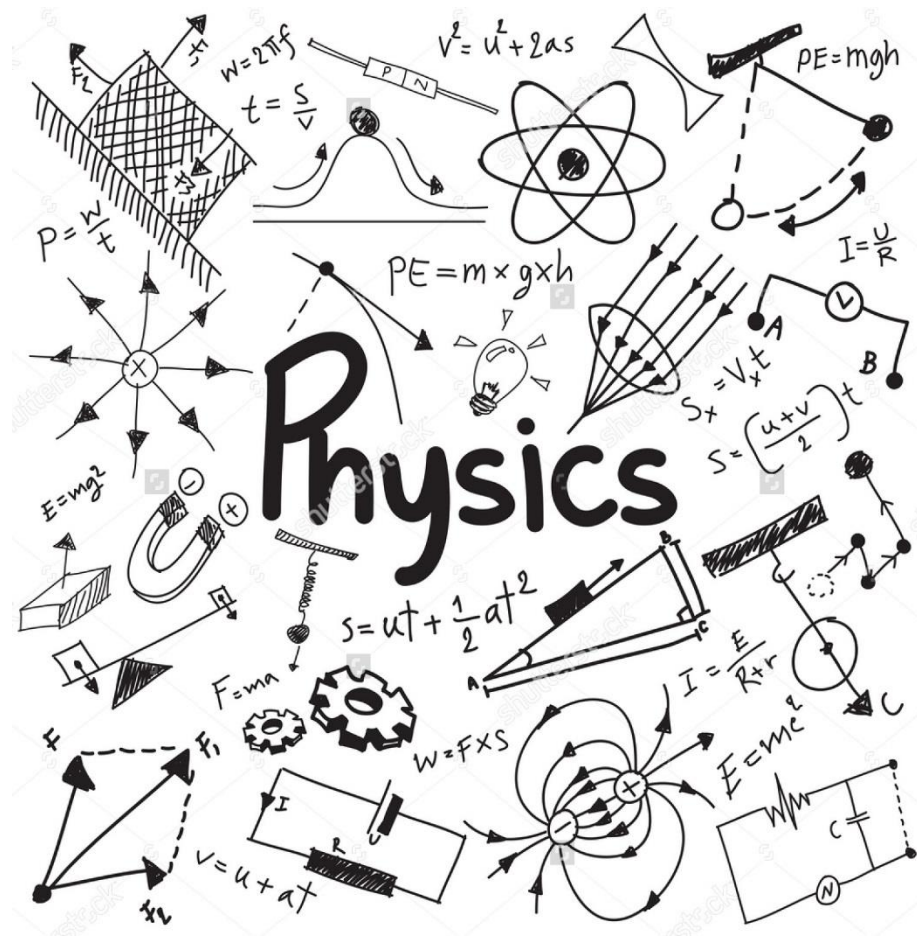# GCSE PHYSICS

# Core Practicals

# Log Book

Name:

Class:

Teacher:

Target:

**Students are required to carry out all core practicals and make a contemporaneous record of work undertaken.**

The following codes are used in this document:

- **AT** – use of apparatus and techniques
- **WS**- working scientifically skills
- **MS**– mathematical skills.

You will be required to use certain techniques and apparatus and demonstrate working scientifically and mathematics skills as described in each of the core practicals below. Questions about these practicals, their procedures, techniques and skills will be included in your final GCSE exams. GCSE exam papers will contain a number of different types of question which will assess your practical skills and your understanding of practical techniques.

1. Questions that require a knowledge and understanding of a specific required practical activity procedure.

2. Questions that require a knowledge and understanding of apparatus and techniques from the list, but do not relate to a specific required practical activity.

3. Questions set in a practical context where students require an understanding of the science rather than direct experience of the practical activity**.**

# Once a core practical has been completed you need to add the date of completion to this log.

**Required practical activity –Specific heat capacity**

**An investigation to determine the specific heat capacity of one or more materials. The investigation will involve linking the decrease of one energy store (or work done) to the increase in temperature and subsequent increase in thermal energy stored.**

|  | Date completed |
|---|---|
| **Apparatus and techniques**<br>AT1 – use appropriate apparatus to make and record measurements of mass, time and temperature accurately.<br>AT5 – use, in a safe manner, appropriate apparatus to measure energy changes/transfers and associated values such as work done. |  |
| **Key opportunities for skills development**<br>WS 2.1 – Use scientific theories and explanations to develop hypotheses.<br>WS 2.2 – Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena.<br>WS 2.3 – Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment.<br>WS 2.4 – Carry out experiments appropriately having due regard for the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations. |  |

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| WS 2.6 – Make and record observations and measurements using a range of apparatus and methods.<br>WS 2.7 – Evaluate methods and suggest possible improvements and further investigations.<br>WS 3.1 – Present observations and other data using appropriate methods.<br>WS 3.2 – Translate data from one form to another.<br>WS 3.3 – Carry out and represent mathematical and statistical analysis.<br>WS 3.4 – Represent the distribution of results and make estimations of uncertainty.<br>WS 3.5 – Interpret observations and other data (presented in verbal, diagrammatic, graphical, symbolic or numerical form), including identifying patterns and trends, making inferences and drawing conclusions.<br>WS 3.6 – Present reasoned explanations including relating data to hypotheses.<br>WS 3.7 – Be objective, evaluate data in terms of accuracy, precision, repeatability and reproducibility and identify potential sources of random and systematic error.<br>WS 3.8 – Communicate the scientific rationale for investigations, methods used, findings and reasoned conclusions through written and electronic reports and presentations using verbal, diagrammatic, graphical, numerical and symbolic forms.<br>WS 4.2 – Recognise the importance of scientific quantities and understand how they are determined.<br>WS 4.3 – Use SI units (eg kg, g, mg; km, m, mm; kJ, J) and IUPAC chemical nomenclature unless inappropriate.<br>WS 4.6 – Use an appropriate number of significant figures in calculation.<br>MS 2a – Use an appropriate number of significant figures.<br>MS 2b – Find arithmetic means.<br>MS 3b – Change the subject of an equation.<br>MS 3c – Substitute numerical values into algebraic equations using appropriate units for physical quantities. | |

**Required practical activity - Insulators**

**Investigate the effectiveness of different materials as thermal insulators and the factors that may affect the thermal insulation properties of a material.**

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| **Apparatus and techniques requirements.**<br>AT 1 – use appropriate apparatus to make and record a range of measurements accurately, including length, area, mass, time, volume and temperature.<br>AT 5 – use, in a safe manner, appropriate apparatus to measure energy changes/transfers. | |
| **Key opportunities for skills development**<br><br>WS 1.2 – Use a variety of models such as representational, spatial, descriptive, computational and mathematical to solve problems, make predictions and to develop scientific explanations and understanding of familiar and unfamiliar facts.<br>WS 2.1 – Use scientific theories and explanations to develop hypotheses.<br>WS 2.2 – Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena.<br>WS 2.3 – Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment. | |

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| WS 2.4 – Carry out experiments appropriately having due regard for the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations. <br> WS 2.6 – Make and record observations and measurements using a range of apparatus and methods. <br> WS 2.7 – Evaluate methods and suggest possible improvements and further investigations. <br> WS 3.1 – Present observations and other data using appropriate methods. <br> WS 3.3 – Carry out and represent mathematical and statistical analysis. <br> WS 3.4 – Represent the distribution of results and make estimations of uncertainty. <br> WS 3.5 – Interpret observations and other data (presented in verbal, diagrammatic, graphical, symbolic or numerical form), including identifying patterns and trends, making inferences and drawing conclusions. <br> WS 3.6 – Present reasoned explanations including relating data to hypotheses. <br> WS 3.8 – Communicate the scientific rationale for investigations, methods used, findings and reasoned conclusions through written and electronic reports and presentations using verbal, diagrammatic, graphical, numerical and symbolic forms. <br> WS 4.2 – Recognise the importance of scientific quantities and understand how they are determined. <br> WS 4.3 – Use SI units (eg kg, g, mg; km, m, mm; kJ, J) and IUPAC chemical nomenclature unless inappropriate. <br> WS 4.6 – Use an appropriate number of significant figures in calculation. <br> MS 2a – Use an appropriate number of significant figures. <br> MS 2c – Construct and interpret frequency tables and diagrams, bar charts and histograms. <br> MS 4c – Plot two variables from experimental or other data. <br> MS 5c – Calculate areas of triangles and rectangles, surface areas and volumes of cubes. | |

**Required practical activity – Circuits, resistance**

**Use circuit diagrams to set up and check appropriate circuits to investigate the factors affecting the resistance of electrical circuits. This should include:**

**• the length of a wire at constant temperature**

**• combinations of resistors in series and parallel.**

| | Date completed |
|---|---|
| **Apparatus and techniques** <br> AT 1 – use appropriate apparatus to measure and record length accurately. <br> AT 6 – use appropriate apparatus to measure current, potential difference and resistance. <br> AT 7 – use circuit diagrams to construct and check series and parallel circuits. | |
| **Key opportunities for skills development** <br> WS 2.1 – Use scientific theories and explanations to develop hypotheses. <br> WS 2.2 – Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena. <br> WS 2.3 – Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment. | |

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| WS 2.4 – Carry out experiments appropriately having due regard for the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations. | |
| WS 2.5 – Recognise when to apply a knowledge of sampling techniques to ensure any samples collected are representative. | |
| WS 2.6 – Make and record observations and measurements using a range of apparatus and methods. | |
| WS 2.7 – Evaluate methods and suggest possible improvements and further investigations. | |
| WS 3.1 – Present observations and other data using appropriate methods. | |
| WS 3.2 – Translate data from one form to another. | |
| WS 3.3 – Carry out and represent mathematical and statistical analysis. | |
| WS 3.4 – Represent the distribution of results and make estimations of uncertainty. | |
| WS 3.5 – Interpret observations and other data (presented in verbal, diagrammatic, graphical, symbolic or numerical form), including identifying patterns and trends, making inferences and drawing conclusions. | |
| WS 3.6 – Present reasoned explanations including relating data to hypotheses. | |
| WS 3.7 – Be objective, evaluate data in terms of accuracy, precision, repeatability and reproducibility and identify potential sources of random and systematic error. | |
| WS 3.8 – Communicate the scientific rationale for investigations, methods used, findings and reasoned conclusions through written and electronic reports and presentations using verbal, diagrammatic, graphical, numerical and symbolic forms. | |
| WS 4.2 – Recognise the importance of scientific quantities and understand how they are determined. | |
| WS 4.3 – Use SI units (eg kg, g, mg; km, m, mm; kJ, J) and IUPAC chemical nomenclature unless inappropriate. | |
| WS 4.6 – Use an appropriate number of significant figures in calculation. | |
| MS 2a – Use an appropriate number of significant figures. | |
| MS 2b – Find arithmetic means. | |
| MS 4b – understand that $y = mx + c$ represents a linear relationship. | |
| MS 4c – Plot two variables from experimental or other data. | |
| MS 4d – Determine the slope and intercept of a linear graph. | |

**Required practical activity – I-V Characteristics**

**Use circuit diagrams to construct appropriate circuits to investigate the I–V characteristics of a variety of circuit elements including a filament lamp, a diode and a resistor at constant temperature.**

| | Date completed |
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| **Apparatus and techniques**<br><br>AT 6 – use appropriate apparatus to measure current and potential difference and to explore the characteristics of a variety of circuit elements.<br>AT 7 – use circuit diagrams to construct and check series and parallel circuits including a variety of common circuit elements. | |
| **Key opportunities for skills development**<br><br>WS 2.1 – Use scientific theories and explanations to develop hypotheses. | |

WS 2.2 – Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena.

WS 2.3 – Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment.

WS 2.4 – Carry out experiments appropriately having due regard for the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations.

WS 2.5 – Recognise when to apply a knowledge of sampling techniques to ensure any samples collected are representative.

WS 2.6 – Make and record observations and measurements using a range of apparatus and methods.

WS 2.7 – Evaluate methods and suggest possible improvements and further investigations.

WS 3.1 – Present observations and other data using appropriate methods.

WS 3.2 – Translate data from one form to another.

WS 3.3 – Carry out and represent mathematical and statistical analysis.

WS 3.4 – Represent the distribution of results and make estimations of uncertainty.

WS 3.5 – Interpret observations and other data (presented in verbal, diagrammatic, graphical, symbolic or numerical form), including identifying patterns and trends, making inferences and drawing conclusions.

WS 3.6 – Present reasoned explanations including relating data to hypotheses.

WS 3.7 – Be objective, evaluate data in terms of accuracy, precision, repeatability and reproducibility and identify potential sources of random and systematic error.

WS 3.8 – Communicate the scientific rationale for investigations, methods used, findings and reasoned conclusions through written and electronic reports and presentations using verbal, diagrammatic, graphical, numerical and symbolic forms.

WS 4.2 – Recognise the importance of scientific quantities and understand how they are determined.

WS 4.3 – Use SI units (eg kg, g, mg; km, m, mm; kJ, J) and IUPAC chemical nomenclature unless inappropriate.

WS 4.6 – Use an appropriate number of significant figures in calculation.

MS 2a – Use an appropriate number of significant figures.

MS 2g – Use a scatter diagram to identify a correlation between two variables.

MS 4b – understand that y = mx + c represents a linear relationship.

MS 4c – Plot two variables from experimental or other data.

## Required practical activity - Density

**Use appropriate apparatus to make and record the measurements needed to determine the densities of regular and irregular solid objects and liquids. Volume should be determined from the dimensions of a regularly shaped object and by a displacement technique for irregularly shaped objects. Dimensions to be measured using appropriate apparatus such as a ruler, micrometer or Vernier callipers.**

|  | Date completed |
|---|---|
| **Apparatus and techniques** <br><br> AT1 – use appropriate apparatus to make and record measurements of length, area, mass and volume accurately. Use such measurements to determine the density of solid objects and liquids. |  |
| **Key opportunities for skills development** |  |

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|---|---|
| WS 1.2 – Use a variety of models such as representational, spatial, descriptive, computational and mathematical to solve problems, make predictions and to develop scientific explanations and understanding of familiar and unfamiliar facts. WS 2.1 – Use scientific theories and explanations to develop hypotheses. WS 2.2 – Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena. WS 2.3 – Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment. WS 2.4 – Carry out experiments appropriately having due regard for the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations. WS 2.6 – Make and record observations and measurements using a range of apparatus and methods. WS 2.7 – Evaluate methods and suggest possible improvements and further investigations. WS 3.1 – Present observations and other data using appropriate methods. WS 3.5 – Interpret observations and other data (presented in verbal, diagrammatic, graphical, symbolic or numerical form), including identifying patterns and trends, making inferences and drawing conclusions. WS 3.8 – Communicate the scientific rationale for investigations, methods used, findings and reasoned conclusions through written and electronic reports and presentations using verbal, diagrammatic, graphical, numerical and symbolic forms. WS 4.2 – Recognise the importance of scientific quantities and understand how they are determined. WS 4.3 – Use SI units (eg kg, g, mg; km, m, mm; kJ, J) and IUPAC chemical nomenclature unless inappropriate. WS 4.6 – Use an appropriate number of significant figures in calculation. MS 2a – Use an appropriate number of significant figures. MS 2b – Find arithmetic means. MS 5c – Calculate areas of triangles and rectangles, surface areas and volumes of cubes. | |

### Required practical activity- Force and extension

**Investigate the relationship between force and extension for a spring.**

| | Date completed |
|---|---|
| **Apparatus and techniques** AT 1 - use appropriate apparatus to make and record length accurately. AT 2 - use appropriate apparatus to measure and observe the effect of force on the extension of springs and collect the data required to plot a force-extension graph. | |
| **Key opportunities for skills development** WS 2.1 – Use scientific theories and explanations to develop hypotheses. WS 2.2 – Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena. WS 2.3 – Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment. | |

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|---|---|
| WS 2.4 – Carry out experiments appropriately having due regard for the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations.<br>WS 2.6 – Make and record observations and measurements using a range of apparatus and methods.<br>WS 3.1 – Present observations and other data using appropriate methods.<br>WS 3.2 – Translate data from one form to another.<br>WS 3.3 – Carry out and represent mathematical and statistical analysis.<br>WS 3.5 – Interpret observations and other data (presented in verbal, diagrammatic, graphical, symbolic or numerical form), including identifying patterns and trends, making inferences and drawing conclusions.<br>WS 3.8 – Communicate the scientific rationale for investigations, methods used, findings and reasoned conclusions through written and electronic reports and presentations using verbal, diagrammatic, graphical, numerical and symbolic forms.<br>WS 4.6 – Use an appropriate number of significant figures in calculation.<br>MS 2a – Use an appropriate number of significant figures.<br>MS 2b – Find arithmetic means.<br>MS 4a – Translate information between graphical and numeric form.<br>MS 4b – understand that y = mx + c represents a linear relationship.<br>MS 4c – Plot two variables from experimental or other data. | |

**Required practical activity - Acceleration**

**Investigate the effect of varying the force on the acceleration of an object of constant mass and the effect of varying the mass of an object on the acceleration produced by a constant force.**

| | Date completed |
|---|---|
| **Apparatus and techniques**<br><br>AT 1 – use appropriate apparatus to make and record measurements of length, mass and time accurately.<br>AT 2 – use appropriate apparatus to measure and observe the effect of force.<br>AT 3 – use appropriate apparatus and techniques for measuring motion, including determination of speed and rate of change of speed (acceleration/deceleration). | |
| **Key opportunities for skills development**<br><br>WS 2.1 – Use scientific theories and explanations to develop hypotheses.<br>WS 2.2 – Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena.<br>WS 2.3 – Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment.<br>WS 2.4 – Carry out experiments appropriately having due regard for the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations.<br>WS 2.6 – Make and record observations and measurements using a range of apparatus and methods.<br>WS 2.7 – Evaluate methods and suggest possible improvements and further investigations.<br>WS 3.1 – Present observations and other data using appropriate methods.<br>WS 3.2 – Translate data from one form to another. | |

WS 3.3 – Carry out and represent mathematical and statistical analysis.
WS 3.4 – Represent the distribution of results and make estimations of uncertainty.
WS 3.5 – Interpret observations and other data (presented in verbal, diagrammatic, graphical, symbolic or numerical form), including identifying patterns and trends, making inferences and drawing conclusions.
WS 3.6 – Present reasoned explanations including relating data to hypotheses.
WS 3.7 – Be objective, evaluate data in terms of accuracy, precision, repeatability and reproducibility and identify potential sources of random and systematic error.
WS 3.8 – Communicate the scientific rationale for investigations, methods used, findings and reasoned conclusions through written and electronic reports and presentations using verbal, diagrammatic, graphical, numerical and symbolic forms.
WS 4.2 – Recognise the importance of scientific quantities and understand how they are determined.
WS 4.3 – Use SI units (eg kg, g, mg; km, m, mm; kJ, J) and IUPAC chemical nomenclature unless inappropriate.
WS 4.6 – Use an appropriate number of significant figures in calculation.
MS 2a – Use an appropriate number of significant figures.
MS 2b – Find arithmetic means.
MS 2g – Use a scatter diagram to identify a correlation between two variables.
MS 4a – Translate information between graphical and numeric form.
MS 4b – understand that $y = mx + c$ represents a linear relationship.
MS 4c – Plot two variables from experimental or other data.

**Required practical activity -Waves**

**Make observations to identify the suitability of apparatus to measure the frequency, wavelength and speed of waves in a ripple tank and waves in a solid and take appropriate measurements.**

| | Date completed |
|---|---|
| **Apparatus and techniques**<br><br>AT4 – make observations of waves in fluids and solids to identify the suitability of apparatus to measure speed, frequency and wavelength. | |
| **Key opportunities for skills development**<br><br>WS 2.3 – Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment.<br>WS 2.6 – Make and record observations and measurements using a range of apparatus and methods.<br>WS 3.8 – Communicate the scientific rationale for investigations, methods used, findings and reasoned conclusions through written and electronic reports and presentations using verbal, diagrammatic, graphical, numerical and symbolic forms.<br>WS 4.2 – Recognise the importance of scientific quantities and understand how they are determined.<br>WS 4.3 – Use SI units (eg kg, g, mg; km, m, mm; kJ, J) and IUPAC chemical nomenclature unless inappropriate. | |

## Required practical activity - Light

**Investigate the reflection of light by different types of surface and the refraction of light by different substances.**

| | Date completed |
|---|---|
| **Apparatus and techniques**<br><br>AT4 – make observations of the effects of the interaction of electromagnetic waves (light) with matter.<br>AT8 – make observations of waves in fluids and solids to identify the suitability of apparatus to measure the effects of the interaction of waves with matter. | |
| **Key opportunities for skills development**<br><br>WS 2.1 – Use scientific theories and explanations to develop hypotheses.<br>WS 2.2 – Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena.<br>WS 2.3 – Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment.<br>WS 2.4 – Carry out experiments appropriately having due regard for the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations.<br>WS 2.7 – Evaluate methods and suggest possible improvements and further investigations.<br>WS 3.1 – Present observations and other data using appropriate methods.<br>WS 3.4 – Represent the distribution of results and make estimations of uncertainty.<br>WS 3.6 – Present reasoned explanations including relating data to hypotheses.<br>WS 3.8 – Communicate the scientific rationale for investigations, methods used, findings and reasoned conclusions through written and electronic reports and presentations using verbal, diagrammatic, graphical, numerical and symbolic forms.<br>WS 4.2 – Recognise the importance of scientific quantities and understand how they are determined.<br>WS 4.3 – Use SI units (eg kg, g, mg; km, m, mm; kJ, J) and IUPAC chemical nomenclature unless inappropriate.<br>MS 2g – Use a scatter diagram to identify a correlation between two variables.<br>MS 4c – Plot two variables from experimental or other data.<br>MS 5a – Use angular measures in degrees.<br>MS 5b – Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects. | |

## Required practical activity- IR radiation

**Investigate how the amount of infrared radiation absorbed or radiated by a surface depends on the nature of that surface.**

| | Date completed |
|---|---|
| **Apparatus and techniques**<br><br>AT1 – use appropriate apparatus to make and record temperature accurately.<br>AT4 – make observations of the effects of the interaction of electromagnetic waves with matter. | |

**Key opportunities for skills development**

WS 3.8 – Communicate the scientific rationale for investigations, methods used, findings and reasoned conclusions through written and electronic reports and presentations using verbal, diagrammatic, graphical, numerical and symbolic forms.
WS 4.2 – Recognise the importance of scientific quantities and understand how they are determined.
WS 4.3 – Use SI units (eg kg, g, mg; km, m, mm; kJ, J) and IUPAC chemical nomenclature unless inappropriate.
WS 4.6 – Use an appropriate number of significant figures in calculation.
MS 2c – Construct and interpret frequency tables and diagrams, bar charts and histograms.