Surname	Centre Number	Candidate Number
First name(s)		2

GCE A LEVEL

1601U30-1

S23-1601U30-1

WEDNESDAY, 7 JUNE 2023 – AFTERNOON

DESIGN AND TECHNOLOGY – A2 unit 3
Engineering Design

2 hours 30 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**8**	
2.	**12**	
3.	**12**	
4.	**12**	
5.	**8**	
6.	**8**	
7.	**12**	
8.	**8**	
9.	**10**	
10.	**10**	
Total	**100**	

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ADDITIONAL MATERIALS

A calculator, ruler, pencil and coloured pencils.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **ALL** questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the continuation page(s) at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question. You are advised to divide your time accordingly.

The total number of marks available is 100.

You are reminded of the need for good English and orderly, clear presentation in your answers. The quality of your written communication, including appropriate use of punctuation and grammar, will be assessed in your answer to question **10**.

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Answer **all** questions.

1. Study the images of two electric hand dryers shown below.

Existing button operated hand dryer
RRP £89

Replacement automatic hand dryer
RRP £359

(a) Describe how cost and performance are related when developing the two electric hand dryers shown above. [3]

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(b) Explain how the replacement hand dryer can be considered a 'radically new' replacement for the existing hand dryer. [5]

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2. Study the images below of a prototype electronic circuit constructed on stripboard.

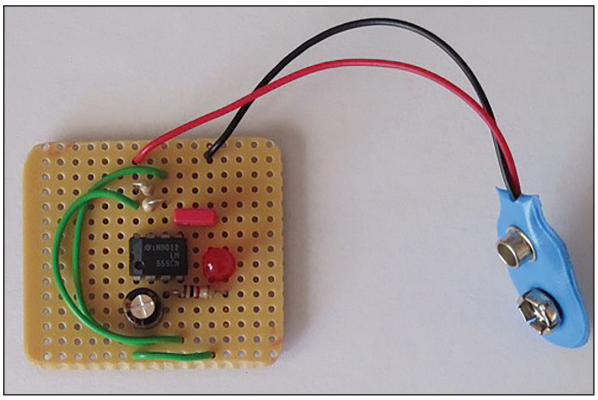

Figure 1

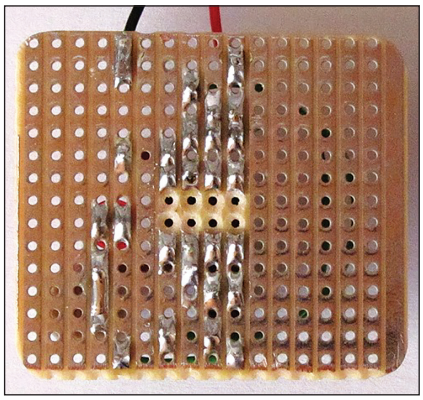

Figure 2

(a) (i) Describe **two** benefits to the designer of using stripboard to construct the prototype electronic circuit. 2 × [2]

Benefit 1: .....

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Benefit 2: .....

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(ii) Explain in detail why the surface of the stripboard has been removed in **Figure 2**. [4]

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Examiner only

(b) Following the prototyping stage, the final circuit is produced in volume using a Just-in-Time (JIT) manufacturing system.

Explain the meaning of JIT and how this system impacts on the manufacturer. [4]

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Examiner only

3. The mechanical log splitter shown below is designed to provide a quieter and safer alternative to using sharp tools or powered machinery.

(a) (i) In the space below, produce a detailed block diagram to represent the mechanical log splitter. [3]

Examiner only

(ii) Name **three** different forces, describing how they will occur when using the mechanical log splitter. 3 × [2]

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(b) Explain the difference between static and dynamic forces when using the mechanical log splitter. [3]

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Examiner only

4. A new personal computer has been launched following market research into users of tablets and laptops.

(a) Describe how 'market segmentation' allows the designer to ensure the success of the new personal computer. [4]

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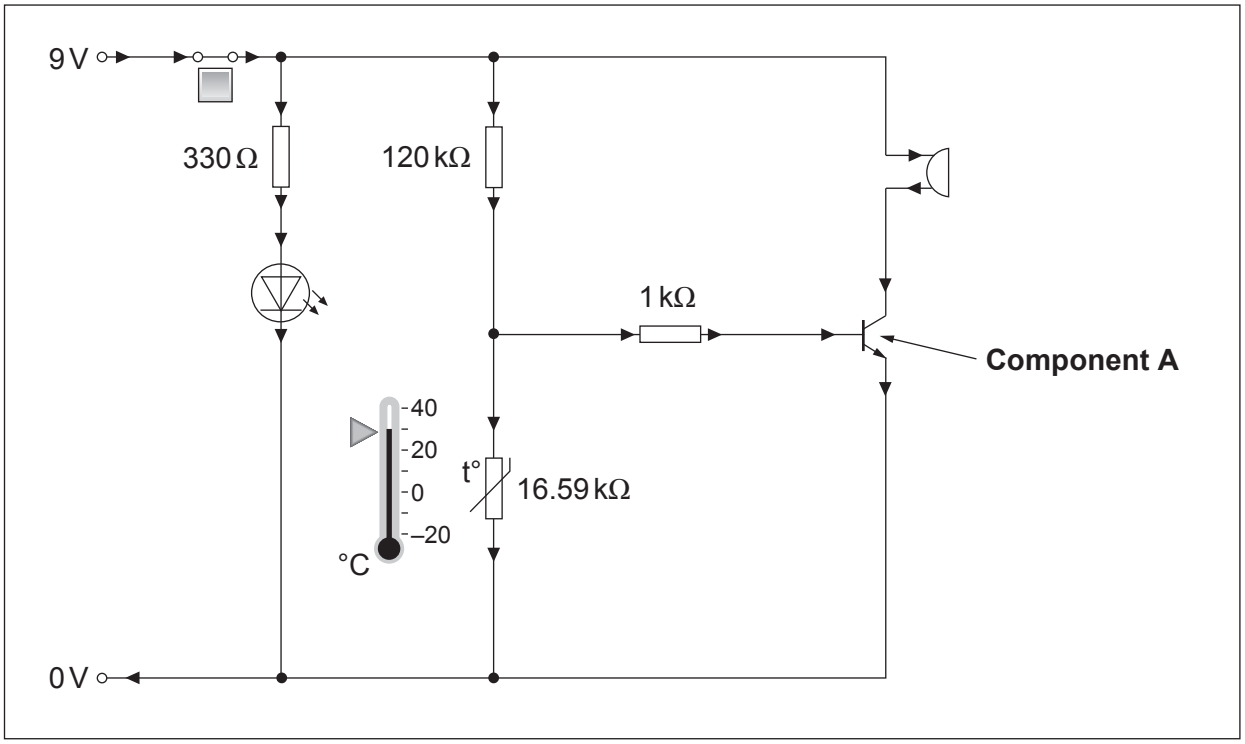
Examiner only

(b) Explain how the 4 Ps (Product, Price, Place, Promotion) can affect the success of the new personal computer. [8]

Examiner only

5. The CAD simulation below shows an electronic control system.



(a) Describe how the sensing system functions as the input. [2]

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(b) State the name of **Component A** and describe its role in the system.

Component A : ..... [1]

Role: .....

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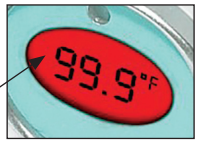
Examiner only

(c) Produce an annotated diagram modifying the electronic control system to allow the user to adjust the threshold of the circuit and describe how this works. [3]

Examiner only

6. A baby soother has been re-designed to include a digital electronic temperature monitoring facility.

- Fever alert glow feature
- Memory feature recalls last reading
- Auto power off retains battery life
- Beeps when readings are complete
- Audible and visible warning when temperature rises to a dangerous level.



(i) Describe **one** creative thinking strategy that has been used by the designer of the baby soother to create an innovative product. [2]

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(ii) Identify **one** aesthetic factor that would have been included in the design specification. [2]

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(iii) Explain how the interaction of modern technology and existing design needs has contributed towards the development of the baby soother. [4]

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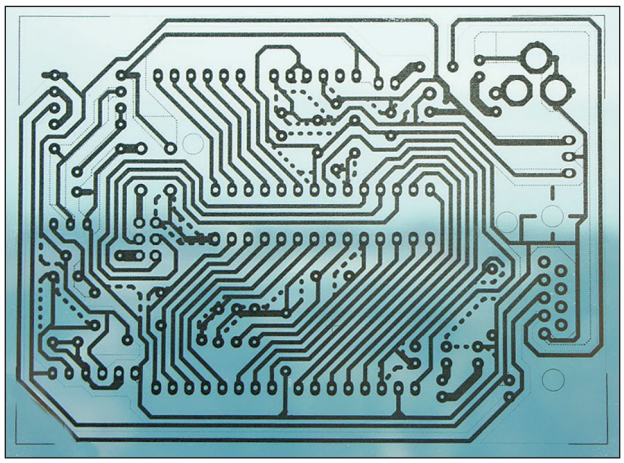
7. A transparency for a printed circuit board (PCB) is shown below.



(a) (i) Give **one** reason for using a laser printer to directly print the PCB design onto a transparency. [2]

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(ii) Describe in detail, naming all equipment and resources, how the transparency above can be used in a school workshop to produce a high-quality PCB. [6]

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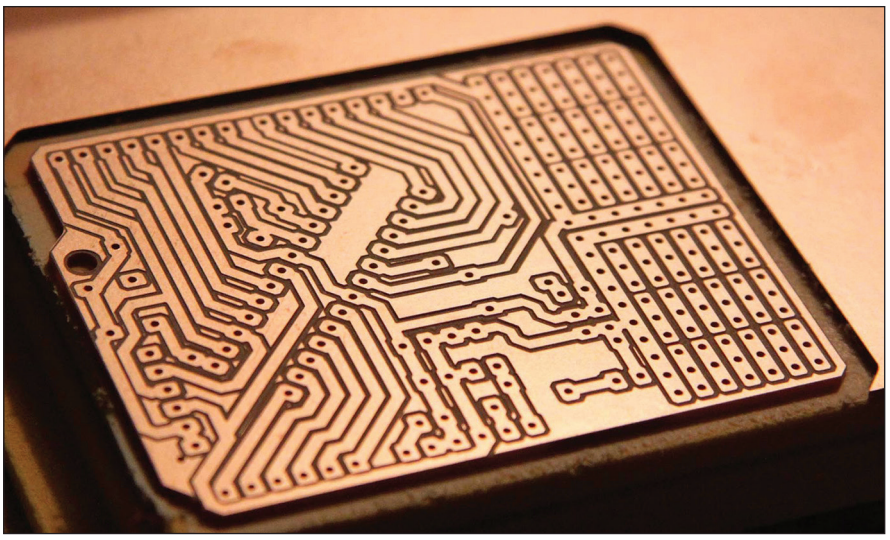
(b) Explain how the alternative PCB shown below has been produced. [4]



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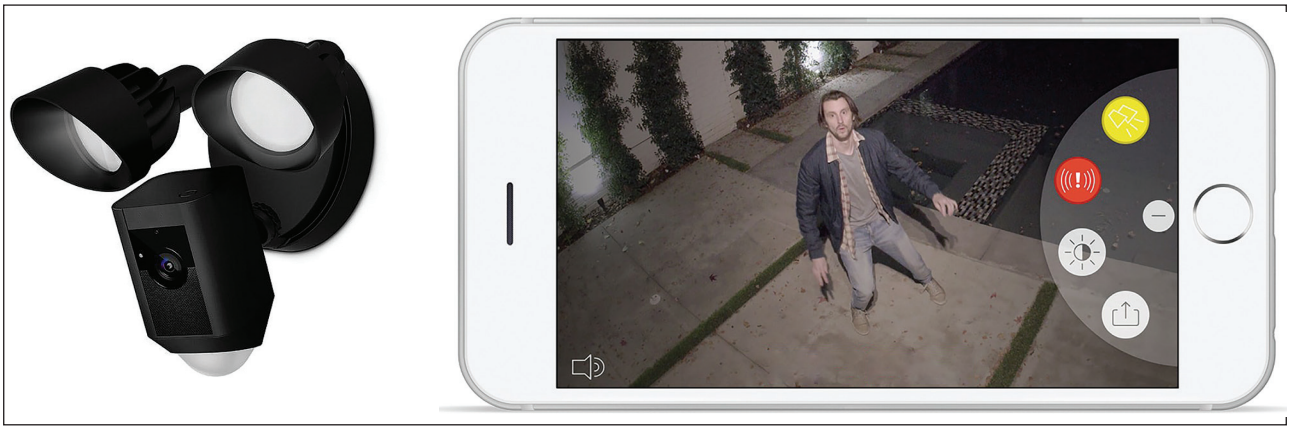
Examiner only

8. The motion activated home security camera shown below includes built-in floodlights, a siren alarm, and a two-way talk feature.



(a) (i) Name a suitable thermoforming polymer and manufacturing process for the mass production of the home security camera shell.

Name of thermoplastic ..... [1]

Manufacturing process ..... [1]

(ii) Explain how the home security camera allows the homeowner to view live images and communicate with others. [3]

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(b) Periodically, the manufacturer releases software updates. Describe the importance of this to the homeowner. [3]

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Examiner only

9. "Success is made of 99% failure." **James Dyson**

Analyse how this quote applies to the application of the iterative design process. [10]

Examiner only

10. Evaluate the importance of environmental factors when designing, manufacturing, using and disposing of products. [10]

Marks will be awarded for the content of the answer and the quality of written communication.

END OF PAPER

Examiner only

For continuation only.