

Surname	Centre Number	Candidate Number
First name(s)		2



GCE A LEVEL

1601U30-1



S24-1601U30-1

WEDNESDAY, 5 JUNE 2024 – 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. Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

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 image of a food processor, shown below.



Generate a detailed and measurable specification point under each of the headings below, that would have been required when designing the food processor.

Function:

 [2]

Aesthetics:

 [2]

Portability:

 [2]

Safety:

 [2]



2. The pet door shown below features an electronic control system which is paired with either an existing microchip inserted under a household pet's skin, or with a supplied microchip that can be attached to the pet's collar.



- (a) (i) Describe how push-pull market forces would have been used by the designer of the pet door. [4]

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- (ii) Explain how the pet door can be considered innovative. [4]

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- (b) Following the production of the final prototype of the pet door, the designer applies for a Patent.

Explain the meaning of a Patent and how this relates to the design of the pet door. [4]

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3. The mechanical storage device shown below is fixed to a ceiling and uses a pulley system to hoist bicycles and other household items, for safe storage.



- (a) (i) Explain how the storage device provides mechanical advantage when lifting items. [4]

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- (ii) Explain the properties of a specific named material that make it suitable for the rope. [3]

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- (b) The clips that hold the items to be lifted are made from mild steel and are plastic coated.

Using notes and sketches, in the space below, describe an appropriate process for finishing the mild steel clips.

[5]

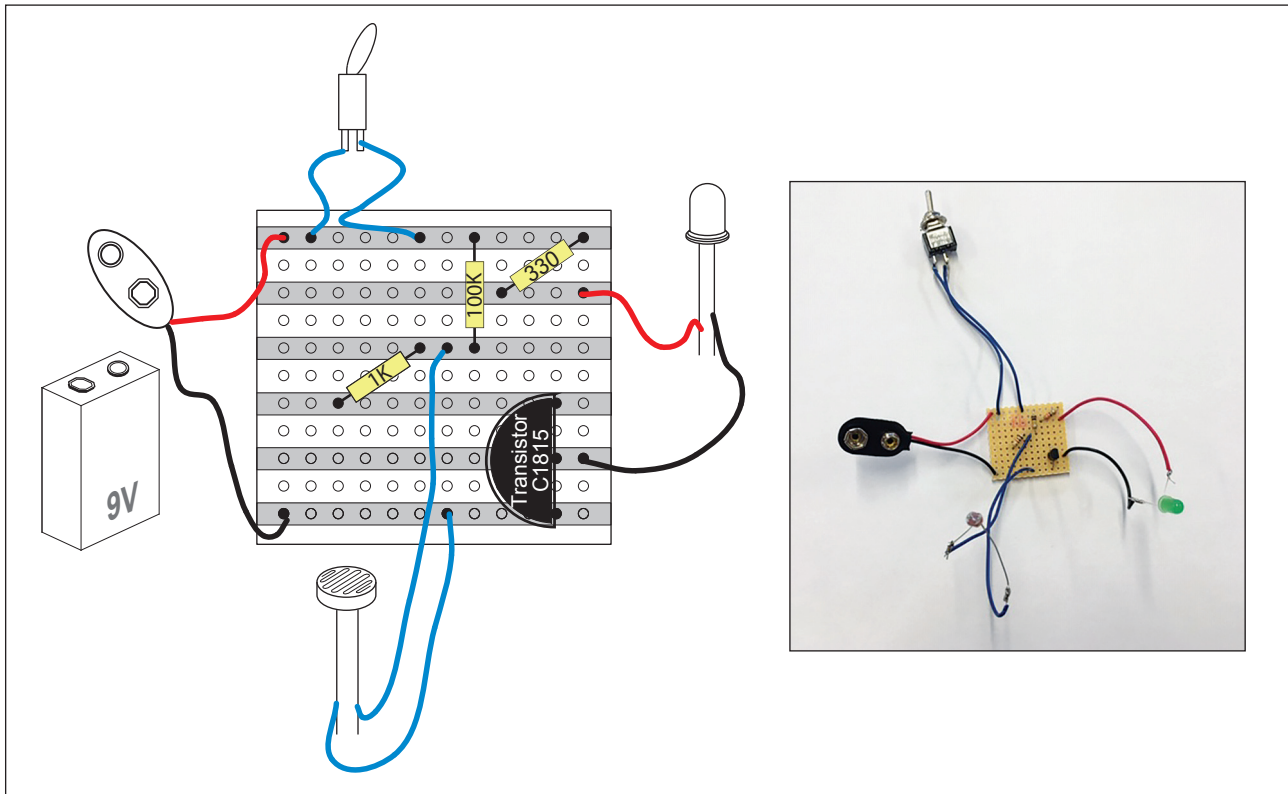


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5. The diagram below shows a student's plan for a simple transistor stripboard circuit and a photograph of the end result.



- (i) Produce an electronic circuit diagram for this system in the space below.

[5]

- (ii) Describe in detail how the circuit functions.

[3]

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6. Many towns and cities are now installing smart road traffic signs like the ones shown below.



- (i) Describe how advances in technology have influenced the development of smart road traffic signs. [4]

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- (ii) Explain the critical factors that would need to be present for the smart road traffic signs to achieve fitness for purpose. [4]

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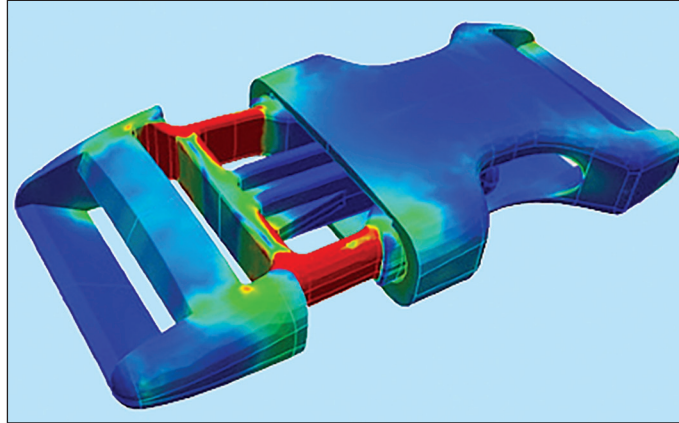
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7. The CAD model of a mechanical buckle shown below uses colours to analyse the stress that can be anticipated when the product is subjected to external forces.



- (i) Describe **two** benefits to the designer of using CAD to model a successful mechanical buckle fastening. [4]

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- (ii) Explain the specific information this CAD model gives the designer. [4]

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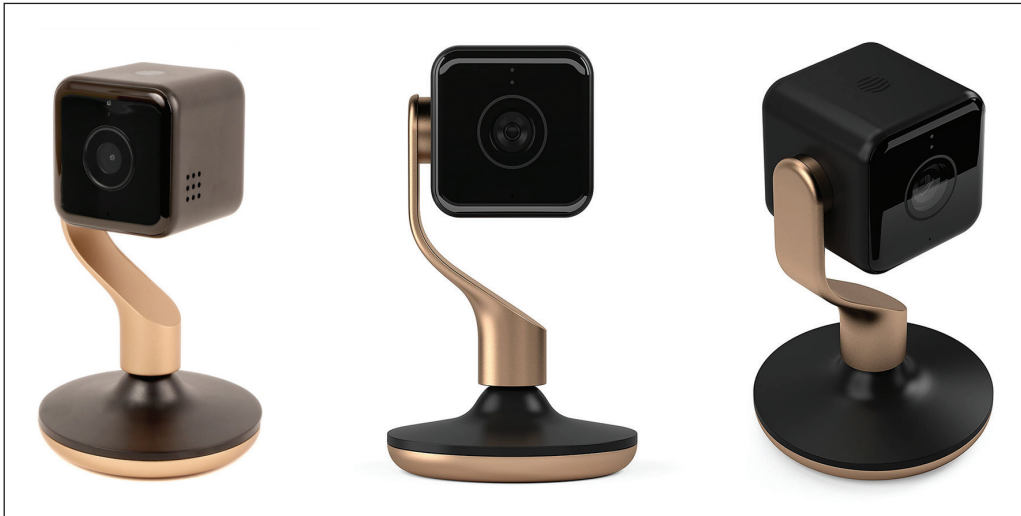


- (iii) Using annotated sketches, illustrate the modifications necessary to improve the mechanical buckle fastening following the production of the CAD model.

[4]

Examiner
only

8. A high-quality indoor webcam is shown below.



- (a) Explain how the manufacturer would employ effective internal quality control (QC) and external quality assurance (QA) when mass producing the high-quality indoor webcam. [4]

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- (b) Describe why the manufacturer would produce a critical path analysis prior to production, and the effect this would have when mass producing the high-quality indoor webcam. [4]

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[10]

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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



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