Edexcel International AS/A Level

IAL Physics
ONLINE Module 1
Understanding assessment and improving delivery

Event Code:

First teaching in 2018, first assessment 2019

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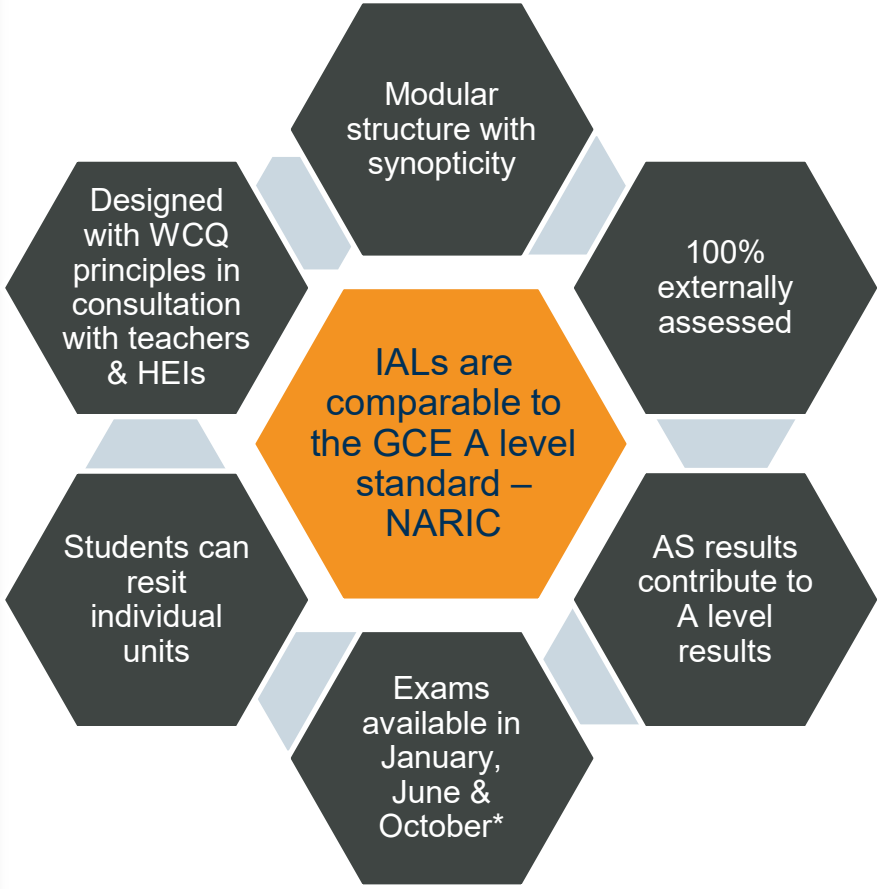
IAL features

- International A levels and AS levels are created for international students
- Globally recognised



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Aims and objectives

Understanding assessment and improving delivery in International A level Physics

During this module you will:

- Be introduced to the idea of assessment objectives: what are they and why they are used when writing examination papers,
- Analyse recent question papers and learn which types of question match the different assessment objectives,
- Investigate different assessment objectives, considering how questions in these areas have been answered by looking at feedback from previous exam series
- Discuss strategies for teaching to try and make sure students can access questions targeting different assessment objectives
- Network, discuss best practice and share ideas with other teachers.

Explanation of assessment objectives

Explanation of the Assessment Objectives

- What are the Assessment Objectives (AOs)?
- Why they are used
- Balance of AOs in the papers
- Exercise: applying AOs to questions

The Assessment Objectives

AO1	Demonstrate knowledge and understanding of science
AO2a	Application of knowledge and understanding of science in familiar and unfamiliar contexts
AO2b	Analysis and evaluation of scientific information to make judgements and reach conclusions.
AO3	Experimental skills in science, including analysis and evaluation of data and methods.

AO1, AO2a and AO2b will be assessed in units 1, 2, 4 & 5 AO3 will be assessed in units 3 & 6.

AO1

The focus of questions targeting this assessment objective will be to assess fundamental routine knowledge that students studying the content of the specification have learnt.

Examples of AO1 questions in Unit 1

- State the principle of conservation of momentum (or any law)
- Expressing the units of derived quantities in terms of base units
- Derive the equation for the resistance of two resistors in parallel (or any other derivations)
- Draw a free body force diagram
- Identify vector and scalar quantities
- Interpret force/extension graphs
- **Recall the method of any of the 16 core practicals**

AO1

The focus of questions targeting this assessment objective will be to assess fundamental routine knowledge that students studying the content of the specification have learnt.

- Examples of AO1 questions in Unit 2
- Explanation of how a standing wave is formed
- Explanation of the conditions for constructive and destructive interference
- Use of Huygens' construction to explain diffraction
- The wave model and the photon models of electromagnetic radiation
- Sketching, recognising and interpreting current – potential difference graphs
- Recall of the method of any of the 16 core practicals

AO2a

The focus of questions targeting AO2a will be to assess the student's ability to apply their knowledge and understanding to different physics contexts which they may or may not have come across. A question is AO2a if it requires the student to use information in the question, i.e. it is more that just the knowledge brought to the exam.

Examples of AO2a questions

- Calculations
- Drawing scaled vector diagrams
- Context-based questions where students have to apply knowledge to a given situation. These are usually 'explain' questions
- Interpretation of particle track diagrams

AO2b

The focus of questions targeting AO2b will be to assess the student's ability to analyse, interpret and evaluate different forms of physics information. A question is AO2b if it requires the student to make a conclusion or a choice or to justify a statement.

Examples of AO2b questions

These questions don't tell the students exactly what to calculate. They usually require the students to carry out calculations to come to a conclusion.

AO3

By carrying out the core practicals and other experiments students should be able to:

- Plan an experiment
- For a given experiment be able to comment on experimental techniques, measurements, uncertainties, significant figures and anomalous results
- Analyse data by plotting a graph using correct units and sensible scales, determine relationships or constants, deal qualitatively and quantitatively with uncertainties, make conclusions.

Why Assessment Objectives are used

- A range of skills tested on each unit examination
- Consistency between the different units of a specification
- Similar standard papers produced each year
- Same assessment objectives across all the sciences

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Balance of AOs on the papers

		% in AS	% in IAL
AO1	Demonstrate knowledge and understanding of science	34–36	32–34
AO2a	Application of knowledge and understanding of science in familiar and unfamiliar contexts	34–36	34–36
AO2b	Analysis and evaluation of scientific information to make judgements and reach conclusions	9–11	12–14
AO3	Experimental skills in science, including analysis and evaluation of data and methods	20	20

AO1

Linkage questions

- These questions are always 6 marks.
- There will be 6 indicative content points.
- These points can be awarded a maximum of 4 marks.
- 2 more marks are available for linkage between the indicative content points and reasoning.
- Usually questions will require an explanation with linkage on knowledge from the specification. so likely to be AO1.
- Recall of the core practicals is AO1, so these could be used for this type of question.
- Questions can be AO2a if some marks are for applying knowledge to a new situation.

WPH11 1906 Q16c

This question was about a core practical, measuring the Young Modulus for a length of copper wire. The linkage question was (c) and asked:

Explain why the sample of wire used in this experiment should be long and thin.

Indicative content

- For long(er) wire, the extension will be large(r)
- (For the same load) extension is proportional to the original length
  Or extension/original length= constant
- For a thin(ner) wire, the extension will be large(r)
- (For the same load) extension is inversely proportional to cross-sectional area
  (may be explained in terms of E, σ and ε)
- The percentage uncertainty in the extension/length will be lower (although this will be greater for the cross-sectional area)
- A small(er) load can be used with a long/thin wire

WPH12 1906 Q14

***14** In 1921, Albert Einstein was awarded the Nobel Prize for Physics for his 'discovery of the law of the photoelectric effect'.

To explain this effect, Einstein proposed that electromagnetic radiation should be modelled as a particle rather than as a wave.

Explain why, when considering the photoelectric effect, treating electromagnetic radiation as a particle is a more successful model than treating electromagnetic radiation as a wave.

WPH12 1906 Q14

Indicative content

- Minimum / threshold frequency required to release electrons.
- For waves, any frequency would be able to release electrons.
- Release of electrons is instantaneous.
- If the wave model were correct, energy would take time to build up before electrons were released.
- (Kinetic) energy of released electrons is dependent on frequency.
- If the wave model were correct, the (kinetic) energy of the released electrons would be dependent on the intensity.

Wave/particle nature of light

57 Understand how the behaviour of electromagnetic radiation can be described in terms of a wave model and a photon model, and how these models developed over time

62 Understand how the photoelectric effect provides evidence for the particle nature of electromagnetic radiation

Linkage questions require:

- some sort of comparison, as in this question
- an explanation where there is a consequential change, e.g. effect on resistance of heating a component

or:

- describing a change over time, e.g. evolution of a star.

For this question, most students were able to make statements about either the wave model or the particle model, but there were very few comparative statements.

Marking exercise

Using copies of the mark scheme, mark the examples of answers for these questions that are in the handout 'Exemplar Material'. You will also need the 'Marking exercise mark schemes'

First, mark the five examples A-E of the Q16 on extension of a wire. Enter your marks into the polls onscreen – your trainer will then go through these exemplars.

Next - mark the five examples A-E of the Q14 on the photoelectric effect. Enter your marks into the polls onscreen.

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