# Key information for your AQA Physics GCSE Science

You are following the **AQA Physics Science GCSE** specification. This is worth 1 GCSE and will be graded from 1-9

## Physics units

1. Energy.
2. Electricity.
3. Particle model of matter.
4. Atomic structure.
5. Forces.
6. Waves.
7. Magnetism and electromagnetism.
8. Space physics.

### How will you be examined?

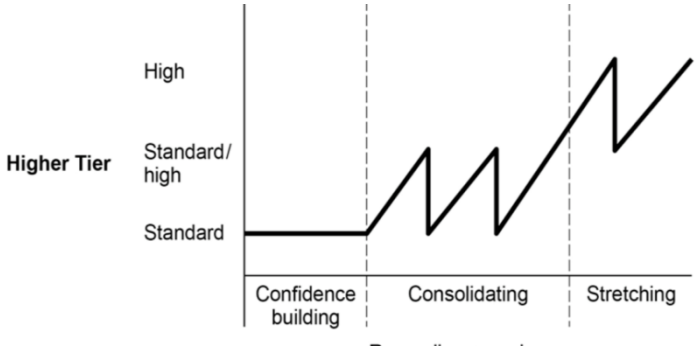
You will take 2 exams at the end of the course, each lasting 1 hour 45 minutes.
Higher tier allows you to gain grades from 4 to 9. If you get a mark below the grade boundary for a 4 you will be given U (unclassified), unless you are very close when you will be awarded 4-3.

### What is in each exam paper?

- Each exam will test different units. Below are listed the content of each of the papers.
- Also at least 15% of the exam questions will test your understanding of the 10 required practicals you have carried out in your Physics GCSE. This will include describing the method, explaining how to present results (graph to plot) and what information can be obtained from the graph. (Refer to your separate revision booklet we have produced to help you with your required practical revision).

| Paper 1: | Paper 2: |
|---|---|
| **What's assessed**<br>Topics 1–4: Energy; Electricity; Particle model of matter; and Atomic structure. | **What's assessed**<br>Topics 5–8: Forces; Waves; Magnetism and electromagnetism; and Space physics.<br>Questions in Paper 2 may draw on an understanding of energy changes and transfers due to heating, mechanical and electrical work and the concept of energy conservation from Energy and Electricity. |
| **How it's assessed**<br>• Written exam: 1 hour 45 minutes<br>• Foundation and Higher Tier<br>• 100 marks<br>• 50 % of GCSE | **How it's assessed**<br>• Written exam: 1 hour 45 minutes<br>• Foundation and Higher Tier<br>• 100 marks<br>• 50 % of GCSE |
| **Questions**<br>Multiple choice, structured, closed short answer and open response. | **Questions**<br>Multiple choice, structured, closed short answer and open response. |

## How will the exams be structured?




- At the start. Standard demand questions (grades 4-5). These questions are the same as those at the end of the foundation level paper.
- In the middle, questions that start at standard demand and rise to high demand (grades 6-7). Dropping back to start at standard demand for the next question.
- Final questions are high demand questions (grades 8-9)

## What resources can I use to help me revise?

- You have a revision guide given to you in year 10. Use it to revise for end of topic tests and to help with homework, so you start to familiarise yourself with it.
- Key notes in your exercise book
- Revision booklet outlining the required practicals (available for summer exams)
- Personal Learning checklists for each topic, so you know what you need to be able to do and can self-assess which parts your need to focus on more in your revision.
- Collated exam papers with answers for each module for final practice and revision (available for summer exams)
- KS4 Bitesize website.
- Doddle revision resources.

## Mathematical skills tested (Refer to your separate Maths skills booklet for details)

| 1 | Arithmetic and numerical computation |
|---|---|
| a | Recognise and use expressions in decimal form |
| b | Recognise and use expressions in standard form |
| c | Use ratios, fractions and percentages |
| d | Make estimates of the results of simple calculations |

| 2 | Handling data |
|---|---|
| a | Use an appropriate number of significant figures |
| b | Find arithmetic means |
| c | Construct and interpret frequency tables and diagrams, bar charts and histograms |
| f | Understand the terms mean, mode and median |
| g | Use a scatter diagram to identify a correlation between two variables |
| h | Make order of magnitude calculations |

| 3 | Algebra |
|---|---|
| a | Understand and use the symbols: =, <, <<, >>, >, ∝ , ~ |
| 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 numeric form |
| b | Understand that $y = mx + c$ represents a linear relationship |
| c | Plot two variables from experimental or other data |
| d | Determine the slope and intercept of a linear graph |
| e | 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 |

| 5 | Geometry and trigonometry |
|---|---|
| a | Use angular measures in degrees |
| b | Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects |
| c | Calculate areas of triangles and rectangles, surface areas and volumes of cubes |

## Key ideas that go through the syllabus

The complex and diverse phenomena of the natural and man-made world can be described in terms of a small number of key ideas in physics.

These key ideas are of universal application, and we have embedded them throughout the subject content. They underpin many aspects of the science assessment and will therefore be assessed across all papers.

Key ideas in physics include:

- the use of models, as in the particle model of matter or the wave models of light and of sound
- the concept of cause and effect in explaining such links as those between force and acceleration, or between changes in atomic nuclei and radioactive emissions
- the phenomena of 'action at a distance' and the related concept of the field as the key to analysing electrical, magnetic and gravitational effects
- that differences, for example between pressures or temperatures or electrical potentials, are the drivers of change
- that proportionality, for example between weight and mass of an object or between force and extension in a spring, is an important aspect of many models in science
- that physical laws and models are expressed in mathematical form.

# What required practicals do I need to know about?

Below is a list of the required practicals you need to know for your Physics GCSE. Refer to the revision booklets to learn the method and outcome of them.

| Required practical number | In which paper? | What does the required practical activity involve? |
|---|---|---|
| 1 | Paper 1 | An investigation to determine the specific heat capacity of one or more materials. |
| 2 | Paper 1 | Investigate the effectiveness of different materials as thermal insulators and the factors that may affect the thermal insulation properties of a material. |
| 3 | Paper1 | Use circuit diagrams to set up and investigate the factors affecting resistance of electrical circuits. This should include:<br>• The length of a wire at constant temperature<br>• Combinations of resistors in series parallel |
| 4 | Paper 1 | Use circuit diagrams to construct appropriate circuits to investigate the current – Voltage (I –V) characteristics of the following components; filament lamp, diode and resistor at a constant temperature. |
| 5 | Paper 1 | Use appropriate apparatus to make and record the measurements needed to determine the densities of regular and irregular solids and liquids. |
| 6 | Paper 2 | Investigate the relationship between force and extension of a spring. |
| 7 | Paper 2 | • Investigate the effect of varying the force, on the acceleration of an object with constant mass.<br>• Investigate the effect of varying the mass of an object on the acceleration produced by a constant force. |
| 8 | Paper 2 | Make observations and take appropriate measurements, to measure the frequency and wavelength of waves in a ripple tank and waves in solid. Use the frequency and wavelength measured to calculate the speed of the waves. |
| 9 | Paper 1 | Investigate the reflection of light by different types of surface and the refraction of light by different substances. |
| 10 | Paper 2 | Investigate how the amount of infrared radiation absorbed or radiated by a surface depends on the nature of that surface. |

# What equations do I need to learn and which ones will be given to me in the exam?

**These 21 equations you MUST LEARN and be able to recall in the exam. (HT = higher tier paper only)**

| Equation number | Word equation | Symbol equation |
|---|---|---|
| 1 | weight = mass × gravitational field strength ($g$) | $W = m\,g$ |
| 2 | work done = force × distance (along the line of action of the force) | $W = F\,s$ |
| 3 | force applied to a spring = spring constant × extension | $F = k\,e$ |
| 4 | distance travelled = speed × time | $s = v\,t$ |
| 5 | acceleration = $\frac{\text{change in velocity}}{\text{time taken}}$ | $a = \frac{\Delta v}{t}$ |
| 6 | resultant force = mass × acceleration | $F = m\,a$ |
| 7 HT | momentum = mass × velocity | $p = m\,v$ |
| 8 | kinetic energy = 0.5 × mass × (speed)$^2$ | $E_k = \frac{1}{2}m\,v^2$ |
| 9 | gravitational potential energy = mass × gravitational field strength ($g$) × height | $E_p = m\,g\,h$ |
| 10 | power = $\frac{\text{energy transferred}}{\text{time}}$ | $P = \frac{E}{t}$ |
| 11 | power = $\frac{\text{work done}}{\text{time}}$ | $P = \frac{W}{t}$ |
| 12 | efficiency = $\frac{\text{useful output energy transfer}}{\text{total input energy transfer}}$ | |
| 13 | efficiency = $\frac{\text{useful power output}}{\text{total power input}}$ | |
| 14 | wave speed = frequency × wavelength | $v = f\,\lambda$ |
| 15 | charge flow = current × time | $Q = I\,t$ |
| 16 | potential difference = current × resistance | $V = I\,R$ |
| 17 | power = potential difference × current | $P = V\,I$ |
| 18 | power = (current)$^2$ × resistance | $P = I^2\,R$ |
| 19 | energy transferred = power × time | $E = P\,t$ |
| 20 | energy transferred = charge flow × potential difference | $E = Q\,V$ |
| 21 | density = $\frac{\text{mass}}{\text{volume}}$ | $\rho = \frac{m}{V}$ |

**These equations will be given to you in the exam.**

Students should be able to select and apply the following equations from the *Physics equation sheet*.

Equations required for higher tier papers only are indicated by HT in the left-hand column.

| Equation number | Word equation | Symbol equation |
|---|---|---|
| 1 | (final velocity)$^2$ – (initial velocity)$^2$ = 2 × acceleration × distance | $v^2 - u^2 = 2\,a\,s$ |
| 2 | elastic potential energy = 0.5 × spring constant × (extension)$^2$ | $E_e = \frac{1}{2}\,k\,e^2$ |
| 3 | change in thermal energy = mass × specific heat capacity × temperature change | $\Delta E = m\,c\,\Delta\theta$ |
| 4 | period = $\frac{1}{\text{frequency}}$ | |
| 5 HT | force on a conductor (at right angles to a magnetic field) carrying a current = magnetic flux density × current × length | $F = B\,I\,l$ |
| 6 | thermal energy for a change of state = mass × specific latent heat | $E = m\,L$ |
| 7 HT | potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil | $V_s\,I_s = V_p\,I_p$ |

# Prefixes and converting to base units

| Name | Symbol | Value (how to convert) | What it is |
|---|---|---|---|
| **Giga** | **G** | **x $10^9$** | **billion (1,000,000,000)** |
| **Mega** | **M** | **x $10^6$** | **million (1,000,000)** |
| **Kilo** | **K** | **x $10^3$** | **thousand (1,000)** |
| | | | |
| **milli** | **m** | **x $10^{-3}$** | **thousandth (0.001)** |
| **micro** | μ | **x $10^{-6}$** | **millionth (0.000001)** |
| **nano** | N | **x $10^{-9}$** | **billionth (0.000000001)** |