

Edexcel International AS/A Level

IAL PHYSICS

YPH11-20IF1

First teaching in 2018, first assessment 2019



Timetable

9:30 – 10:00	Registration
10:00 – 11.30	Session 1: Welcome to Pearson – getting ready for delivery
11.30 – 11.45	BREAK
11.45 – 12.45	Session 2: Assessment Objectives and exemplars
12:45 – 13.45	LUNCH
13.45 – 14.30	Session 2 continued: Assessment of practical work and exam techniques
14:30 – 15.30	Session 3: Support from Pearson



Aims and objectives

During this training you will:

Session 1:

- identify how the qualifications are devised
- review the content of the qualification
- explore how to plan the course and/or lessons
- understand the assessment of the qualification and how to prepare students

Session 2:

- understand the Assessment Objectives, question types and mark schemes for the qualification
- practise using the mark schemes using exemplar student work

Session 3:

- look in more detail at the free support available on the website
- learn about personal support – such as subject advisor/credible specialists/training
- investigate support available from Pearson.



Session 1

Getting ready for delivery



Welcome to Pearson Edexcel

Welcome to Pearson Edexcel,
the world's leading learning company
and the UK's largest awarding body.

We set the standard for worldwide
recognised qualifications, built on the
UK educational system and accepted
by universities worldwide.

We have a simple mission:
**to help make a measurable impact on
improving people's lives through learning.**

*'We judge
ourselves –
and invite
others to
judge us – not
by the
products that
we make but
by the impact
on learners.'*

John Fallon,
Chief Executive Officer,
Pearson



About Pearson Edexcel

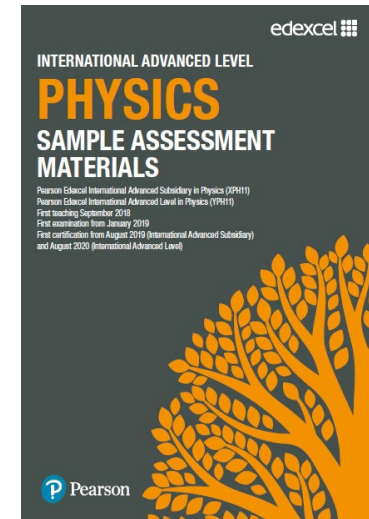
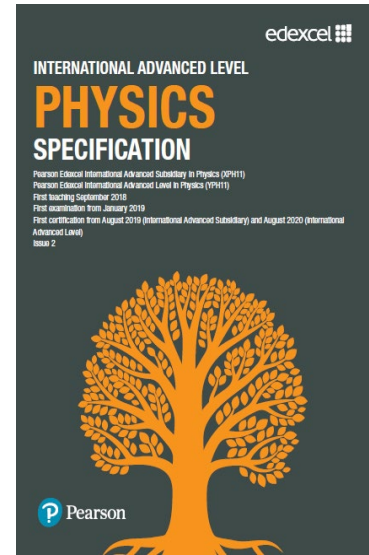
- As the UK's largest awarding organisation, we are best placed to provide qualifications that are most closely aligned to the British educational system.
- We are the most reliable awarding organisation in the UK, recognised and trusted by educators, learners and employers to provide high quality qualifications.
- By helping you to realise student potential, you can prepare and empower all your students to progress to further education, university and employment.
- Our technology capability allows us to provide you with more advanced support services, tools and resources to make life easier for school leaders, teachers and students.
- Pearson Edexcel are leading the way, challenging thinking and creating new ideas so you can be confident our qualifications will always be world-class.



What is the specification?

- The specification is the main document you need to teach the course.
- It outlines the aims of the course, the content you **MUST** cover and all the information you need about assessing your students.
- A copy of this document is in your download pack and on our website.

There are also Sample Assessment Materials. This document provides examples of the question papers and was especially useful when this specification was launched. Since there are now at least two series of live exam papers, it is arguable that the real papers become a more important resource than the SAM.



Key features

Structure: the International Advanced Subsidiary and Advanced Level in Physics are modular qualifications.

Content: the content is relevant for learners who have achieved a GCSE or IGCSE in Physics and who want to study this subject at a higher level.

Assessment: assessment consists of three written papers at IAS level that are externally assessed. The International A level consists of three further written papers that are externally assessed.

Approach: Learners will develop their knowledge and understanding of Physics by applying the concepts in this specification to a range of different problems that include a variety of contexts. Problems will require the application of mathematical skills. Learners will also develop their practical skills.



Using this specification

Compulsory content: as a minimum, all the items in the content must be taught. The word 'including' in content specifies the detail of what must be covered.

Assessments: use a range of material and are not limited to the examples given. Teachers should deliver these qualifications using a good range of examples to support the assessment of the content.

Depth and breadth of content: teachers should use the full range of content and all the assessment objectives given in the subject content section.



Practical investigation

Practical investigation

Students will be assessed on their ability to:

23	be able to use the equation density $\rho = \frac{m}{V}$
24	understand how to use the relationship upthrust = weight of fluid displaced
25	<p>a be able to use the equation for viscous drag (Stokes' Law), $F = 6\pi\eta rv$.</p> <p>b understand that this equation applies only to small spherical objects moving at low speeds with <i>laminar flow</i> (or in the absence of <i>turbulent flow</i>) and that viscosity is temperature dependent</p>
26	CORE PRACTICAL 2: Use a falling-ball method to determine the viscosity of a liquid
27	be able to use the Hooke's law equation, $\Delta F = k\Delta x$, where k is the stiffness of the object
28	<p>understand how to use the relationships</p> <ul style="list-style-type: none"> (tensile or compressive) stress = force/cross-sectional area (tensile or compressive) strain = change in length/original length <p>Young modulus = stress/strain.</p>
29	<p>a be able to draw and interpret force-extension and force-compression graphs</p> <p>b understand the terms limit of proportionality, elastic limit, yield point, elastic deformation and plastic deformation and be able to apply them to these graphs</p>
30	be able to draw and interpret tensile or compressive stress-strain graphs, and understand the term <i>breaking stress</i>
31	CORE PRACTICAL 3: Determine the Young modulus of a material
32	<p>be able to calculate the elastic strain energy E_{el} in a deformed material sample, using the equation $\Delta E_{el} = \frac{1}{2} F\Delta x$, and from the area under the force-extension graph</p> <p><i>The estimation of area and hence energy change for both linear and non-linear force-extension graphs is expected.</i></p>



Overview of the physics specification

International Advanced Subsidiary

This qualification consists of **three** externally examined units.

The IAS is the first half of the IAL qualification and consists of three IAS units: Units 1, 2 and 3. This qualification can be awarded as a discrete qualification or can contribute 50 per cent towards the International A Level.

The qualification will include questions that target mathematics at Level 2 or above. Overall, a minimum of 40% of the marks across the papers will be awarded for mathematics at Level 2 or above.

International Advanced Level

This qualification consists of **six** externally examined units.

The International A Level consists of the three IAS units (Units 1, 2 and 3) plus three IA2 units (Units 4, 5 and 6). Students wishing to take the International A Level must, therefore, complete all six units.

The qualification will include questions that target mathematics at Level 2 or above. Overall, a minimum of 40% of the marks across the papers will be awarded for mathematics at Level 2 or above.



Unit 1: Mechanics and Materials	Unit 2: Waves and Electricity	Unit 3: Practical Skills in Physics I
<p>Externally assessed Written exam: 1 h 30 m 80 marks 40% of IAS 20% of IAL</p> <p>The paper may include multiple-choice, short open, open-response, calculations and extended writing questions.</p>	<p>Externally assessed Written exam: 1 h 30 m 80 marks 40% of IAS 20% of IAL</p> <p>The paper may include multiple-choice, short open, open-response, calculations and extended writing questions.</p>	<p>Externally assessed Written exam: 1 h 20 m 50 marks 20% of IAS 10% of IAL</p> <p>This unit will assess students' knowledge and understanding of experimental procedures and techniques developed in Units 1 and 2. The paper may include short open, open-response, calculations and extended writing questions.</p>



Unit 4: Further Mechanics, Fields and Particles	Unit 5: Thermodynamics, Radiation, Oscillations and Cosmology	Unit 6: Practical Skills in Physics II
<p>Externally assessed Written exam: 1 h 45 m 90 marks 40% of IA2 20% of IAL</p> <p>The paper may include multiple-choice, short open, open-response, calculations and extended writing questions.</p>	<p>Externally assessed Written exam: 1 h 45 m 90 marks 40% of IA2 20% of IAL</p> <p>The paper may include multiple-choice, short open, open-response, calculations and extended writing questions.</p>	<p>Externally assessed Written exam: 1 h 20 m 50 marks 20% of IA2 10% of IAL</p> <p>This unit will assess students' knowledge and understanding of experimental procedures and techniques developed in Units 4 and 5. The paper may include short open, open-response, calculations and extended writing questions.</p>

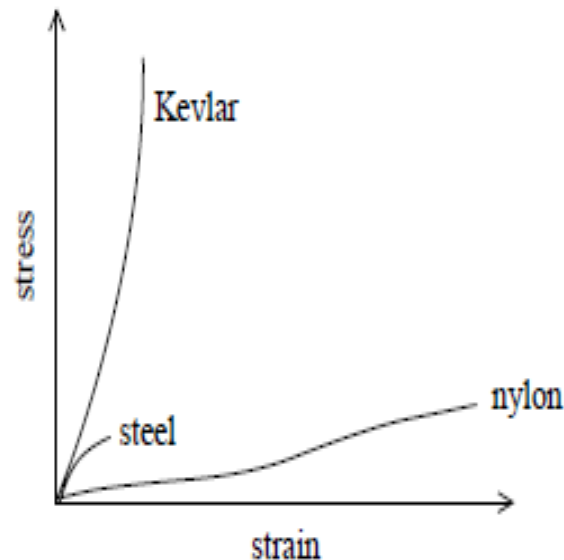


Activity

This is part of a question – what part of the content (which specification points) are being assessed?

Kevlar is a modern lightweight material. Due to its physical properties, Kevlar is being used to replace nylon and steel in many applications.

The stress-strain graphs for Kevlar, nylon and steel are shown.



(a) When pulling a heavy load, Kevlar cables are now often used instead of nylon cables.

Explain two advantages of using Kevlar in cables compared to using nylon.



Unit 1: Mechanics and Materials	Unit 2: Waves and Electricity	Unit 3: Practical Skills in Physics I
<ul style="list-style-type: none"> • Mechanics • Materials 	<ul style="list-style-type: none"> • Waves and Particle Nature of Light • Electric Circuits 	<p>Students are expected to develop experimental skills, and techniques by carrying out a range of practical experiments in Units 1 and 2.</p>
Unit 4: Further Mechanics, Fields and Particles	Unit 5: Thermodynamics, Radiation, Oscillations and Cosmology	Unit 6: Practical Skills in Physics II
<ul style="list-style-type: none"> • Further Mechanics • Electric and Magnetic Fields • Nuclear and Particle Physics 	<ul style="list-style-type: none"> • Thermodynamics • Nuclear Decay • Oscillations • Astrophysics and Cosmology 	<p>Students are expected to further develop the skills and techniques acquired in Units 1 and 2 by carrying out a range of practical experiments in Units 4 and 5.</p>



Activity

Choose one topic (or part of a topic) from the Physics specification. Plan the order in which you would teach that topic.

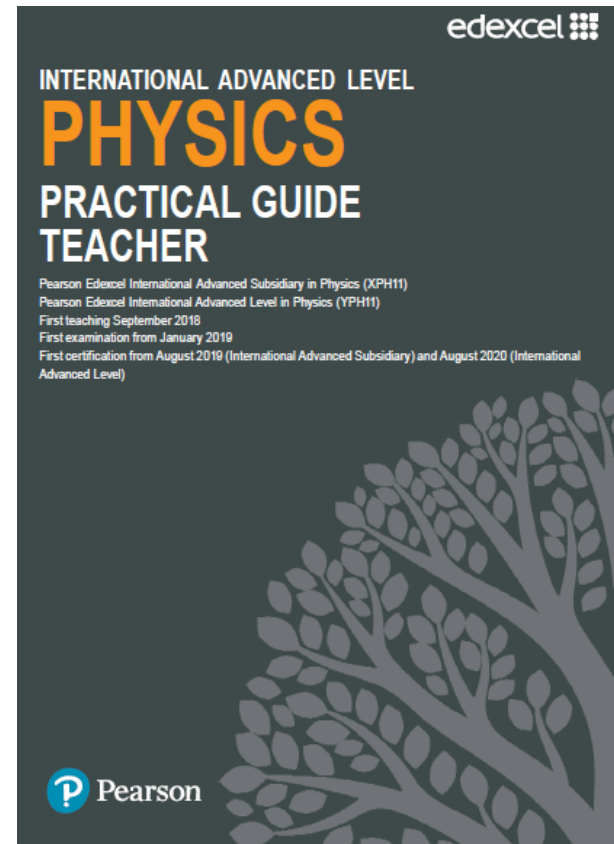
Be prepared to share your preferred teaching order, with your reasoning.



Experimental skills

In order to prepare students for the assessment of experimental skills (Units 3 and 6), centres should give students opportunities to plan experiments, implement their plans, collect data, analyse their data and draw conclusions.

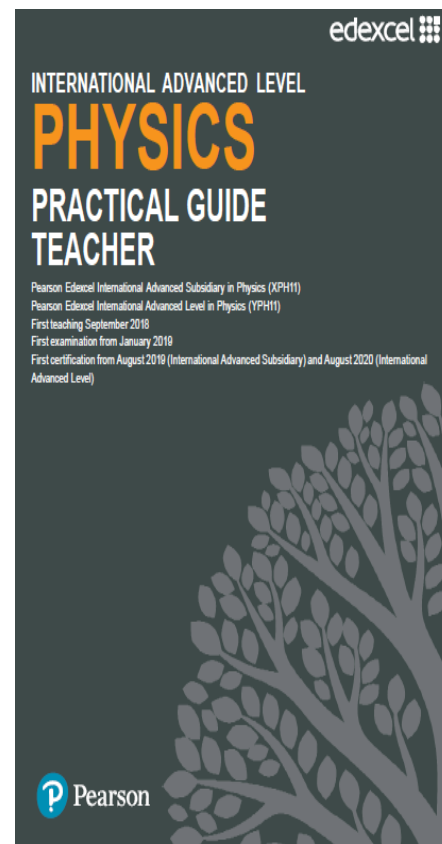
Experiments should cover a range of different topic areas and require the use of a variety of practical techniques.



How do the core practicals cover practical skills?

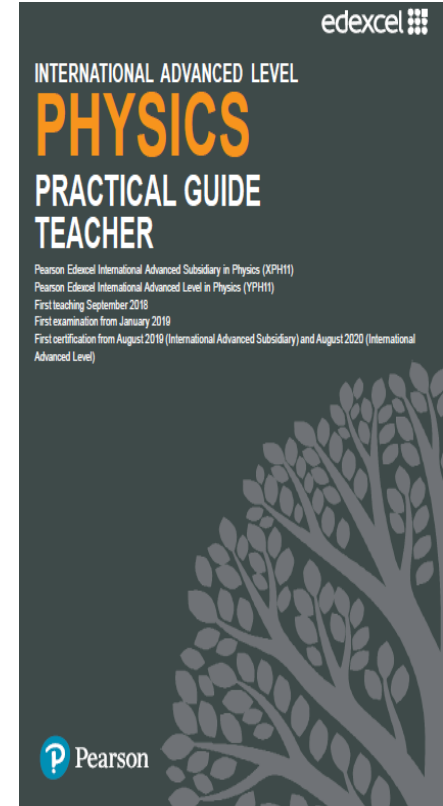
As long as you follow the programme of core practicals, you will automatically cover all of the standard techniques and apparatus the students are expected to know and reproduce in their examinations.

However, students who do well in Units 3 and 6 are often those that have carried out a range of practicals so you should aim to complete **more** than just the core practicals.



How do the core practicals cover practical skills?

- The core practicals are part of the specification and the students are expected to know them for the examinations.
- Students can use different methods and techniques to those stated – but they will still need to know and understand the methods stated in the core practicals.
- We'd recommend that you did other practical work as well as the practicals specified.
- These need not include expensive pieces of apparatus. Any practical work that your students attempt – not just the core practicals – will develop their practical competency.



Teaching practical skills



What our examiners have noticed:

Units 1 and 2

- Many candidates showed a good progression from GCSE to A Level, with prior knowledge extended and new concepts taught and understood well.
- Candidates found the length of some of the calculations to be challenging, often missing out key steps therefore only scoring 1 or 2 marks for interim steps.
- The new regions of the specification were answered as expected, if not better.



What our examiners have noticed:

Units 1 and 2

- It was the problem-solving nature of some of the questions as well as the requirement for explanations in an unstructured setting that many found to be challenging.
- The main challenges were on questions requiring more application.
- Candidates who had a sound understanding of the physics involved did not always demonstrate this in their responses due to a lack of precision of the language and terminology used. Some missed exactly what the question was actually asking.
- While the mathematical ability seen was strong, application to the context was not as expected.



What our examiners have noticed: Unit 3

- For this paper, the topics included **materials, waves and particle nature of light**. As *understanding* of the core practicals is assessed by the Unit 1 and 2 papers, the practical context met in the Unit 3 paper may be less familiar. However, it is the skills rather than the details of the practical that we are assessing.
- There were many questions that would be familiar for candidates but there are some questions where performances would suggest they were unfamiliar with the practical skills.
- Understanding of key words (such as **resolution**) and command words (such as **describe how**) proved a challenge to candidates at the lower end of the ability range.
- At all ability levels, there were some questions where candidates answered in generic terms, rather than being specific to the particular practical described in the question.



Share with a neighbour...

**What are the implications for
teaching and learning
arising from the feedback
from the Examiners'
Reports?**



Guidance and support

- A range of support resources and materials are available on the Pearson website (a screenshot of this is on the next slide and we will be exploring the various elements of support available there in more detail later on).
- The support includes exam materials and teaching and learning support, as well as a range of analysis and planning tools.



<https://qualifications.pearson.com/en/qualifications/edexcel-international-advanced-levels/physics-2018.html>

International Advanced Levels Physics (2018)



Specification

[Course materials](#)

[Published resources](#)

[News](#)

Specification



DOWNLOAD

First teaching: **September 2018**

First external assessment: **2019**

Our International Advanced Subsidiary and Advanced Level Physics has been developed to be engaging for international learners and to give them the necessary skills to support progression to higher education or further study in physics, as well as to a wide range of other subjects.

Register your interest

Find out more about Pearson Edexcel International qualifications and sign up to receive the latest news.

[▶ Let us know](#)

Course materials

- ▶ [Specification and sample assessments \(2\)](#)
- ▶ [Exam materials \(19\)](#)
- ▶ [Teaching and learning materials \(16\)](#)

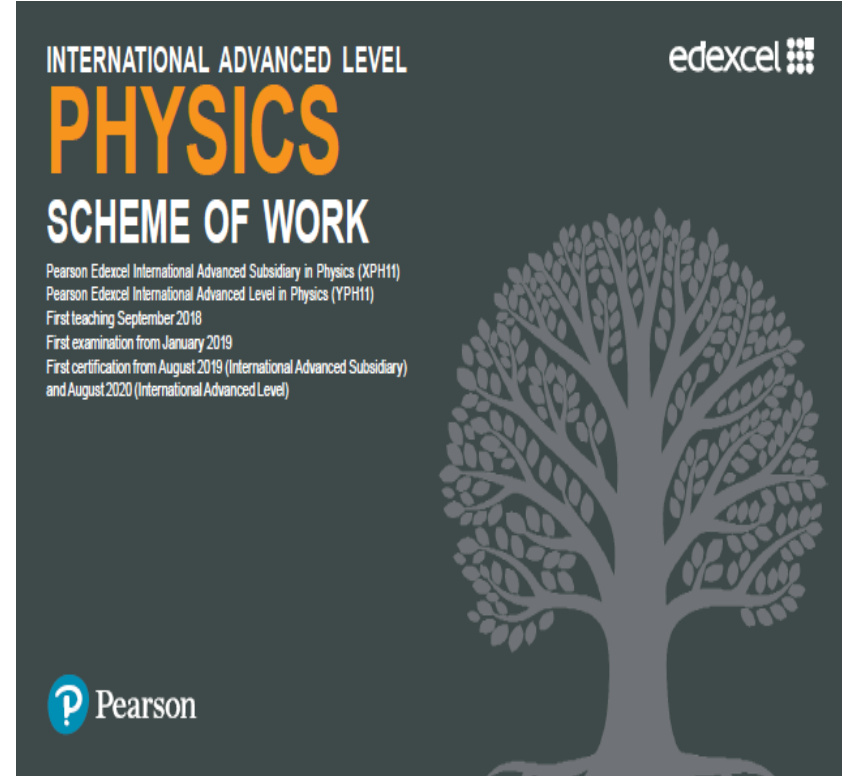
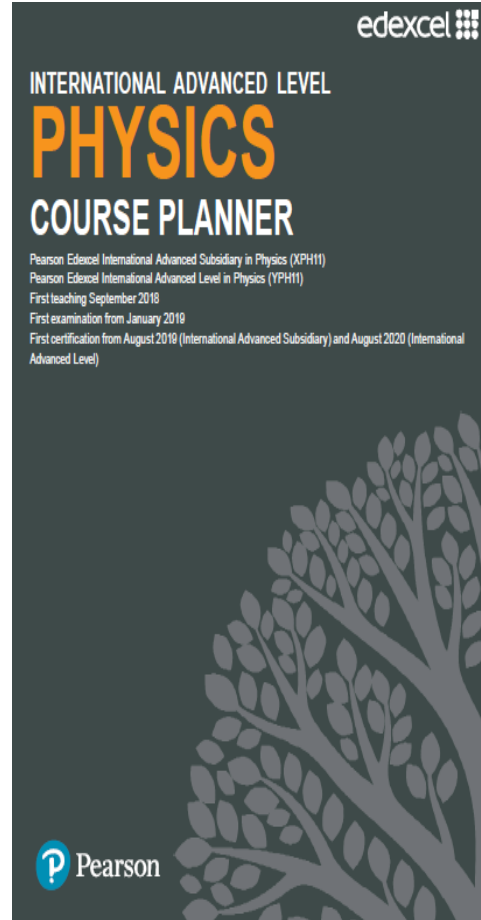
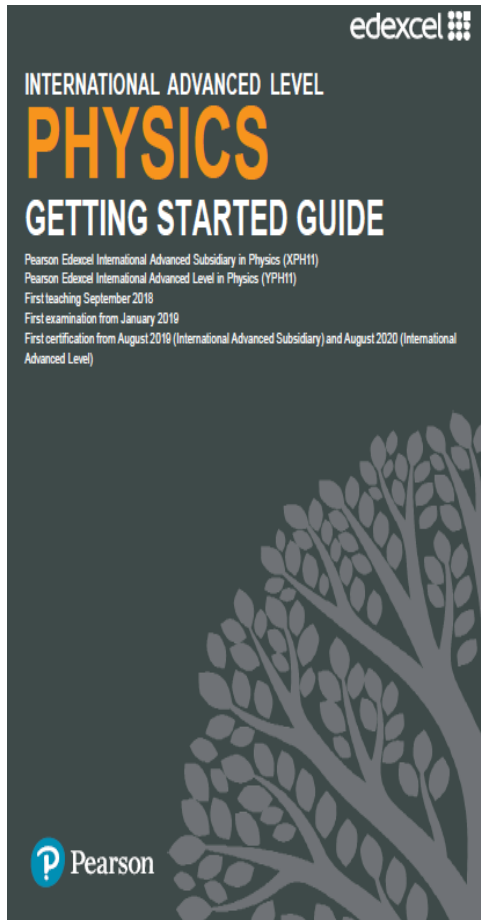


How do I make sure I cover all the content?

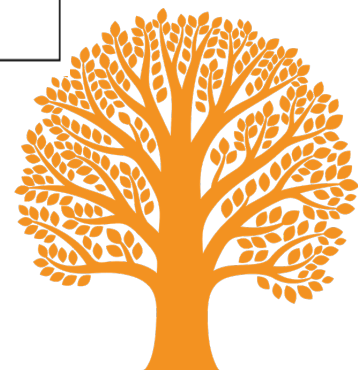
- Specification
- Lesson plans
- Schemes of work
- Year planners



How do I make sure I cover all the content?



Week	Prior Learning	Content of Lessons	Teaching Suggestions	Spec Reference
1	International GCSE/GCSE mechanics – describing motion	SI base and derived units. Measurement & techniques. Sig. figs., scientific notation, standard form and prefixes. Distance, displacement, speed, velocity and acceleration.	The work on SI base and derived units, Sig. figs., standard form and prefixes is required for all topics and needs to be revisited regularly.	
2	describing motion graphically	Displacement/time and velocity/time graphs and their interpretation, for motion with uniform and non-uniform acceleration.	Displacement/time graph for a trolley on a runway with a motion sensor. Mathematical requirement: graph plotting and measuring gradients	2, 3
3	International GCSE/GCSE mechanics – equations for speed and acceleration	Derive equations of motion: $s = \frac{(u + v)t}{2}$ $v = u + at$ $s = ut + \frac{1}{2}at^2$ $v^2 = u^2 + 2as$ Practise problems in one dimension. Measurement of the acceleration of free fall. CORE PRACTICAL 1: Determine the acceleration of a freely falling object.	Examples to include positive and negative values of the variables. Mathematical requirement: manipulate of equations. Investigate the motion of a bouncing ball. All students should carry out this experiment.	1, 11



Activity

How do you plan your lessons in physics? Do you, for example, have a common lesson structure as a starting point? Are there any ways you might need to adapt your method(s) of lesson planning to deliver this specification?



Mid-session break



Session 2

Assessment



What are the Assessment Objectives?

Assessment objectives and weightings

		% in IAS	% in IA2	% in IAL
A01	Demonstrate knowledge and understanding of science.	34–36	29–31	32–34
A02	(a) Application of knowledge and understanding of science in familiar and unfamiliar contexts.	34–36	33–36	34–36
	(b) Analysis and evaluation of scientific information to make judgements and reach conclusions.	9–11	14–16	11–14
A03	Experimental skills in science, including analysis and evaluation of data and methods.	20	20	20



Relationship of assessment objectives to units for the International Advanced Subsidiary qualification

Unit number	Assessment objective (%)			
	A01	A02(a)	A02(b)	A03
Unit 1	17-18	17-18	4.5-5.5	0.0
Unit 2	17-18	17-18	4.5-5.5	0.0
Unit 3	0.0	0.0	0.0	20
Total for International Advanced Subsidiary	34-36	34-36	9-11	20

Relationship of assessment objectives to units for the International Advanced Level qualification

Unit number	Assessment objective (%)			
	A01	A02(a)	A02(b)	A03
Unit 1	8.5-9.0	8.5-9.0	2.25-2.75	0
Unit 2	8.5-9.0	8.5-9.0	2.25-2.75	0
Unit 3	0	0	0	10
Unit 4	7.3-7.8	8.4-8.9	3.6-4.0	0
Unit 5	7.3-7.8	8.4-8.9	3.6-4.0	0
Unit 6	0	0	0	10
Total for International Advanced Level	32-34	34-36	11-14	20



What types of question are asked?

Papers on the content units (1, 2, 4 and 5) will include a mixture of different question styles, including:

- multiple-choice questions
- short open questions
- calculations
- open-response questions
- extended writing questions.

Papers on the practical skills Units 3 and 6 have all of these question styles *except* multiple choice.



Multiple-choice questions

A car is travelling at a velocity v . The driver applies the brakes and the car decelerates until it comes to rest. The work done by the brakes on the car is W .

Which of the following expressions is correct?

☐ A $W \propto v$

☐ B $W \propto v^2$

☐ C $W \propto \frac{1}{v}$

☐ D $W \propto \frac{1}{v^2}$



Short open questions

A light dependent resistor (LDR) has a resistance of $6100\ \Omega$ when illuminated with indoor lighting.

- (a) Explain how the resistance of an LDR changes with illumination. Your answer should include reference to conduction electrons.

(2)



Calculation questions

Zinc has a work function of 4.3 eV . Calculate the maximum wavelength of light that will produce the photoelectric effect with zinc.

(3)

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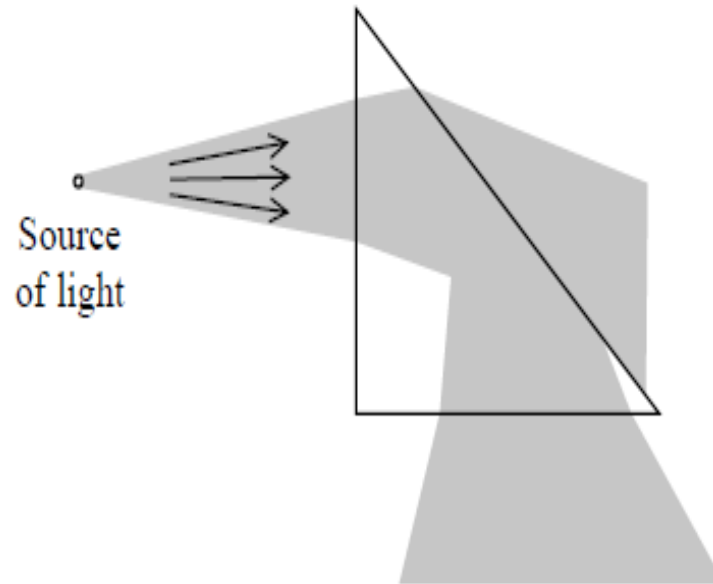
.....

Maximum wavelength =



Open response questions

The diagram shows the path of a beam of light travelling from a light source in air through a 45° glass prism. The path taken by the beam of light is shaded. The critical angle for glass is 41° .



Explain the path of the beam of light.

(4)



Extended writing questions

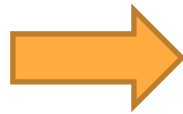
A spectrum can be produced by light from the Sun.



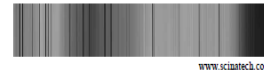
www.scinatech.com

Discuss why black lines appear on this spectrum.

A screenshot of the full page with this question at the top shows that a fair amount of space – a whole side of A4 – is provided for a candidate to respond to this 6-mark question.



A spectrum can be produced by light from the Sun.



Discuss why black lines appear on this spectrum

(6)

0



What are mark schemes and examiner reports?



Mark Scheme (Results)

October 2019

Pearson Edexcel International Advanced Level
In Physics (WPH12) Paper 01
Waves and Electricity



Examiners' Report

June 2019

IAL Physics WPH12 01



What are mark schemes?

- These are the 'answers' to the questions.
- They often give a number of alternative answers students might give.
- They can show indicative content to guide the markers.
- They also advise marker of common errors and what to credit and not credit.
- Examiners are encouraged to use the mark scheme positively and to look to reward marks for what is there rather than penalise students for what isn't.



What is in the mark schemes?

Question Number	Answer	Mark
13a	<p>Use of $V=W/Q$ (1) $W = 7.92 \times 10^5 \text{ J}$ (1)</p> <p><u>Example of calculation</u> $W = V \times Q = 22 \times 36,000 = 792,000 \text{ J}$</p>	(2)
13bi	<p>Use of speed = distance/time (1) Time = 0.45 s (1) (Accept 7.5×10^{-3} minutes or 1.25×10^{-4} hours)</p> <p><u>Example of calculation</u> $16 \text{ km hr}^{-1} = 16,000 \text{ m} / 3,600 \text{ s} = 4.4 \text{ m s}^{-1}$ Time = distance / speed = $2.0 \text{ m} / 4.4 \text{ m s}^{-1} = 0.45 \text{ seconds}$.</p>	(2)
13bii	<p>Use of $I = Q / t$ (1) Calculates total charge used in 2.00 m (1) Number of electrons = 4.2×10^{19} (1) (e.c.f. from (i))</p> <p>OR</p> <p>Use of speed = distance / time (1) Calculates total charge used in 2.00m (1) Number of electrons = 4.2×10^{19} (1) (no e.c.f. required from (i) for this method)</p> <p><u>Example of calculation</u> $I = Q / t = 36,000 \text{ C} / (40 \times 60) \text{ s} = 15 \text{ A}$ Total charge used in 2.00m = $I \times t = 15 \text{ A} \times 0.45 \text{ s} = 6.75 \text{ C}$ number of electrons = $6.75 \text{ C} / 1.6 \times 10^{-19} \text{ C} = 4.2 \times 10^{19}$</p>	(3)
Total for question 13		7



What is in the mark schemes?

Question Number	Answer	Mark												
*14a	<p>This question assesses a student's ability to show a coherent and logically structured answer with linkages and fully-sustained reasoning.</p> <p>Marks are awarded for indicative content and for how the answer is structured and shows lines of reasoning.</p> <p>The following table shows how the marks should be awarded for indicative content.</p> <table><tr><th>Number of indicative marking points seen in answer</th><th>Number of marks awarded for indicative marking points</th></tr><tr><td>6</td><td>4</td></tr><tr><td>5-4</td><td>3</td></tr><tr><td>3-2</td><td>2</td></tr><tr><td>1</td><td>1</td></tr><tr><td>0</td><td>0</td></tr></table>	Number of indicative marking points seen in answer	Number of marks awarded for indicative marking points	6	4	5-4	3	3-2	2	1	1	0	0	
Number of indicative marking points seen in answer	Number of marks awarded for indicative marking points													
6	4													
5-4	3													
3-2	2													
1	1													
0	0													

The following table shows how the marks should be awarded for structure and lines of reasoning.

	Number of marks awarded for structure of answer and sustained line of reasoning
Answer shows a coherent and logical structure with linkages and fully sustained lines of reasoning demonstrated throughout	2
Answer is partially structured with some linkages and lines of reasoning	1
Answer has no linkages between points and is unstructured	0

Indicative content

- When temperature is higher, greater energy to electrons (in thermistor)
- When temperature is higher, more conduction/free electrons
- When temperature is higher, lower resistance in thermistor
- Decreased p.d. across thermistor / YZ
Or current in circuit/thermistor increases
- Increased p.d. across fixed resistor Or increased p.d. across XY
- So for the air conditioning application, secondary circuit should be across XY

(Allow converse statements for IC 1,2, 3 and 4)

(Do not allow contradicting statements for IC4 e.g. lower V so lower I)

(6)



General marking guidance

- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.



Discuss

Which Assessment Objectives are being assessed in this part of an exam question?

A student carried out an experiment to determine the resistivity of a metal in the form of a wire. She made the following measurements:

length of wire = 0.20 m

resistance of wire = 50 mΩ

diameter of wire = 0.36 mm

Determine the metal of the wire using information from the table below.

Metal	Resistivity / Ωm
aluminium	2.7×10^{-8}
tungsten	5.6×10^{-8}
iron	1.0×10^{-7}

Assessment objectives and weightings

A01	Demonstrate knowledge and understanding of science.
A02	(a) Application of knowledge and understanding of science in familiar and unfamiliar contexts. (b) Analysis and evaluation of scientific information to make judgements and reach conclusions.
A03	Experimental skills in science, including analysis and evaluation of data and methods.



Discuss

- How can we encourage students to develop confidence in tackling questions (such as this one) where the context is different from that in which the concept was initially learned?

The photograph shows a machine used for surveying the seabed. A communications cable connects the machine to a ship on the surface.

communications cable



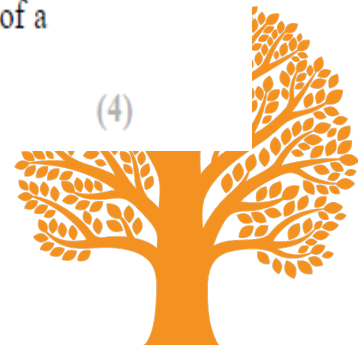
Source from: http://www2.dupont.com/Personal_Protection/en_GB/assets/PDF/OandG/Nexans%20Case%20Study.pdf

The material used in the outer casing of the communications cable must withstand the large pressures at the seabed, yet be light enough to lift out of the water.

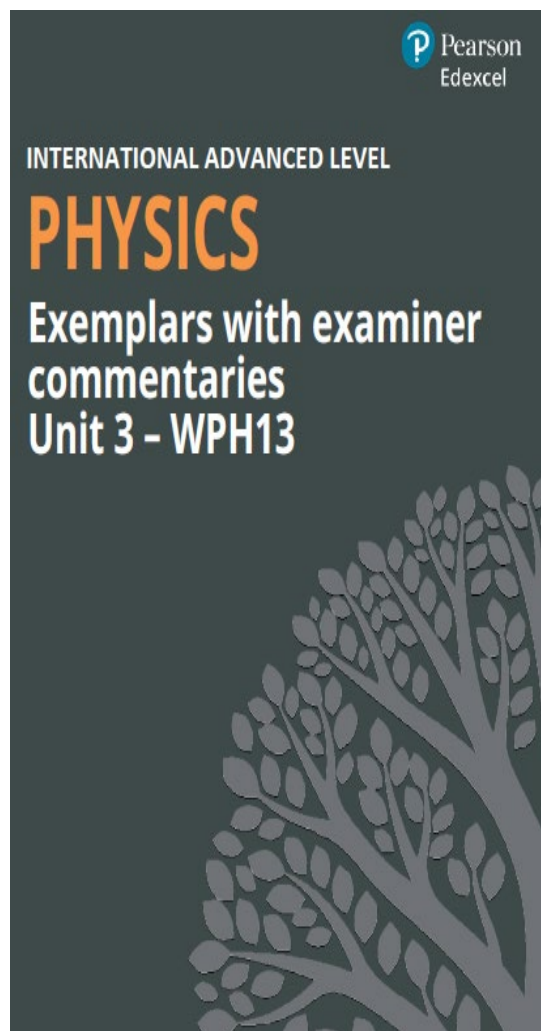
density of Kevlar = 1400 kg m^{-3}

density of steel = 7800 kg m^{-3}

- Deduce whether steel or Kevlar is more suitable to use in the outer casing of a communications cable at the seabed.



Exemplars



Exemplar response A

(a) Describe what the student should do to obtain the data to plot the force-extension graph. (4)

Measure the mass of the load using an electronic balance and repeat for same mass. Multiply with gravitational acceleration to get F . Use a meter-rule and set square to place the meter rule parallel to the spring and measure the initial length. Hang loads of varying masses and measure the final length of the spring for each mass. Subtract initial length to find extension for each of value of F . Plot the graph. Repeat measurements of each mass and its corresponding extension.

Examiner's comments:

This response was given 4 marks.

The first marking point is clear in the first 3 lines of this response.

There is a clear reference to the calculation of extension by subtracting the initial length from the final length in the 7th and 8th lines, so achieving the second marking point.

Although the response does not refer to parallax, it does make a credit worthy attempt at the third marking point, using the set square and ensuring the ruler is parallel to the spring.


Note – this mark was awarded rarely, as many candidates did not include ideas of accuracy when giving an account of what should be done to obtain the data.

The final marking point is awarded for responses that explain how the multiple pairs of force/mass and extension needed to plot a graph are achieved. Here, "hang loads of varying masses" is enough for the final marking point.



Exemplar activity

- Here is an example, from an IAS 'Exemplars' document, of a part-question requiring a force diagram and the related mark scheme below.

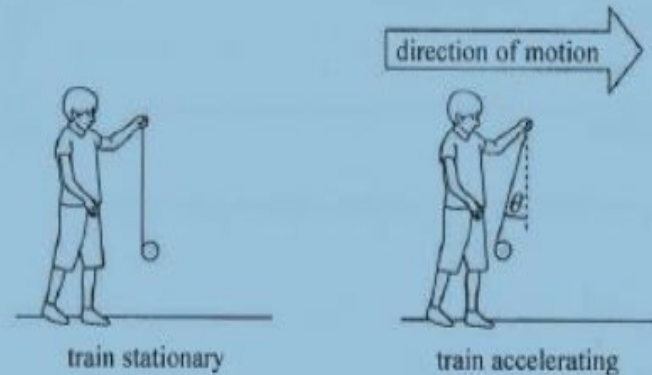
Answer	Mark
<ul style="list-style-type: none"> Weight/W/mg labelled Tension/T 	2
	

A yo-yo is a toy that consists of two connected discs on a piece of string.

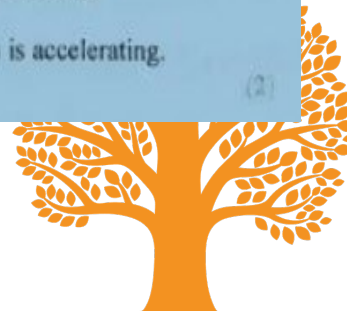


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A child stands in a stationary train holding a yo-yo. The train accelerates and the string moves into the position shown, at an angle θ to the vertical.




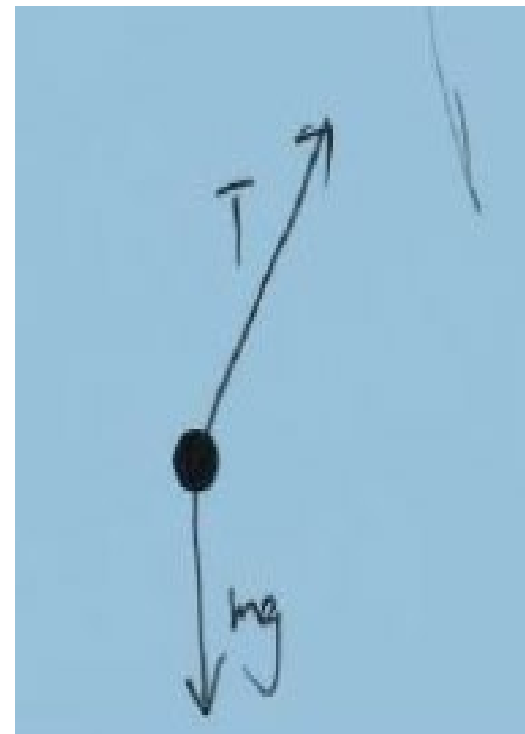
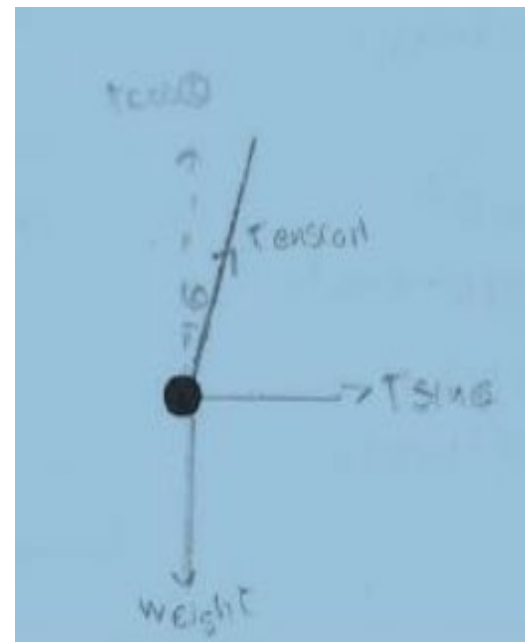
(a) Draw the free-body force diagram for the yo-yo when the train is accelerating.



Exemplars

What mark would you give?

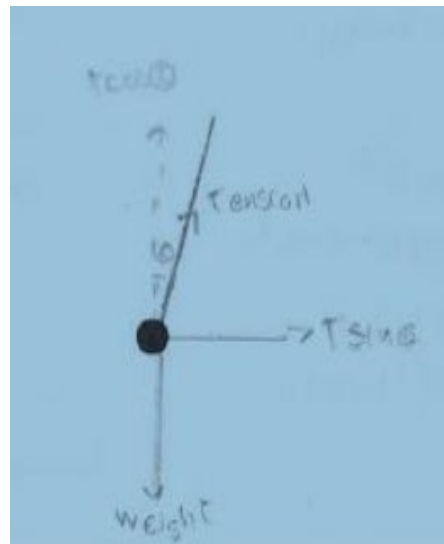
Answer	Mark
<ul style="list-style-type: none"> Weight/W/mg labelled (1) Tension/T (1) 	2
	



Exemplars – the examiner’s decision

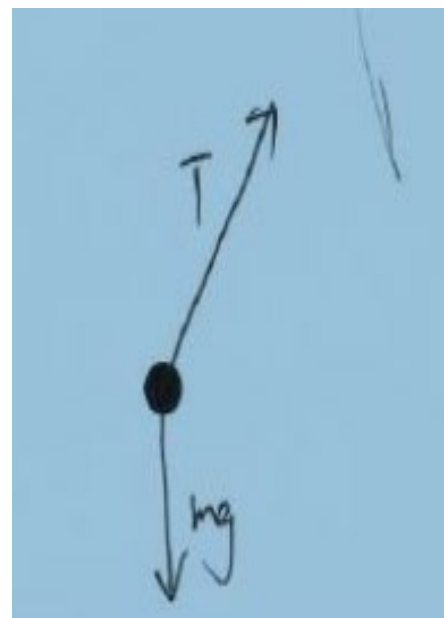
Exemplar A: 1 mark

- This candidate has drawn both of the forces expected to score the 2 marks, but has added in the components of tension in both the horizontal and vertical planes. This might have been acceptable if both of the components of T drawn had been dotted lines. In this case the $T\sin\theta$ is drawn as a solid line, so this candidate scores just 1 mark.



Exemplar B: 2 marks

- Ideally, lines of force would be drawn using a ruler. However, this candidate has scored both marks even though the lines are not completely straight. This is because it is completely clear which directions the weight and tension are acting. There are no additional forces drawn so all is correct.



<https://qualifications.pearson.com/en/qualifications/edexcel/i-international-advanced-levels/physics-2018.html>

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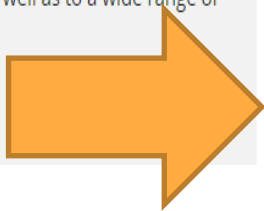


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Lunch break



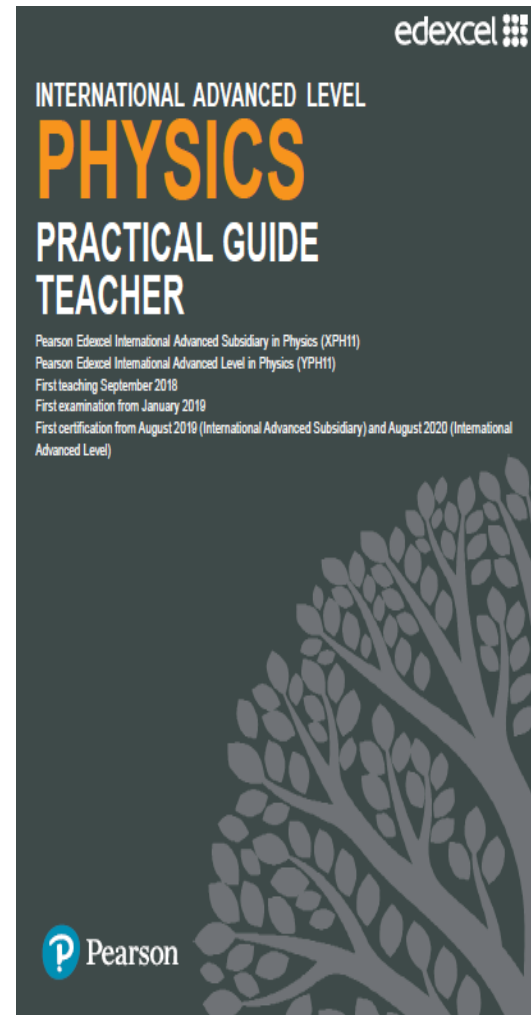
Session 2 continued

Assessment of practical work and exam techniques



Assessment of practical work

- As mentioned earlier, all of the assessment of practical work is in the final written exams on Units 3 and 6 (about 20% of the total marks) – there is no practical exam, nor ‘assessed practicals’ in this course.
- This increases the need (over what may have happened in some older specifications) for learning during practical lessons to be planned carefully so that students develop the skills necessary to tackle those exam questions.
- The Practical Guide (Teacher) is an invaluable tool to aid this area of learning.



Practical Guide – Teachers

The Practical Guide for teachers includes:

- practical assessment – the whole picture
- assessment of practical skills
- using core practicals to teach skills
- mapping core practicals for mathematics skills development
- teaching approaches to core practicals
- answers to Student Guide Questions
- answers to Core Practical Questions.



Practical Guide – Teachers

Student records

Possible formats for students to keep records of their practical work include:

- a lab book. This has some advantages, mostly in being a ‘working document’ where students can write notes on procedures, as well as take down data, sketch rough graphs and so on
- a folder of practical work, having the advantage of being able to store worksheets and other stimulus material alongside the practical notes
- integrating practical notes into students’ main folder.

Whichever format you decide works best, it is important that the method of collecting and recording the practical work that students do meets the following requirements:

- be a useful revision aid for students at the end of their course
- allow students to record evidence in a variety of formats, such as diagrams/drawings, tables, graphs and so on. This would also include space for any data analysis or evaluation.



5. Investigate the effects of length, tension and mass per unit length on the frequency of a vibrating string or wire

This experiment has 3 variables to test and so is another that makes a very good investigation and the sheets in the guide take this approach. The students might write a plan out of class and come to the lesson ready to carry it out so clearly the theory will have to be done thoroughly first. Because it is more open ended than some of these practicals students will need to keep a complete record of all that they do from the plan onwards.

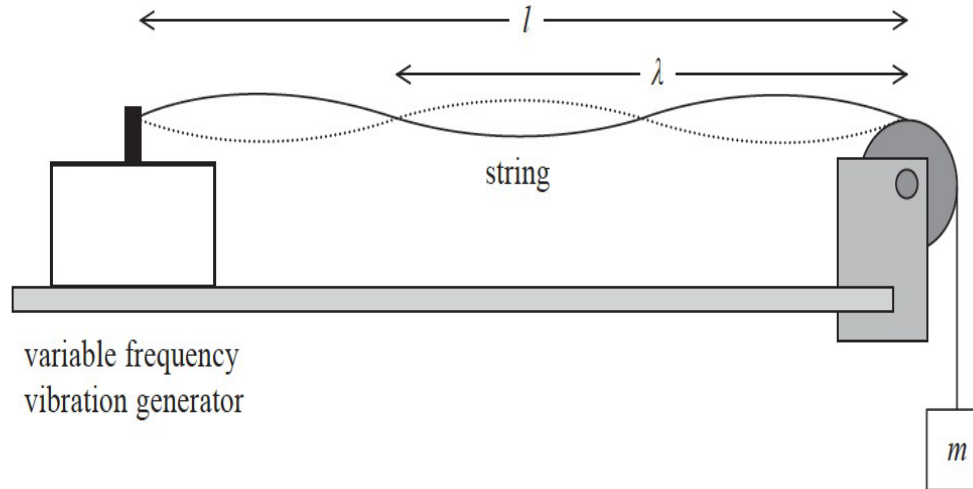
It is unlikely that centres will have enough vibration transducers for a class set so if all students are to do this at the same time a vertical alternative is possible. A wire is hung vertically with slotted masses at the bottom, an alternating current is passed down the wire, leads attached with crocodile clips, and a magnetic field is placed at the centre – either a horseshoe magnet or pole faced magnets on a yoke. This removes frequency as a variable since it is 50 Hz, unless frequency generators are available. This makes a good alternative and students can still make measurements of standing waves by varying the mass on the wire. There will be no variable to control but students could still plan for frequency as a variable.

Safety should feature in all reports but this one has it as a feature since there are wires under tension and hanging masses. The data can be processed using ICT as there is a non-linear relation in the variables.



Example question on practical skills

A student carried out an experiment to determine the mass per unit length μ of a string, using a standing wave. The standing wave produced is shown in the diagram.



The student recorded the following data.

Length of string l	1.25 m
Frequency f	105 Hz
Mass m	0.25 kg

(a) Calculate μ given the equation below.

$$\sqrt{\frac{mg}{\mu}} = f\lambda$$



Example question on practical skills

– mark scheme for part (a):

Question Number	Answer	Mark
4(a)	<ul style="list-style-type: none"> • Use of $\sqrt{\frac{mg}{\mu}} = f\lambda$ • Use of $l = 1.5 \times \lambda$ • $\mu = 3.2 \times 10^{-4} \text{ kg m}^{-1}$ <p><u>Example of calculation</u></p> $1.5 \times \lambda = 1.25 \text{ m}$ $\lambda = 0.833 \text{ m}$ $\mu = (0.25 \text{ kg} \times 9.81 \text{ m s}^{-2}) / (105^2 \text{ Hz}^2 \times 0.833^2 \text{ m}^2)$ $\mu = 3.21 \times 10^{-4} \text{ kg m}^{-1}$	<p>(1)</p> <p>(1)</p> <p>(1)</p> <p>3</p>



Example question on practical skills (continued)

(b) (i) Identify two significant sources of uncertainty in the student's measurements.

(2)

(ii) For each of these sources of uncertainty, describe an experimental technique the student could have used to obtain an accurate measurement.

(4)

... and the accompanying mark scheme for part b(i):

4(b)(i)	Mark 4(b)(i) and (b)(ii) holistically	
	Max 2 from	
	<i>Frequency</i>	
	• Uncertainty in identifying when nodes form	(1)
	• Uncertainty in identifying maximum amplitude	(1)
	<i>Length</i>	
	• Parallax error when measuring length	(1)
	• Uncertainty in measuring length to top of pulley	
	Or uncertainty in measuring length as string is not straight	(1)
	<i>Mass</i>	
	• Zero error on mass balance	(1)
		2



...and for part b(ii):

4(b)(ii)	Max 4 (from only 2 pairs)	
	For each source from (b)(i)	
	Description of experimental technique	(1)
	Additional detail	(1)
	<u>Examples</u>	
	<u>Frequency</u>	
	<ul style="list-style-type: none"> Repeat and calculate the mean frequency 	(1)
	<ul style="list-style-type: none"> Vary frequency from above and below resonance to find two values for the frequency when the standing wave forms 	(1)
	<u>Length</u>	
	<ul style="list-style-type: none"> Use a set square to reduce parallax error in length 	
	Or hold ruler in contact with the wire to reduce parallax error in length	
	Or ensure ruler and string are at eye-level	(1)
	<ul style="list-style-type: none"> Switch off vibrator 	(1)
	Or ensure string is straight	(1)
	<u>Mass</u>	
	<ul style="list-style-type: none"> Zero balance before each measurement 	(1)
	<ul style="list-style-type: none"> To remove systematic error 	(1)
	Or idea that this error is not reduced by repeating	(1)

4



Activity

In the light of those sections of the specification which describe what students will be assessed on in the practical units (and the example question we have just looked at) what are the implications for teaching and learning when students are engaged in experiments and investigations?



Exam technique



The exam paper

Instructions

- Use **black** ink or **black** ball-point pen.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- **Show all your working in calculations and include units where appropriate.**

Information

- The total mark for this paper is 80.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- In questions marked with an **asterisk** (*), marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.
- The list of data, formulae and relationships is printed at the end of this booklet.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.



Exam technique

Preparation

- Effective exam techniques need to be practised by students using past papers or part-papers; perhaps 'home-made' papers using Exam Wizard tailored to suit the exercise or focused on the particular technique being practised.
- Give students such a paper to practise how to access it.
- Give students mark schemes so they can learn what is expected.
- Having a 'go to' strategy, a starting point, builds confidence and reduces the stress of 'what do I do first'.



Exam strategy – one way to tackle a paper

- Look through the whole paper first, underlining (or, better, highlighting) the command words in each question.
- Decide which question to do first – start with the question(s) you feel most confident with, which is not necessarily question 1.
- Read question carefully – don't repeat stem in your answer.
- Don't give up on a whole question if you find one section of the question difficult – move on to the next part.
- The same strategy holds for whole questions you find difficult – move on.
- Come back to missed questions and parts of questions when you have picked off all the 'low-hanging fruit'.

Activity question

What strategies do you share with your students that you find effective?



Walking talking mocks

- Students sit in the same exam room where they will do their exam, preferably in the same seats (it can be done in the classroom, but not always as effective in building confidence in exam conditions).
- Students are given an exam paper which is as close to being like the real thing as possible (i.e. exam writing booklet if relevant).
- Students are literally walked through every question on the paper – the person leading the session talks them through the smallest steps, such as underlining key words, how to plan, things to remember, etc.
- You might focus on a particular area – such as mathematical questions, or questions based on devising a practical investigation.
- Students then write their responses in timed conditions.

Discussion

Have you had any successful experience of using walking talking mocks?



Session 3

Support from Pearson



Online teaching and learning support and assessment support

You can type all of this link into your browser:

<https://qualifications.pearson.com/en/qualifications/edexcel-international-advanced-levels/physics-2018.html>

or (easier!) type:

Pearson International Advance Level into a search engine (e.g. Google) and then choose '**Physics**' (all subjects arranged alphabetically).



<https://qualifications.pearson.com/en/qualifications/edexcel/International-advanced-levels/physics-2018.html>



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International A Level Physics Specification

| PDF 1.8 MB | 22 Jan 2018

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International A Level Physics Sample Assessment Materials

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Exemplar material

- AS Exemplars with commentaries
- International A Level Unit 3 Exemplars

Guide

- Getting Started Guide
- Mapping Guide
- Mapping of content between new 2018 and legacy 2013 specifications
- Student Practical Guide
- Teacher Mathematics Support
- Teacher Practical Guide
- Your subject guide to International A Level Science (Biology, Chemistry and Physics)

Past training content

Scheme of work

Skills for learning and work

Skills mapping for Physics

Transferrable skills subject definitions for Physics

Student guide

Student mathematics support





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on paper

2.
Exam papers
scanned

3.
Examiners
mark papers
online

4.
Performance
reports
shared



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- Whole centre
- Department
- Class
- Student

Detailed Analysis

- Performance on each question
- Comparison to Edexcel data

Skills Maps

- Curriculum mapped
- Contextualised performance

Comparison

- by subject
- by class
- by specification
- by centre
- by year

Mock Analysis

- Provides insight
- Develops student learning


Exam Documents


- Exam per
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ResultsPlus



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Review of moderation for internally assessed/externally moderated controlled assessment and coursework components (Service 3)



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Evaluation and next steps



Next steps

**Think of THREE things
you might try or do
differently as a result of
ideas you've discussed
today.**

**(You won't be asked to
share these.)**

**Share with your
neighbour ONE thing
you would like to do as
soon as you return to
your classroom or
department.**



Evaluation

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