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INTERNATIONAL ADVANCED LEVEL

PHYSICS

GETTING STARTED GUIDE

Pearson Edexcel International Advanced Subsidiary in Physics (XPH11)
Pearson Edexcel International Advanced Level in Physics (YPH11)
First teaching September 2018
First examination from January 2019
First certification from August 2019 (International Advanced Subsidiary) and August 2020 (International Advanced Level)

Pearson

Contents

Introduction

This Getting Started Guide provides an overview of the new Pearson Edexcel International A level in Physics (2018), to provide information about the content and assessment, and to give you a better understanding of what these mean for you and your students.

Support for delivering the new specification

Our package of support to help you plan and implement the new specification includes:

Planning – In addition to this Guide, we will provide a course planner and an editable scheme of work that you can adapt to suit your department.

Teaching and learning – To support you in delivering the new specification, we will provide Guides for Practical Skills and for Mathematical Skills, for you and for your students. In addition, we will provide Topic Guides, giving further background information to support your teaching of key areas of the new specification.

Understanding the standard – A full set of sample assessment materials is provided.

Tracking learner progress – **ResultsPlus** provides the most detailed analysis available of your students' exam performance. It can help you identify topics and skills where students could benefit from further learning.

We will also offer **examWizard**, which is a free exam preparation tool containing a bank of past Edexcel exam questions, mark schemes and examiner reports for a range of International GCSE and International A level subjects.

Support – Our **Subject Advisor service** will ensure you receive help and guidance from us as well as enabling you to share ideas and information with each other. You can sign up to receive e-newsletters to keep up to date with qualification updates, and product and service news.
You can email our Subject Advisor at: TeachingScience@pearson.com

Key features of the qualification

- The specification content has been designed to be similar to that of the existing International A level. However, some changes have been made to the content. These changes are mostly influenced by changes made in the new GCE A level (2015) specifications.

- The assessment model has six question papers (Units) in total: Units 1 – 3 make up the International AS level and Units 4 – 6 make up the International A2 level. Students who complete all six Units are eligible for the full International A level award.

- The specification is modular. Students can sit Units in any of the examination series in which they are offered and cash-in for the qualification when they have completed the required number of Units. Each Unit is designed to cover a particular area of specification content, although some Units may also draw on knowledge from other areas of the specification.

- All Units will have a range of question styles, including calculations for which calculators may be used.

- Practical skills will be assessed in two Units: Unit 3 at IAS and Unit 6 at IAL. There is no coursework or practical exam.

- Students will develop analytical and logical thinking skills by applying understanding of scientific concepts and principles to a range of situations. Some examination questions will be more problem solving in style – and may also address the need for mathematical skills to complement students' knowledge.

- We have designed our International A level qualification to be of equivalent standard to the GCE A level (2015) in Physics. This ensures that International A levels are recognised globally and provide students with the same progression routes.

- The specification content also gives you the opportunity to consider key transferrable skills whilst teaching the subject. These skills are key for students to progress to Higher Education or the workplace.

Qualification overview

This section provides an overview of the course to help you see what you will need to teach. The overview gives a general summary of each of the Unit examinations.

Unit 1: Mechanics and Materials	**Unit code: WPH11/01**
• Externally assessed • 1 hour 30 minutes, 80 marks • Availability: January, June & October • First assessment: January 2019	40% of the total IAS 20% of the total IAL
Content summary • Mechanics • Materials	
Assessment • This paper has two sections: o Section A: multiple choice questions o Section B: mixture of short-open, open-response, calculations and extended-response questions. • This paper will include a minimum of 32 marks that target mathematics at Level 2 or above (see *Appendix 6: Mathematical skills and exemplifications*). • Students will be expected to apply their knowledge and understanding to familiar and unfamiliar contexts.	

Unit 2: Waves and Electricity	Unit code: WPH12/01
• Externally assessed • 1 hour 30 minutes, 80 marks • Availability: January, June & October • First assessment: June 2019	40% of the total IAS 20% of the total IAL
Content summary • Waves and the Particle Nature of Light • Electricity	
Assessment • This paper has two sections: o Section A: multiple choice questions o Section B: mixture of short-open, open-response, calculations and extended response questions. • This paper will include a minimum of 32 marks that target mathematics at Level 2 or above (see *Appendix 6: Mathematical skills and exemplifications*). • Students will be expected to apply their knowledge and understanding to familiar and unfamiliar contexts.	

Unit 3: Practical Skills in Physics I	Unit code: WPH13/01
• Externally assessed • 1 hour 20 minutes, 50 marks • Availability: January, June & October • First assessment: June 2019	20% of the total IAS 10% of the total IAL
Content summary This unit will assess students' knowledge and understanding of experimental procedures and techniques that were developed in Units 1 and 2.	
Assessment • This paper may include short-open, open-response, calculations and extended-writing questions. • This paper will include a minimum of 20 marks that target mathematics at Level 2 or above (see *Appendix 6: Mathematical skills and exemplifications*). • Students will be expected to apply their knowledge and understanding of practical skills to familiar and unfamiliar situations.	

Unit 4: Further Mechanics, Fields and Particles	Unit code: WPH14/01
• Externally assessed • 1 hour 45 minutes, 90 marks • Availability: January, June & October • First assessment: January 2020	40% of the total IA2 20% of the total IAL
Content summary • Further Mechanics • Electric and Magnetic Fields • Nuclear and Particle Physics	
Assessment • This paper has two sections: o Section A: multiple choice questions o Section B: mixture of short-open, open-response, calculations and extended response questions. • This paper will include a minimum of 36 marks that target mathematics at Level 2 or above (see *Appendix 6: Mathematical skills and exemplifications*). • Students will be expected to apply their knowledge and understanding to familiar and unfamiliar contexts. • This paper may contain some synoptic questions which require knowledge and understanding from Unit 1 and 2.	

Unit 5: Thermodynamics, Radiation, Oscillations and Cosmology	Unit code: WPH15/01
• Externally assessed • 1 hour 45 minutes, 90 marks • Availability: January, June & October • First assessment: June 2020	40% of the total IA2 20% of the total IAL
Content summary • Thermodynamics • Nuclear Decay • Oscillations • Astrophysics and Cosmology	
Assessment • This paper has two sections: o Section A: multiple choice questions o Section B: mixture of short-open, open-response, calculations and extended response questions. • This paper will include a minimum of 36 marks that target mathematics at Level 2 or above (see *Appendix 6: Mathematical skills and exemplifications*). • Students will be expected to apply their knowledge and understanding to familiar and unfamiliar contexts. • This paper may contain some synoptic questions which require knowledge and understanding from Unit 1, 2 and 4.	

Unit 6: Practical Skills in Physics II	Unit code: WPH16/01
• Externally assessed • 1 hour 20 minutes, 50 marks • Availability: January, June & October • First assessment: June 2020	20% of the total IAS 10% of the total IAL
Content summary This unit will assess students' knowledge and understanding of experimental procedures and techniques that were developed in Units 4 and 5.	
Assessment • This paper may include short-open, open-response, calculations and extended-writing questions. • This paper will include a minimum of 20 marks that target mathematics at Level 2 or above (see *Appendix 6: Mathematical skills and exemplifications*). • Students will be expected to apply their knowledge and understanding of practical skills to familiar and unfamiliar situations.	

Assessment Objectives

		% in IAS	% in IA2	% in IAL
AO1	Demonstrate knowledge and understanding of chemistry	34 – 36	29 – 31	32 – 34
AO2	(a) Application of knowledge and understanding of chemistry in familiar and unfamiliar contexts. (b) Analysis and evaluation of scientific information to make judgements and reach conclusions.	34 – 36 9 – 11	33 – 36 14 – 16	34 – 36 11 – 14
AO3	Experimental skills in chemistry, including analysis and evaluation of data and methods.	20	20	20

A more detailed breakdown showing the proportion of each Assessment Objective in each Unit can be found in the specification.

Unit availability

The assessment for this qualification is modular and Units may be sat in any examination series in which they are offered.

The revised specification is designed for first teaching in September 2018, and Units will be introduced from January 2019. The Units will be introduced so that AS units will be offered first, then A2 units once students start the second year of the IAL after September 2019.

At the same time, Units from the existing specification will be phased out. Please note that Units from the existing specification and the new specification cannot be combined together. Please note carefully, which Units will be offered in which exam session, and when the qualification can be cashed-in for a grade.

	June 2018	October 2018	January 2019	June 2019	October 2019	January 2020	June 2020	October 2020
LEGACY SPEC								
WPH01	✓	✓	✓	✓	×	×	×	×
WPH02	✓	✓	✓	✓	×	×	×	×
WPH03	✓	✓	✓	✓	×	×	×	×
WPH04	✓	✓	✓	✓	✓	×	✓	×
WPH05	✓	✓	✓	✓	✓	×	✓	×
WPH06	✓	✓	✓	✓	✓	×	✓	×
AS CASH-IN	✓	✓	✓	✓	×	×	×	×
IAL CASH-IN	✓	✓	✓	✓	✓	×	✓	×
REVISED SPEC								
WPH11	×	×	✓	✓	✓	✓	✓	✓
WPH12	×	×	×	✓	✓	✓	✓	✓
WPH13	×	×	×	✓	✓	✓	✓	✓
WPH14	×	×	×	×	×	✓	✓	✓
WPH15	×	×	×	×	×	×	✓	✓
WPH16	×	×	×	×	×	×	✓	✓
AS CASH-IN	×	×	×	✓	✓	✓	✓	✓
IAL CASH-IN	×	×	×	×	×	×	✓	✓

Assessment guidance

Changes to assessment

Some changes have been made to the question papers for the new IAL specification.

- Exam papers for AS Unit 1 and 2 will be 1h 30 minutes and contain 80 marks
- Exam papers for A2 Units 4 and 5 will be 1h 45 minutes and contain 90 marks
- Exam papers for AS Unit 3 and A2 Unit 6 will be 1h 20 minutes and contain 50 marks

- Exam papers will contain a proportion of marks which assess mathematical skills. This will be a total of 40% of marks across the suite of Physics examinations.

- At least one question on Units 1, 2, 4 and 5 will be an extended writing question worth 6 marks. These questions will assess physical knowledge and understanding, but also the ability to structure an answer in a logical and reasoned order.

Features of our question papers

Units 1, 2, 4 and 5 are divided into Sections.

The first Section consists of 10 multiple choice questions. Section B will consist of a range of short-answer questions, calculations and extended open-response questions.

Some of the question contexts will be unfamiliar to students; these questions are designed to assess the ability to apply scientific principles to unfamiliar situations, as well as data-handling skills.

Units 3 and 6 will assess practical and experimental skills which students have developed during the course. Questions on these units will consist of a range of short-answer questions. Students may be required to perform calculations, draw graphs and describe, explain and interpret experimental methods and observations.

Command words

All our examination papers in Science subjects – across the three sciences and across GCSE and A level – use a consistent set of command words in examination questions.

The use of a particular command word gives candidates an indication of the nature of answer that is expected. For example, a question using "Describe…" is asking for a series of factual statements to be presented in series; but a question using "Explain…" is asking for any points made to be justified, or reasons given for their inclusion.

Mark schemes are developed with the command word in mind so that, to score full credit, a student must address the demand of the question. Some students find this hard, and may take a "scatter gun" approach, simply focusing on a key word in the question and writing all they know about that topic.

Students are advised to look closely at the command word before answering. For example, a student who answers an "Explain…" question by giving a number of factual statements without reasoning or justification (i.e. gives a description) is likely to score few marks.

Assessment of practical skills

Throughout the IAL Physics course, students should be completing a series of practical activities. Some of these activities will correspond to the Core Practicals or additional suggested practicals included in the specification content, but others might be other activities selected by the teacher. Hands-on experience of practical work may be supplemented with teacher demonstrations or by using videos.

When considering how to deliver practical activities, teachers should be aware that the inclusion of practical work in the IAL specification is not intended to simply involve factual recall of practical methods. Instead, students should be using practical activities to develop competency in a range of physical techniques across a variety of experimental situations.

Manipulative practical skills cannot easily be assessed through written questions on Unit 3 and Unit 6 examinations. Therefore, questions on these papers are likely to assess understanding of techniques, as well as aspects of planning, and the evaluation of data and methods.

Students with a familiarity of practical scenarios, gained from consistent practical work throughout the IAL course, are much more likely to be successful in answering questions in Unit 3 and Unit 6. This is especially the case because a number of questions will be set in the context of unfamiliar practical situations, where students will need to apply their experience of practical work in order to answer.

Teachers and students should be aware that some questions placed in a practical context may appear on Units 1, 2, 4 and 5. These questions should focus on theoretical physical knowledge that derives from practical activities. For example, a Unit 2 paper may contain a question involving a calculation based on an experiment in which the photoelectric effect is investigated. Although data obtained from the experiment may be provided, an evaluation of the method used would not be required.

Assessment of mathematical skills

The use of relevant mathematical techniques is an integral part of any student of the Science subjects.

As part of the IAL Physics, students will encounter and learn a number of different mathematical skills. This may include simple calculations, re-arranging equations, using standard form, taking logs, plotting and interpreting graphs, and considering significant figures.

Questions on examination papers have always tested the ability of students to use relevant mathematical skills. Although this does not change with the new IAL specification, there will be a greater consistency about the assessment of mathematical skills in the new examination papers.

This means two things: firstly that examination papers will assess a defined range of mathematical skills (these can be found in Appendix 6 in the specification), and secondly that the proportion of marks assessing mathematical skills will be more consistent. For Physics, this means approximately 40% of marks on examination papers will assess these skills. The exact number of marks assigned to mathematical skills may vary across the Units. Please consult the specification for more details.

Course planner

This course planner is designed to give an overview of how the topics making up IAL Physics can be delivered over a two-year period.

You will find a more detailed lesson plan in the **Scheme of Work** document on the IAL Physics page of the Pearson Qualifications website. This gives more detailed information on a week-by-week basis, giving suggestion of the teaching times for each unit. This is editable so that you can customise it to meet your own needs.

An overview of a two-year course planner might be as follows. Each week accounts for 5 Guided Learning Hours over 60 weeks of teaching to give a total of 150 hours for IAS and a further 150 hours for IA2.

Week Number	AS Lesson Content
1-10	Unit 1: Mechanics
11-13	Unit 1: Materials
14 -21	Unit 2: Waves and the Particle Nature of Light
22 -28	Unit 2: Current Electricity

Week Number	A2 Lesson Content
1-5	Unit 4: Further Mechanics
6-13	Unit 4: Electric and Magnetic Fields
14-16	Unit 4: Nuclear and Particle Physics
17-19	Unit 5: Thermodynamics
20-22	Nuclear decay
23-25	Oscillations
26-30	Astrophysics and Cosmology

Delivery of the qualification: Transferable Skills

Why transferable skills?

Ensuring that our International A level qualifications will help improve student outcomes through the acquisition of transferable skills, as well as subject content and skills, is a key aim for Pearson.

In recent years, Higher Education Institutions and employers have flagged the need for students to develop a range of transferable skills to enable them to respond with confidence to the demands of undergraduate study and the world of work.

Through our teaching materials and support offered we want to:

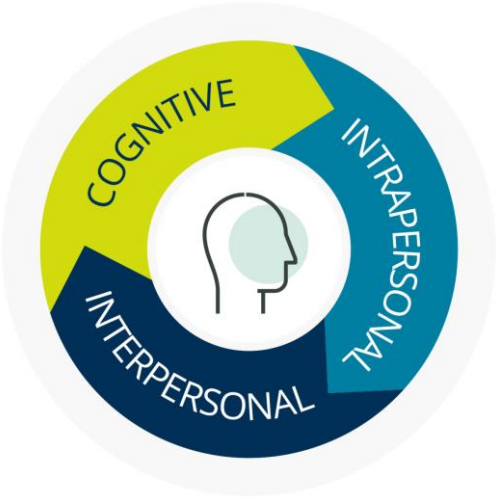
1. increase awareness of transferable skills that are already being assessed (for both students and teachers),
2. indicate where, for teachers, there are opportunities to teach additional skills that won't be formally assessed, but that would be of benefit to students.

What are transferable skills?

The Organisation for Economic Co-operation and Development (OECD) defines skills, or competencies, as 'the bundle of knowledge, attributes and capacities that can be learned and enable individuals to successfully and consistently perform an activity or task and can be built upon and extended through learning.'[1]

To support the design of our qualifications, the Pearson Research Team selected and evaluated seven global 21st-century skills frameworks. Following on from this process, we identified the National Research Council's (NRC) framework [2] as the most evidence-based and robust skills framework, and have used this as a basis for our adapted skills framework.

The framework includes cognitive, intrapersonal skills and interpersonal skills.



The skills have been interpreted for this specification to ensure they are appropriate for the subject. All of the skills listed are evident or accessible in the teaching, learning and/or assessment of the qualifications. Some skills are directly assessed. Pearson materials will support you in identifying these skills and developing these skills in students.

The table below sets out the framework and gives an indication of the skills that can be found in Physics and indicates the interpretation of the skill in this area. A full subject interpretation of each skill, with mapping to show opportunities for student development is given on the subject pages of our website.

COGNITIVE SKILLS	**Cognitive processes and strategies**	• Critical thinking • Problem solving • Analysis • Reasoning / argumentation	• Interpretation • Decision making • Adaptive learning • Executive function
	Creativity	• Creativity • Adaptability • Personal & social responsibility	• Innovation • Continuous learning • Intellectual interest and curiosity
INTRAPERSONAL SKILLS	**Intellectual openness**		
	Work ethic/ conscientiousness	• Initiative • Self-direction • Responsibility • Perseverance • Productivity	• Self-regulation (metacognition, forethought, reflection) • Ethics • Integrity
	Positive core self-evaluation	• Self-monitoring / self-evaluation / self-reinforcement	
INTERPERSONAL SKILLS	**Teamwork and collaboration**	• Communication • Collaboration • Teamwork	• Cooperation • Empathy / perspective taking • Negotiation
	Leadership	• Responsibility • Assertive communication	• Self-presentation

[1] (OECD (2012), Better Skills, Better Jobs, Better Lives (2012):http://skills.oecd.org/documents/OECDSkillsStrategyFINALENG.pdf)

Suggested resources

It is hard to give a complete list of all resources that will be relevant for IAL Physics, as this will change over time. Also, a number of potential resources which are available online may not be available in all countries.

Teachers are recommended to check the IAL Physics (2018) page on the Pearson Qualifications website on a regular basis.

Name of resource	Link and information
Dedicated Science Subject Advisor	Email: TeachingScience@pearson.com Telephone UK: +44 (0)20 7010 2190 Twitter: @PearsonSciences Our Subject Advisor team is here to help with any questions about the content or delivery of any of our Science qualifications. The Subject Advisor team can also forward questions, using the Ask The Expert service, to our team of senior examiners.
examWizard	**examWizard** is a free online resource for teachers containing a huge bank of past paper questions and support materials to help you create your own mock exam and tests. http://qualifications.pearson.com/en/support/Services/examwizard.html
ResultsPlus	**ResultsPlus** is a free online results tool analysis for teachers that gives a detailed breakdown of your students' performance in Edexcel exams. https://qualifications.pearson.com/en/support/Services/ResultsPlus.html
Sample assessment materials and past papers	A complete set of Specimen Assessment Materials is available on the IAL Physics page of the Pearson Qualifications website. **Past papers** are also available on the equivalent IAL Physics (2013) page.
Guides for teachers	The "Course materials" tab of the IAL Physics page contains a number of guidance documents including a Getting Started Guide, Scheme of Work, Mapping Documents and Guides to Practical and Mathematical skills.
Textbooks	**Details of published resources** for the new IAL specifications can be found through the Pearson Global Schools website: www.pearsonglobalschools.com

Appendix A - NRC Framework Skills interpretation

Sources: Cognitive/Intrapersonal and Interpersonal skills adapted and taken from the NRC framework

NRC framework skill	Skill interpretation in Physics	Examples of where this skill is covered in specification	Examples of where this skill is explicitly assessed in examination	Opportunity for the skill to be covered in teaching and learning approaches.
Cognitive skills				
Cognitive Processes and Strategies				
Critical thinking	Using more than one area of Physics concepts to link ideas and synthesise knowledge when solving a problem.	Topics 5.6 and 4.3	Paper 5 Qu 20 AO1: 4 marks and AO2a: 2 marks and AO2b : 4 marks	The motion of satellites combines both Newton's law of gravitation and circular motion. Students can use equations to predict the relationship between the radius of the orbit and the time period.
Problem solving	Applying knowledge and understanding to familiar and unfamiliar contexts to produce a reasoned explanation or calculate a value.	All topics	Paper 1 Qu 16 is an example of a familiar context whilst Qu 18 is likely to be unfamiliar. Qu 16 AO1: 6 marks Qu 18 AO1: 5 marks and AO2a: 3 marks and AO2b: 4 marks	One introduction to mathematical problem solving is to apply the appropriate equations for accelerated motion in one dimension to a variety of examples. Give several examples using different combinations of *u, v, s, a* and *t.*
Analysis	Considering data from an experiment and using a graph to test for correlations or causal relationships. Developing the ability to solve physics problems, including those of a mathematical nature.	3.5 and 6.5	Paper 6 Qu 5 (d) AO3: 11 marks	The core practicals can be used to collect data. In most cases a graphical method can be used to establish the mathematical relationship between two variables. In practical 7 most experiments will use different lengths of wire and corresponding resistance to graphically determine resistivity. One variation is to use the same length of different cross-sections of wire - if available. Solve a variety of problems in physics eg mechanics.

Cognitive skills				
Cognitive Processes and Strategies				
Reasoning/argumentation	Drawing a valid conclusion from a practical, using reasoned arguments.	3.5 and 6.5	Paper 6 Qu 4 (b) AO3: 3 marks	Use the core practicals to explore the more common mathematical relationships between variables. Eg Investigate and graphically test the differences between inversely proportional and exponential decay.
Interpretation	Recognising that information can be presented in different forms.	4.3: 83 4.4	Paper 4 Qu 13 AO1: 1 mark and AO2a: 1 mark and AO2b 6 marks	Information can be presented as a drawing, text, a list of numerical values, graphically or tabulated. Problems concerning momentum in two dimensions will benefit from a well-drawn diagram.
Decision making	Selecting suitable apparatus and an appropriate method for an experiment.	3.3 and 6.3	Paper 6 Qu 3 (a) AO3: 5 marks	The core practicals can be used to generate class discussion about suitable apparatus and an appropriate method which will generate the data required.
Adaptive learning	Responding to a novel context and using knowledge and understanding to identify the key physics concepts under discussion.	All topics	Paper 2 Qu 15 AO1: 2 marks and AO2a: 4 marks	Students should know and understand what is meant by interference of waves and the associated vocabulary. There are then many applications that teachers can present eg CD players, astronomical interferometry which students can apply their knowledge to explain.
Executive function	Working to appropriate time scales when planning and conducting practical work.	Core practicals		A range of experiments are suggested within the specification.
Creativity				
Creativity	Identifying possible sources of uncertainty when planning a practical. Explaining how these may be reduced or eliminated.	3.3	Paper 3 Qu 1(b) AO3: 3 marks	The core practicals provide opportunities for class discussion. In core practical 5 discuss how the tension in a wire can be varied and measured.
Innovation	Commenting on how an experiment may be improved,	3.4 and 6.4	Paper 3 Qu 5 (b) AO3: 3 marks	The core practicals provide opportunities for class discussion.

	possibly by using additional apparatus.			In core practical 7 discuss what effect, if any, the width of the connections might have on the length of wire. This may lead to a systematic error which would be evidenced on a suitable graph.
Intrapersonal skills				
Intellectual openness				
Adaptability	Reflecting on a method and the apparatus used when carrying out practical work and considering what improvements could be made.	3.4 and 6.4	Paper 6 Qu 3 (b) AO3: 2 marks	Use class practicals and discussion to consider improvements that could be made.
Personal and social responsibility	Discussing areas of the specification eg big bang theory of the universe and how it is based on factual scientific evidence.	5.6: 171	Paper 5 Qu 21 (b)(i) AO2b: 4 marks	There are opportunities eg in topic 5.6 to discuss ideas within physics that some students may find challenging for cultural or religious reasons. Discuss the fact that conclusions reached within science are based on evidence.
Continuous learning	Consolidating the AS topics within Physics as many of the A2 topics are related.	4.3: 83 depends on 1.3: 13 and 1.3: 14	Paper 5 Q18(b) AO2b: 3 marks	The treatment of momentum in topic 4.3 depends on and revisits earlier work covered in topic 1.3. This emphasises the nature of the subject as one in which deeper levels of understanding are achieved incrementally.
Intellectual interest and curiosity	Undertaking a research project such as the extended project.	Appendix 4 within the specification gives further details and examples about the extended project.		See appendix 4 in the specification.
Intrapersonal skills				
Work ethic/conscientiousness				
Initiative	Showing a willingness to study and read beyond that routinely			Use group or individual presentations to assess whether students have been prepared

	suggested by the teacher.			to research beyond the obvious.
Self-direction	Planning and carrying out individual lines of enquiry.			Set students the task to write their own learning plan for a particular topic.
Responsibility	Taking responsibility to manage one's own learning and creating a plan to improve. Managing practical work safely.			Review the plan with the student, encourage them to be reflective and honest. Taking responsibility for carrying out practical work in a safe manner, following all safety requirements.
Perseverance	Recognising areas of weakness and prioritising these as a way to improve.			Follow up the learning plan and encourage the student to consider whether they have completed it fully.
Productivity	Developing a succinct written style to answer questions directly and fluently.			This can be encouraged by asking students to exchange written answers to problems. Ask them to be critical about the effectiveness of the level of communication.
Self-regulation (metacognition, forethought, reflection)	Developing strategies over time, including self-assessment and critical review, for reflecting on the success or otherwise of the work.			Follow up learning plans and encourage the student to reflect and consider a new set of actions and goals.
Ethics	Engaging in discussions and arguing from an appropriate standpoint whilst being considerate to other views and positions.			Learners could consider the ethics of spending a large amount of money on the space programme, or ethical issues relating to the impact of physics on the environment.
Integrity	Employing working methods which are honest and appropriate.	Core practicals		Records practical results with integrity, including anomalous results.
Intrapersonal skills				
Positive Core Self Evaluation				
Self-monitoring/self-evaluation/self-reinforcement	Developing the ability to reflect both positively and negatively about one's understanding of the concepts being covered.			Students can be encouraged to reflect on their progress and consider actions which will improve their overall level of achievement.
Teamwork and collaboration				
Communication	Developing an ability to form an		Paper 2 Qu 16 b (ii)	Use scenarios to encourage students to write

	argument using verbal and written, linguistic and/or mathematical, expression.			a paragraph explanation using physics principles or work through a mathematical solution which involves multiple steps. Presenting practical results in a standard scientific format; presenting problems to solutions in a clear and coherent fashion.
Collaboration	Sharing ideas when discussing approaches to class practical work.	Core practicals		Use a class practical to discuss apparatus, appropriate methods and data analysis.
Teamwork	Working with others to develop an understanding of a key concept.			Use groups to research different scenarios within a given topic and then feed back their findings to the rest of the class. Eg give each group a different application of electromagnetic induction.
Co-operation	Listening, discussing and criticising respective answers/presentations from groups of students to a problem solving activity.			Encourage each group to be considerate yet usefully critical of group presentations.
Interpersonal skills	Using verbal and non-verbal skills in presenting, or listening to, a reasoned argument.			Use opportunities within class to allow students to present an explanation to a physics scenario or problem.
Empathy/perspective taking	Being considerate of the position of others during class discussions.			Encourage each group to be equally interested in the work of others as they are of their own when participating in group presentations.
Negotiation	Learning to agree to someone else's position or using the art of persuasion to reach a common understanding of a particular scenario or problem.			This can be developed by asking groups to work on a solution to the same problem. There may be different approaches but students will learn the art of recognising when another point of view is valid.
Intrapersonal skills				
Leadership				
Leadership	Taking a leading role during discussions, shared problem solving sessions and practical work whilst ensuring other students are able to contribute appropriately.			Leadership can be developed by encouraging a particular student to take the lead in a discussion or problem solving session. Consequently encourage the student to ask for the opinions or help from other students

				in the class.
Responsibility	Considering others when participating in class discussions.			Leadership can be developed by encouraging students to be considerate of other points of view and, consequently earning the respect of other students.
Assertive communication	Learning to address conflicting viewpoints, using persuasive techniques effectively to convince a point of view which leads to a singular conclusion or answer.			There will be times when a number of points of view are prevalent, use this to encourage students to weigh up the different arguments for themselves and reach a conclusion.
Self-presentation	Developing a reflective attitude to one's behaviour during classroom discussions, shared problem solving sessions and practical work.			Encourage students to reflectively consider their approach to classroom activity on a regular basis.