

PEARSON EDEXCEL INTERNATIONAL GCSE (9-1)

Physics Understanding Assessment and Improving Delivery

ONLINE Module 1

First teaching in 2017, first assessment in 2019.



Aims and Objectives

Understanding assessment and improving delivery in International GCSE Physics

During the day you will:

- Be introduced to the idea of assessment objectives: what they are 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, focusing in this module on AO1, 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: identifying AOs in questions



The Assessment Objectives

AO1	Knowledge and understanding of physics
AO2	Application of knowledge and understanding, analysis and evaluation of physics
AO3	Experimental skills, analysis and evaluation of data and methods in physics

All assessment objectives are assessed in both Paper 1 and Paper 2.
Each paper targets the same distribution of these assessment objectives.



AO1

This assessment objective covers all areas of physics that students should have routinely covered as part of studying the content of the specification. It covers the recall of formulae and units through to understanding standard identified contexts, such as explaining how a loudspeaker works.

Examples of AO1 questions

- State the formula linking average speed, distance moved and time taken
- State the name of component X
- Describe the uses of three different radiations in the electromagnetic spectrum
- Describe how the average kinetic energy of a gas particle changes when the temperature of the gas increases
- Sketch a graph to show what is meant by a.c.
- Give an example of a longitudinal wave



AO2

Questions targeting this assessment objective will require students to apply their knowledge and understanding to a context that may not be familiar to them. Questions requiring a calculation also target AO2. The most demanding AO2 questions may require the use of a calculation to make a suitable evaluation about an unfamiliar context.

Examples of AO2 questions

- Calculate the average speed of the ball
- Explain how the sound heard from a buzzer changes when the buzzer is thrown towards a student
- Explain why hydrogen must be heated to a high temperature for fusion to take place
- Explain what information the two spectra give about the movement of the galaxy



AO3

Students are expected to have completed the 12 practical investigations outlined in the specification. Ideally, they will also have completed many other practical investigations. Questions targeting AO3 assess students' knowledge and understanding of designing, performing, presenting and concluding an experimental investigation.

Examples of AO3 questions

- Draw a voltmeter on the circuit diagram to measure the voltage of component X
- State two control variables for this investigation
- Plot the student's results on the grid
- Explain which type of graph is appropriate for this investigation
- Describe how the power output of a wind turbine varies with wind speed using data from the graph



Why assessment objectives are used

- A range of skills are assessed in every paper
- Consistency between the two papers in terms of accessibility and level of demand
- Similar difficulty of assessment achieved across all examination series over time
- Same assessment objectives and distribution of assessment objectives used across all sciences in the International GCSE suite of qualifications



Balance of AOs on the papers

		%
AO1	Knowledge and understanding of physics	38–42
AO2	Application of knowledge and understanding, analysis and evaluation of physics	38–42
AO3	Experimental skills, analysis and evaluation of data and methods in physics	19–21

This distribution of assessment objectives is identical in Paper 1 and Paper 2.



Activity 1 – Identifying AOs

Look at the 4PH1 1P paper in your delegate pack. This paper was sat by candidates in May 2019 and was the first assessment for the 9-1 specification.

Task 1

Look at Q3. Which assessment objective is this question targeting? What features does this question have that links it to this assessment objective?

Task 2

Look at Q6. Which assessment objectives is this question targeting? What features does this question have that links it to these assessment objectives?

Task 3

Look at Q7. Determine which assessment objectives are being targeted in each part of this question.



Activity 1 feedback

Task 1 Q3 targets AO2.

Students were expected to apply their knowledge and understanding of the penetration powers of alpha and gamma and the difference between irradiation and contamination.

Task 2 Q6(a) targets AO3.

Students were expected to use their experimental skills to answer this question.

Q6(b) targets AO1 (Q6(b)(i) and Q6(b)(iii)) and AO2 (Q6(b)(ii)).

Task 3 Q7 targets a mixture of AO1 and AO2.

There are some standard definitions, formulae and ray diagrams (AO1).

The calculations target AO2.



A01



Why do we ask AO1?

- A physicist should develop their knowledge and understanding of different physical processes and theories as their education develops.
- The purpose of AO1 is to assess students' knowledge and understanding of these processes and theories.
- AO1 questions are often (but not always) targeted at the lower and middle grade ranges (Grades 1-3 and Grades 4-6 respectively).
- AO1 is not limited to questions where students have to simply recall something from their knowledge. However, such recall questions would always be considered as targeting AO1.
- AO1 questions may be interpreted or referred to as 'standard' questions by teachers and students.



Identifying AO1 questions in assessments

The command word used in a question is often a very strong indicator as to which assessment objective that question is targeting.

Command words linked to AO1 questions may include:

- Add / label
- Describe
- Discuss
- Draw
- Give / state / name
- State what is meant by
- What / why / which (only used in multiple-choice questions)



4PH1 1PR Q2

This question linked nuclear fission and nuclear fusion to the generation of electricity.

(a) A nuclear fission power station generates electricity.

(i) State the role of the moderator in a nuclear fission power station.

(1)

(iii) The daughter nuclei can cause contamination and irradiation.

Describe the difference between contamination and irradiation.

(2)



4PH1 1PR Q2

Mark scheme

Question number	Answer	Notes	Marks
2 (a)	(i) reduce the kinetic energy of <u>neutrons</u> ;	allow 'slow down' <u>neutrons</u>	1
	(ii) to absorb (high energy) neutrons;	allow absorb / reduce strength of neutron radiation condone "stop neutrons escaping"	2
	use of (concrete / lead) shielding;	allow "concrete walls"	
	(iii) idea that contamination is when a non-radioactive object comes into contact with a radioactive material; idea that irradiation is when radiation is present;	Condone idea of exposure for 1 mark if no other mark scored	



4PH1 1PR Q2

This question linked nuclear fission and nuclear fusion to the generation of electricity.

(b) Nuclear fusion is another process that could be used to generate electricity.

(i) Describe the process of nuclear fusion.

(2)

(ii) State where nuclear fusion occurs naturally.

(1)

(iii) Generating electricity from nuclear fusion is very difficult as the conditions needed are hard to achieve and maintain.

Explain the conditions required for nuclear fusion.

(3)



4PH1 1PR Q2

Mark scheme

(b) (i)	any two from: MP1. creation of a (large) nucleus from small <u>nuclei</u> ; MP2. resulting in a loss of mass; MP3. and the release of energy;	condone “fusing of two nuclei” accept reference to $E=mc^2$ condone “converted to energy”	2
(ii)	(in) star(s);	allow named star e.g. The Sun	1
(iii)	any three from: MP1. high temperature required; MP2. to increase kinetic energy of nuclei; MP3. high pressure required; MP4. (because) <u>nuclei</u> need to be close enough to collide; MP5. (since) <u>nuclei</u> repel each other;	allow to make nuclei move faster allow particles or atoms for this MP allow higher level answers in terms of short range strong nuclear force	3



4PH1 1PR Q9

This question assessed students' knowledge and understanding of refraction.

(a) A light ray travels from air into water.

Diagram 1 shows the direction of the light ray and the wavefronts in air.

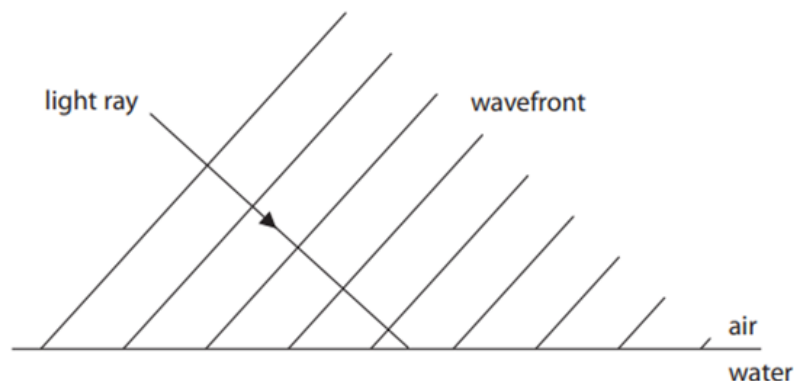


Diagram 1

The refractive index of water is greater than the refractive index of air.

(i) Complete diagram 1 by showing

- the wavefronts in the water
- the path of the light ray in the water

(3)



4PH1 1PR Q9

Mark scheme

Question number	Answer	Notes	Marks
9 (a) (i)	light ray refracting and bending in the correct direction; wavefronts in water drawn closer together by eye; wavefronts drawn in water join up with wavefronts in air;	ignore any response in the air e.g. reflected wavefronts or direction of travel of reflected ray allow wherever seen in diagram	3



4PH1 1PR Q9

This question assessed students' knowledge and understanding of refraction.

(b) Diagram 2 shows what can happen when a light ray travelling in glass meets the boundary with air.

The wavefronts are not shown in this diagram.

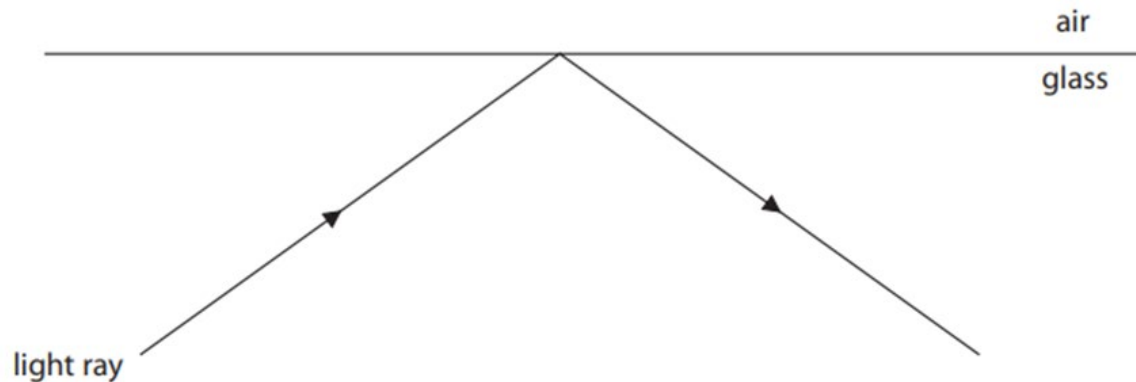


Diagram 2

(i) Add the normal to diagram 2.

(1)



4PH1 1PR Q9

Mark scheme

(b)	(i)	normal drawn at right angles where light ray meets boundary;	judge by eye	1
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Activity 2 – Marking exercise

Look at the Activity 2 booklet in your delegate pack.

This activity shows some real student responses to parts of Q2 and Q9 from the 4PH1 1PR sat in May 2019.

Using the mark schemes, mark the students' responses.



Activity 3 – Facilitating achievement in AO1 questions

As teachers, what strategies can we use to help students succeed when attempting AO1 questions?

Consider teaching and revision strategies that may improve students' performance in AO1 questions.

There is a page in your delegate booklet to enter some of your ideas. Please then post some of your ideas in the chatbox onscreen to share with other delegates.



Activity 3 – some suggestions

- Using a spiral curriculum – teaching a little of each of the 8 topics in each year of study to allow frequent opportunities to revise and revisit challenging concepts and theories.
- Whiteboard starter activities / mini plenaries – assess students' retention of key concepts at the beginning of a lesson and at relevant points throughout the lesson.
- Revision flashcards – these can be bought or made (even better for students to make their own) to revise definitions, formulae and units that need to be recalled.
- Topic checklists – edit the specification to turn it into a list of questions for students to answer.



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