Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2017

Technology and Design

Unit 3: Product Design

MV18

[GTD31]

THURSDAY 8 JUNE, AFTERNOON

Time

1 hour, plus your additional time allowance.

Instructions to Candidates

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Questions which require drawing or sketching should be completed using an H.B. pencil. All other questions must be completed using black ink only.
Do not write in pencil or with a gel pen.
Answer **all eight** questions.

Information for Candidates

The total mark for this paper is 80.
Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.

Answer **all** questions

1 **(a)** Outline **one** effect and **one** cause of expansion in a wooden door. [1 mark for each]

Effect _____

_____

Cause _____

_____

(b) A number of different materials are named below.

Materials:

- Oak
- Urea formaldehyde
- Aluminium
- Parana pine
- Nylon
- Stainless steel

Complete **Table 1** by inserting the name of the material that relates to its material property. [6 marks]

Table 1

Material Property	**Name of Material**
Ferrous Metal	
Non-ferrous Metal	
Hardwood	
Softwood	
Thermoset	
Thermoplastic	

2 A number of manufacturing processes are used in industry. Two of these are laminating and die-casting.

(a) (i) Outline **two** features of laminating. [2 marks]

1. _____

_____

2. _____

_____

(ii) Give **two** applications of laminating. [2 marks]

1. _____

_____

2. _____

(b) (i) Outline **two** features of die-casting. [2 marks]

1. _____

_____

2. _____

_____

(ii) Give **two** applications of die-casting. [2 marks]

1. _____

_____

2. _____

_____

3 Three consumer protection acts are listed below. They are:

- The Trade Descriptions Act;
- The Consumer Safety Act;
- The Sale of Goods Act.

(a) Outline the main purpose of each act. [3 marks]

The Trade Descriptions Act _____

_____

The Consumer Safety Act _____

_____

The Sale of Goods Act _____

_____

(b) **Fig. 1** shows a tricycle that has been designed and produced by a manufacturer of children's toys. The tricycle has been advertised as being suitable for children aged between three and seven years of age.

Fig. 1

(i) Identify **two** features of the tricycle and suggest how each may have been influenced by The Trade Descriptions Act. [1 mark for each feature]

Trade Descriptions Act

Feature 1: _____

Influence: _____

_____

Feature 2: _____

Influence: _____

_____

(ii) Identify **two** features of the tricycle and suggest how each may have been influenced by The Consumer Safety Act. [1 mark for each feature]

The Consumer Safety Act

Feature 1: _____

Influence: _____

_____

Feature 2: _____

Influence: _____

_____

(iii) How can the consumer be assured that the tricycle is fit for purpose? [1 mark]

_____

4 **(a)** **(i)** State **three** methods which are used to reduce heat loss from a home. [3 marks]

1. _____

2. _____

3. _____

(ii) State **two** energy saving features which could be included in the lighting for a house. [2 marks]

1. _____

2. _____

(b) Wastage should be considered in the design of a product.

State **three** ways to reduce wastage in the design and marketing of a product. [3 marks]

1. _____

2. _____

3. _____

5 A manufacturer of an electronic game controller, shown in **Fig. 2** below, has used ABS plastic for the outside casing. The casing was made in large volumes using the injection moulding process.

Fig. 2

(a) Give **three** reasons, other than large volumes, why the injection moulding process was selected by the manufacturer to make the game controller casing. [1 mark for each reason]

(i) _____

_____

(ii) _____

_____

(iii) _____

_____

(b) Outline any **two** stages in the injection moulding process. [1 mark for each stage]

1. _____

_____

2. _____

_____

(c) Name the **category** of plastic used for injection moulding of the casing. [1 mark]

_____

(d) The controller casing was designed using Computer Aided Design (CAD).

CAD performs a number of tasks when used in designing products.

Give **two** different tasks which CAD can perform when used to design the electronic game controller.
[1 mark for each task]

1. _____

_____

2. _____

_____

6 **(a)** Give **one** characteristic of:

- Quality Assurance [1 mark]

_____

_____

- Quality Control [1 mark]

_____

_____

- Tolerance [1 mark]

_____

_____

(b) A company has limited capacity and is unable to manufacture all parts of a proposed product.

State **three** alternative ways by which some parts of the product could be obtained. [1 mark for each way]

1. _____

2. _____

3. _____

(c) Outline a method which could be used to ensure that the parts obtained meet the required quality standards. [2 marks]

_____

_____

7 A knowledge and understanding of the properties of materials is essential for the design and use of products.

(a) Complete **Table 2** below by inserting the property number that is most appropriate to the given material. [4 marks]

List of properties:

1. Changes shape from a rigid form to an elastic form when heat is applied. Reverts back to its original form when heat is removed

2. Changes colour due to a change in temperature

3. At 62 °C can be shaped and reshaped any number of times

4. It decomposes

Table 2

Materials	Property Number
Biodegradable Plastic	
Thermochromic Pigments	
Shape Memory Alloy (nitinol)	
Polymorph	

(b) From the given list of plastics select the most appropriate plastic for the Lego bricks and the sports clothing shown below. In each case give a reason for the selected material. [1 mark for each material and 1 mark for each reason]

Note: the same reason cannot be used twice.

List of plastics:

Nylon; Epoxy Resin; Urea Formaldehyde; ABS

(i) Lego bricks

Material: _____

Reason: _____

_____

(ii) Sports clothing

Material: _____

Reason: _____

_____

8 **Fig. 3** shows a picture of children's toys. Using annotated sketch(es), design a pull along trolley suitable for children of 3**+** years of age. The trolley should be designed to hold and transport a variety of toys around a room by the child. The overall dimension of the base of trolley is to be 400 mm long by 300 mm wide and 100 mm high.

Fig. 3

The design must satisfy the following specification points:

(a) The trolley must move easily and be capable of holding a selection of toys. There needs to be easy access to the toys. [2 marks]

(b) An appropriate secure method of moving the trolley by a child must be shown. [3 marks]

(c) The material(s) selection, justification and the economy of material(s) used need to be specified. [4 marks]

(d) The method(s) of construction, assembly and finish of the trolley must be clearly shown. [5 marks]

(e) The trolley must be safe to use, aesthetically pleasing and appealing to young children. [4 marks]

(f) The solution should show good quality detailed sketch(es) with explanatory notes. Include **three** overall dimensions. [6 marks]

Use the next two pages for your answer.

Answer page

Answer page

SOURCES

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THIS IS THE END OF THE QUESTION PAPER

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Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
Total Marks	

Examiner Number