Introducing Cambridge Advanced Nationals (AAQs) in Engineering

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What are Alternative Academic Qualifications (AAQs)?

Designed for students aged 16 to 19 years, Alternative Academic Qualifications (AAQs) are Level 3 academic qualifications that can be combined with A Levels as part of a post-16 mixed-study programme. They are designed to help students learn the wider transferable skills, knowledge and understanding desired by HEIs.

Cambridge Advanced Nationals, our Alternative Academic Qualifications (AAQs), will encourage students to:

- develop key knowledge, understanding and skills, relevant to the subject
- think creatively, innovatively, analytically, logically and critically
- develop valuable communication skills that are important in all aspects of further study and life
- develop transferable learning and skills, such as evaluation, planning, presentation and research skills, that are important for progression to HE and can be applied to real-life contexts and work situations
- develop independence and confidence in applying the knowledge and skills that are vital for progression to HE and relevant to the health and social care sector and more widely

Q1. – Which Level 3 engineering qualifications you are currently teaching? Please use the chat function

How are Cambridge Advanced Nationals assessed?

Cambridge Advanced Nationals in Engineering are assessed holistically and have a simple and intuitive assessment model, comprising:

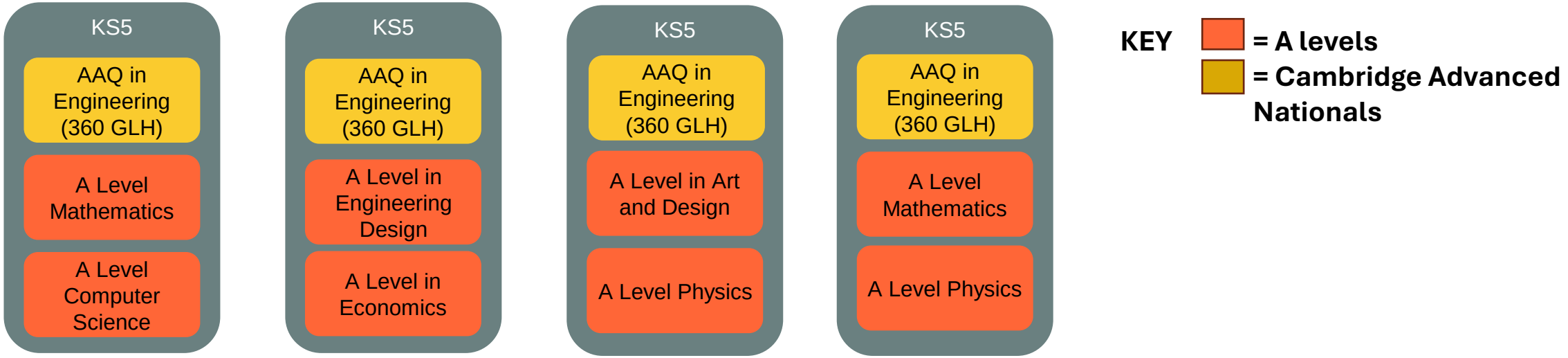
- externally assessed units, which focus on subject knowledge and understanding
- applied or practical non-exam assessment units (NEA)
- optional NEA units to provide flexibility.

Qualification	Size	External assessment (Exam)	Non-exam assessment (NEA)
Certificate	180 GLH	50%	60%
Extended Certificate	**360 GLH**	**40%**	**60%**

Where do they fit into a post-16 programme of study?

Students who want to progress onto further or higher education, but don't want to study only A Levels (or a T Level programme), can choose a mixed study programme.

These can be taken alongside complimentary A Levels to create programme of study. Here are some examples:



Compensation at unit level

Hurdles based model

P1	M1	D1
P2	M2	D2
P3	M3	
P4		

- In the hurdles-based model above, the student would fail to achieve a pass grade for the unit.

New Advanced National compensation based model

P1	M1	D1
P2	M2	D2
P3	M3	
P4		

Using our new compensation-based model, the same student would **still** achieve a grade/result for the unit.

Boundaries* for each unit can be found in the specification. The example above is simplified for illustration.

Compensation Example – 60 GLH unit

All 60 GLH units have a total of **22** criteria (11 Pass, 6 Merit, 5 Distinction)

The total number of criteria needed for each grade are:

- **Pass = 9***
- **Merit = 13***
- **Distinction = 18***

- Remember the total number of criteria required for a Pass, Merit or Distinction can come from any of the criteria. This is the new compensatory approach. *Boundaries will be reviewed over time.

- **Q2. If a student achieved 8 pass, 3 merit and 2 distinction criteria what unit grade would they achieve?**

Compensation at qualification level

Every criterion that a student achieves will count towards their final qualification outcome.

Hurdles based model

P1	M1	D1
P2	M2	D2
P3	M3	
P4		

In the hurdles-based model above, the student would have achieved a **Pass** at unit level.

New compensation based model

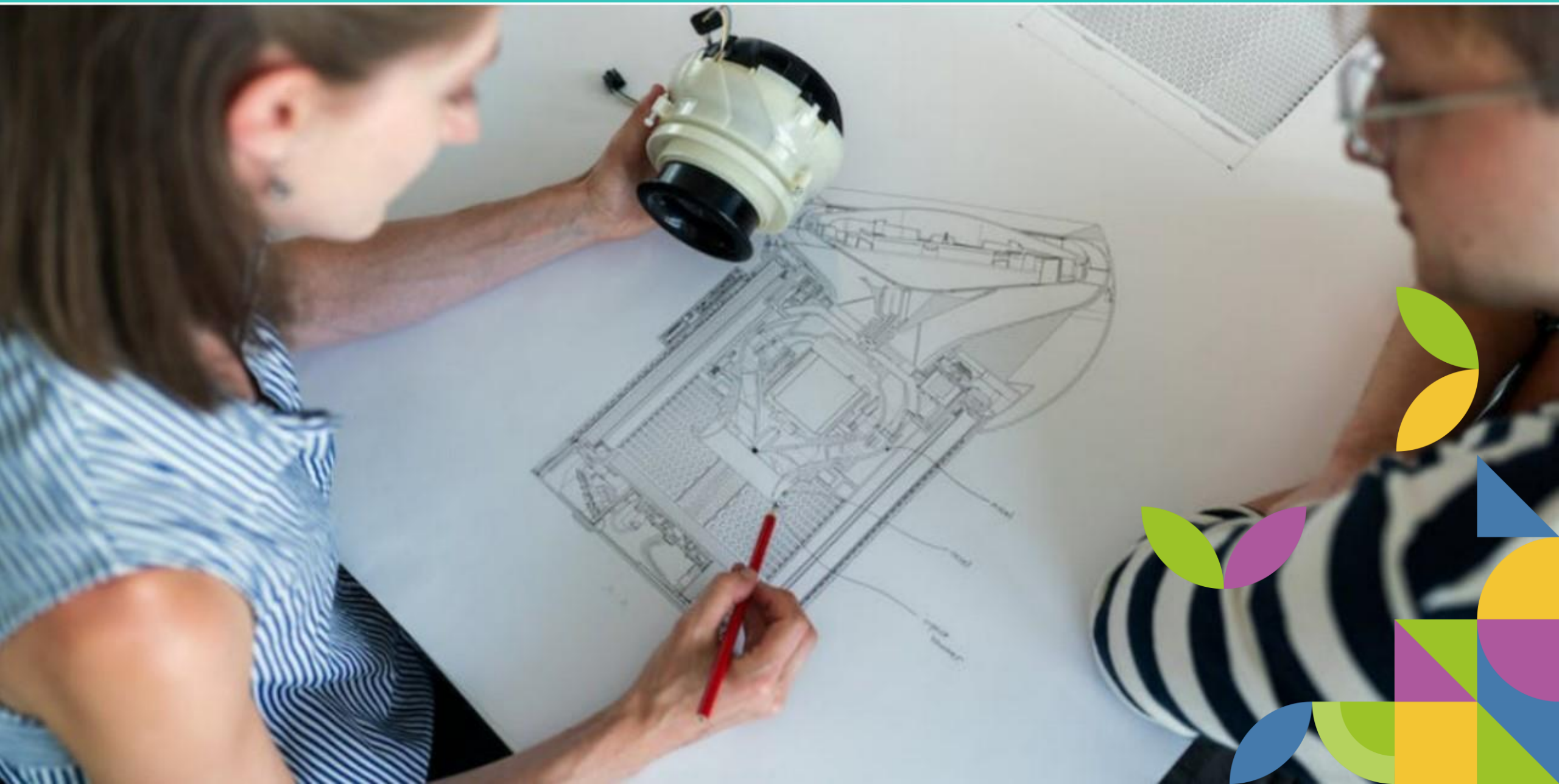
P1	M1	D1
P2	M2	D2
P3	M3	
P4		

Using our new compensation-based model, M1, M2 and D1 all count towards the final qualification grade, even if a student had not achieved a Merit or Distinction at unit level.

No criteria/mark will go to waste

Boundaries* for each unit can be found in the specification. The example above is simplified for illustration.

Cambridge Advanced Nationals in Engineering

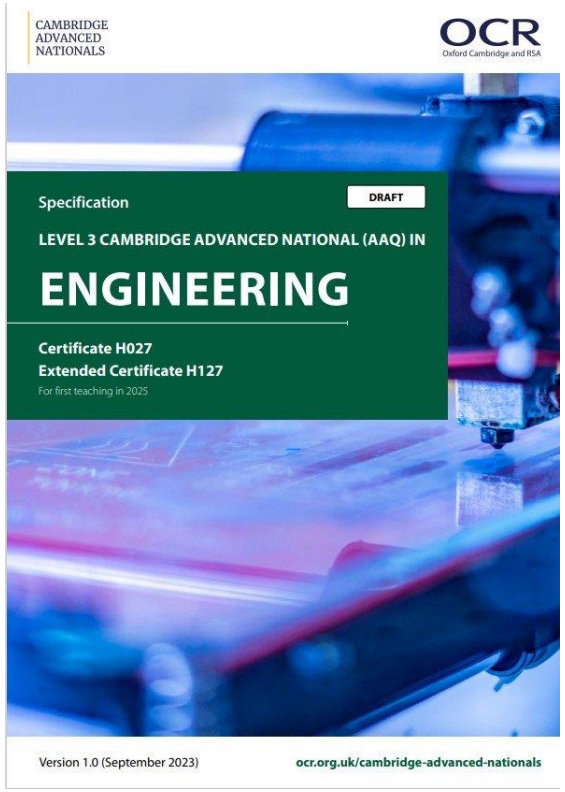


Cambridge Advanced Nationals in Engineering - Introduction

Engineering is the safe, efficient and sustainable application of science/mathematics knowledge and practical skill to transform ideas and material into products and services that solve problems (as a team).

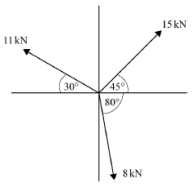
- These are 'general engineering' qualifications
- The **benefit** is better preparation to study a variety of engineering degrees
- It is general engineering, because the mandatory units cover a mix of:
    - mechanical engineering, and
    - electrical/electronic engineering

- Built in lots of **flexibility** to support you and your students depending on:
    - Student needs
    - Teacher's skills/expertise
    - Centre resources
    - University progression



Qualification Structure

		GLH	180	360	Assessment
F130	Principles of Engineering	90	M	M	External
F131	Material Science and Technology	60	-	M	External
F132	Engineering in Practice	90	M	M	Internal
F133	Computer Aided Design	60	-	O	Internal
F134	Programmable Electronics	60	-	O	Internal
F135	Mechanical Product Design	60	-	O	Internal
F136	Computer Aided Manufacture	60	-	O	Internal
F137	Electrical Devices and Circuits	60	-	O	Internal



$$v^2 = u^2 + 2as$$

$$s = ut + \frac{1}{2}at^2$$

$$x + 2y = 6 \quad \ldots(1)$$
$$x - y = 3 \quad \ldots(2)$$

$$E = \frac{1}{2}CV^2$$

Cambridge Advanced National in Engineering

- Mandatory Units
- Content and Assessment Summary

Unit F130: Principles of Engineering

Topic Area 1: Mathematics	Topic Area 2: Mechanical principles	Topic Area 3: Electrical / electronic principles
• 1.1 Application of SI Units • 1.2 Mensuration • 1.3 Algebra • 1.4 Trigonometry	**2.1 Systems of forces** • 2.1.1 Forces • 2.1.2 Moments • 2.1.3 Systems of coplanar concurrent forces • 2.1.4 Systems of coplanar non-concurrent force in equilibrium • 2.1.5 Direct loading of engineering components • 2.1.6 Sheer loading of engineering components • 2.1.7 Stress vs strain graphs **2.2 Simply supported beams** • 2.2.1 Beams and beam supports • 2.2.2 Forces acting on beams • 2.2.3 Beam calculations • 2.2.4 Bending moment diagrams **2.3 Linear dynamic systems** • 2.3.1 Parameters and applications • 2.3.2 Interpretation of graphs • 2.3.3 Newton's Laws of Motion • 2.3.4 SUVAT equations • 2.3.5 Energy and power • 2.3.6 Friction • 2.3.7 Conservation of energy • 2.3.8 Momentum	**3.1 Electrical principles** • 3.1.1 Concepts of electricity • 3.1.2 Capacitors and capacitance • 3.1.3 Direct current networks • 3.1.4 Inductors and inductance • 3.1.5 Alternating current • 3.1.6 Electrical efficiency **3.2 Analogue and digital circuits** • 3.2.1 Analogue circuit • 3.2.2 Digital logic circuits

Unit F130: Exam Questions – Section A

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2 Which quantity is defined as the straight-line distance between two points in a given direction?

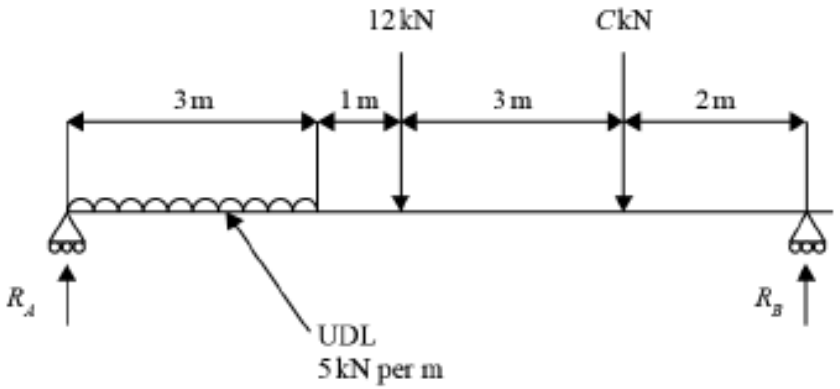
Tick (✓) **one** box.

- Displacement ☐
- Height ☐
- Length ☐
- Work done ☐

8 This diagram shows a simply supported beam under load. The beam is in static equilibrium.

Ignore the weight of the beam.

Diagram not to scale.



(a) Calculate the magnitude and position of the single point load that is equivalent to the uniformly distributed load (UDL).

Magnitude = ... kN

Distance from R_A = ... m

[2]

(b) The reaction force acting at R_B is 22.3 kN.

Determine the magnitude of the applied point load *C*.

You must show your working.

Magnitude of point load (*C*) = ... kN

[4]

Q3. How long is the longest EA?

1 hour 15 minutes // 1 hour 30 minutes // 2 hours // 2 hours 30 minutes

Unit F130: Exam Questions - Section B

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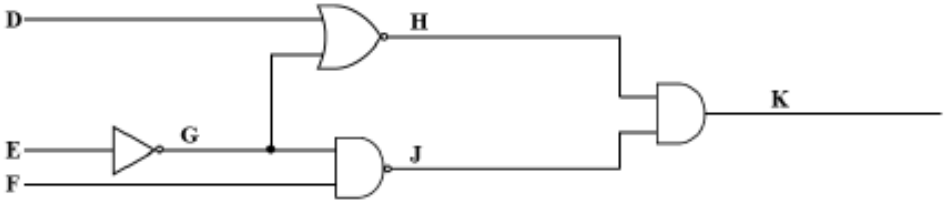
15 A coil has 200 turns of copper wire which produces a magnetic flux of 0.01Wb. A steady 50 A current is being passed through the coil.

Calculate the inductance (L) of the coil.

Inductance (L) = ... H
[2]

(b) The diagram shows a logic gate circuit.



Complete the truth table for this circuit.

D	E	F	G	H	J	K
0	0	0				
0	0	1				
0	1	0				
0	1	1				
1	0	0				
1	0	1				
1	1	0				
1	1	1				

[4]

Unit F132: Engineering in Practice

Topic Area 1: Product analysis **1.1 Product analysis of the components**	**Topic Area 2: Produce CAD mechanical and electronic drawings** **2.1 Produce a 2D CAD engineering drawing of a mechanical prototype** • 2.1.1 Engineering Drawing Standards • 2.1.2 Mechanical features and component types **2.2 Produce a CAD engineering drawing of an electronic circuit** • 2.2.1 Engineering drawing standards • 2.2.2 Electronic circuit diagrams • 2.2.3 Circuit simulation	**Topic Area 3: Plan the safe manufacture of a mechanical prototype and an electronic circuit prototype** **3.1 Plan the safe manufacture of a mechanical prototype** **3.2 Plan the safe manufacture of an electronic circuit prototype**
Topic Area 4: Manufacturing processes **4.1 Manufacture a mechanical prototype** **4.2 Manufacture an electronic circuit prototype**	**Topic Area 5: Evaluate a prototype** **5.1 Evaluate a mechanical prototype** **5.2 Evaluate an electronic circuit prototype**	

Unit F132: NEA Scenario & Part A Mechanical Prototype

Scenario

You work for a lighting company that manufactures different types of lighting solution. The product you have been asked to investigate is an **angled desk lamp**.

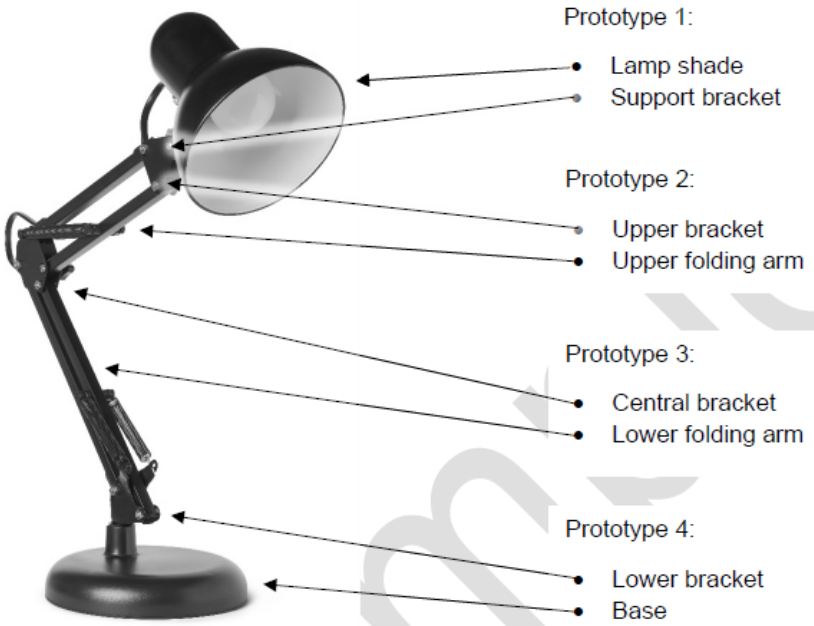
To ensure that a work area is well lit for different purposes, angled desk lamps need their height, angle and tilt to be adjustable.

An example of an angled desk lamp is shown below. The angled desk lamp you are using may look slightly different to this one

Part A: Mechanical Analysis, Drawing and Prototype Manufacture

The non-standard components in the angled desk lamp have been grouped together as shown in **Fig. 1**.

Fig. 1



Each prototype (1, 2, 3 and 4) may also contain relevant standard components, such as nuts and bolts.

You will be told which **one** of these prototypes to use in your assignment.

Unit F132: NEA Part A - Task 2

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Task 2:

Produce two-dimensional (2D) Computer Aided Design (CAD) mechanical drawings

Topic Area 2 is assessed in this task.
Having carried out your product analysis, you now need to produce 2D CAD engineering drawings of the prototype you are going to manufacture.

The task is:
Use a CAD software package to produce 2D CAD engineering drawings of the prototype which follow standard drawing conventions.
Your evidence **must** include:

- Annotated screenshots of CAD software being used to produce the engineering drawings.
- Final 2D CAD engineering drawings in a pdf file format.

Use the assessment criteria below to tell you what you need to do in more detail.

Pass	Merit	Distinction
P3: Produce an appropriate third angle orthographic projection of the non-standard component(s) in the prototype using engineering drawing standards.	**M2: Produce** an appropriate sectioned/detailed view of **one** non-standard component from the prototype using engineering drawing standards.	**D1: Produce** an appropriate isometric assembly projection for the prototype using engineering drawing standards.

Unit F132: NEA Part B Scenario for the Electronic Prototype

Scenario:

Part B: Electronic Circuit Analysis, Drawing and Prototype Manufacture
The lighting company want to improve the angled desk lamp by making it automatically turn the light on or off depending on the ambient light level.
They want you to make a prototype of the electronic circuit using a Light Emitting Diode (LED).

Important

Part A and Part B are independent activities and should not be integrated together.

Unit F132: NEA Part B Task 6

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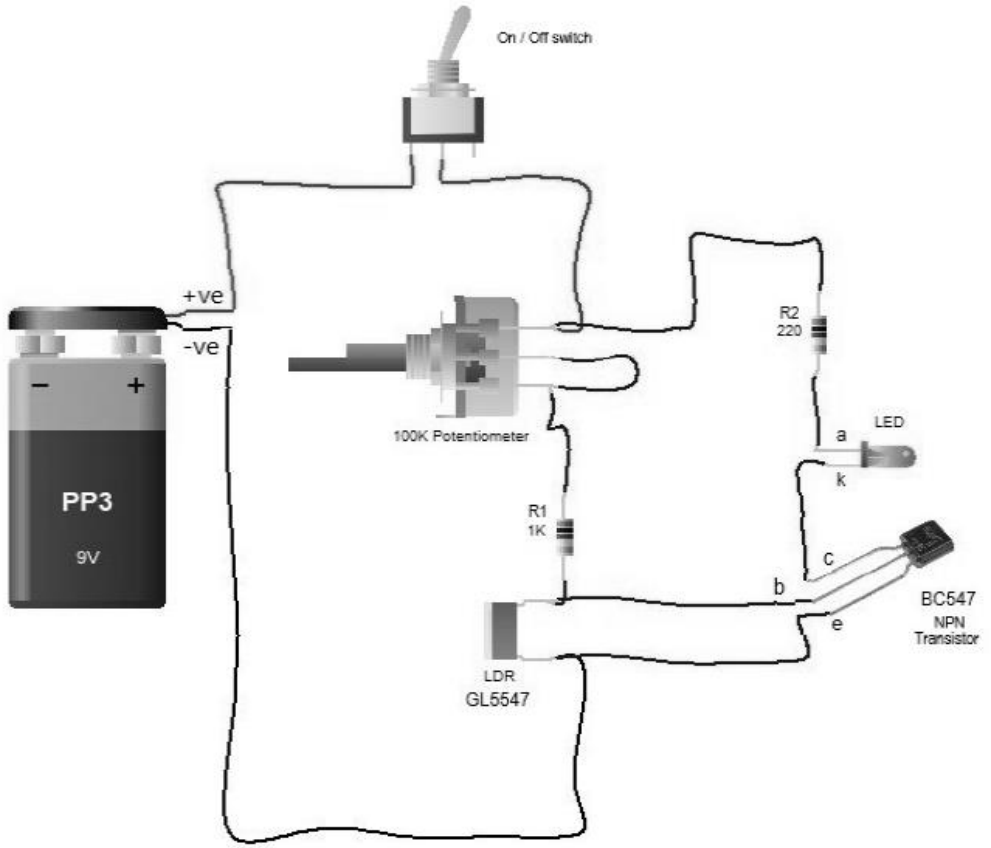
Task 6

Produce a CAD drawing and simulate an electronic circuit.
Topic Area 2 is assessed in this task.

This is a picture of the electronic circuit needed to achieve the improvement. The LED should turn on when the ambient light falls below a threshold set by the potentiometer. The LED should turn off when the ambient light goes above this threshold.



Unit F132: NEA Part B Task 6 continued

The task is:
Produce a CAD engineering drawing of the electronic circuit diagram using standard drawing conventions.
Simulate the circuit in operation so you can complete these tests. Use the test table in Appendix A to record your simulated values.

Parameter	Explanation
V_{R2}off	Voltage across R2 when the LED is off
V_{LDR}off	Voltage across LDR when the LED is off
$I_T$off	Total current through the circuit when the LED is off
V_{R2}on	Voltage across R2 when the LED is off
V_{LDR}on	Voltage across LDR when the LED is off
$I_T$on	Total current through the circuit when the LED is on

Your evidence **must** include:

- Final CAD drawing of the electronic circuit diagram.
- Annotated screenshots of the simulation of the electronic circuit in operation.
- A completed test table (Appendix A) showing simulated values.
- Annotated screenshots of any simulated testing completed, including connections of virtual test equipment and readings.

Use the assessment criteria below to tell you what you need to do in more detail.

Pass	Merit	Distinction
P8: Produce a CAD drawing of the electronic circuit diagram using engineering drawing standards.		
P9: Simulate the electronic circuit to demonstrate its correct operation.		**D4: Use** correct methods to measure appropriate values and voltages from the simulated circuit.

Assessment Guidance

This assessment guidance gives you information to meet the assessment criteria. There might not be additional assessment guidance for each criterion. It is only given where it is needed. You must read this guidance before you complete your evidence.

Assessment Criteria	Assessment guidance
P8	• The circuit diagram must be an accurate representation of the required circuit and be drawn to meet current engineering drawing standards (e.g. BS 60617).
P9	• Students must use simulation to show the function of the circuit to meet the stated requirement(s).
D4	• Students need to use correct testing methods and virtual test equipment to generate the results required.

Support Package for Engineering

Teaching & Learning	Assessment	Training
• Textbook • Switching Guide • Mapping Guide • Getting Started Guide • Curriculum Planner • Scheme of Work • E-Learning course	• Annotated Sample Assessment Materials • Assessment Story • Practice Papers • Candidate Style Answers (EA) • Candidate Style Work (NEA) • NEA Guide • Student Guide	• Choosing AAQs and understanding the compensation model • Starting to Teach • Ask the SA • Ask the Moderator • Preparing for the Exam • Preparing for the NEA • Exploring the exam (*after live examination series*) • Exploring the NEA (*after live examination series)* • Enhance your teaching

Website - OCR Level 3 AAQ Cambridge Advanced Nationals in Engineering

Teach Cambridge - https://www.ocr.org.uk/qualifications/teach-cambridge/

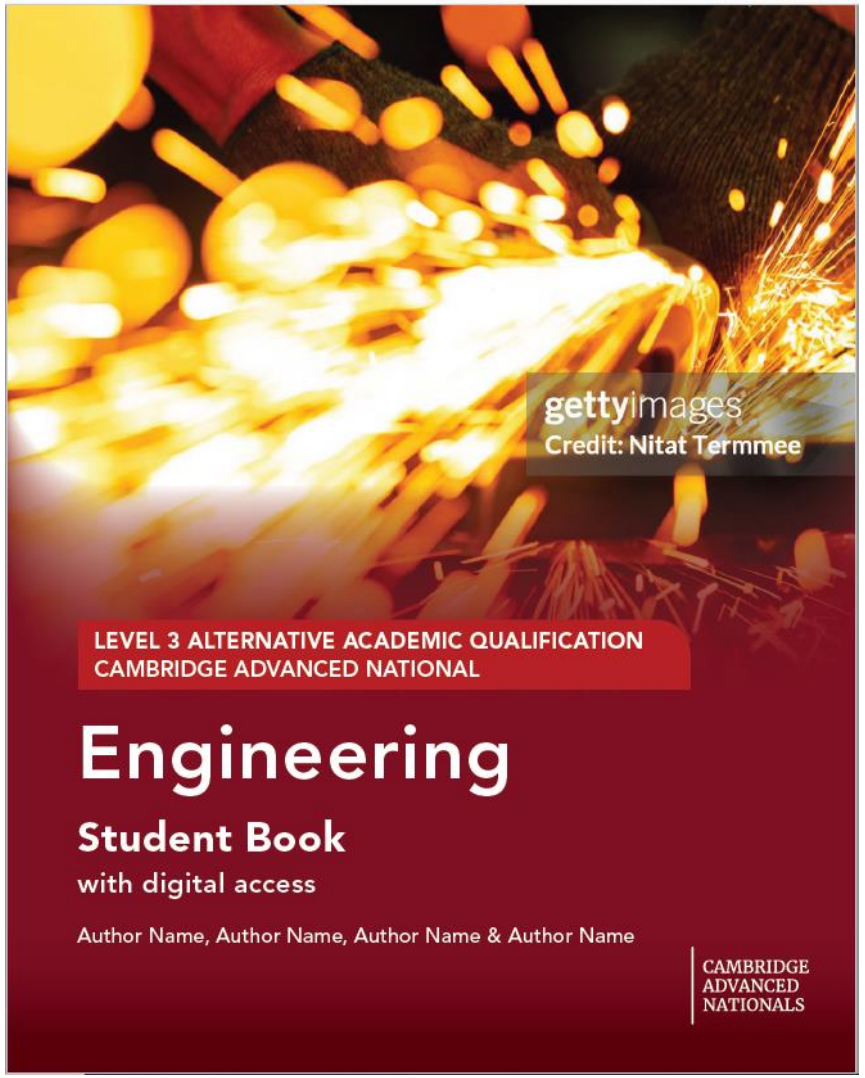
Key support – Teaching and Learning

Support Resource	What is it?
Switching guide	Offers a guide for moving to OCR from another awarding body. The Switching guide contains information on the differences between the specifications, including at the specification point level, differences between the assessment models, and some next steps that can be taken as you prepare to teach with OCR
Mapping guide	Offers a guide to help you move forward from your current OCR qualification to a new one
Curriculum planner	Suggested ways of delivering the specification content across a particular time frame
Scheme of work	A scheme of work that outlines the teaching of the specification over a 2-year course. Breaks down the specification into specification point, guided learning hours, earning intentions, teaching ideas, subject knowledge and further support.
Textbook	Print and digital publication covering the mandatory and optional units.
E-Learning course	A course to support the delivery of the Cambridge Advanced Nationals

Key support – Assessment

Support resource	What is it?
Sample Assessment Material	A sample exam paper to ensure familiarity with the layout of the exam
Annotated Sample Assessment Materials	*'Exploring our exams: a guide to our sample assessment material'* Understanding the format and structure of the exam, an insight into the assessment objectives and an explanation of the sample assessment
Assessment Story	'*Understanding the assessment – examined and moderated*' Understanding the rationale for the assessment strategy
Candidate style answers	Answers produced to offer teachers an insight into how the assessment objectives are applied in the examined unit.
Practice papers	Practice papers to help students prepare for the examined units
NEA Guide	Guidance to support the delivery, internal assessment and submission of work
Candidate style work	For use by teachers only, with the purpose of helping you mark your candidates' work. We will provide a range of example pieces of work with a Principal Moderator commentary measuring the work against the NEA requirements.
Student guide	Guides for parents and students on key points about their assessments.

Textbook Publication



Planned publication date: 10 July 2025

*mandatory units in print, optional units will publish in July and August in a digital format.

Why choose Cambridge Advanced Nationals?

Full compensation grading: Students are always rewarded for their demonstrated abilities - every single mark your students earn will directly contribute to their final grade. No mark will go to waste.

Every mark matters: Gone are the days of hurdle elements in units. If a student meets all but one Pass criterion and some Merit criteria, they won't face failure. Our approach compensates for performance at both the unit and qualification levels, ensuring fairness and encouragement for every student.

Features teachers love and more: Cambridge Advanced Nationals incorporate the popular features from our Cambridge Technicals, including visiting moderation, a blend of examination and coursework units, and we're keeping the well-recognised Pass, Merit, Distinction grade scale. Plus, you'll continue to benefit from our range of comprehensive support and resources.

Pathways to university: Designed in collaboration with teachers and universities, Cambridge Advanced Nationals equip students with a well-rounded skill set for today's undergraduate studies as part of a Level 3 programme of study.

Complementary practical application: Designed to be taken alongside A Levels, Cambridge Advanced Nationals seamlessly complement a mixed study programme while maintaining a strong focus on the practical application of skills and knowledge - a valuable supplement to A Levels, enabling clear progression to university.

Contact details – do stay in touch

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