Edexcel International AS/A Level

IAL Physics

Understanding assessment and improving delivery

Event Code:

First teaching in 2018, first assessment 2019

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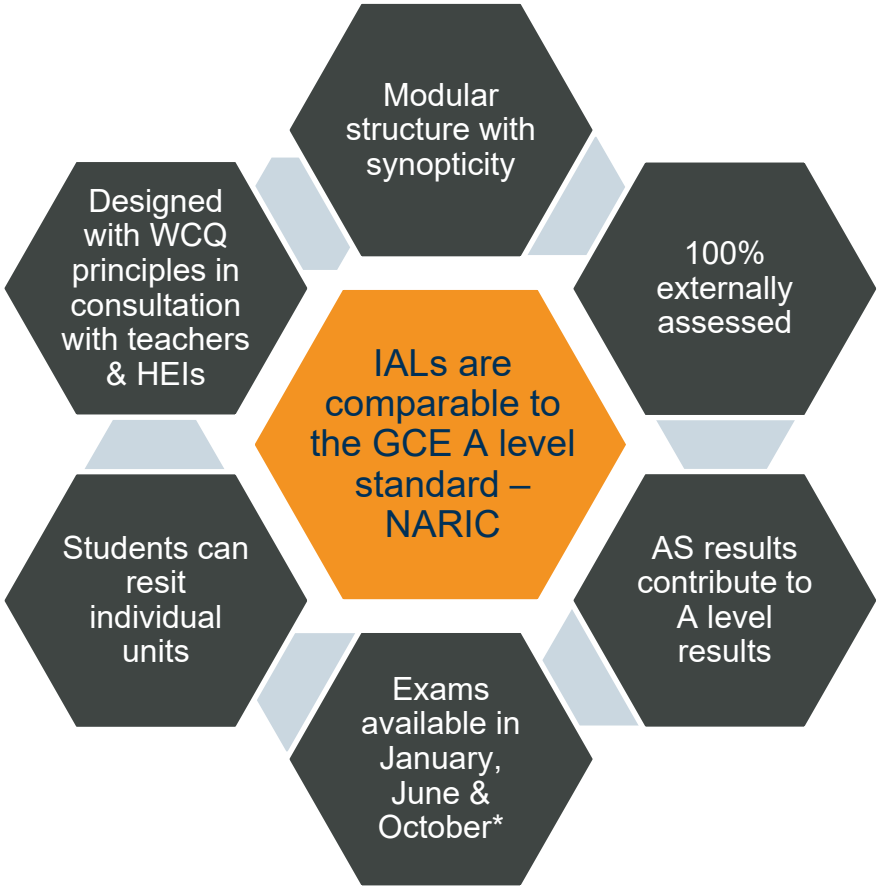
IAL features

- 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 the day 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
- Review the support Pearson offers for the qualification
- Network, discuss best practice and share ideas with other teachers.

Agenda

- 10.00 – 10.10 Introductions
- 10.10 – 11.10 Session 1: Explanation of the Assessment Objectives
- 11.10 – 11.30 BREAK
- 11.30 – 12.45 Session 2: AO1
- 12.45 - 13.45 LUNCH
- 13.45 – 15.00 Session 3: AO2
- 15.00 – 15.30 Session 4: AO3
- 15.30 – 16.00 Any questions / feedback / depart

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Session 1
Explanation of assessment objectives

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Session 1 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

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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 require the students to usual 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.

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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

Analysing a paper in terms of Assessment Objectives

Go through the WPH11 2019 paper deciding which AOs apply to the questions.

80-mark paper which counts for 80% of the AS award:

- 35 marks AO1
- 35 marks AO2a
- 10 marks AO2b

Session 2
AO1

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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’.

Session 3
AO2a & AO2b

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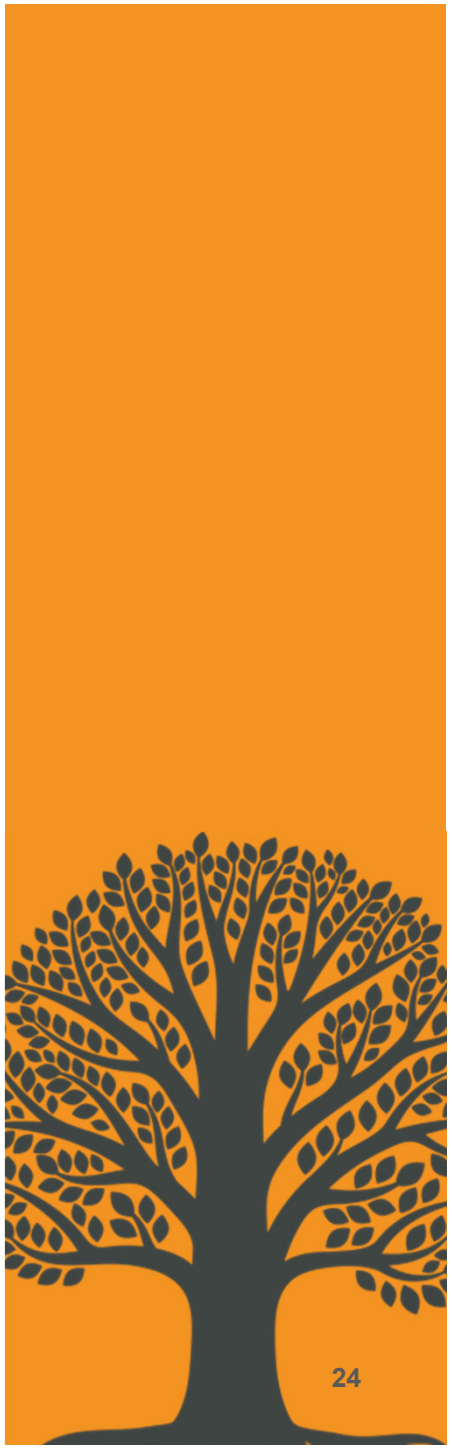
AO2a

These include:

- Questions involving calculations from data or a graph
- Questions involving explanations based on the context of the question.



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WPH12 Q19c (AO2a x 4)

(c) In a separate experiment two resistors, with equal resistance R, are connected to a battery (with internal resistance r) with the two resistors firstly in a series arrangement (diagram A) and then in a parallel arrangement (diagram B).

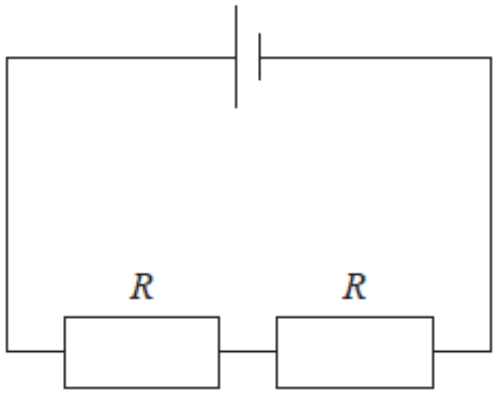


Diagram A

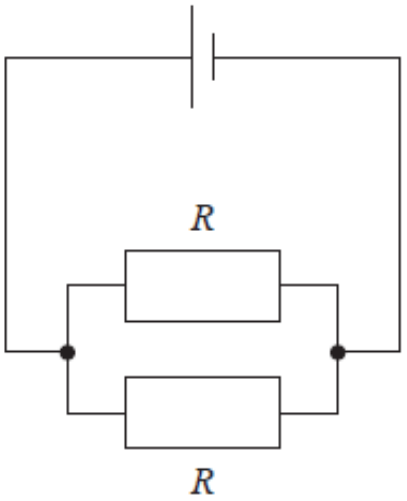


Diagram B

Explain which, if either, of the two arrangements would lead to a greater value for the terminal potential difference.

(4)

1st answer

The arrangement in the diagram A because since both the resistors are in series. Therefore the resistance will be 2R and ~~the~~ that is why the would require greater share of the emf ~~provid~~ supplied. lost volts will be less. ~~the~~ in diagram B the resistance would be $R/_2$ Therefore the resistor would not require much share of the emf.

2nd answer

In parallel $\frac{1}{R} = \frac{1}{R} + \frac{1}{R} = \frac{2}{R}$ therefore resistance

$\rightarrow$ therefore the $\text{resistance}_{\text{total}} = \frac{2}{R}$ If resistance is lower

then more current flows through the battery, there will

be greater "loss volts" therefore Terminal P.D is lower

In series $R_{\text{total}} = 2R$ Therefore the Resistance of the two

resistors is greater than the parallel circuit. $V = I \times R$ Therefore

the terminal pd in series circuit will have

a greater value

WPH12 Q13

13 The orbits of planets around the Sun are elliptical.

The intensity of radiation received at the top of the Earth's atmosphere is monitored during one orbit of the Earth around the Sun.

The following data is recorded:

maximum intensity of radiation = 1.41 kW m^{-2}
minimum intensity of radiation = 1.32 kW m^{-2}

(a) Calculate the minimum distance between the Earth and the Sun.

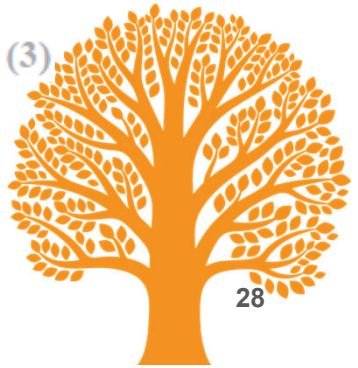
power of the Sun = 3.83×10^{26} W

(3)

(b) As Mars orbits the Sun, the intensity of radiation received at the top of its atmosphere varies from 491 W m^{-2} to 711 W m^{-2}.

Explain two differences between the orbits of Mars and Earth that can be deduced from this data.

(3)



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1st answer

mars having a maximum intensity of $711 Wm^{-2}$ while earth has $1.41 kWm^{-2}$ means that mars ~~is~~ Orbital is having a less distance from Sun compared to that of earth. Also it will indicate that mars has smaller orbital than that of earth.

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2nd answer

Mars' orbit

It is much further from the sun compared to the Earth's, as the intensity is lower. It is also much more elliptical as the intensity varies much more than Earth's orbit. Earth's orbit goes from 1.47×10^{11} m to 1.51×10^{11} m, whereas Mars' goes from 2.07×10^{11} to 2.49×10^{11} m.

3rd answer

According to the data on the radiation flux ~~of~~, ~~stars~~ It can be deduced that mars is further always from the sun compared to earth as mars maximum intensity is lower then the minimum intensity of the sun in the earths atmosphere. It can be deduced that ~~earths~~ mars path around the sun is less elliptical compared to ~~earth~~ earth as the difference between the intensities in ~~mars~~ earth is greater then that of earth.

(Total for Question 13 = 6 marks)

AO2b

These questions require students to evaluate information, sometimes do a calculation and always write a conclusion.

Examples are:

- WPH11 1906 Q12 & Q17b
- WPH12 1906 Q 11, 16c, 17bii & 17c

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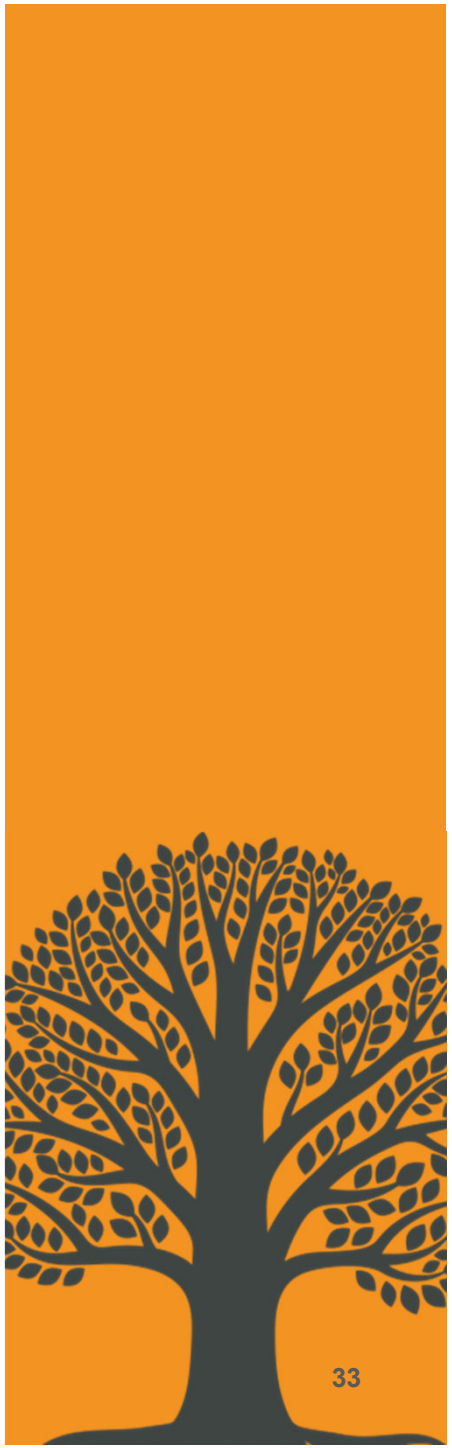
Marking exercise

Return to the exemplar booklet and mark the examples of questions that assess AO2b



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Session 4
AO3

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AO3 assessment of practical skills

WPH13

Students are expected to develop experimental skills, and a knowledge and understanding of experimental techniques, by carrying out a range of practical experiments and investigations while they study Units 1 and 2.

This unit will assess students' knowledge and understanding of experimental procedures and techniques that were developed in Units 1 and 2.

WPH16

Students are expected to further develop the experimental skills and the knowledge and understanding of experimental techniques that they acquired in Units 1 and 2 by carrying out a range of practical experiments and investigations while they study Units 4 and 5.

This unit will assess students' knowledge and understanding of the experimental procedures and techniques that were developed in Units 4 and 5.

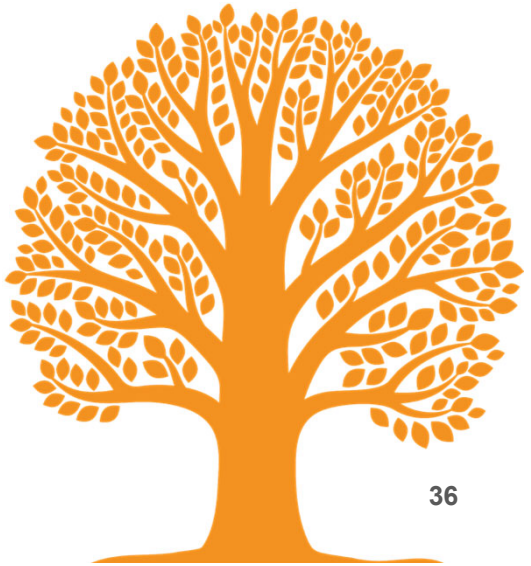
WPH03 1906

Q1 measurements question, instruments and percentage uncertainty

Q2 measuring techniques (based on a core practical)

Q3 data analysis and graph plotting of experiment they will not have seen

Q4 calculation-type question based on a core practical but using an unfamiliar equation



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Support and resources

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Support overview

Free support

- Getting Started Guide & Scheme of Work
- Getting Ready to Teach Events
- Subject interpretation of transferable skills
- Subject Advisor
- Results Plus
- Regional Support Manager

Additional support for selected subjects

- Curriculum matched publishing
- Lesson plans
- Exemplar marked responses
- Topic booklets & subject guides
- Additional SAMs
- Exam Wizard

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ResultsPlus

ResultsPlus is the free online results analysis tool for teachers – it provides analysis features that other similar solutions don't.

- It provides a detailed breakdown of student performance in Edexcel exams.
- It helps identify topics where the student can benefit from further learning and allows this knowledge to inform teaching strategies and approaches.
- It provides a comparison of student performance at regional level.
- It allows you to view your school's performance against other Pearson Edexcel schools in your country. You can also find student results analysis from their previous Pearson Edexcel school
- Mock exams results can also be fed into the system to produce an analysis, so not just post results!
- ResultsPlus Direct gives your students access to their final grades and performance breakdown, wherever they are
- Schools can sign up for free ResultsPlus account in just a few quick and easy steps: https://qualifications.pearson.com/en/support/Services/ResultsPlus.html

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examWizard is a free tool for teachers containing a bank of past paper questions to help create their own bespoke mock exams and tests to focus on particular topic areas as needed.

- Use existing mark schemes for accurate marking.
- Use existing examiner report for insight.
- Use the results to understand where students need more support, informing teaching strategies.

Unlike other similar question banks, ExamWizard is:

- Available free to all Edexcel centres
- Updated with latest questions faster, following the exam series
- One-stop shop for assessment material with access to whole past papers and examiner reports as well as the ability to construct bespoke ones easily with content tagged to specific attributes.

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New Access to Scripts (ATS) online portal

Access to Scripts (ATS) is a free online portal which allows teachers to immediately access electronically marked exam papers.

Provides enhanced transparency and:

- Offers transparent approach to marking process
- Provides better understanding of marking before requests for enquiries about results are made
- Provides excellent aid for teaching and preparing other cohorts for examinations by helping you to evaluate a student's performance on particular questions in relation to what they have been taught.

Available instantly from results day for all our examination series, for a defined window, you can view and download scripts which have been marked online free of charge from our self-service portal.

For more information on ATS, and the post-results windows, visit our post-results pages.

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