (1) • Design for recycling (1) by incorporating component parts that can easily be extracted and recycled (1) *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.*	**(4)**

Question Number	Question	
2. (a) (i)	Outline the benefits of using ICT when designing and manufacturing a product in **two** different countries.	
	Answer	Mark
	An answer that makes reference to any **five** of the following: • Data sent electronically via e-mail/ISDN from design team to manufacturing company in different countries (1) • Product could be produced at a fraction of the cost by manufacturing in a developed country (1) • Speed and efficiency of modelling and modification of ideas (1) • Speed of decision making by design team and manufacturing team (1) • Easy access to design data/working drawings/manufacturing specifications for design and manufacturing teams (1) Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(5)**

Question Number	Question	
2. (a) (ii)	Discuss the impact 'off-shore' manufacturing has upon the local community in a developing country.	
	Answer	Mark
	Answers must include both advantages and disadvantages for maximum marks. Maximum 3 marks if only advantages or only disadvantages addressed. **Advantages** • Economic regeneration of local area through increased employment in manufacturing and service industries/wages spent in local shops etc (1) • Improvement in living standards through career development and multi-skilling of workforce (1) • Physical regeneration of local area through development of infrastructure, transportation and/or local amenities (1) **Disadvantages** Environmental issues: • increased pollution and waste production as a result of manufacturing activities (1) • destruction of local environment to build factories, processing plants, infrastructure etc (1) Employment issues: • lower wages than workers in developed countries where a minimum wage operates (1) • promotion restrictions as managerial roles by employees from developed countries (1) • no unions for equal rights issues including unfair dismissal/ hire and fire (1) • lower safety standards when using 'sweat shops' (1) • devaluing of traditional craft skills, replacement by	

	repetitive 'machine minding' tasks (1) Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(5)**

Question Number	Question	
3. (a)	Explain **two** advantages and **two** disadvantages of using nuclear energy.	
	Answer	Mark
QWC (iii)	**Advantages** Any **two** of the following examples from: • Uses Uranium which is an abundant (1) and widely distributed fuel (1) • Controlled chain reaction creates heat (1) which can be used to heat power station (1) • Mitigates the greenhouse effect (1) if used to replace fossil-fuel-derived electricity (1) • Passively-safe nuclear reactors using new technology (1) leading to increased levels of safety to avoid leaks and overheating leading to melt-down (1) • Future development fission reactor (1) which are cleaner and more efficient (1) *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.* **Disadvantages** Any **two** of the following examples from: • Unpopular/mistrust with public (1) due to media coverage of large-scale accidents e.g. Chernobyl in 1986 (1) • Problem of storing radioactive waste for indefinite periods (1) e.g. thousands of years to decay (1) • Potential for: severe radioactive contamination by accident or sabotage (1) proliferation of nuclear weapons in some countries (1) *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.* Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(4)** **(4)**

Question Number	Question	
3. (b) (i)	Explain how Biopol® (a biodegradable polymer) is manufactured.	
	Answer	Mark
QWC (iii)	Any **one** of the following examples from: • Biopol® is naturally produced in bacteria (Alcaligenes eutrophus) (1) from the fermentation of sugars (glucose)/fermentation of carbohydrates in wheat by the bacterium (1) which are collected in their cells as reserve material (1) • The polymer is separated and refined from the bacteria (1), subject to granulation process (1), and can then be used in such form for plastics processing (1). *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.*	**(3)**

Question Number	Question	
3. (b) (ii)	Discuss the benefits of using genetic engineering in the production of paper and board.	
	Answer	Mark
	A discussion that makes reference to any **three** of the following examples from: • Aids trees' resistance to disease (1) • Reduction of lignin in tree growth (1) • Reduces the toxic chemicals used in the paper industry needed to break down lignin (1) • Produces trees with increased growth rate (1) • Reduces deforestation (1) • Trees grown specifically for the paper industry (1) • Enzymes break down timber fibres more effectively (1) • Paper fibres can be more effectively bonded (1) • Treat recycled paper more effectively/easier (1) • Paper treated to biodegrade more easily and quicker (1) • Efficient production/made faster (1) Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(3)**

Question Number	Question	
4. (a)	Using the two examples in Figure 3 and Figure 4, evaluate how the designers have considered **form** and **function** as part of their design criteria.	
	Answer	Mark
	Answer must include both form and function for maximum marks. Maximum **four** marks in total for each kettle. **Figure 3** **Form (up to 2 marks)** • Form over function (1) where kettle is a sculptural 'object of desire'/lifestyle product (1) • Aesthetically pleasing for fashion conscious (1) incorporating a brightly coloured polymer handle and aluminium body/cone-shaped shaft serves as both its handle and spout (1) **Function (up to 2 marks)** • Art form where functionality became irrelevant (1) does not have to look like a kettle in order to boil water (1) • Poor functionality/user friendliness (1) shape proved difficult to pour boiling water from/impractical to fill water through narrow cylindrical handle (1) • Intrinsic design flaws/poor safety (1) as heating mechanism largely unreliable/handle became hot once water had boiled/water leaked easily/dangerous to lift as it weighed so much (1) **Figure 4** **Form (up to 2 marks)** • Form follows function (1) where the functionality of boiling water is the prime driver/secondary requirement to look good in the kitchen (1) • Inoffensive neutral style (1) that fits in with a wide range of domestic kitchen environments (1) • Attractive to wide range of customers (1) with curved handle with ergonomic grip/ stainless steel body with contrasting blue water level indicator (1) **Function (up to 2 marks)** • Good functional aspects/user friendliness (1) ergonomically designed handle grip for comfortable pouring/ON/OFF switch positioned at top for easy access/handle at side of kettle body for easy filling and pouring/water level indicator tells user how much water is in kettle/large opening lid to fill kettle (1) • Important safety features incorporated (1) such as automatic switch off once boiled/removable from power supply base so no risk of trailing power cable(1) *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.*	**(4)** **(4)**

	Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	

Question Number	Question	
4. (b) (i)	Explain **two** ways in which CIM enables the efficient manufacture of products.	
	Answer	Mark
	Any **two** of the following examples from: • Information data required (1), from the planning and design stages, right through the production, to the final release can be stored, reviewed and altered quickly, allowing a change of production (1). • The need to respond to consumer demand (1), by expanding/ reducing product diversity and updating products on a regular basis is a primary factor (1). • A central computer can be used to control manufacturing cells and stock/material levels (1). Products can be designed on one site and data transferred to another site for global manufacture (1) *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.* Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(4)**

Question Number	Question	
4. (b) (ii)	Explain **two** ways in which CIM provides a safer working environment.	
	Answer	Mark
	Any **two** of the following examples from: • safer for workers on the shopfloor (1) through use of sensors on machines controlling potentially dangerous manufacturing operations (1) • can handle hazardous manufacturing processes (1) through use of CNC machines (1) • can work continuously (1) and does not suffer from fatigue and make errors relative to safety aspects (1) *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.* Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(4)**

Question Number	Question	
5. (a)	Consider how advances in technology have led to the miniaturisation of electronic products.	
	Answer	Mark
QWC (iii)	A consideration that makes reference to **three** of the following examples from: • **Advanced integrated circuits** (IC's) or microprocessors have miniaturized electronic circuits (1) allowing more circuitry to be included on each micro-chip but with increased power (1) • **Advanced battery technology**/rechargeable Lithium ion battery provides a lightweight battery that stores a lot of energy (1) resulting in smaller and thinner fuel cells (1) • **Advanced liquid crystal displays** (LCD's) enable thinner and brighter colour screens that require much smaller current (1) therefore, prolong the life of batteries/greater energy efficiency/slim-line housings (1) *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.* Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(6)**

Question Number	Question	
5. (b)	Evaluate the use of fully automated production and assembly lines incorporating robots when manufacturing products compared to labour intensive methods.	
	Answer	Mark
	Answer must include both advantages and disadvantages for maximum marks. Maximum 6 marks if only advantages or only disadvantages given. **Advantages** (up to 6 marks) • Increases productivity and reduces costs (1) due to efficiency of machines and less wages (1) • Provides flexibility in the manufacturing process (1) by re-programming for different products, components and scale of production/without completely re-building production lines (1) • Increases repeatable quality of products (1) using programmable logic controllers (PLCs) to precisely control actions/that permit a tight control of almost any industrial process (1) • Robots can work freely in hazardous conditions i.e. paint shops (1) that humans could not without risks to health and safety (1) • 'Freeing up' of the labour force (1) allows more people to enter higher skilled jobs/which are typically higher paying (1) **Disadvantages** (up to 6 marks) • Devalues labour (1) through its replacement with less-expensive machines/unskilled workforce (1) • High cost of recruiting and training highly skilled operators (1) to programme and maintain sophisticated machines and complex systems (1) • Extremely high initial set up costs (1) involving the buying, installing and commissioning new technology so that it is effective (1) • Not suitable for extremely detailed manufacturing/finishing activities (1) where human 'eye for detail' still prevails i.e. painting (1) • The high cost of keeping up with new technological advances (1) enabling the company to maintain its competitive edge (1) *For maximum marks **both** the lead-in and justification must be present and linked.* *Each bullet point indicates a single answer containing two linked points.* Answers are indicative of the responses expected of candidates. They are not exhaustive so apply professional judgement to interpret if candidate's response is appropriate, using the indicative answers as a guide.	**(10)**

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