



Rewarding Learning

General Certificate of Secondary Education
January 2019

Centre Number

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Candidate Number

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Technology and Design

Unit 3: Product Design



[GTD31]

GTD31

FRIDAY 11 JANUARY, 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.



- 1 (a) (i) Complete **Table 1** below by matching each metal with its correct category. The first one has been done for you.

Table 1

Metal	Ferrous	Non-Ferrous
Iron	✓	
Copper		
Stainless Steel		
High Carbon Steel		
Aluminium		

[4]

- (ii) Name the **two** alloys in **Table 1** above.

_____ [2]

- (b) Identify **one** property of copper and **one** applied use of this property.

Property _____

_____ [1]

Applied use _____

_____ [1]



2 (a) **Extrusion** and **vacuum forming** are two common industrial manufacturing processes used to produce plastic components.

Which process is considered as a **reforming** process and which process is considered as a **deforming** process?

Reforming process _____ [1]

Deforming process _____ [1]

(b) (i) Outline **three** key features of the **extrusion** process.

1. _____

2. _____

3. _____
_____ [3]

(ii) Outline **three** key features of the **vacuum forming** process.

The key features should be different to those used in part (b)(i).

1. _____

2. _____

3. _____
_____ [3]

[Turn over



- 3 **Fig. 1** shows a picture of a free-standing acrylic photo frame designed and made by a pupil.
Using a Gantt chart to plan the manufacture of the photo frame was very important.
Each stage and time for manufacture had to be identified.



Source: © Principal examiner

Fig. 1

The stages and times of manufacture were:

- Mark out and cut acrylic – 20 minutes
- File and smooth edges – 60 minutes
- Cut hole and file – 20 minutes
- Fold shape – 20 minutes
- Mark out stars – 20 minutes
- Cut out stars – 40 minutes
- File and smooth stars – 40 minutes
- Assemble and glue stars – 20 minutes



Complete the Gantt chart in **Table 2** to illustrate the stages/times for the manufacture of the photo frame. Each manufacturing stage must be completed before moving onto the next stage. Each division in **Table 2** equals 20 minutes.

Table 2

Manufacturing Stages	Time													
Mark out and cut acrylic														
File and smooth edges														
Cut hole and file														
Fold shape														
Mark out stars														
Cut out stars														
File and smooth stars														
Assemble and glue stars														

[8]

[Turn over



4 **Anthropometrics** and **ergonomics** are important factors that need to be considered in the design of products.

(i) Define what is meant by anthropometrics.

_____ [1]

(ii) Define what is meant by ergonomics.

_____ [1]

(iii) Outline **two** specific **anthropometric** factors that would have an important influence on the design of a **remote control** for a television. For each factor selected explain its influence on the design.

Specific factor 1 _____
Influence _____ [2]

Specific factor 2 _____
Influence _____ [2]

(iv) Discuss **two** specific **ergonomic** factors that would have an important influence on the position/location of the television.

_____ [2]





5 Modelling is an important part of the design and make process.

(a) Describe one **main benefit** and one **limitation** of each of the following modelling types.

Note: A different benefit and limitation should be used in each case.

(i) Mock-ups

Benefit _____

Limitation _____

_____ [2]

(ii) Prototypes

Benefit _____

Limitation _____

_____ [2]

(iii) Computer modelling

Benefit _____

Limitation _____

_____ [2]

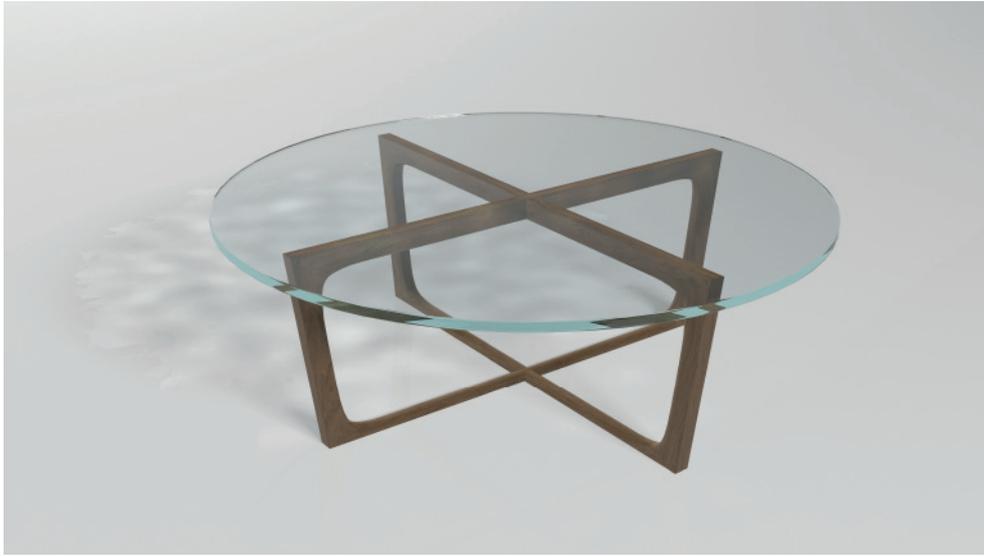
(b) Explain the purpose of a working drawing in the design and make process.

_____ [2]

[Turn over



6 Fig. 2 shows a prototype of a coffee table made from glass and mahogany. The table is to be made by batch production.



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Fig. 2

(a) What is the purpose of product analysis?

[1]

(b) Suggest **two** reasons why the designer selected mahogany for the frame structure of the table.

1. _____

[1]

2. _____

[1]



(c) (i) Each frame could be made by:

- assembly, using four pieces of wood

or

- cutting out each frame from a solid piece of timber

The designer selected the **assembly** method for the frames. Give **two** reasons to suggest why the designer preferred this method for the manufacture of the frames.

[2]

(ii) Name a suitable joint that could be used for the corners of the frame.

[1]

(d) Describe **two** characteristics of batch production.

1. _____

2. _____

[2]

[Turn over



7 (a) Health and Safety is very important when using machine tools. Describe **three** different potential safety hazards associated with machine tools and a method employed to reduce the risk to the operator in each case.

The method employed to reduce the risk should be different in each case.

Hazard 1 _____

Risk reduction _____

Hazard 2 _____

Risk reduction _____

Hazard 3 _____

Risk reduction _____

_____ [6]

(b) Outline **two** examples of good practice when using a wood chisel.

1. _____

2. _____

_____ [2]





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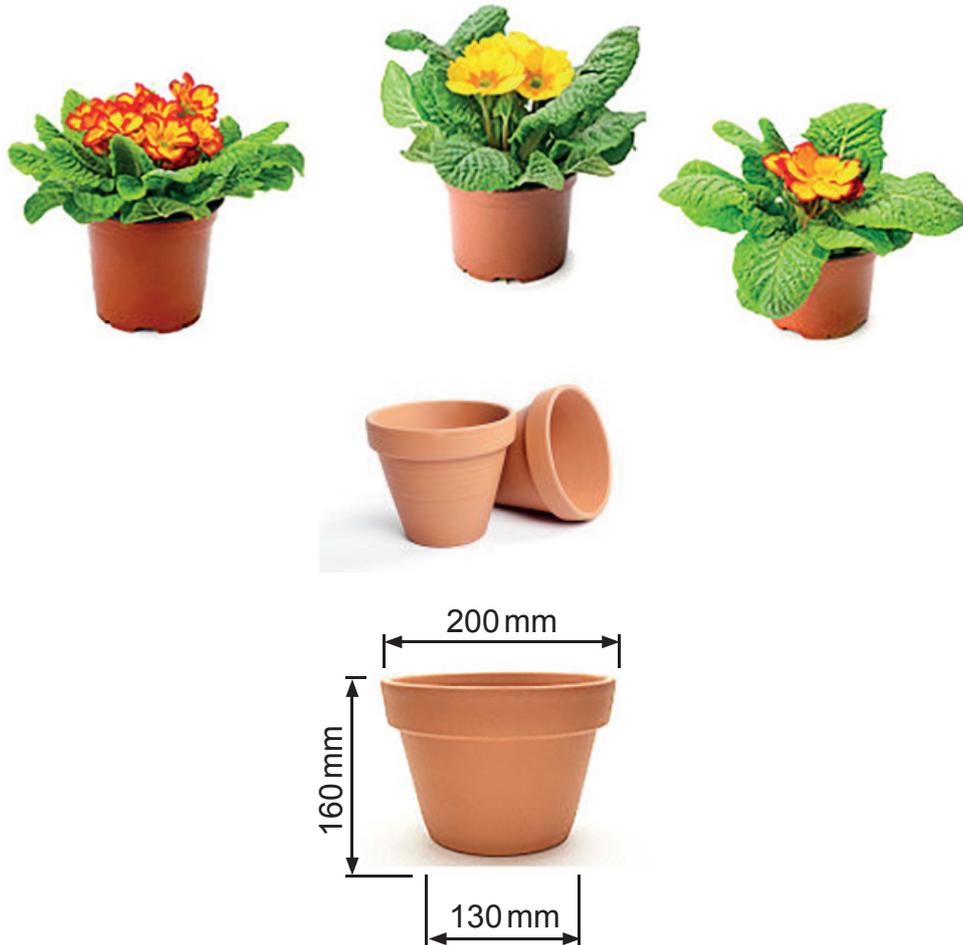
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8 **Fig. 3** shows outdoor flower plants and the dimensions for the flower pots used. Using annotated sketches, design a freestanding portable plant holder to contain **three** flower plants at a variety of different heights. The average weight of a full flower pot is 2 kg. The plant holder must be capable of being wheeled to various locations in a garden.



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Fig. 3



The design must satisfy the following specification points:

- (a) The portable plant holder must be capable of holding **three** flower pots at different heights. The flower pots should be easy to be attached and removed from the holder [3]
- (b) The portable plant holder must be strong and stable, safe to use, freestanding and be able to be moved to various locations [3]
- (c) The material(s) selection, justification and the economy of material(s) used, need to be specified [4]
- (d) The manufacture, assembly and finish of the holder must be clearly detailed [5]
- (e) The portable plant holder must be aesthetically pleasing, of appropriate size and proportions, including **three** key overall dimensions [4]
- (f) The solution should show good quality detailed sketches with notes [5]

Use the next page for your answer. If you need more space there is an additional page at the end of this booklet.

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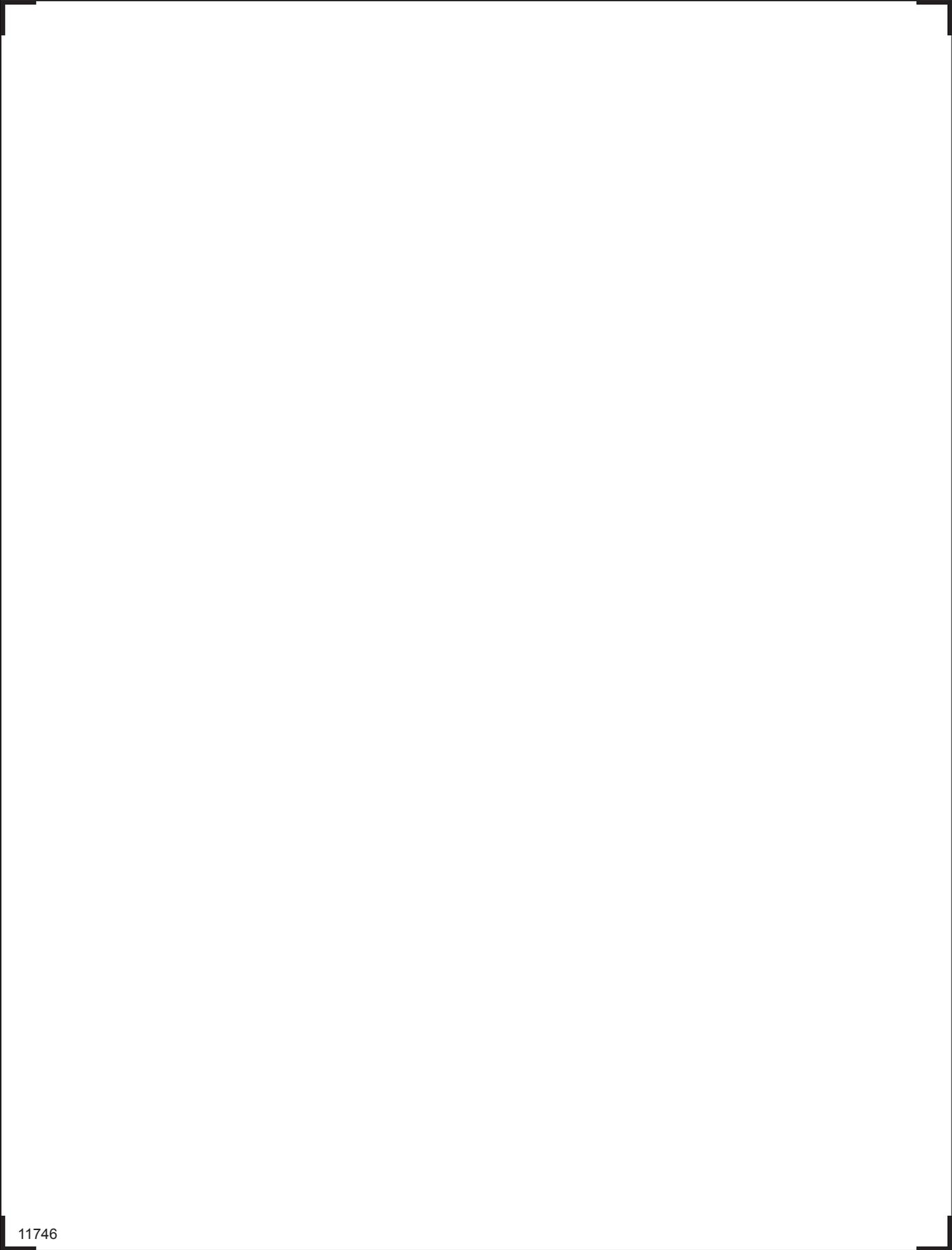




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For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
Total Marks	

Examiner Number

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