

Surname	Centre Number	Candidate Number
First name(s)		2



GCE AS/A LEVEL

2601U10-1



S25-2601U10-1

MONDAY, 12 MAY 2025 – AFTERNOON

DESIGN AND TECHNOLOGY – AS Unit 1

Engineering Design

2 hours

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	8	
2.	8	
3.	8	
4.	8	
5.	8	
6.	40	
Total	80	

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01

ADDITIONAL MATERIALS

A calculator, ruler, pencils and coloured pencils.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

A pencil may be used to draw sketches or diagrams.

Answer **all** questions.

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

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional 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 80.

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 3.



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Answer **all** questions.

1. The image shows a handheld, modern rechargeable work light.



- (a) Select **three** design features of the handheld, modern rechargeable work light and explain how each feature would be beneficial to the consumer. 3 × [2]

Design feature 1:

Benefit:

.....

.....

Design feature 2:

Benefit:

.....

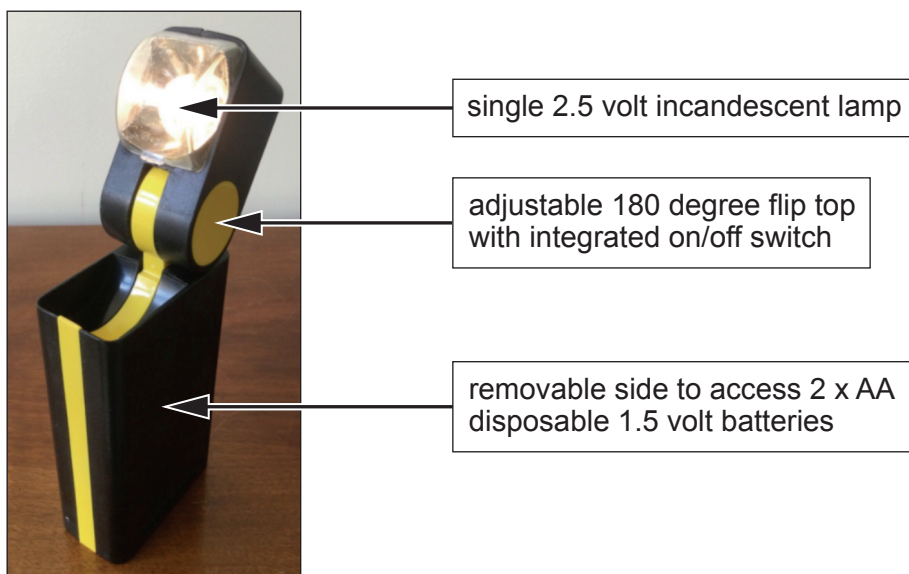
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Design feature 3:

Benefit:

This image shows a flip top handheld torch that was designed in the 1980's.



(b) Explain a technological difference between this handheld torch and the work light. [2]

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2. A chain and sprocket mechanism used to transmit the drive from the engine to the rear wheel on a motorcycle is shown below.

The small driver sprocket has 13 teeth and the large driven sprocket has 22 teeth.



- (a) Calculate the rotational velocity (RV) of the driven sprocket when the driver sprocket rotates at 1300 rpm. Show your calculation and your answer in the space provided. [2]

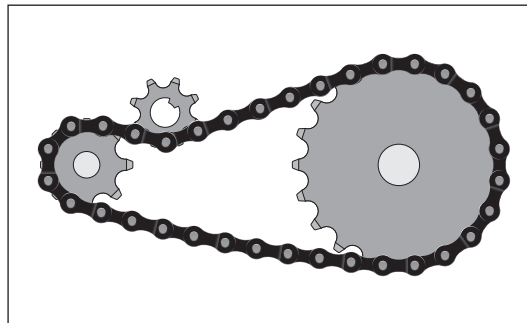
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- (b) Describe the purpose of the extra sprocket in the diagram shown below. [2]



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- (c) Explain the purpose of the elongated slot that has been cut into the sprocket shown below.

[2]



- (d) The sprocket has been made from a steel alloy. Describe why this is a suitable material for the sprocket.

[2]



3. When selecting materials, design engineers consider a wide range of factors.

Evaluate the factors that have influenced the selection of thermoplastic materials to manufacture the casing of the coffee-making appliance shown below.

[8]

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

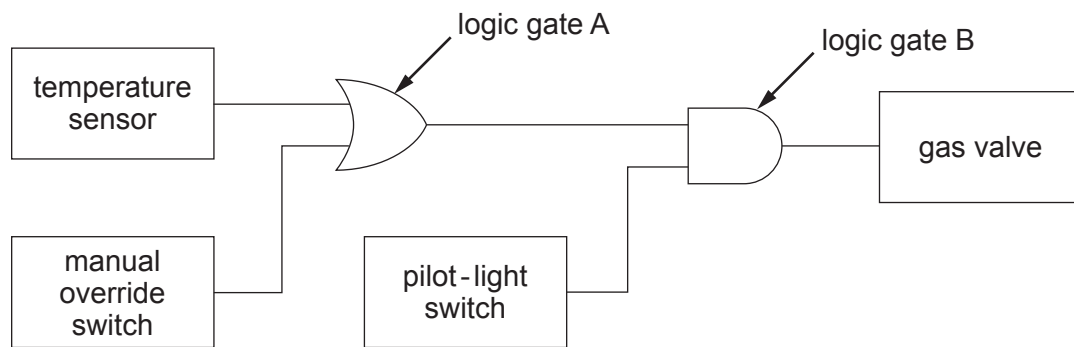


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4. The logic diagram shows the control system for a domestic central heating boiler.



- (a) Name the type of logic gate labelled A. [1]

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- (b) Name the type of logic gate labelled B. [1]

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- (c) Describe the conditions that must be met in order for the gas valve to turn on. [3]

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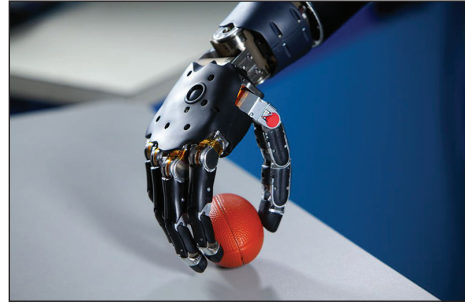
(d) Complete the truth table for the central heating control system.

[3]

Temperature Sensor	Manual Override	Pilot Light	Gas Valve
0	0	0	0
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	1



5. Modern prosthetic limbs are increasingly produced by 3D scanning and additive manufacturing (3D printing).



- (a) Describe **two** advantages of using 3D printing to manufacture modern prosthetic limbs. 2 × [3]

Advantage 1:

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Advantage 2:

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- (b) Explain why 3D printing is particularly beneficial in less economically developed countries. [2]

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6. E-scooters are available for hire in many cities globally. Modern scooters have a range in excess of 25 miles between charges.



- (a) Describe a technological development that has been made in recent years that has made e-scooters a viable form of transport. [2]

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(b) Three design specification points for the e-scooter have been given below.

- The e-scooter should have a range in excess of 25 miles so that it can be used during the day without recharging.
- The e-scooter should have handlebars that can be easily adjusted in order to accommodate users of different heights.
- The e-scooter requires a red flashing light to be fitted to the rear mudguard in order that it can be seen by other road users after dark.

Add three other justified specification points that would be needed to guide the design and development of an e-scooter that is intended for public hire.

3 × [2]

Design specification point 1:

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Design specification point 2:

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Design specification point 3:

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- (c) Using notes and sketches, in the space below design a method that would enable the handlebars to be easily adjusted in order to accommodate users of different heights.

Your design must:

- be easily adjusted by one person without the use of specialist tools and equipment
- lock securely in position so that it does not move when the scooter is in use
- allow the handlebar to remain attached to the scooter even when adjustment is being made, preventing theft or damage.

Your proposed solution should include reference to suitable materials and manufacturing processes.

[8]



- (d) The e-scooter requires a red flashing light to be fitted to the rear mudguard in order that it can be seen by other road users after dark.

The light should:

- turn on automatically in low-level lighting conditions
- turn off automatically when the e-scooter is not being ridden
- use a regulated 5 volt power supply that is derived from the 12 volt cell that powers the scooter.

In the space below draw a detailed circuit that uses a microcontroller to operate the light. You should include two input devices, an output device, suitable interface devices where required and the microcontroller. [8]



- (e) The warning light and electronic circuit is to be fixed inside a housing that can be mounted on the rear mudguard of the e-scooter shown below.



Use the space below to draw a suitable housing for the light that will attach to the mudguard.

Marks will be awarded for:

- a well-drawn design for the proposed casing
- an illustration showing how the casing is attached to the mudguard
- a suitable mounting for the light
- a method of securely mounting the circuit board inside the casing
- an annotation that provides justified selections of suitable materials and appropriate manufacturing processes.

[8]





[illegible]

[illegible]

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