Pearson Edexcel

International GCSE

Physics (9–1) (Modular)

Specification

Pearson Edexcel International GCSE in Physics (Modular) (4XPH1)

First teaching September 2024

First examination June 2025

First certification August 2025

Issue 1

About Pearson

We are the world's leading learning company operating in countries all around the world. We provide content, assessment and digital services to learners, educational institutions, employers, governments and other partners globally. We are committed to helping equip learners with the skills they need to enhance their employability prospects and to succeed in the changing world of work. We believe that wherever learning flourishes so do people.

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All information in this specification is correct at time of publication.

Publication code: GQ000039

Contents

1 About this specification

Pearson Edexcel International GCSE in Physics (Modular) is part of a suite of International GCSE (Modular) qualifications offered by Pearson.

This qualification is not accredited or regulated by any UK regulatory body.

This specification includes the following key features.

Structure:

Pearson Edexcel International GCSE in Physics (Modular) is a modular qualification. All units are available in the June and November exam series and can be sat in any order or re-sat. A cash-in code must be used to obtain an overall grade for the qualification.

Content:

The content is relevant, up-to-date, engaging and appropriate for an international audience.

Assessment

Untiered, written examinations with questions designed to be accessible to learners of all abilities.

Approach

It builds a foundation for learners wishing to progress to the Pearson Edexcel Advanced Subsidiary and Advanced GCE, International AS and A Level qualifications or equivalent qualifications, focusing on key Physics theory.

Specification updates

This specification is Issue 1 and is valid for first teaching from September 2024, with first assessment from June 2025 and first certification from August 2025. If there are any significant changes to the specification, Pearson will inform centres in writing. Changes will also be posted on our website.

For more information, please visit qualifications.pearson.com.

Using this specification

This specification gives teachers guidance and encourages effective delivery of the qualification. The following information will help you get the most out of the content and guidance.

Content:

This is arranged as nine topics in *Section 3: Physics content*. A summary of sub-topics is included at the start of each topic. As a minimum, all the bullet points in the content must be taught. The word 'including' in the content specifies the detail of what must be covered.

Examples:

Throughout the content, we have included examples of what could be covered or what might support teaching and learning. It is important to note that examples are for illustrative purposes only and centres can use other examples. We have included examples that are easily understood and recognised by international centres.

Practical investigations:

These are included within *Section 3: Physics content* as specification points in italics. Learners will develop knowledge and understanding of experimental skills through the context of the physics they are learning. Experimental skills are assessed through written examinations.

Referencing:

Specification statements that are in bold with a ‘P’ reference relate to content that is in the International GCSE in Physics (Modular) only and is not found in the International GCSE in Science (Double Award) (Modular).

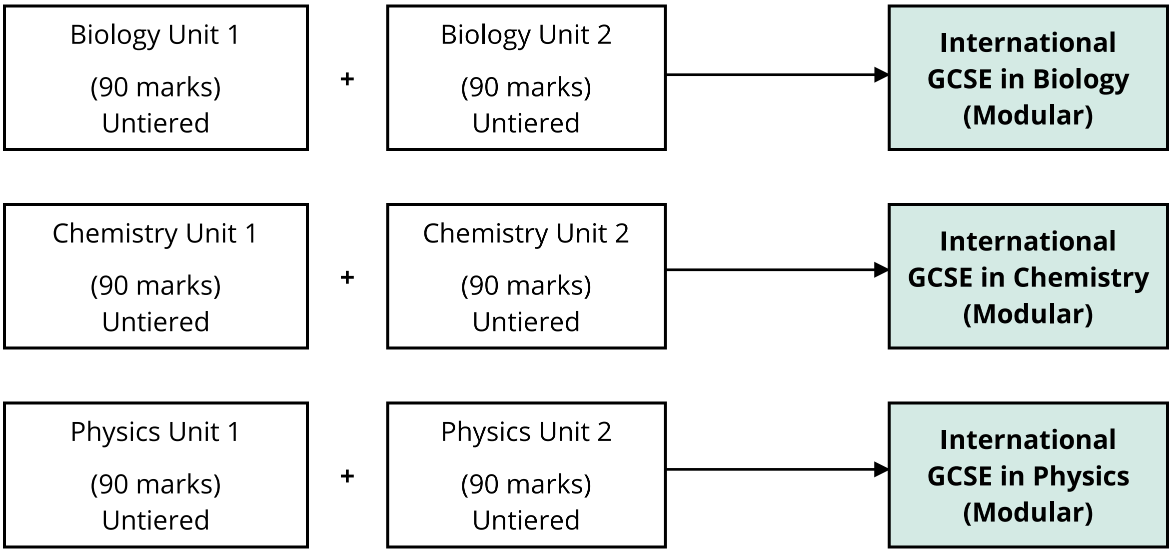
Course introduction

The Pearson Edexcel International GCSE in Physics (Modular) is designed for use in schools and colleges. It is part of a suite of International GCSE (Modular) qualifications offered by Pearson.

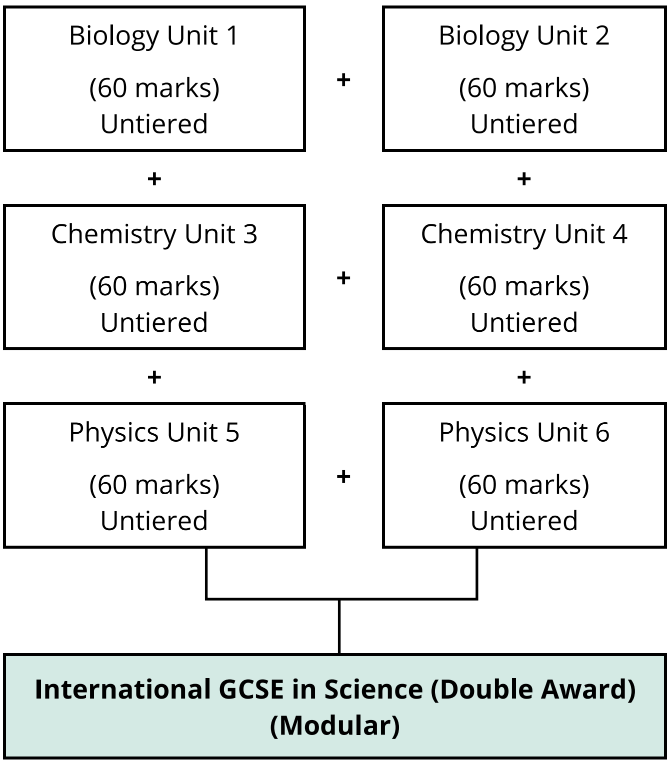
The course gives students the opportunity to experience physics within the context of their general education.

How assessment relates to the qualifications available is shown below.

International GCSE Separate Sciences (Modular)



International GCSE Double Award (Modular)



A Pearson Edexcel International GCSE in Science (Single Award) qualification is available in linear route only.

Qualification aims

The aims of this qualification are to enable learners to:

- learn about unifying patterns and themes in physics and use them in new and changing situations
- acquire knowledge and understanding of physical facts, terminology, concepts, principles and practical techniques
- apply the principles and concepts of physics, including those related to the applications of physics, to different contexts
- evaluate physical information, making judgements on the basis of this information
- appreciate the practical nature of physics, developing experimental and investigative skills based on correct and safe laboratory techniques
- analyse, interpret and evaluate data and experimental methods, drawing conclusions that are consistent with evidence from experimental activities and suggesting possible improvements and further investigations
- recognise the importance of accurate experimental work and reporting scientific methods in physics
- select, organise and present relevant information clearly and logically using appropriate vocabulary, definitions and conventions
- develop a logical approach to problem solving in a wider context
- select and apply appropriate areas of mathematics relevant to physics as set out under each topic
- prepare for more advanced courses in physics and for other courses that require knowledge of physics.

Why choose Pearson Edexcel qualifications?

Pearson – the world's largest education company

Edexcel academic qualifications are from Pearson, the UK's largest awarding organisation. With over 3.4 million learners studying our academic and vocational qualifications worldwide, we offer internationally recognised qualifications to schools, colleges and employers globally.

Pearson is recognised as the world's largest education company, allowing us to drive innovation and provide comprehensive support for Pearson Edexcel learners in acquiring the knowledge and skills they need for progression in study, work and life.

A heritage you can trust

The background to Pearson becoming the UK's largest awarding organisation began in 1836, when a royal charter gave the University of London its first powers to conduct exams and confer degrees on its learners. With over 150 years of international education experience, Edexcel qualifications have firm academic foundations, built on the traditions and rigour associated with Britain's educational system.

Results you can trust

Pearson's leading online marking technology has been shown to produce exceptionally reliable results, demonstrating that, at every stage, Pearson Edexcel qualifications maintain the highest standards.

Why choose Pearson Edexcel International GCSE in Physics (Modular)?

We have listened to feedback from all parts of the international school and language teaching community including a large number of teachers. We have made changes that will engage students and give them skills that will support progression to further study in physics, physical science and other related subjects. Our content and assessment approach has been designed to meet students' needs and be consistent with our approach across the sciences.

Key qualification features

At Pearson, we offer separate science modular qualifications in Biology, Chemistry and Physics, as well as Double Award Science modular qualification – these have been designed to meet different learners' needs. The content and assessment approach for this qualification has been designed to maintain the rigorous standards of all Pearson Edexcel qualifications and meet learner needs in the following ways.

- Content that is interesting and engaging for learners but is also designed to ensure good preparation, both for those continuing to further study and for those wishing to work in a physics-related field.
- There are opportunities to 'localise' the content to make it more relevant for learners in their own country.

Modular structure

- The modular assessment structure offers learners the flexibility to sit examinations when they are ready and provides opportunities to resit individual unit assessments before receiving an overall qualification grade.

Clear and straightforward question papers

- Our question papers are clear and accessible for learners of all abilities. Our mark schemes are straightforward, so that the assessment requirements are clear.

Broad and deep development of learners' skills

- The design of the revised international GCSE aims to extend learners' knowledge and understanding by broadening and deepening skills, for example learners develop the ability to:
    - focus on practical skills through a number of practicals listed in the specification content. These can be supplemented with other suggested practicals. The skills developed will be assessed through questions in written examinations
    - improve learners' analytical and logic skills by applying understanding of scientific concepts and principles to a range of situations. This will include some examination questions that are more problem-solving in style
    - address the need for mathematical skills to complement learners' physics skills by covering a range of mathematical areas.

Progression

International GCSE (Modular) qualifications enable successful progression to A Level and beyond. Through our development process, we have consulted with International Advanced Level and GCE A Level teachers as well as higher education professionals to validate the appropriateness of the qualification, including its content, skills development and assessment structure.

Courses to suit your students' needs and interests

Teachers of physics have a choice of International GCSE courses to deliver, each giving different levels of depth to meet learners' needs. As well as the Pearson Edexcel International GCSE in Physics (Modular), students can also be taught our International GCSE in Science (Double Award) (Modular) This course offers a reduced amount of content, but is assessed to the same standard. Progression routes for this course may vary slightly from those for the Pearson Edexcel International GCSE in Physics (Modular).

More information about all our qualifications can be found on our Edexcel International GCSE pages at qualifications.pearson.com.

Supporting you in planning and implementing this qualification

Planning

- Our *Getting Started Guide* gives you an overview of the Pearson Edexcel International GCSE in Physics (Modular) to help you understand the changes to content and assessment, and what these changes mean for you and your learners.
- We will provide you with an editable scheme of work.

Teaching and learning

- Print and digital learning and teaching resources promote 'any time, any place' learning to improve learner motivation and encourage new ways of working.

Preparing for exams

We will also provide you with a range of resources to help you prepare your learners for the assessments, including:

- specimen papers to support formative assessments and mock exams
- examiner commentaries following each examination series.

ResultsPlus

ResultsPlus provides the most detailed analysis available of your learners' exam performance. It can help you to identify the topics and skills where further learning would benefit your learners.

examWizard

This is an included online resource designed to support learners and teachers with examination preparation and assessment.

Training events

In addition to online training, we host a series of training events for teachers to deepen their understanding of our qualifications.

Get help and support

Our subject advisor service will ensure that you receive help and guidance from us. You can email our subject advisor at: teachingscience@pearson.com. You can also sign up to receive subject advisor updates or contact us using our support portal.

2 Qualification at a glance

Qualification overview

The Pearson Edexcel International GCSE in Physics consists of two mandatory units:

- Physics Unit 1
- Physics Unit 2

It is a modular qualification in which unit assessments can be sat and resat in any order. Assessments must be cashed in to obtain a final grade for the qualification.

Content and assessment overview

<table>
<tr><td>Physics Unit 1</td><td>Unit code 4WPH1/1P*</td></tr>
<tr><td>Externally assessed
Written examination: 1 hour and 40 minutes
Availability: June and November
90 marks</td><td>50% of the total International GCSE (Modular)</td></tr>
<tr><td colspan="2">Content summary
Assesses content listed below, including content that is in bold and has a ‘P’ reference. Questions may come from any topic area listed below.
Statements in bold cover some sub-topics in greater depth.
1. Forces and motion
a. Units
b. Movement and position
c. Forces, movement, shape and momentum
2. Electricity
a. Units
b. Mains electricity
c. Energy and voltage circuits
d. Electrical charge
3. Energy resources and energy transfer
a. Units
b. Energy transfers
c. Work and power
d. Energy resources and electrical generation
4. Solids, liquids and gases: Part 1
a. Units
b. Density and pressure
c. Change of state</td></tr>
</table>

<table>
<tr><td>Physics Unit 1</td><td>Unit code 4WPH1/1P*</td></tr>
<tr><td colspan="2">Assessment

A combination of different question styles, including multiple-choice questions, short-answer questions, calculations and extended open-response questions.

A calculator may be used in the examinations.</td></tr>
</table>

Physics Unit 2	Unit code 4WPH2/1P*
Externally assessed Written examination: 1 hour and 40 minutes Availability: June and November 90 marks	50% of the total International GCSE (Modular)

Content summary

Assesses **content listed below**, including content that is in bold and has a 'P' reference. Questions may come from any topic area listed below.

Statements in bold cover some sub-topics in greater depth.

5. Waves
   a. Units
   b. Properties of waves
   c. The electromagnetic spectrum
   d. Light and sound
6. Solids, liquids and gases: Part 2
   a. Units (note that this is the same content from *4. Solids, liquids and gases: Part 1*)
   d. Ideal gas molecules
7. Magnetism and electromagnetism
   a. Units
   b. Magnetism
   c. Electromagnetism
   d. Electromagnetism induction
8. Radioactivity and particles
   a. Units
   b. Radioactivity
   c. Fission and fusion
9. Astrophysics
   a. Units
   b. Motion in the universe
   c. Stellar evolution
   d. Cosmology

Assessment

A combination of different question styles, including multiple-choice questions, short-answer questions, calculations and extended open-response questions.

A calculator may be used in the examinations.

* See *Appendix 1: Codes* for a description of this code and all the other codes relevant to this qualification.

3 Physics content

1 Forces and motion

The following sub-topics are covered in this section.

(a) Units

(b) Movement and position

(c) Forces, movement, shape and momentum

(a)	**Units**
Learners should:	
1.1	use the following units: kilogram (kg), metre (m), metre/second (m/s), metre/second^2 (m/s^2), newton (N), second (s) and newton/kilogram (N/kg)
1.2P	**use the following units: newton metre (Nm), kilogram metre/second (kg m/s)**

(b)	**Movement and position**
Learners should:	
1.3	plot and explain distance−time graphs
1.4	know and use the relationship between average speed, distance moved and time taken: $$\text{average speed} = \frac{\text{distance moved}}{\text{time taken}}$$
1.5	*practical: investigate the motion of everyday objects such as toy cars or tennis balls*
1.6	know and use the relationship between acceleration, change in velocity and time taken: $$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$$ $$a = \frac{(v-u)}{t}$$
1.7	plot and explain velocity−time graphs
1.8	determine acceleration from the gradient of a velocity−time graph
1.9	determine the distance travelled from the area between a velocity−time graph and the time axis
1.10	use the relationship between final speed, initial speed, acceleration and distance moved: $$(\text{final speed})^2 = (\text{initial speed})^2 + (2 \times \text{acceleration} \times \text{distance moved})$$ $$v^2 = u^2 + (2 \times a \times s)$$

(c)	**Forces, movement, shape and momentum**
Learners should:	
1.11	describe the effects of forces between bodies such as changes in speed, shape or direction
1.12	identify different types of force such as gravitational or electrostatic
1.13	understand how vector quantities differ from scalar quantities
1.14	understand that force is a vector quantity
1.15	calculate the resultant force of forces that act along a line
1.16	know that friction is a force that opposes motion
1.17	know and use the relationship between unbalanced force, mass and acceleration: force = mass × acceleration $F = m \times a$
1.18	know and use the relationship between weight, mass and gravitational field strength: weight = mass × gravitational field strength $W = m \times g$
1.19	know that the stopping distance of a vehicle is made up of the sum of the thinking distance and the braking distance
1.20	describe the factors affecting vehicle stopping distance, including speed, mass, road condition and reaction time
1.21	describe the forces acting on falling objects (and explain why falling objects reach a terminal velocity)
1.22	*practical: investigate how extension varies with applied force for helical springs, metal wires and rubber bands*
1.23	know that the initial linear region of a force-extension graph is associated with Hooke's law
1.24	describe elastic behaviour as the ability of a material to recover its original shape after the forces causing deformation have been removed
1.25P	**know and use the relationship between momentum, mass and velocity:** **momentum = mass × velocity** $\boldsymbol{p = m \times v}$
1.26P	**use the idea of momentum to explain safety features**
1.27P	**use the conservation of momentum to calculate the mass, velocity or momentum of objects**
1.28P	**use the relationship between force, change in momentum and time taken:** force = $\frac{\text{change in momentum}}{\text{time taken}}$ $\boldsymbol{F = \frac{(mv - mu)}{t}}$
1.29P	**demonstrate an understanding of Newton's third law**

(c)	**Forces, movement, shape and momentum**
Learners should:	
1.30P	**know and use the relationship between the moment of a force and its perpendicular distance from the pivot:** **moment = force × perpendicular distance from the pivot**
1.31P	**know that the weight of a body acts through its centre of gravity**
1.32P	**use the principle of moments for a simple system of parallel forces acting in one plane**
1.33P	**understand how the upward forces on a light beam, supported at its ends, vary with the position of a heavy object placed on the beam**

2 Electricity

The following sub-topics are covered in this section.

(a) Units

(b) Mains electricity

(c) Energy and voltage in circuits

(d) Electric charge

(a)	**Units**
Learners should:	
2.1	use the following units: ampere (A), coulomb (C), joule (J), ohm (Ω), second (s), volt (V) and watt (W)

(b)	**Mains electricity**
Learners should:	
2.2	understand how the use of insulation, double insulation, earthing, fuses and circuit breakers protects the device or user in a range of domestic appliances
2.3	understand why a current in a resistor results in the electrical transfer of energy and an increase in temperature, and how this can be used in a variety of domestic contexts
2.4	know and use the relationship between power, current and voltage: power = current × voltage $P = I \times V$ and apply the relationship to the selection of appropriate fuses
2.5	use the relationship between energy transferred, current, voltage and time: energy transferred = current × voltage × time $E = I \times V \times t$
2.6	know the difference between mains electricity being alternating current (a.c.) and direct current (d.c.) being supplied by a cell or battery

(c)	**Energy and voltage in circuits**
Learners should:	
2.7	explain why a series or parallel circuit is more appropriate for particular applications, including domestic lighting
2.8	understand how the current in a series circuit depends on the applied voltage and the number and nature of other components
2.9	describe how current varies with voltage in wires, resistors, metal filament lamps and diodes, and how to investigate this experimentally
2.10	describe the qualitative effect of changing resistance on the current in a circuit

(c)	**Energy and voltage in circuits**
Learners should:	
2.11	describe the qualitative variation of resistance of light-dependent resistors (LDRs) with illumination and thermistors with temperature
2.12	know that lamps and LEDs can be used to indicate the presence of a current in a circuit
2.13	know and use the relationship between voltage, current and resistance: voltage = current × resistance $V = I \times R$
2.14	know that current is the rate of flow of charge
2.15	know and use the relationship between charge, current and time: charge = current × time $Q = I \times t$
2.16	know that electric current in solid metallic conductors is a flow of negatively charged electrons
2.17	understand why current is conserved at a junction in a circuit
2.18	know that the voltage across two components connected in parallel is the same
2.19	calculate the currents, voltages and resistances of two resistive components connected in a series circuit
2.20	know that: • voltage is the energy transferred per unit charge passed • the volt is a joule per coulomb
2.21	know and use the relationship between energy transferred, charge and voltage: energy transferred = charge × voltage $E = Q \times V$

(d)	**Electric charge**
Learners should:	
2.22P	**identify common materials that are electrical conductors or insulators, including metals and plastics**
2.23P	***practical: investigate how insulating materials can be charged by friction***
2.24P	**explain how positive and negative electrostatic charges are produced on materials by the loss and gain of electrons**
2.25P	**know that there are forces of attraction between unlike charges and forces of repulsion between like charges**
2.26P	**explain electrostatic phenomena in terms of the movement of electrons**
2.27P	**explain the potential dangers of electrostatic charges, e.g. when fuelling aircraft and tankers**
2.28P	**explain some uses of electrostatic charges, e.g. in photocopiers and inkjet printers**

3 Energy resources and energy transfers

The following sub-topics are covered in this section.

(a) Units

(b) Energy transfers

(c) Work and power

(d) Energy resources and electricity generation

(a)	**Units**
Learners should:	
3.1	use the following units: kilogram (kg), joule (J), metre (m), metre/second (m/s), metre/second^2 (m/s^2), newton (N), second (s) and watt (W)

(b)	**Energy transfers**
Learners should:	
3.2	describe energy transfers involving energy stores: • energy stores: chemical, kinetic, gravitational, elastic, thermal, magnetic, electrostatic, nuclear • energy transfers: mechanically, electrically, by heating, by radiation (light and sound)
3.3	use the principle of conservation of energy
3.4	know and use the relationship between efficiency, useful energy output and total energy output: $\text{efficiency} = \dfrac{\text{useful energy output}}{\text{total energy output}} \times 100\%$
3.5	describe a variety of everyday and scientific devices and situations, explaining the transfer of the input energy in terms of the above relationship, including their representation by Sankey diagrams
3.6	describe how thermal energy transfer may take place by conduction, convection and radiation
3.7	explain the role of convection in everyday phenomena
3.8	explain how emission and absorption of radiation are related to surface and temperature
3.9	*practical: investigate thermal energy transfer by conduction, convection and radiation*
3.10	explain ways of reducing unwanted energy transfer, such as insulation

(c)	Work and power
Learners should:	
3.11	know and use the relationship between work done, force and distance moved in the direction of the force: work done = force × distance moved $W = F \times d$
3.12	know that work done is equal to energy transferred
3.13	know and use the relationship between gravitational potential energy, mass, gravitational field strength and height: gravitational potential energy = mass × gravitational field strength × height $GPE = m \times g \times h$
3.14	know and use the relationship: kinetic energy = $\frac{1}{2}$ × mass × speed^2 $KE = \frac{1}{2} \times m \times v^2$
3.15	understand how conservation of energy produces a link between gravitational potential energy, kinetic energy and work
3.16	describe power as the rate of transfer of energy or the rate of doing work
3.17	use the relationship between power, work done (energy transferred) and time taken: power = $\frac{\text{work done}}{\text{time taken}}$ $P = \frac{W}{t}$

(d)	Energy resources and electricity generation
Learners should:	
3.18P	**describe the energy transfers involved in generating electricity using:** • **wind** • **water** • **geothermal resources** • **solar heating systems** • **solar cells** • **fossil fuels** • **nuclear power**
3.19P	**describe the advantages and disadvantages of methods of large-scale electricity production from various renewable and non-renewable resources**

4 Solids, liquids and gases: Part 1

The following sub-topics are covered in this section.

(a) Units

(b) Density and pressure

(c) Change of state

(a)	**Units**
Learners should:	
4.1	use the following units: degree Celsius (°C), Kelvin (K), joule (J), kilogram (kg), kilogram/metre^3 (kg/m^3), metre (m), metre^2 (m^2), metre^3 (m^3), metre/second (m/s), metre/second^2 (m/s^2), newton (N) and pascal (Pa)
4.2P	**use the following unit: joules/kilogram degree Celsius (J/kg °C)**

Please note: subtopic (a) will also be assessed in Part 2, as well as Part 1.

(b)	**Density and pressure**
Learners should:	
4.3	know and use the relationship between density, mass and volume: $\text{density} = \dfrac{\text{mass}}{\text{volume}}$ $\rho = \dfrac{m}{V}$
4.4	*practical: investigate density using direct measurements of mass and volume*
4.5	know and use the relationship between pressure, force and area: $\text{pressure} = \dfrac{\text{force}}{\text{area}}$ $p = \dfrac{F}{A}$
4.6	understand how the pressure at a point in a gas or liquid at rest acts equally in all directions
4.7	know and use the relationship for pressure difference: pressure difference = height × density × gravitational field strength $p = h \times \rho \times g$

(c)	**Change of state**
Learners should:	
4.8P	**explain why heating a system will change the energy stored within the system and raise its temperature or produce changes of state**
4.9P	**describe the changes that occur when a solid melts to form a liquid, and when a liquid evaporates or boils to form a gas**
4.10P	**describe the arrangement and motion of particles in solids, liquids and gases**
4.11P	***practical: obtain a temperature–time graph to show the constant temperature during a change of state***
4.12P	**know that specific heat capacity is the energy required to change the temperature of an object by one degree Celsius per kilogram of mass (J/kg °C)**
4.13P	**use the equation:** **change in thermal energy = mass × specific heat capacity × change in temperature** $\Delta Q = m \times c \times \Delta T$
4.14P	***practical: investigate the specific heat capacity of materials including water and some solids***

5 Waves

The following sub-topics are covered in this section.

(a) Units

(b) Properties of waves

(c) The electromagnetic spectrum

(d) Light and sound

(a)	**Units**
Learners should:	
5.1	use the following units: degree (°), hertz (Hz), metre (m), metre/second (m/s) and second (s)

(b)	**Properties of waves**
Learners should:	
5.2	explain the difference between longitudinal and transverse waves
5.3	know the definitions of amplitude, wavefront, frequency, wavelength and period of a wave
5.4	know that waves transfer energy and information without transferring matter
5.5	know and use the relationship between the speed, frequency and wavelength of a wave: wave speed = frequency × wavelength $v = f \times \lambda$
5.6	use the relationship between frequency and time period: $\text{frequency} = \dfrac{1}{\text{time period}}$ $f = \dfrac{1}{T}$
5.7	use the above relationships in different contexts, including sound waves and electromagnetic waves
5.8	explain why there is a change in the observed frequency and wavelength of a wave when its source is moving relative to an observer and that this is known as the Doppler effect
5.9	explain that all waves can be reflected and refracted

(c)	**The electromagnetic spectrum**
Learners should:	
5.10	know that light is part of a continuous electromagnetic spectrum that includes radio, microwave, infrared, visible, ultraviolet, x-ray and gamma ray radiations, and that all these waves travel at the same speed in free space
5.11	know the order of the electromagnetic spectrum in terms of decreasing wavelength and increasing frequency, including the colours of the visible spectrum
5.12	explain some of the uses of electromagnetic radiations, including: • radio waves: broadcasting and communications • microwaves: cooking and satellite transmissions • infrared: heaters and night vision equipment • visible light: optical fibres and photography • ultraviolet: fluorescent lamps • x-rays: observing the internal structure of objects and materials, including for medical applications • gamma rays: sterilising food and medical equipment
5.13	explain the detrimental effects of excessive exposure of the human body to electromagnetic waves, including: • microwaves: internal heating of body tissue • infrared: skin burns • ultraviolet: damage to surface cells and blindness • gamma rays: cancer, mutation and describe simple protective measures against the risks

(d)	**Light and sound**
Learners should:	
5.14	know that light waves are transverse waves and that they can be reflected and refracted
5.15	use the law of reflection (the angle of incidence equals the angle of reflection)
5.16	draw ray diagrams to illustrate reflection and refraction
5.17	*practical: investigate the refraction of light, using rectangular blocks, semi-circular blocks and triangular prisms*
5.18	know and use the relationship between refractive index, angle of incidence and angle of refraction: $n = \frac{\sin i}{\sin r}$
5.19	*practical: investigate the refractive index of glass, using a glass block*
5.20	describe the role of total internal reflection in transmitting information along optical fibres and in prisms
5.21	explain the meaning of critical angle c

(d)	Light and sound
Learners should:	
5.22	know and use the relationship between critical angle and refractive index: $\sin c = \frac{1}{n}$
5.23	know that sound waves are longitudinal waves that can be reflected and refracted
5.24P	**know that the frequency range for human hearing is 20–20 000 Hz**
5.25P	***practical: investigate the speed of sound in air***
5.26P	**understand how an oscilloscope and microphone can be used to display a sound wave**
5.27P	***practical: investigate the frequency of a sound wave using an oscilloscope***
5.28P	**understand how the pitch of a sound relates to the frequency of vibration of the source**
5.29P	**understand how the loudness of a sound relates to the amplitude of vibration of the source**

6 Solids, liquids and gases: Part 2

The following sub-topics are covered in this section.

(a) Units (refer to *4. Solids, liquids and gases: Part 1* for more detail)

(d) Ideal gas molecules

(d)	**Ideal gas molecules**
Learners should:	
6.1	explain how molecules in a gas have random motion and that they exert a force, and hence a pressure, on the walls of a container
6.2	understand why there is an absolute zero of temperature, which is –273 °C
6.3	describe the Kelvin scale of temperature and be able to convert between the Kelvin and Celsius scales
6.4	understand why an increase in temperature results in an increase in the average speed of gas molecules
6.5	know that the Kelvin temperature of a gas is proportional to the average kinetic energy of its molecules
6.6	explain, for a fixed amount of gas, the qualitative relationship between: • pressure and volume at constant temperature • pressure and Kelvin temperature at constant volume
6.7	use the relationship between the pressure and Kelvin temperature of a fixed mass of gas at constant volume: $\frac{p_1}{T_1} = \frac{p_2}{T_2}$
6.8	use the relationship between the pressure and volume of a fixed mass of gas at constant temperature: $p_1V_1 = p_2V_2$

7 Magnetism and electromagnetism

The following sub-topics are covered in this section.

(a) Units

(b) Magnetism

(c) Electromagnetism

(d) Electromagnetic induction

(a)	**Units**
Learners should:	
7.1	use the following units: ampere (A), volt (V) and watt (W)

(b)	**Magnetism**
Learners should:	
7.2	know that magnets repel and attract other magnets and attract magnetic substances
7.3	describe the properties of magnetically hard and soft materials
7.4	understand the term 'magnetic field line'
7.5	know that magnetism is induced in some materials when they are placed in a magnetic field
7.6	*practical: investigate the magnetic field pattern for a permanent bar magnet and between two bar magnets*
7.7	describe how to use two permanent magnets to produce a uniform magnetic field pattern

(c)	**Electromagnetism**
Learners should:	
7.8	know that an electric current in a conductor produces a magnetic field around it
7.9P	**describe the construction of electromagnets**
7.10P	**draw magnetic field patterns for a straight wire, a flat circular coil and a solenoid when each is carrying a current**
7.11P	**know that there is a force on a charged particle when it moves in a magnetic field as long as its motion is not parallel to the field**
7.12	understand why a force is exerted on a current-carrying wire in a magnetic field and how this effect is applied in simple d.c. electric motors and loudspeakers
7.13	use the left-hand rule to predict the direction of the resulting force when a wire carries a current perpendicular to a magnetic field
7.14	describe how the force on a current-carrying conductor in a magnetic field changes with the magnitude and direction of the field and current

(d)	**Electromagnetic induction**
Learners should:	
7.15	know that a voltage is induced in a conductor or a coil when it moves through a magnetic field or when a magnetic field changes through it and describe the factors that affect the size of the induced voltage
7.16	describe the generation of electricity by the rotation of a magnet within a coil of wire and of a coil of wire within a magnetic field, and describe the factors that affect the size of the induced voltage
7.17P	**describe the structure of a transformer and understand that a transformer changes the size of an alternating voltage by having different numbers of turns on the input and output sides**
7.18P	**explain the use of step-up and step-down transformers in the large-scale generation and transmission of electrical energy**
7.19P	**know and use the relationship between input (primary) and output (secondary) voltages and the turns ratio for a transformer:** $\dfrac{\textbf{input (primary) voltage}}{\textbf{output (secondary) voltage}} = \dfrac{\textbf{primary turns}}{\textbf{secondary turns}}$
7.20P	**know and use the relationship:** **input power = output power** $\boldsymbol{V_p I_p = V_s I_s}$ **for 100% efficiency**

8 Radioactivity and particles

The following sub-topics are covered in this section.

(a) Units

(b) Radioactivity

(c) Fission and fusion

(a)	**Units**
Learners should:	
8.1	use the following units: becquerel (Bq), centimetre (cm), hour (h), minute (min) and second (s)

(b)	**Radioactivity**
Learners should:	
8.2	describe the structure of an atom in terms of protons, neutrons and electrons and use symbols such as ${}^{14}_{6}\mathrm{C}$ to describe particular nuclei
8.3	know the terms atomic (proton) number, mass (nucleon) number and isotope
8.4	know that alpha (α) particles, beta (β^-) particles, and gamma (γ) rays are ionising radiations emitted from unstable nuclei in a random process
8.5	describe the nature of alpha (α) particles, beta (β^-) particles and gamma (γ) rays, and recall that they may be distinguished in terms of penetrating power and ability to ionise
8.6	*practical: investigate the penetration powers of different types of radiation using either radioactive sources or simulations*
8.7	describe the effects on the atomic and mass numbers of a nucleus of the emission of each of the four main types of radiation (alpha, beta, gamma and neutron radiation)
8.8	understand how to balance nuclear equations in terms of mass and charge
8.9	know that photographic film or a Geiger−Müller detector can detect ionising radiations
8.10	explain the sources of background (ionising) radiation from Earth and space
8.11	know that the activity of a radioactive source decreases over a period of time and is measured in becquerels
8.12	know the definition of the term 'half-life' and understand that it is different for different radioactive isotopes
8.13	use the concept of the half-life to carry out simple calculations on activity, including graphical methods
8.14	describe uses of radioactivity in industry and medicine
8.15	describe the difference between contamination and irradiation

(b)	Radioactivity
Learners should:	
8.16	describe the dangers of ionising radiations, including: • that radiation can cause mutations in living organisms • that radiation can damage cells and tissue • the problems arising from the disposal of radioactive waste and how the associated risks can be reduced

(c)	Fission and fusion
Learners should:	
8.17	know that nuclear reactions, including fission, fusion and radioactive decay, can be a source of energy
8.18	understand how a nucleus of U-235 can be split (the process of fission) by collision with a neutron and that this process releases energy as kinetic energy of the fission products
8.19	know that the fission of U-235 produces two radioactive daughter nuclei and a small number of neutrons
8.20	describe how a chain reaction can be set up if the neutrons produced by one fission strike other U-235 nuclei
8.21	describe the role played by the control rods and moderator in the fission process
8.22	understand the role of shielding around a nuclear reactor
8.23	explain the difference between nuclear fusion and nuclear fission
8.24	describe nuclear fusion as the creation of larger nuclei resulting in a loss of mass from smaller nuclei, accompanied by a release of energy
8.25	know that fusion is the energy source for stars
8.26	explain why nuclear fusion does not happen at low temperatures and pressures, due to electrostatic repulsion of protons

9 Astrophysics

The following sub-topics are covered in this section.

(a) Units

(b) Motion in the universe

(c) Stellar evolution

(d) Cosmology

(a)	**Units**
Learners should:	
9.1	use the following units: kilogram (kg), metre (m), metre/second (m/s), metre/second^2 (m/s^2), newton (N), second (s), newton/kilogram (N/kg)

(b)	**Motion in the universe**
Learners should:	
9.2	know that: • the universe is a large collection of billions of galaxies • a galaxy is a large collection of billions of stars • our solar system is in the Milky Way galaxy
9.3	understand why gravitational field strength, g, varies and know that it is different on other planets and the Moon from that on the Earth
9.4	explain that gravitational force: • causes moons to orbit planets • causes the planets to orbit the Sun • causes artificial satellites to orbit the Earth • causes comets to orbit the Sun
9.5	describe the differences in the orbits of comets, moons and planets
9.6	use the relationship between orbital speed, orbital radius and time period: $\text{orbital speed} = \frac{2 \times \pi \times \text{orbital radius}}{\text{time period}}$ $v = \frac{2 \times \pi \times r}{T}$

(c)	**Stellar evolution**
Learners should:	
9.7	understand how stars can be classified according to their colour
9.8	know that a star's colour is related to its surface temperature
9.9	describe the evolution of stars of similar mass to the Sun through the following stages: • nebula • star (main sequence) • red giant • white dwarf
9.10	describe the evolution of stars with a mass larger than the Sun
9.11P	**understand how the brightness of a star at a standard distance can be represented using absolute magnitude**
9.12P	**draw the main components of the Hertzsprung–Russell diagram (HR diagram)**

(d)	**Cosmology**
Learners should:	
9.13P	**describe the past evolution of the universe and the main arguments in favour of the Big Bang theory**
9.14P	**describe evidence that supports the Big Bang theory (red-shift and cosmic microwave background – CMB – radiation)**
9.15P	**describe that if a wave source is moving relative to an observer, there will be a change in the observed frequency and wavelength**
9.16P	**use the equation relating to change in wavelength, reference wavelength, velocity of a galaxy and the speed of light:** $\dfrac{\text{change in wavelength}}{\text{reference wavelength}} = \dfrac{\text{velocity of a galaxy}}{\text{speed of light}}$ $\dfrac{\lambda - \lambda_0}{\lambda_0} = \dfrac{\Delta\lambda}{\lambda_0} = \dfrac{v}{c}$
9.17P	**describe the red-shift in light received from galaxies at different distances away from the Earth**
9.18P	**explain why the red-shift of galaxies provides evidence for the expansion of the universe**

4 Assessment information

Assessment requirements

Paper number	Level	Assessment information	Number of marks allocated in the unit
Unit 1	1/2	Assessed through a 1 hour and 40 minute written examination, set and marked by Pearson. The paper is weighted at 50% of the qualification. A combination of different question styles, including multiple-choice questions, short-answer questions, calculations and extended open-response questions. Assesses all the content prescribed in **Section 2 Qualification at a glance, Content and assessment Unit 1 overview,** including content that is in bold and has a 'B' reference. Questions may come from set topic area across the Unit 1 area of the specification. Statements in bold cover some sub-topics in greater depth.	90
Unit 2	1/2	Assessed through a 1 hour and 40 minute written examination, set and marked by Pearson. The paper is weighted at 50% of the qualification. A combination of different question styles, including multiple-choice questions, short-answer questions, calculations and extended open-response questions. Assesses all the content prescribed in **Section 2 Qualification at a glance, Content and assessment Unit 2 overview**, including content that is in bold and has a 'B' reference. Questions may come from set topic area across the Unit 2 area of the specification. Statements in bold cover some sub-topics in greater depth.	90

Experimental skills

The best way to develop experimental skills is to embed practical investigations in teaching or theory. The development of knowledge and experimental skills can then happen together, leading to secure acquisition of both knowledge and skills.

Our practical investigations are embedded within *Section 3: Physics content* as specification points in italics. The skills developed through these and other practicals will be assessed through written examinations.

In the assessment of experimental skills, students may be tested on their ability to:

- solve problems set in a practical context
- apply scientific knowledge and understanding in questions with a practical context
- devise and plan investigations, using scientific knowledge and understanding when selecting appropriate techniques
- demonstrate or describe appropriate experimental and investigative methods, including safe and skilful practical techniques
- make observations and measurements with appropriate precision, record these methodically and present them in appropriate ways
- identify independent, dependent and control variables
- use scientific knowledge and understanding to analyse and interpret data to draw conclusions from experimental activities that are consistent with the evidence
- communicate the findings from experimental activities, using appropriate technical language, relevant calculations and graphs
- assess the reliability of an experimental activity
- evaluate data and methods, taking into account factors that affect accuracy and validity.

Calculators

Learners will be expected to have access to a suitable electronic calculator for all examination papers. Calculators that allow for the retrieval of text or formulae, or QWERTY keyboards will not be allowed for use in examinations.

Assessment objectives and weightings

		% in International GCSE (Modular)
AO1	Knowledge and understanding of physics	38–42
AO2	Application of knowledge and understanding, analysis and evaluation of physics	38–42
AO3	Experimental skills, analysis and evaluation of data and methods in physics	19–21
		100

Relationship of assessment objectives and units

Paper number	**Assessment objective**		
	AO1	**AO2**	**AO3**
Physics Unit 1	19–21%	19–21%	9.5–10.5%
Physics Unit 2	19–21%	19–21%	9.5–10.5%
Total for International GCSE (Modular)	38–42%	38–42%	19–21%

5 Administration and general information

Entries and forbidden combinations

Details of how to enter students for the examinations for this qualification can be found in our *International information manual*. A copy is made available to all examinations officers and is also available on our website.

Students should be advised that if they take two qualifications in the same subject, colleges, universities and employers are very likely to take the view that they have achieved only one of the two GCSEs/International GCSEs. Students or their advisers, who have any doubts about subject combinations should check with the institution to which they wish to progress before embarking on their programmes.

This qualification may not be taken alongside:

- Pearson Edexcel International GCSE in Science (Double Award) (Modular) (4XSD1)
- Pearson Edexcel International GCSE in Science (Double Award) (Linear) (4SD0)
- Pearson Edexcel International GCSE in Physics (Linear) (4PH1).

Access arrangements, reasonable adjustments, special consideration and malpractice

Equality and fairness are central to our work. Our equality policy requires all students to have equal opportunity to access our qualifications and assessments, and our qualifications to be awarded in a way that is fair to every learner.

We are committed to making sure that:

- learners with a protected characteristic (as defined by the UK Equality Act 2010) are not, when they are undertaking one of our qualifications, disadvantaged in comparison to students who do not share that characteristic
- all learners achieve the recognition they deserve for undertaking a qualification and that this achievement can be compared fairly to the achievement of their peers.

Language of assessment

Assessment of this qualification will be available in English only. All learner work must be in English.

We recommend that learners have the ability to read and write in English at Level B2 of the Common European Framework of Reference for Languages.

Access arrangements

Access arrangements are agreed before an assessment. They allow students with special educational needs, disabilities or temporary injuries to:

- access the assessment
- show what they know and can do without changing the demands of the assessment.

The intention behind an access arrangement is to meet the particular needs of an individual learner with a disability without affecting the integrity of the assessment. Access arrangements are the principal way in which awarding bodies comply with the duty under the UK Equality Act 2010 to make 'reasonable adjustments'.

Access arrangements should always be processed at the start of the course. Learners will then know what is available and have the access arrangement(s) in place for assessment.

Reasonable adjustments

The UK Equality Act 2010 requires an awarding organisation to make reasonable adjustments where a student with a disability would be at a substantial disadvantage in undertaking an assessment. The awarding organisation is required to take reasonable steps to overcome that disadvantage.

A reasonable adjustment for a particular learner may be unique to that individual and therefore might not be in the list of available access arrangements.

Whether an adjustment will be considered reasonable will depend on a number of factors, including:

- the needs of the learner with the disability
- the effectiveness of the adjustment
- the cost of the adjustment
- the likely impact of the adjustment on the learner with the disability and other learners.

An adjustment will not be approved if it involves unreasonable costs to the awarding organisation or unreasonable timeframes or if it affects the security or integrity of the assessment. This is because the adjustment is not 'reasonable'.

Special considerations

Special consideration is a post-examination adjustment to a learner's mark or grade to reflect temporary injury, illness or other indisposition at the time of the examination/assessment, which has had, or is reasonably likely to have had, a material effect on a learner's ability to take an assessment or demonstrate their level of attainment in an assessment.

Further information

Please see our website for further information about how to apply for access arrangements and special considerations.

For further information about access arrangements, reasonable adjustments and special considerations, please refer to the JCQ website: www.jcq.org.uk.

Candidate malpractice

Candidate malpractice refers to any act by a candidate that compromises or seeks to compromise the process of assessment which undermines the integrity of the qualifications or the validity of results/certificates.

Candidate malpractice in controlled assessments discovered before the candidate has signed the declaration of authentication form does not need to be reported to Pearson.

Candidate malpractice found in controlled assessments after the declaration of authenticity has been signed, and in examinations **must** be reported to Pearson on a *JCQ Form M1* (available at http://www.jcq.org.uk/exams-office/malpractice). The completed form should be emailed to candidatemalpractice@pearson.com. Please provide as much information and supporting documentation as possible. Note that the final decision regarding appropriate sanctions lies with Pearson.

Failure to report candidate malpractice constitutes staff or centre malpractice.

Staff/centre malpractice

Staff and centre malpractice includes both deliberate malpractice and maladministration of our qualifications. As with candidate malpractice, staff and centre malpractice is any act that compromises or seeks to compromise the process of assessment, or undermines the integrity of the qualifications or the validity of results/certificates.

All cases of suspected staff malpractice and maladministration **must** be reported immediately, before any investigation is undertaken by the centre, to Pearson on a *JCQ Form M2(a)* (available at www.jcq.org.uk/exams-office/malpractice).

The form, supporting documentation and as much information as possible should be emailed to pqsmalpractice@pearson.com. Note that the final decision regarding appropriate sanctions lies with Pearson.

Failure to report malpractice itself constitutes malpractice.

More-detailed guidance on malpractice can be found in the latest version of the document *JCQ Suspected Malpractice: Policies and Procedures,* available at www.jcq.org.uk/exams-office/malpractice.

Awarding and reporting

The International GCSE qualification (Modular) will be graded and certificated on a nine-grade scale from 9 to 1 using the total UMS where 9 is the highest grade. Individual unit results will be reported. The first certification opportunity for the Pearson Edexcel International GCSE in Physics (Modular) will be in August 2025. Learners whose level of achievement is below the minimum judged by Pearson to be of sufficient standard to be recorded on a certificate will receive an unclassified U result.

Unit results

This shows the total UMS for each unit and the associated grade boundaries. Students will receive a uniform mark between 0 and the maximum uniform mark for each unit.

Unit 1 (code: 4WPH1)

Unit Grade	Maximum uniform mark	9	8	7	6	5	4	3	2	1	U
	120	108	96	84	72	60	48	36	24	12	0

Unit 2 (code: 4WPH2)

Unit Grade	Maximum uniform mark	9	8	7	6	5	4	3	2	1	U
	120	108	96	84	72	60	48	36	24	12	0

Qualification results

This shows the total UMS for the qualification as a whole and the associated grade boundaries.
The minimum uniform marks required for each grade: International GCSE Physics (modular) (cash-in code: 4XPH1)

Qualification Grade	Maximum uniform mark	9	8	7	6	5	4	3	2	1	U
	240	216	192	168	144	120	96	72	48	24	0

Students with a uniform mark range 0-23 will be Unclassified.

Resitting of units

Learners can resit any unit irrespective of whether the qualification is to be cashed in. If a learner resits a unit more than once, only the better of the two most recent attempts of that unit will be available for aggregation to a qualification grade.

Results of units will be held in Pearson's Edexcel's unit bank for as many years as this specification remains available. Once International GCSE in Physics (Modular) has been certificated, all unit results are deemed to be used up at that level. These results cannot be used again towards a further award of the same qualification at the same level.

Learner recruitment and progression

Pearson’s policy concerning recruitment to our qualifications is that:

- they must be available to anyone who is capable of reaching the required standard
- they must be free from barriers that restrict access and progression
- equal opportunities exist for all learners.

Prior learning and other requirements

The qualification builds on the content, knowledge and skills developed in the Key Stage 3 Programme of Study (ages 11–14) or international equivalences for science.

Progression

Learners can progress from this qualification to:

- International Advanced Subsidiary Level, for example in Physics
- International Advanced Level, for example in Physics
- GCE Advanced Subsidiary Level, for example in Physics
- GCE Advanced Level, for example in Physics
- Level 3 vocational qualifications in science, for example BTEC Level 3 in Applied Science
- other comparable, Level 3 qualifications, such as the International Baccalaureate
- employment, for example in a science-based industry where an apprenticeship may be available.

Appendices

Appendix 1: Codes

Type of code	Use of code	Code
Cash-in codes	Cash-in codes are used in combination with entry codes to aggregate the learner's unit scores to obtain the overall grade for the qualification.	4XPH1
Entry codes	To enter the learner for their examination, unit codes are used as entry codes. To obtain the overall grade for the qualification, entry codes are used in combination with cash-in codes.	Please refer to the Pearson Edexcel *Information Manual*, available on the Pearson qualifications website.
Unit codes	Each unit is assigned a unit code. This unit code is used as an entry code to indicate that a learner wishes to take the assessment for a particular unit.	Unit 1: 4WPH1/1P Unit 2: 4WPH2/1P

Appendix 2: Transferable skills

The need for transferable skills

In recent years, higher education institutions and employers have consistently flagged the need for learners 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.

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 that 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 qualification. Some skills are directly assessed. Pearson materials will support you in identifying these skills and developing these skills in learners.

The table on the next page 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 learners' development is provided on the subject pages of our website: qualifications.pearson.com.

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[1] OECD – *Better Skills, Better Jobs, Better Lives: A Strategic Approach to Skills Policies* (OECD Publishing, 2012)

[2] Koenig J A, National Research Council – *Assessing 21st Century Skills: Summary of a Workshop* (National Academies Press, 2011)

Cognitive skills	Cognitive processes and strategies	• Critical thinking • Problem solving • Analysis • Reasoning • Interpretation • Decision making • Adaptive learning • Executive function
	Creativity	• Creativity • Innovation
Intrapersonal skills	Intellectual openness	• Adaptability • Personal and social responsibility • Continuous learning • Intellectual interest and curiosity
	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 • Interpersonal skills
	Leadership	• Leadership • Responsibility • Assertive communication • Self-presentation

Problem solving in the application of unifying patterns and themes in physics, and using them in new and changing situations.

Initiative when using knowledge of physics, independently (without guided learning), to further own understanding.

Communication to convey a science process or technique (verbally or in writing) to peers and teachers and answer questions from others.

Appendix 3: Mathematical skills

The table below identifies the mathematical skills that will be developed and assessed throughout this qualification. These are not explicitly referenced in the content. Details of the mathematical skills in other science subjects are given for reference.

		B	C	P
1	**Arithmetic and numerical computation**			
A	Recognise and use numbers in decimal form	✓	✓	✓
B	Recognise and use numbers in standard form	✓	✓	✓
C	Use ratios, fractions, percentages, powers and roots	✓	✓	✓
D	Make estimates of the results of simple calculations, without using a calculator	✓		✓
E	Use calculators to handle sin x and $\sin^{-1} x$, where x is expressed in degrees			✓
2	**Handling data**			
A	Use an appropriate number of significant figures	✓	✓	✓
B	Understand and find the arithmetic mean (average)	✓	✓	✓
C	Construct and interpret bar charts	✓	✓	✓
D	Construct and interpret frequency tables, diagrams and histograms	✓		✓
E	Understand the principles of sampling as applied to scientific data	✓		
F	Understand simple probability	✓	✓	✓
G	Understand the terms mode and median	✓		
H	Use a scatter diagram to identify a pattern or trend between two variables	✓	✓	✓
I	Make order of magnitude calculations	✓	✓	✓
3	**Algebra**			
A	Understand and use the symbols $<$, $>$, $\propto$, $\sim$		✓	✓
B	Change the subject of an equation	✓	✓	✓
C	Substitute numerical values into algebraic equations using appropriate units for physical quantities	✓	✓	✓
D	Solve simple algebraic equations	✓	✓	✓
4	**Graphs**			
A	Translate information between graphical and numerical form	✓	✓	✓
B	Understand that $y = mx + c$ represents a linear relationship		✓	✓
C	Plot two variables (discrete and continuous) from experimental or other data	✓	✓	✓
D	Determine the slope and intercept of a linear graph	✓	✓	✓
E	Understand, draw and use the slope of a tangent to a curve as a measure of rate of change		✓	✓
F	Understand the physical significance of area between a curve and the x-axis, and measure it by counting squares as appropriate			✓

		B	C	P
5	**Geometry and trigonometry**			
A	Use angular measures in degrees			✓
B	Visualise and represent 2D and 3D objects, including 2D representations of 3D objects			✓
C	Calculate areas of triangles and rectangles, surface areas and volumes of cubes	✓		✓

Appendix 4: Command word taxonomy

The following table lists the command words used in the external assessments.

Command word	Definition
Add/Label	Requires the addition or labelling of a stimulus material given in the question, for example labelling a diagram or adding units to a table.
Calculate	Obtain a numerical answer, showing relevant working.
Comment on	Requires the synthesis of a number of variables from data/information to form a judgement.
Compare	Looking for the similarities **or** differences of two (or more) things. Should not require the drawing of a conclusion. Answer must relate to both (or all) things mentioned in the question.
Complete	Requires the completion of a table/diagram.
Deduce	Draw/reach conclusion(s) from the information provided.
Describe	To give an account of something. Statements in the response need to be developed, as they are often linked but **do not** need to include a justification or reason.
Determine	The answer must have an element that is quantitative from the stimulus provided, or must show how the answer can be reached quantitatively. To gain maximum marks, there must be a quantitative element to the answer.
Design	Plan or invent a procedure from existing principles/ideas.
Discuss	• Identify the issue/situation/problem/argument that is being assessed within the question. • Explore all aspects of an issue/situation/problem/argument. • Investigate the issue/situation etc. by reasoning or argument.
Draw	Produce a diagram using a ruler or freehand.
Estimate	Find an approximate value, number or quantity from a diagram/given data or through a calculation.
Evaluate	Review information (e.g. data, methods) then bring it together to form a conclusion, drawing on evidence including strengths, weaknesses, alternative actions, relevant data or information. Come to a supported judgement of a subject's quality and relate it to its context.
Explain	An explanation requires a justification/exemplification of a point. The answer must contain some element of reasoning/justification – this can include mathematical explanations.
Give/State/Name	All of these command words are really synonyms. They generally all require recall of one or more pieces of information.
Give a reason/reasons	When a statement has been made and the requirement is only to give the reason(s) why.

Command word	Definition
Identify	Usually requires some key information to be selected from a given stimulus/resource.
Justify	Give evidence to support (either the statement given in the question or an earlier answer).
Measure	To determine the dimensions or angle from a diagram using an instrument such as a ruler or protractor.
Plot	Produce a graph by marking points accurately on a grid from data that is provided and then draw a line of best fit through these points. A suitable scale and appropriately labelled axes must be included if these are not provided in the question.
Predict	Give an expected result.
Show that	Verify the statement given in the question.
Sketch	Produce a freehand drawing. For a graph, this would need a line and labelled axes with important features indicated. The axes are not scaled.
State what is meant by	When the meaning of a term is expected but there are different ways for how these can be described.
Suggest	Use your knowledge to propose a solution to a problem in a novel context.
Write	When the question asks for an equation.
Verb proceeding a command word	
Analyse the data/graph to explain	Examine the data/graph in detail to provide an explanation.
Multiple choice questions	
What, Why, Where, Which, How many	Direct command words used for multiple-choice questions.

Appendix 5: Suggested practical investigations

The following suggestions are *additional* practical investigations that exemplify the scientific process. They can be used to supplement students' understanding of physics in addition to the practical investigations found in the main body of the content.

- Investigate the power consumption of low-voltage electrical items.
- Investigate factors affecting the generation of electric current by induction.
- Investigate how the nature of a surface affects the amount of energy radiated or absorbed.
- Investigate models to show refraction, such as toy cars travelling into a region of sand.
- Investigate the areas beyond the visible spectrum, such as those found by Herschel and Ritter, who discovered infrared and ultraviolet (UV) respectively.
- Investigate the relationship between potential difference (voltage), current and resistance.
- Investigate the relationship between force, mass and acceleration.
- Investigate the forces required to slide blocks along different surfaces, with differing amounts of friction.
- Investigate how crumple zones can be used to reduce the forces in collisions.
- Investigate forces between charges.
- Conduct experiments to show the relationship between potential difference (voltage), current and resistance, for a component whose resistance varies with a given factor, such as temperature, light intensity and pressure.
- Investigate the motion of falling.
- Investigate momentum during collisions.
- Investigate power by running up the stairs or lifting objects of different weights.
- Investigate the critical angle for Perspex®/air, glass/air or water/air boundaries.
- Investigate factors affecting the height of rebound of bouncing balls.
- Investigate the temperature and volume relationship for a gas.
- Investigate the volume and pressure relationship for a gas.
- Investigate the absorption of light by translucent materials in order to simulate the absorption of rays.

Safety is an overriding requirement for all practical work. Centres are responsible for ensuring that whenever their students complete practical work, appropriate safety procedures are followed.

Appendix 6: Physics formulae for relationships

The relationships listed below will **not** be provided for students either in the form given or in rearranged form.

(1) the relationship between average speed, distance moved and time taken:

$$\text{average speed} = \frac{\text{distance moved}}{\text{time taken}}$$

(2) the relationship between force, mass and acceleration:

force = mass × acceleration

(3) the relationship between acceleration, change in velocity and time taken:

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$$

(4) the relationship between momentum, mass and velocity:

momentum = mass × velocity

momentum = $m \times v$

(5) the relationship between density, mass and volume:

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

(6) the relationship between work done, force and distance moved:

work done = force × distance moved

(7) the energy relationships:

energy transferred = work done

kinetic energy = $\frac{1}{2}$ × mass × speed^2

gravitational potential energy = mass × g × height

(8) the relationship between mass, weight and gravitational field strength:

weight = mass × gravitational field strength

(9) the relationship between an applied force, the area over which it acts and the resulting pressure:

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

(10) The relationship between the moment of a force and its perpendicular distance from the pivot:

moment = force × perpendicular distance from the pivot

(11) the relationship between charge, current, voltage, resistance, energy and power:

charge = current × time

voltage = current × resistance

electrical power = voltage × current

energy transferred = charge × voltage

(12) the relationship between speed, frequency and wavelength of wave:

wave speed = frequency × wavelength

(13) the relationship between turns and voltage for a transformer:

$$\frac{\text{input (primary) voltage}}{\text{output (secondary) voltage}} = \frac{\text{primary turns}}{\text{secondary turns}}$$

(14) the relationship between refractive index, angle of incidence and angle of refraction:

$$n = \frac{\sin i}{\sin r}$$

(15) the relationship between refractive index and critical angle:

$$\sin c = \frac{1}{n}$$

(16) the relationship for efficiency:

$$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy output}} \times 100\%$$

(17) the relationship for pressure difference:

pressure difference = height × density × gravitational field strength

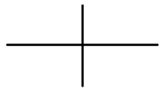
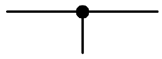
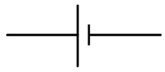
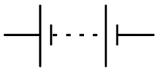
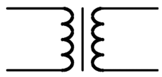
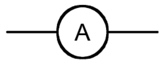
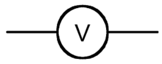
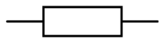
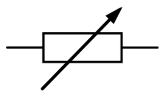
$p = h \times \rho \times g$

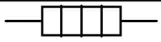
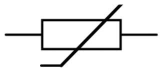
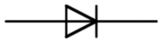
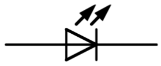
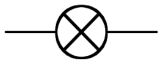
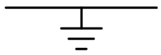
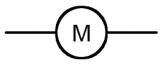
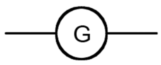
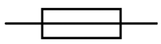
(18) input power = output power

$$V_p I_p = V_s I_s$$

for 100% efficiency

Appendix 7: Electrical circuit symbols

Description	Symbol
Conductors crossing with no connection	
Junction of conductors	
Open switch	
Cell	
Battery of cells	
Power supply (DC)	
Power supply (AC)	
Transformer	
Ammeter	
Voltmeter	
Fixed resistor	
Variable resistor	

Description	Symbol
Heater	
Thermistor	
Light-dependent resistor (LDR)	
Diode	
Light-emitting diode (LED)	
Lamp	
Loudspeaker	
Microphone	
Electric bell	
Earth or ground	
Motor	
Generator	
Fuse/circuit breaker	

Although these are the forms of circuit symbols that will be used in examination papers, there may be other internationally agreed symbols that are acceptable in learner answers.

Appendix 8: Glossary

Term	Definition
Assessment objectives	The requirements that learners need to meet to succeed in the qualification. Each assessment objective has a unique focus, which is then targeted in examinations or non-examined assessment (NEA). Assessment objectives may be assessed individually or in combination.
Cash-in codes	Cash-in codes are used in combination with entry codes to aggregate the learner's unit scores to obtain the overall grade for the qualification.
Entry codes	To enter the learner for their examination, unit codes are used as entry codes. To obtain the overall grade for the qualification, entry codes are used in combination with cash-in codes.
External assessment	Assessment set and marked by an awarding organisation, taken by centres at the same time in the global region.
JCQ	Joint Council for Qualifications. This is a group of UK exam boards which develops policy related to the administration of examinations.
Modular	Modular qualifications contain units of assessment. These units can be taken during the course of study. The final qualification grade is worked out from the combined unit results.
Uniform mark scale (UMS)	A learner's actual marks (or raw marks) will be converted into a UMS mark so that it is possible to see the proportionate result of a learner. The raw marks for each unit may differ, but the uniform mark will be the same.
Unit	A modular qualification will be divided into a number of units. Each unit will have its own assessment.
Unit codes	Each unit is assigned a unit code. This unit code is used as an entry code to indicate that a learner wishes to take the assessment for a particular unit.

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