Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2018

Technology and Design

Unit 3: Product Design

[GTD31]

GTD31

FRIDAY 25 MAY, AFTERNOON

TIME

1 hour.

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.
Do not write outside the boxed area on each page or on blank pages.
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 down the right-hand side of pages indicate the marks awarded to each question or part question.

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Answer **all** questions

1 **Table 1** lists 8 materials. For each material listed, place a tick (✓) in the box that relates to the classification of that material.

Table 1

Material	Ferrous Metal	Hardwood	Softwood	Thermosetting	Thermoplastic	Manufactured board
Parana Pine						
Stainless Steel						
Urea formaldehyde						
ABS						
Nylon						
Oak						
Polymorph						
Plywood						

[8]

[Turn over

2 **Fig. 1** shows a prototype for a child's toy which is mostly made from plywood.

Source: Author: P. Ex.

Fig. 1

(a) What is the purpose of the pull cord?

_____ [1]

(b) **(i)** Other than cost, suggest a reason for the use of plywood for the toy.

_____ [1]

(ii) Name a manually operated machine that could be used to cut out the plywood for the body, arms and legs of the toy.

_____ [1]

(iii) Name **two** specific safety precautions that should be observed when using the machine named in **(b)(ii)**.

1. _____ [1]

2. _____ [1]

(c) The toy is to be produced by a manufacturing company in large batches using CAM.

(i) Outline **two** benefits for the manufacturer when using this type of production.

Benefit 1: _____

_____ [1]

Benefit 2: _____

_____ [1]

(ii) Outline why quality control is important for the manufacturer when producing the toy.

_____

_____ [1]

[Turn over

3 A company which designs, manufactures and assembles racing bicycles engages in:

Just-in-time manufacture and **Sub-contracting.**

(a) Outline what each term means and give a reason for its use by the company.

Just-in-time manufacture: _____

_____ [1]

Reason: _____

_____ [1]

Sub-contracting: _____

_____ [1]

Reason: _____

_____ [1]

(b) The design team in the company makes use of ergonomics when designing and developing new bicycles.

Explain why the design team needs to have a knowledge of ergonomics.

Ergonomics _____

_____ [2]

(c) The manufacturer of the bicycles employs an **in-line assembly** process.

State **two** main features of this type of assembly process.

1. _____

_____

2. _____

_____ [2]

4 Available shapes and properties are two important criteria in the selection of materials.

(a) Suggest what shape or form of material should be ordered for manufacturing:

1. The outer casing of a refrigerator.

_____

2. The frame of a bicycle.

_____ [2]

(b) For each of the following applications give a suitable material and a property which makes it appropriate for this application. A different material and property should be given in each case.

Kitchen worktop surface:

Material: _____

Property: _____

Bicycle chain:

Material: _____

Property: _____

Front door of a house:

Material: _____

Property: _____

[6]

[Turn over

5 In Marketing it is important to be able to demonstrate an understanding of the life cycle of a product.

The product life cycle consists of five important stages.

One of these stages is called the **maturity** stage.

(i) Name the other **four** stages.

1. _____ [1]

2. _____ [1]

3. _____ [1]

4. _____ [1]

(ii) Outline **four** characteristics associated with the **maturity** stage of a product.

Characteristic 1: _____

_____ [1]

Characteristic 2: _____

_____ [1]

Characteristic 3: _____

_____ [1]

Characteristic 4: _____

_____ [1]

6 **(a)** Outline what is meant by the Recycling of materials.

_____

_____ [1]

(b) Many items of food and drink, for example, peas, beans and soft drinks, are sold in supermarkets in sealed metal cans.

Name **two** of the metals used for this purpose which can then be recycled.

1. _____

2. _____ [2]

(c) Outline **four** benefits of recycling.

1. _____

_____

2. _____

_____

3. _____

_____

4. _____

_____ [4]

(d) Explain **one** drawback associated with the recycling process.

_____ [1]

[Turn over

7 An understanding of production processes is essential for the design and manufacture of products.

(a) Using the given list of production processes below, complete **Table 2** by inserting the most appropriate process for each given product.
The first one is done for you.

LIST OF PRODUCTION PROCESSES:

Extrusion

Injection Moulding

Vacuum Forming

Die Casting

Blow Moulding

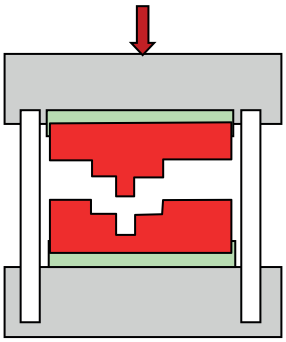
Table 2

Product	Process
Plastic tray for sweets  © ngkaki / iStock / Thinkstock	**Vacuum Forming**
Metal Toy  © Soundsnaps / iStock / Thinkstock	
Plastic seat  © sunstock / iStock / Thinkstock	
Plastic bottles  © Niteenrk / iStock / Thinkstock	
Aluminium tubes  © Rost-9D / iStock / Thinkstock	

[4]

[Turn over

(b) **Fig. 2** shows an outline sketch of a compression or press moulding machine used in the production process for certain plastic products.



Source:Author P.Ex

Fig. 2

(i) Outline **three** key features of this process.

_____

_____ [1]

_____

_____ [1]

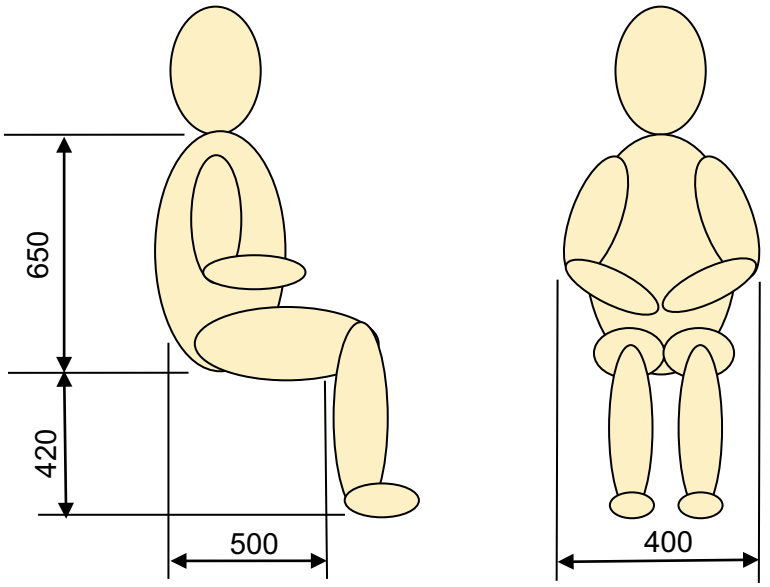
_____

_____ [1]

(ii) Name **one** specific plastic used in this process.

Plastic: _____ [1]

8 **Fig. 3** shows a sketch of a manikin with anthropometric data for an average person. Using annotated sketch(es), design a park bench with a back support, capable of holding up to three people of average size and weight. The estimated average weight of a person is 80 kg. The overall dimension of the bench should be no greater than 1700 mm long by 600 mm wide and 850 mm high.



Source: Author P.Ex

Fig. 3

The design must satisfy the following specification points:

(a) The bench must be strong and capable of holding **three** people of average size and weight. [2]

(b) The bench must be stable and be comfortable to sit on. [3]

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

(d) The manufacture, assembly and finish of the bench must be clearly detailed. [6]

(e) The bench must be of appropriate sizes and proportions, safe to use, and aesthetically pleasing. [3]

(f) The solution should show good quality detailed sketch(es) with notes, including **three** key important dimensions. [6]

Use the next two pages for your answer.

[Turn over

Answer page

Answer page

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For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
Total Marks	

Examiner Number