

# PEARSON EDEXCEL INTERNATIONAL GCSE (9-1)

## Physics Understanding Assessment and Improving Delivery

### ONLINE Module 2

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First teaching in 2017, first assessment in 2019.

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# 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, 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.



# 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.



# A02



# Why do we ask AO2?

- A physicist should be able to apply what they have learned to solve problems.
- A physicist should also be able to apply their knowledge and understanding in unfamiliar contexts.
- The most able physicists should be able to extend their knowledge and understanding into linked areas of study.
- AO2 questions are targeted at assessing these skills.



# Identifying AO2 questions in assessments

All calculations (unless they are linked to experimental skills) target AO2.

Students are assessed on their ability to use a suitable formula and their mathematical skills to solve a quantitative problem.

Marks are given for:

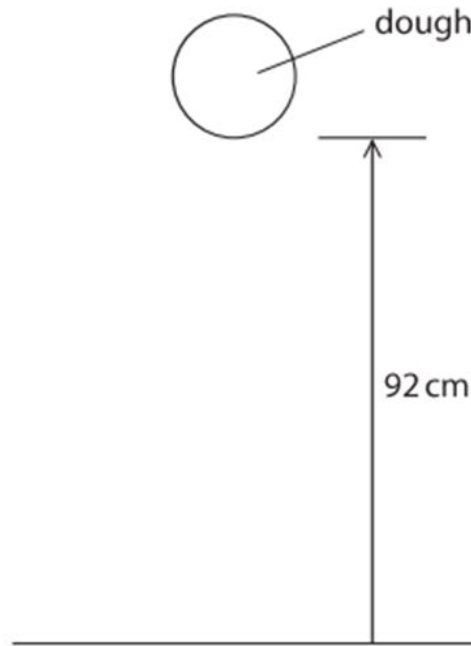
- Substituting values correctly into a formula
- Rearranging a formula
- Changing units into standard units (where relevant)
- Evaluating a mathematical expression to give an answer in decimal or standard form
- Giving an answer to a given number of significant figures (when requested)



# Example calculation question

## 4PH1 1P Q12(a)

**12 (a)** The diagram shows a ball of dough, of mass 580 g, held at a height of 92 cm above the floor.



Calculate the increase in gravitational potential energy (GPE) stored in the ball of dough when it is above the floor.

(3)



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# Example calculation question

## 4PH1 1P Q12(a)

Question number	Answer	Notes	Marks
12 (a)	<p>substitution into GPE = mass <math>\times</math> <math>g</math> <math>\times</math> height;</p> <p>at least one quantity correctly converted to SI units; correct evaluation;</p> <p>e.g.  <math>\text{GPE} = 0.580 \times 10 \times 0.92</math>  mass = 0.580 (kg) OR height = 0.92 (m)  (GPE =) 5.3 (J)</p>	<p>allow substitution with no unit conversions allow <math>g = 9.8, 9.81</math></p> <p>allow 5.2, 5.34, 5.336, 5.23...</p>	3





# Example calculation question

## 4PH1 1P Q12(a)

gravitational potential energy = mass  $\times$  gravity  $\times$  height

✓ =  $580 \times 10 \times 0.92$  ✓  $\left[ \frac{92\text{cm}}{100} = 0.92\text{m} \right]$

= 5336 J

~~answer~~

GPE = 5336 J

2 marks awarded



# Example calculation question

## 4PH1 1P Q12(a)

Calculate the increase in gravitational potential energy (GPE) stored in the ball of dough when it is above the floor.

$$\begin{aligned} \text{gpe} &= \text{mass}^{\text{kg}} \times \text{gravity}^{\text{g}} \times \text{height}^{\text{m}} & (3) \\ &= \frac{580}{1000} \times 10 \times \frac{92}{100} \\ &= 0.58 \times 10 \times 0.92 \\ &= 5.336 \end{aligned}$$

$$\text{GPE} = \underline{5.336} \checkmark \text{ J}$$



3 marks awarded

# Identifying AO2 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 AO2 questions may include:

- Calculate
- Deduce
- Determine
- Evaluate
- Explain
- Justify
- Show that
- Suggest



# Example AO2 question

## 4PH1 1P Q8(a)(ii)

**8** Schiaparelli is a spacecraft that was sent to Mars in 2016.

(a) Schiaparelli slowed down as it fell vertically through the atmosphere of Mars.

(ii) Schiaparelli then opened a parachute to slow down.

Explain how the spacecraft reached a low terminal velocity after opening its parachute.

Use ideas about forces in your answer.

(4)



# Example AO2 question

## 4PH1 1P Q8(a)(ii)

(ii)	any four from:	allow "drag" for air resistance throughout condone "gravity" for weight throughout	4
	MP1. air resistance increases (greatly) when parachute is opened;	allow "upwards force" for air resistance	
	MP2. idea that air resistance is greater than weight;	allow upward force is bigger than downward force	
	MP3. (therefore) resultant force is upwards;	allow deceleration / upwards acceleration ignore "it slows down"	
	MP4. idea that as speed decreases, air resistance decreases;		
	MP5. resultant force (eventually) becomes zero;	allow forces are balanced/equal air resistance = weight	
	MP6. constant speed achieved;	allow idea that there is no acceleration	



# Example AO2 question

## 4PH1 1P Q8(a)(ii)

The spacecraft reached a low terminal velocity due to the parachute increasing the surface area, this increased the air resistance. The air resistance then was able to equal the force of the weight. This caused the spacecraft to fall to the ground slower. Terminal velocity is when the air resistance equals the weight. The forces are balanced. No resultant force.



2 marks awarded

# Example AO2 question

## 4PH1 1P Q8(a)(ii)

The parachute opening increased the surface area of the spacecraft, causing the ~~res~~ air resistance to increase<sup>1</sup> and the resultant force to act upwards<sup>2</sup>. This caused the spacecraft to decelerate. Once this happened, the air resistance decreased due to the spacecraft's lower velocity<sup>3</sup>, while the weight stayed constant. Eventually, the air resistance and the weight of the aircraft were equal<sup>4</sup>, and a new terminal velocity (lower) was reached (resultant force = 0).<sup>5</sup>



4 marks awarded

# Example AO2 question

## 4PH1 1P Q8(c)

(c) Suggest why Mars has a lower gravitational field strength than Earth.

(1)

(c)	any one from: MP1. Mars has a smaller mass; MP2. Mars has a lower density; MP3. Mars has a smaller (iron rich) core;	allow RA allow Mars is less massive	1
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# Example AO2 question

## 4PH1 1P Q8(c)

It is fether away from the sun. **x**

0 marks awarded



# Example AO2 question

## 4PH1 1P Q8(c)

Mars has a lower gravitational field strength than Mars  
due to it having less mass. ✓

1 mark awarded



# Raising achievement in AO2 questions

Many students find AO2 questions more challenging than AO1 questions.

Students who have difficulty rearranging formulae find calculations very difficult. The following suggestions may improve achievement:

- Substitute data into a formula **before** rearranging it as this is usually worth 1 mark.
- Try rearranging formula after substituting data – this makes the problem more similar to a maths exercise and some students find they can solve a problem this way.
- Practise as many calculations with as many different formulae as possible, especially with more demanding formulae such as  $v^2 = u^2 + 2as$ .



# Raising achievement in AO2 questions

Students found Q8(a)(ii) (previous terminal velocity question) very difficult because the context was similar to a standard ‘why does a falling object reach terminal velocity?’ question.

However, students still received marks for writing valid statements from their knowledge that were relevant, e.g. forces (eventually) becoming balanced.

Students will never lose marks unless their statements directly contradict each other. Therefore, trying to include as much of their relevant knowledge in their answer as possible is recommended.



# Raising achievement in AO2 questions

The command word '**suggest**' is used when students are being asked to extend their knowledge and understanding to a completely unfamiliar context.

Students should be encouraged to think carefully before answering such questions.

Teachers should refer to such questions as being about something the students haven't been taught before, but that can be answered using their existing knowledge and understanding.



# Activity 4 – Raising achievement in AO2 questions

Students need opportunities to practise applying their knowledge and understanding in unfamiliar contexts.

Exam wizard and past papers allow teachers to provide students (free of charge) with past examination questions.

Teachers may also wish to write their own questions and worksheets to give their students opportunities to practise applying their knowledge and understanding of a particular area of the syllabus.

Refer to the Activity 4 booklet in your delegate pack. Using the given context, write two questions (with accompanying mark schemes) that will allow students to practise applying their knowledge and understanding of physics.



# A03



# Why do we ask AO3?

A student pursuing an education or career in physics must be able to plan and carry out experiments to test a scientific theory.

The specification outlines 12 compulsory experiments to enable students to develop their experimental skills.

Questions targeting AO3 assess these experimental skills.





# Identifying AO3 questions in assessments

AO3 questions can be whole questions or parts of questions.

Command words commonly used in AO3 questions are:

- Analyse the data / graph to explain
- Design
- Draw
- Give / state / name
- Plot
- Predict



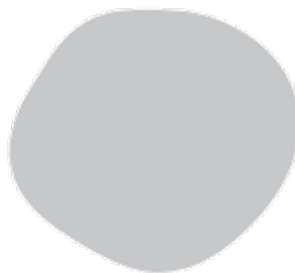
# 4PH1 1PR Q5(a)(i)

- 5 A student is given a type of putty that conducts electricity.  
He rolls the putty into cylinders of different cross-sectional area.  
The photograph shows the cylinders.



The student investigates how the electrical resistance of the putty is affected by its cross-sectional area.

- (a) The diagram shows the cross-sectional area of one of the cylinders of putty.



drawn to scale

- (i) Use the diagram to determine the mean diameter of the cylinder of putty.

(2)



# 4PH1 1PR Q5(a)(i)

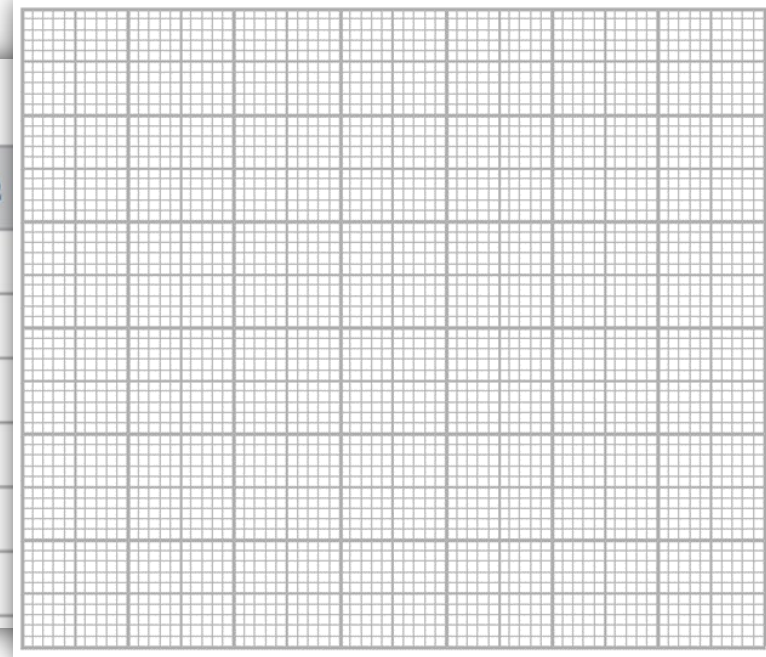
Question number	Answer	Notes	Marks
5 (a) (i)	diameter measured within range 3.5-4.0 cm; evidence of finding a mean of the diameter;		2



# 4PH1 1PR Q5(c)(ii)–(iii)

The table shows some of his results.

Cross-sectional area in $\text{cm}^2$	Voltage in V	Current in A	Resistance in $\Omega$
4.5	4.56	0.049	91.2
6.2	4.56	0.059	77.3
9.1	4.56	0.068	67.1
13.9	4.56	0.085	53.6
18.1	4.56	0.094	48.5
24.6	4.56	0.107	



(ii) Plot a graph of resistance on the y-axis and cross-sectional area on the x-axis.

(3)

(iii) Draw the curve of best fit.

(1)



# 4PH1 1PR Q5(a)(i)

(ii) suitable linear scale chosen (>50% of grid used);

axes labelled with quantities and units;  
plotting correct to nearest half square;

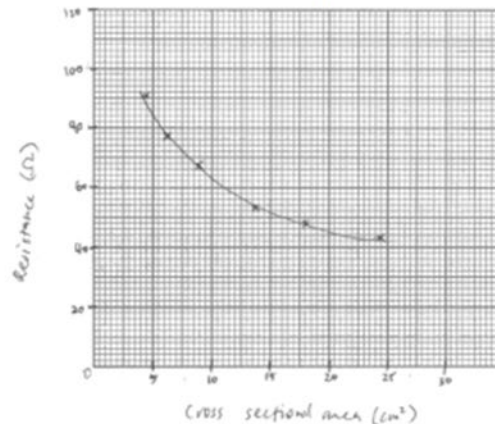
Cross-sectional area in cm <sup>2</sup>	Voltage in V	Current in A	Resistance in $\Omega$
4.5	4.56	0.049	91.2
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18.1	4.56	0.094	48.5
24.6	4.56	0.107	

orientation needs to be correct

3

all points must be correct  
ignore plotting of final point

(iii) line (curve) of best fit acceptable;



allow ECF from plotting  
i.e. smooth curve with  
points evenly  
distributed about it

1



# 4PH1 1PR Q7(a)

**7** A student investigates how the surface material of a ramp affects the average speed of a block sliding down the ramp.

(a) Design a suitable method for the student's investigation.

Your answer should include

- the measuring equipment needed
- details of the independent, dependent and control variables
- how the average speed will be determined

You may include a diagram to help your answer.

(6)



# 4PH1 1PR Q7(a)

Question number	Answer	Notes	Marks
7 (a)	<p><b>measuring equipment:</b></p> <p>MP1. ruler / tape measure; MP2. stopclock / stopwatch;</p> <p><b>variables:</b></p> <p>MP3. surface material is the independent variable; MP4. (average) speed is the dependent variable; MP5. any one control variable from;</p> <ul style="list-style-type: none"> <li>size / mass / material / area / weight of block</li> <li>height/angle/gradient of ramp</li> <li>initial force given to block</li> </ul> <p>• distance travelled down the ramp</p> <p><b>determining average speed:</b></p> <p>MP6. use of (average) speed = distance travelled / time</p>	<p>allow if clearly included in diagram</p> <p>condone 'timer'</p> <p>accept use of light gates if connected to timing device e.g. computer/datalogger</p> <p>accept 'camera' if subsequent method describes 'freeze-frame'/timestamp technique</p> <p>allow time as the dependent variable allow 'keep constant' for 'control variable'</p> <p>allow 'push' given to block allow initial speed or velocity</p> <p>allow same starting point and finishing point</p> <p>accept use of light gate if description includes length of card/block and time of transit</p>	6



# Raising achievement in AO3 questions

In recent examination series, students commonly lost marks for...

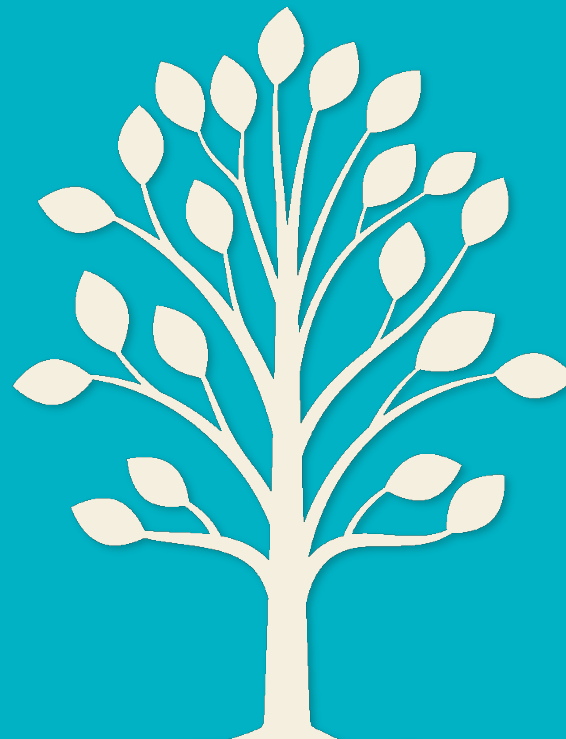
- Confusing the independent, dependent and control variables in an experiment.
- Not being aware of which type of graph is appropriate for a particular experiment.
- Not understanding the meaning of the terms *accuracy*, *precision*, *reliability* and *validity*.
- Designing methods that do not focus on the scaffolding bullet points used in the question.

Teachers should aim to provide as many opportunities for practical work as are realistic in the teaching timeframe.





# Support and resources



# Support overview for International GCSE in Physics

Getting Started Guide & Scheme of Work	Getting Ready to Teach Events	Subject interpretation of transferable skills
Subject Advisor	Results Plus	Regional Support Manager
Curriculum Matched Publishing	Exemplar Marked Responses	Additional SAMs
Exam Wizard	Lesson Plans	Topic booklets



- Free online results analysis tool for teachers.
- Provides a detailed breakdown of student performance in Pearson Edexcel exams.
- Identify topics and questions where the student could benefit from further learning and inform teaching strategies and approaches.
- Benchmark your school's performance against other Pearson Edexcel schools in your country.
- Not just a post-results tool: Mock exam results can also be fed into the system to produce analysis.
- Find student results analysis from their previous Pearson Edexcel school.
- 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>



- A free tool for teachers which helps you make quick homework assignments, topic tests and mock exams.
- Questions tagged against unit, topic and assessment objective or simply choose a whole past paper.
- Use existing mark schemes for accurate marking.
- Use examiner report for insight.
- Most recent exam content available sooner.
- Use the results to understand where students need more support, informing teaching strategies.



# New Access to Script (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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