

## Conservation and dissipation of energy

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P 1.1 Changes in energy stores	I can state some examples of energy stores.	<input type="checkbox"/>	I can describe a wide range of energy stores in different contexts.	<input type="checkbox"/>	I can describe the nature of energy stores in detail including the relationship between objects.	<input type="checkbox"/>
	I can state the processes that can transfer energy from one store to another.	<input type="checkbox"/>	I can describe changes in energy stores in terms of the process that causes the change.	<input type="checkbox"/>	I can explain factors that affect the size of changes in energy stores.	<input type="checkbox"/>
	I can identify changes in some energy stores using simple systems.	<input type="checkbox"/>	I can use quantitative descriptions of changes in energy stores.	<input type="checkbox"/>	I can represent energy changes graphically, accounting for changes in all stores.	<input type="checkbox"/>
P1.2 Conservation of energy	I can state that energy is conserved in any transfer.	<input type="checkbox"/>	I can apply the law of conservation of energy in straightforward situations.	<input type="checkbox"/>	I can apply the law of conservation of energy to explain why forces cause heating effects.	<input type="checkbox"/>
	I can state that energy is dissipated (is no longer useful) when it heats the environment.	<input type="checkbox"/>	I can describe changes in energy stores explaining why energy ceases to be useful.	<input type="checkbox"/>	I can describe closed systems and the changes to energy stores within them using the principle of conservation of energy.	<input type="checkbox"/>
	I can investigate the energy transfers in a pendulum and bungee.	<input type="checkbox"/>	I can describe the energy changes in a range of experiments and account for energy dissipation to the surroundings.	<input type="checkbox"/>	I can evaluate in detail experiments to investigate energy changes.	<input type="checkbox"/>

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P1.3 Energy and work	I can state that energy is measured in joules (J).	<input type="checkbox"/>	I can describe the action of frictional forces on objects and the associated heating effect.	<input type="checkbox"/>	I can use the principle of conservation of energy and forces to explain why objects become heated by frictional forces.	<input type="checkbox"/>
	I can calculate the work done by a force.	<input type="checkbox"/>	I can use the equation for work done to calculate distances or size of forces.	<input type="checkbox"/>	I can apply the equation for work done in a wide range of contexts.	<input type="checkbox"/>
	I can measure the work done by a force experimentally.	<input type="checkbox"/>	I can use repeat values to measure the work done by a force experimentally.	<input type="checkbox"/>	I can evaluate in detail an experiment to measure work done, explaining why there is variation in the measurements.	<input type="checkbox"/>
P1.4 Gravitational potential stores	I can state the factors that affect the change in the gravitational potential energy store of a system.	<input type="checkbox"/>	I can describe the effect of different gravitational field strength on the gravitational potential energy store changes of a system.	<input type="checkbox"/>	I can perform calculations using rearrangements of the gravitational potential energy store equations.	<input type="checkbox"/>
	I can calculate the gravitational potential energy store of a system using the weight of an object and its height.	<input type="checkbox"/>	I can calculate the gravitational potential energy store of a system using the mass gravitational field strength, and height.	<input type="checkbox"/>	I can apply gravitational potential energy store equations in a wide range of contexts.	<input type="checkbox"/>
	I can measure the gravitational potential energy store changes in a system with a simple practical activity.	<input type="checkbox"/>	I can describe energy changes that involve a heating effect as opposed to movement of an object.	<input type="checkbox"/>	I can account for all changes of energy during falls or increases in height, including health effects.	<input type="checkbox"/>
P1.5 Kinetic energy and elastic energy stores	I can state the factors that affect the size of a kinetic energy store of an object.	<input type="checkbox"/>	I can calculate the kinetic energy store of an object.	<input type="checkbox"/>	I can perform calculations involving the rearrangement of the kinetic energy equation.	<input type="checkbox"/>
	I can state the factors that affect the elastic potential energy store of a spring.	<input type="checkbox"/>	I can calculate the elastic potential energy store of a stretched spring.	<input type="checkbox"/>	I can perform calculations involving the rearrangement of the elastic potential energy equation.	<input type="checkbox"/>
	I can describe energy transfers involving elastic potential energy and kinetic energy stores.	<input type="checkbox"/>	I can investigate the relationship between the energy stored in a spring and the kinetic energy store of an object launched from	<input type="checkbox"/>	I can perform a wide range of calculations involving transfer of energy.	<input type="checkbox"/>

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P1.6 Energy dissipation	I can identify useful and wasted energy in simple scenarios.	<input type="checkbox"/>	I can analyse energy transfers to identify useful and less useful energy transfers.	<input type="checkbox"/>	I can use a wide range of energy stores and physical processes to decide on wasted and useful energy transfers.	<input type="checkbox"/>
	I can describe energy dissipation in terms of heating the surroundings.	<input type="checkbox"/>	I can describe energy dissipation and how this reduces the capacity of a system.	<input type="checkbox"/>	I can apply the concept of energy dissipation in a wide range of scenarios.	<input type="checkbox"/>
	I can measure the frictional force acting on an object.	<input type="checkbox"/>	I can investigate the factors that affect frictional forces.	<input type="checkbox"/>	I can evaluate in detail an experiment to measure the frictional forces acting on an object.	<input type="checkbox"/>
P1.7 Energy and efficiency	I can describe an efficient transfer as one that transfers more energy by a useful process.	<input type="checkbox"/>	I can calculate the efficiency of a range of energy transfers.	<input type="checkbox"/>	I can describe design features that can be used to improve the efficiency of an energy transfer.	<input type="checkbox"/>
	I can state that the efficiency of a simple energy transfer is always less than 100%.	<input type="checkbox"/>	I can use the law of conservation of energy to explain why efficiency can never be greater than 100%.	<input type="checkbox"/>	I can rearrange the efficiency equation to find input or total output energy.	<input type="checkbox"/>
	I can describe the energy transfers carried out by electrical devices.	<input type="checkbox"/>	I can describe the processes that waste energy in electrical devices.	<input type="checkbox"/>	I can explain the operation of electrical devices in terms of forces and electric current.	<input type="checkbox"/>
P1.8 Electrical appliances	I can list some electrical appliances.	<input type="checkbox"/>	I can rank electrical devices in terms of their power.	<input type="checkbox"/>	I can compare electrical devices in terms of efficiency.	<input type="checkbox"/>
	I can survey a range of electrical devices and their operation.	<input type="checkbox"/>	I can compare mains-powered and battery-powered devices.	<input type="checkbox"/>	I can calculate the efficiency of an electrical device.	<input type="checkbox"/>
	I can calculate the efficiency of a simple energy transfer.	<input type="checkbox"/>	I can investigate the efficiency of a motor.	<input type="checkbox"/>	I can evaluate in detail an efficiency investigation to justify conclusions.	<input type="checkbox"/>
	I can state the unit of power as the watt and kilowatt.	<input type="checkbox"/>	I can calculate the energy transferred by an electrical device.	<input type="checkbox"/>	I can compare the power ratings of devices using standard form.	<input type="checkbox"/>

P1.9 Energy and power	I can, with support, rank electrical appliances in order of power.		I can calculate the efficiency of a device from power ratings.		I can apply the efficiency equation in a range of situations, including rearrangement of the equation.	
	I can identify 'wasted' and 'useful' energy transfers in electrical devices.		I can find the wasted power of a device.		I can combine the electrical power equation with other equations to solve complex problems.	

# AQA Physics

## GCSE Student Checklist

### P2 Energy transfer by heating

Name ..... Class ..... Date .....

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P2.1 Energy transfer by particles	I can describe materials as good or poor thermal conductors.	<input type="checkbox"/>	I can analyse temperature change data to compare the thermal conductivity of materials.	<input type="checkbox"/>	I can explain the different thermal conductivities of materials using the free electron and lattice vibration explanations of conduction.	<input type="checkbox"/>
	I can compare the thermal conductivities of materials in simple terms.	<input type="checkbox"/>	I can describe the changes in the behaviour of the particles in a material as the temperature of the material increases.	<input type="checkbox"/>	I can evaluate the results of an experiment into thermal conductivity in terms of repeatability and reproducibility of data, and the validity of conclusions drawn from the data.	<input type="checkbox"/>
	I can relate the thermal conductivities of a material to the uses of that material in familiar contexts.	<input type="checkbox"/>	I can apply understanding of thermal conductivity in reducing energy dissipation through the choice of appropriate insulating materials.	<input type="checkbox"/>	I can justify the choices of material involved in insulation or conduction using the concept of thermal conductivity and other data.	<input type="checkbox"/>
P2.2 Energy transfer by radiation	I can compare the cooling and heating of different coloured surfaces.	<input type="checkbox"/>	I can describe the cooling of objects in terms of the rate of emission of radiation.	<input type="checkbox"/>	I can explain why objects stop cooling in terms of the rate of absorption and emission of radiation.	<input type="checkbox"/>
	I can state that an object cools by emitting IR radiation and heats by absorbing IR radiation.	<input type="checkbox"/>	I can describe the heating of objects in terms of the rate of absorption of radiation.	<input type="checkbox"/>	I can apply the concepts of absorption and emission of IR radiation to explain why an object maintains a constant temperature.	<input type="checkbox"/>
	I can measure the difference in cooling of objects of different colours.	<input type="checkbox"/>	I can describe the cooling of an object over a period of time.	<input type="checkbox"/>	I can describe the changes in the rate of cooling of objects of different colours and temperatures.	<input type="checkbox"/>

# AQA Physics

## GCSE Student Checklist

### P2 Energy transfer by heating

Name		Class		Date		
Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P2.3 Radiation and the greenhouse effect	I can state that infrared radiation is electromagnetic radiation with a <u>wavelength shorter than red light</u> .	<input type="checkbox"/>	I can compare the emission of infrared radiation with a wavelength shorter than red light.	<input type="checkbox"/>	I can describe factors that affect the rate of emission of infrared radiation, including <u>temperature and surface area</u> .	<input type="checkbox"/>
	I can state that an object cools by emitting infrared radiation and heats by absorbing infrared radiation.	<input type="checkbox"/>	I can outline the evidence that changes in the concentration of atmospheric gases are the likely cause of global warming.	<input type="checkbox"/>	I can apply the concepts of absorption and emission of infrared radiation to explain why an object maintains a constant temperature.	<input type="checkbox"/>
	I can describe the greenhouse effect in simple terms.	<input type="checkbox"/>	I can describe the greenhouse effect in terms of absorption and emission of radiation.	<input type="checkbox"/>	I can fully explain the greenhouse effect in terms of absorption, emission, and wavelengths of electromagnetic radiation.	<input type="checkbox"/>
P2.4 Specific heat capacity	I can describe materials in terms of being difficult or easy to heat up (increase the <u>temperature of</u> ).	<input type="checkbox"/>	I can describe the effects of changing the factors involved in the equation.	<input type="checkbox"/>	I can evaluate materials used for transferring energy in terms of their <u>specific heat capacity</u> .	<input type="checkbox"/>
	I can state the factors that affect the amount of energy required to increase <u>the temperature of an object</u> .	<input type="checkbox"/>	I can calculate the energy required to change the temperature of an object.	<input type="checkbox"/>	I can use the specific heat capacity equation to perform a wide range of <u>calculations in unfamiliar contexts</u> .	<input type="checkbox"/>
	I can, with some support, measure the specific heat capacity of a material.	<input type="checkbox"/>	I can measure the specific heat capacity of a material and find a mean value.	<input type="checkbox"/>	I can evaluate in detail the results of an experiment to measure specific heat <u>capacity</u> .	<input type="checkbox"/>
P2.5 Heating and insulating buildings	I can state some design features used to prevent energy transfer to the surroundings in the home.	<input type="checkbox"/>	I can describe how some design features used to reduce energy dissipation from a home work.	<input type="checkbox"/>	I can evaluate in detail design features used to reduce energy loss from the home.	<input type="checkbox"/>
	I can calculate the payback time of a simple home improvement feature.	<input type="checkbox"/>	I can compare home improvement features in terms of payback time.	<input type="checkbox"/>	I can decide on home improvement features using payback time and savings beyond the payback time.	<input type="checkbox"/>

Name ..... Class ..... Date .....

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P3.1 Energy demands	I can identify which fuels are renewable and which are non-renewable.	<input type="checkbox"/>	I can outline the operation of a fossil fuel burning power station.	<input type="checkbox"/>	I can compare energy use from different sources and different societies from available data.	<input type="checkbox"/>
	I can identify activities that require large energy transfers.	<input type="checkbox"/>	I can outline the operation of a nuclear power station.	<input type="checkbox"/>	I can compare fossil fuels and nuclear fuels in terms of energy provided, waste, and pollution.	<input type="checkbox"/>
	I can state that biofuels are carbon neutral whereas fossil fuels are not.	<input type="checkbox"/>	I can explain why biofuels are considered carbon neutral.	<input type="checkbox"/>	I can discuss some of the problems associated with biofuel use and production.	<input type="checkbox"/>
P3.2 Energy from wind and water	I can state that wind turbines, wave generators, hydroelectric systems, and tidal systems are renewable energy resources.	<input type="checkbox"/>	I can describe the operation of a wind farm.	<input type="checkbox"/>	I can compare the operation of hydroelectric, wave, and tidal systems in terms of reliability, potential power	<input type="checkbox"/>
	I can state some simple advantages or disadvantages of renewable energy systems.	<input type="checkbox"/>	I can describe the operation of a hydroelectric system.	<input type="checkbox"/>	I can explain in detail the purpose, operation, and advantages of a pumped storage system.	<input type="checkbox"/>
	I can outline the operation of a renewable energy source.	<input type="checkbox"/>	I can suggest the most appropriate energy resource to use in a range of scenarios.	<input type="checkbox"/>	I can justify the choice of an energy resource by using numerical and other appropriate data.	<input type="checkbox"/>
P3.3 Power from the Sun and the Earth	I can explore the operation of a solar cell.	<input type="checkbox"/>	I can compare and contrast the operation of solar cells (photovoltaic cells) with solar heating panels.	<input type="checkbox"/>	I can analyse the power output of a variety of energy resources.	<input type="checkbox"/>
	I can state one difference between solar cells and solar heating systems.	<input type="checkbox"/>	I can describe the operation of a solar power tower.	<input type="checkbox"/>	I can calculate the energy provided by a solar heating system by using the increase in water temperature.	<input type="checkbox"/>
	I can state that radioactive decay is source of heating in geothermal systems.	<input type="checkbox"/>	I can describe the operation of a geothermal power plant.	<input type="checkbox"/>	I can plan in detail an investigation into the factors that affect the power output of a solar cell.	<input type="checkbox"/>

Name ..... Class ..... Date .....

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P3.4 Energy and the environment	I can list some environmental problems associated with burning fossil fuels.	<input type="checkbox"/>	I can describe the effects of acid rain and climate change.	<input type="checkbox"/>	I can evaluate methods of reducing damage caused by waste products of fossil fuels and nuclear fuels.	<input type="checkbox"/>
	I can identify the waste products of fossil fuels and nuclear fuel.	<input type="checkbox"/>	I can describe techniques to reduce the harmful products of burning fossil fuels.	<input type="checkbox"/>	I can discuss in detail the problems associated with nuclear accidents and the public perception of nuclear safety.	<input type="checkbox"/>
	I can state simple advantages and disadvantages of a variety of renewable energy resources.	<input type="checkbox"/>	I can compare a wide range of energy resources in terms of advantages and disadvantages.	<input type="checkbox"/>	I can evaluate the suitability of an energy resource for a range of scenarios, taking into account a wide range of factors.	<input type="checkbox"/>
P3.5 Big energy issues	I can rank the start-up times of various power stations.	<input type="checkbox"/>	I can use base load and start-up time data to explain why some power stations are in constant operation whereas others may be switched on and off.	<input type="checkbox"/>	I can use capital and operational costs of energy resources to evaluate their usefulness.	<input type="checkbox"/>
	I can compare some of the advantages and disadvantages of various energy resources.	<input type="checkbox"/>	I can compare energy resources in terms of capital and operational costs.	<input type="checkbox"/>	I can form persuasive arguments for or against a variety of energy resources.	<input type="checkbox"/>
	I can discuss the construction of a power plant in the local area in simple terms by using information provided.	<input type="checkbox"/>	I can debate the construction of a power plant in the local area by using a wide range of information, much of which is provided.	<input type="checkbox"/>	I can debate the construction of a power plant in local area by using a wide range of information, much of which is independently researched.	<input type="checkbox"/>

Name ..... Class ..... Date .....

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P4.1 Electrical charges	I can label the constituents on an atom (proton, neutron, and electron) on a diagram.	<input type="checkbox"/>	I can compare the electrical properties of protons, neutrons, electrons, and ions.	<input type="checkbox"/>	I can describe the shape of the field and lines of force around a point charge or charged sphere.	<input type="checkbox"/>
	I can describe the interactions between positively and negatively charged objects.	<input type="checkbox"/>	I can use the concept of electric fields to explain why charged objects interact.	<input type="checkbox"/>	I can apply the concept of electric fields to explain in detail why the force between charged objects decreases with distance.	<input type="checkbox"/>
	I can state that objects can become electrically charged by the action of frictional forces.	<input type="checkbox"/>	I can describe how objects become charged in terms of electron transfer.	<input type="checkbox"/>	I can explain why sparks can be produced by charged materials in terms of charge build-up.	<input type="checkbox"/>
P4.2 Electric circuits	I can identify circuit components from their symbols.	<input type="checkbox"/>	I can describe the operation of a variable resistor and a diode and their effects on current.	<input type="checkbox"/>	I can explain the nature of an electric current in wires in terms of electron behaviour.	<input type="checkbox"/>
	I can draw and interpret simple circuit diagrams.	<input type="checkbox"/>	I can calculate the charge transferred by a steady current in a given time.	<input type="checkbox"/>	I can perform a range of calculations, including rearrangement of the equation $Q=It$ .	<input type="checkbox"/>
	I can construct a simple electrical circuit.	<input type="checkbox"/>	I can construct an electrical circuit and accurately measure the current.	<input type="checkbox"/>	I can measure the current in a circuit accurately and use it to calculate the rate of flow of electrons.	<input type="checkbox"/>

# AQA Physics

## GCSE Student Checklist

### P4 Electric circuits

Name ..... Class ..... Date .....

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P4.3 Potential difference and resistance	I can state that resistance restricts the size of a current in a circuit.	<input type="checkbox"/>	I can calculate the potential difference.	<input type="checkbox"/>	I can describe potential difference in terms of work done per unit charge.	<input type="checkbox"/>
	I can state Ohm's law and describe its conditions.	<input type="checkbox"/>	I can calculate the resistance of a component.	<input type="checkbox"/>	I can rearrange equations for resistance and potential difference.	<input type="checkbox"/>
	I can measure the current and potential difference in a circuit to determine the resistance.	<input type="checkbox"/>	I can measure the effect of changing the length of a wire on its resistance in a controlled experiment.	<input type="checkbox"/>	I can investigate a variety of factors that may affect the resistance of a metal wire, such as the current through it, length, cross-sectional area, and metal used.	<input type="checkbox"/>
P4.4 Component characteristics	I can identify the key characteristics of electrical devices.	<input type="checkbox"/>	I can describe the resistance characteristics of a filament lamp.	<input type="checkbox"/>	I can explain the resistance characteristics of a filament lamp in terms of electrons and ion collisions.	<input type="checkbox"/>
	I can identify components from simple $I-V$ graphs.	<input type="checkbox"/>	I can describe the characteristics of diode and light-emitting diode.	<input type="checkbox"/>	I can determine the resistance of a component based on information extracted from an $I-V$ graph.	<input type="checkbox"/>
	I can state the operation of a diode in simple terms.	<input type="checkbox"/>	I can investigate the resistance characteristics of a thermistor and a LDR.	<input type="checkbox"/>	I can compare the characteristics of a variety of electrical components, describing how the components can be used.	<input type="checkbox"/>

Name ..... Class ..... Date .....

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P4.5 Series circuits	I can state that the current in any part of a series circuit is the same.	<input type="checkbox"/>	I can find the potential difference across a component in a circuit by using the p.d. rule.	<input type="checkbox"/>	I can explain, in detail, why the current in a series circuit is the same at all points by using the concept of conservation of charge (electrons).	<input type="checkbox"/>
	I can calculate the potential difference provided by cell combinations.	<input type="checkbox"/>	I can calculate the current in a series circuit containing more than one resistor.	<input type="checkbox"/>	I can analyse a variety of series circuit to determine the current through, p.d. across, and resistance of combinations of components.	<input type="checkbox"/>
	I can calculate the total resistance of two resistors placed in series.	<input type="checkbox"/>	I can investigate the resistance of series circuits with several components.	<input type="checkbox"/>	I can evaluate in detail the investigation of series circuits and explain discrepancies.	<input type="checkbox"/>
P4.6 Parallel circuits	I can identify parallel sections in circuit diagrams.	<input type="checkbox"/>	I can measure the p.d. across parallel circuits and explain any discrepancies.	<input type="checkbox"/>	I can analyse parallel circuits in terms of current loops.	<input type="checkbox"/>
	I can state the effect of adding resistors in parallel on the size of the current in a circuit.	<input type="checkbox"/>	I can describe the effect on the resistance in a circuit of adding a resistor in parallel.	<input type="checkbox"/>	I can calculate the current at any point in a circuit.	<input type="checkbox"/>
	I can state that the p.d. across parallel sections of a circuit is the same.	<input type="checkbox"/>	I can investigate the effect of adding resistors in parallel on the size of the current in a circuit.	<input type="checkbox"/>	I can evaluate in detail an investigation into the effect of adding resistors in parallel on a circuit.	<input type="checkbox"/>

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P5.1 Alternating current	I can state that the UK mains supply is a high-voltage alternating current supply.	<input type="checkbox"/>	I can describe the characteristics of the UK mains supply.	<input type="checkbox"/>	I can explain the process of half-wave rectification of an a.c. source.	<input type="checkbox"/>
	I can state simple differences between a.c. and d.c. sources.	<input type="checkbox"/>	I can compare a.c. traces in terms of period and amplitude (voltage).	<input type="checkbox"/>	I can analyse a.c. traces with an oscilloscope to determine the voltage and frequency.	<input type="checkbox"/>
	I can describe how the trace on an oscilloscope changes when the frequency or amplitude of the signal is changed.	<input type="checkbox"/>	I can operate a cathode ray oscilloscope to display an a.c. trace.	<input type="checkbox"/>	I can compare and contrast the behaviour of electrons in a wire connected to d.c. and a.c. supplies.	<input type="checkbox"/>
P5.2 Cables and plugs	I can identify the live, neutral, and earth wires in a three-pin plug.	<input type="checkbox"/>	I can discuss the choices of materials used in cables and plugs in terms of their physical and electrical properties.	<input type="checkbox"/>	I can explain why it is not necessary for some appliances to be earthed.	<input type="checkbox"/>
	I can identify the key components of a typical three-pin plug and socket.	<input type="checkbox"/>	I can describe why a short circuit inside a device presents a hazard.	<input type="checkbox"/>	I can explain when there will be a current in the live, neutral, and earth wires of an appliance.	<input type="checkbox"/>
	I can identify simple and obvious hazards in electrical wiring.	<input type="checkbox"/>	I can identify a variety of electrical hazards associated with plugs and sockets.	<input type="checkbox"/>	I can discuss in detail the hazards associated with poor electrical wiring.	<input type="checkbox"/>
P5.3 Electrical power and potential difference	I can state that the power of a device is the amount of energy transferred by it each second.	<input type="checkbox"/>	I can calculate the power of systems.	<input type="checkbox"/>	I can measure and compare the power of electrical devices and explain variations in readings.	<input type="checkbox"/>
	I can describe the factors that affect the rate of energy transfer by a current in a circuit.	<input type="checkbox"/>	I can calculate the power of electrical devices.	<input type="checkbox"/>	I can calculate the electrical heating caused by resistance.	<input type="checkbox"/>
	I can explain why different fuses are required electrical devices in simple terms.	<input type="checkbox"/>	I can select an appropriate fuse for a device.	<input type="checkbox"/>	I can combine a variety of calculations to analyse electrical systems.	<input type="checkbox"/>

Name ..... Class ..... Date .....

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P5.4 Electrical currents and energy transfer	I can state that an electric current consists of a flow of charge (electrons in a wire).	<input type="checkbox"/>	I can calculate the charge transferred by a current in a given time.	<input type="checkbox"/>	I can perform calculations involving rearrangement of the equations $Q = It$ and $E = VQ$ .	<input type="checkbox"/>
	I can identify the factors that affect the energy transfers in a circuit.	<input type="checkbox"/>	I can calculate the energy transferred by a charge passing through a potential difference.	<input type="checkbox"/>	I can explain how energy is conserved in terms of current and p.d. during energy transfers by an electric current.	<input type="checkbox"/>
	I can state that a battery or power supply provides energy to a current whereas a resistor causes a transfer of energy to the surroundings.	<input type="checkbox"/>	I can apply the law of conservation of energy in a circuit.	<input type="checkbox"/>	I can use algebra to combine the equations $Q = It$ and $E = VQ$ to form the relationships $E = VIt$ and $P = IV$ .	<input type="checkbox"/>
P5.5 Appliances and efficiency	I can describe the factors that affect the cost of using various electrical devices.	<input type="checkbox"/>	I can calculate energy transfer in kilowatt-hours.	<input type="checkbox"/>	I can convert between relevant units during calculations of energy transfer.	<input type="checkbox"/>
	I can calculate energy transfer in joule.	<input type="checkbox"/>	I can convert between efficiencies stated in percentages and those stated in decimal forms.	<input type="checkbox"/>	I can analyse the use of a variety of electrical devices to determine their costs of operation.	<input type="checkbox"/>
	I can state that energy transfer can be measured in kilowatt-hours.	<input type="checkbox"/>	I can calculate the power rating of a device from the energy transferred and the time of operation.	<input type="checkbox"/>	I can compare a range of electrical devices in terms of efficiency using calculations to support any conclusions.	<input type="checkbox"/>

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P6.1 Density	I can describe density as a property of a material and not a particular object.	<input type="checkbox"/>	I can explain why some materials will float on water.	<input type="checkbox"/>	I can use the density equation in a wide variety of calculations.	<input type="checkbox"/>
	I can state that the density of a material is the mass per unit volume.	<input type="checkbox"/>	I can calculate the density of materials.	<input type="checkbox"/>	I can use appropriate significant figures in final answers when measuring density.	<input type="checkbox"/>
	I can calculate the volume of some regular shapes and the density of materials, with support.	<input type="checkbox"/>	I can measure the density of a solid and a liquid.	<input type="checkbox"/>	I can evaluate in detail the experimental measurement of density, accounting for errors in measurements.	<input type="checkbox"/>
P6.2 States of matter	I can describe the simple properties of solids, liquids and gases.	<input type="checkbox"/>	I can describe the arrangement of the particles in a solid, liquid, and gas.	<input type="checkbox"/>	I can describe the forces acting between particles in a solid, liquid, and gas.	<input type="checkbox"/>
	I can name the changes of state.	<input type="checkbox"/>	I can explain the behaviour of a material in terms of the arrangement of particles within it.	<input type="checkbox"/>	I can describe the changes in the energy of individual particles during changes of state.	<input type="checkbox"/>
	I can state that there are changes in stores of energy associated with a material when its temperature is increased.	<input type="checkbox"/>	I can describe the changes in behaviour of the particles in a material during changes of state.	<input type="checkbox"/>	I can explain in detail why the density of a material changes during a change of state, using a particle model.	<input type="checkbox"/>
P6.3 Changes of state	I can state that the melting point of a substance is a temperature at which it changes from a solid to a liquid and vice versa.	<input type="checkbox"/>	I can state that the melting and boiling points of a pure substance are fixed.	<input type="checkbox"/>	I can describe how the melting and boiling points of a substance can be changed.	<input type="checkbox"/>
	I can state that the boiling point of a substance is the temperature at which it changes from a liquid to a gas and vice versa.	<input type="checkbox"/>	I can use the term 'latent heat' to describe the energy gained by a substance during heating for which there is no change in temperature.	<input type="checkbox"/>	I can describe in detail the behaviour of the particles during changes of state.	<input type="checkbox"/>
	I can describe the process of melting and boiling.	<input type="checkbox"/>	I can find the melting or boiling point of a substance by using a graphical technique.	<input type="checkbox"/>	I can evaluate data produced by a heating experiment to discuss the reproducibility of the measurement of a melting point.	<input type="checkbox"/>

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P6.4 Internal energy	I can state that the internal energy of a system increases as it is heated.	<input type="checkbox"/>	I can describe how the internal energy of an object can be increased by heating.	<input type="checkbox"/>	I can use the concepts of kinetic and potential energy to explain changes in internal energy.	<input type="checkbox"/>
	I can identify which changes of state are related to increases in internal energy and which are related to decreases.	<input type="checkbox"/>	I can describe how the behaviour of particles changes as the energy of a system increases.	<input type="checkbox"/>	I can describe the changes in the size of intermolecular forces during changes of state.	<input type="checkbox"/>
	I can outline the behaviour of particles in solids, liquids, and gases.	<input type="checkbox"/>	I can describe the energy changes by heating between objects within the same system.	<input type="checkbox"/>	I can explain in detail why the pressure of a gas increases as it is heated.	<input type="checkbox"/>
P6.5 Specific latent heat	I can state that heating a material will increase its internal energy.	<input type="checkbox"/>	I can describe the changes in particle bonding during changes of state.	<input type="checkbox"/>	I can perform a variety of calculations based on the latent heat equation.	<input type="checkbox"/>
	I can describe energy changes during melting and vaporisation.	<input type="checkbox"/>	I can calculate the latent heat of fusion and latent heat of vaporisation for a substance.	<input type="checkbox"/>	I can combine variety of equations to solve problems involving heating.	<input type="checkbox"/>
	I can measure the latent heat of vaporisation for water.	<input type="checkbox"/>	I can measure the latent heat of fusion for water.	<input type="checkbox"/>	I can evaluate the reproducibility of a measurement of latent heat based on collated data.	<input type="checkbox"/>
P6.6 Gas pressure and temperature	I can state that as the temperature of a gas in a sealed container increases, the pressure of the gas increases.	<input type="checkbox"/>	I can describe the behaviour of particles in a gas as the gas is heated.	<input type="checkbox"/>	I can describe the linear relationship between changes in temperatures and pressure for a gas.	<input type="checkbox"/>
	I can describe a gas as consisting of a large number of rapidly moving particles.	<input type="checkbox"/>	I can outline Brownian motion and how this provides evidence for the particle nature of matter.	<input type="checkbox"/>	I can explain Brownian motion in terms of particle behaviour and collisions, relating the speeds of smoke particles and air molecules.	<input type="checkbox"/>
	I can describe pressure as being caused by collisions of gas particles with the walls of its container.	<input type="checkbox"/>	I can describe the relationship between an increase in the temperature of a fixed volume of a gas and the increase in pressure of the gas.	<input type="checkbox"/>	I can describe in detail how the relationship between the pressure of a gas and its temperature can be investigated.	<input type="checkbox"/>

Name ..... Class ..... Date .....

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P6.7 Gas pressure and volume	I can state that the temperature of a gas is related to the kinetic energy of the gas particles.	<input type="checkbox"/>	I can describe how the pressure of a gas can change when it is compressed or allowed to expand.	<input type="checkbox"/>	I can explain in terms of particle behaviour why the pressure of a gas increases when its volume decreases.	<input type="checkbox"/>
	I can state that the pressure of a gas increases when it is compressed (at a constant temperature).	<input type="checkbox"/>	I can use the relationship $pV = \text{constant}$ to calculate the constant.	<input type="checkbox"/>	I can calculate the pressure or volume of a gas.	<input type="checkbox"/>
	I can state that forces are required to compress a gas.	<input type="checkbox"/>	I can explain why the temperature of a gas increases when it is compressed.	<input type="checkbox"/>	I can solve a variety of problems in which gas pressure or volume changes.	<input type="checkbox"/>

Name ..... Class ..... Date .....

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P7.1 Atoms and radiation	I can name the three types of nuclear radiation.	<input type="checkbox"/>	I can describe some safety precautions used when dealing with radioactive materials.	<input type="checkbox"/>	I can describe in detail the decay of an unstable nucleus.	<input type="checkbox"/>
	I can name the three sub-atomic particles found in an atom (proton, neutron, and electron).	<input type="checkbox"/>	I can describe how a Geiger counter can be used to detect radiation.	<input type="checkbox"/>	I can explain the similarities and differences between nuclear radiation and visible light.	<input type="checkbox"/>
	I can identify some sources of background radiation.	<input type="checkbox"/>	I can identify natural and man-made sources of background radiation.	<input type="checkbox"/>	I can describe the relative penetrating powers of the three types of nuclear radiation.	<input type="checkbox"/>
P7.2 The discovery of the nucleus	I can identify the Rutherford (nuclear) model of an atom.	<input type="checkbox"/>	I can describe the plum pudding model of the atom.	<input type="checkbox"/>	I can compare the plum pudding model, Rutherford model, and Bohr model of the atom in terms of the evidence for	<input type="checkbox"/>
	I can identify the locations of protons, neutrons, and electrons in the nuclear model.	<input type="checkbox"/>	I can describe the evidence provided by the Rutherford scattering experiment.	<input type="checkbox"/>	I can explain how Rutherford and Marsden's experiment caused a rejection of the plum pudding model.	<input type="checkbox"/>
	I can state that electrons can move between fixed energy levels within an atom.	<input type="checkbox"/>	I can describe the properties of protons, neutrons, and electrons.	<input type="checkbox"/>	I can describe how the initial evidence for the nuclear model was processed and how the model came to be	<input type="checkbox"/>
P7.3 Nuclear reactions	I can identify the mass and atomic number by using nuclear notation.	<input type="checkbox"/>	I can calculate the number of neutrons in an isotope by using nuclear notation.	<input type="checkbox"/>	I can explain why particles are ejected from the nucleus during nuclear decay.	<input type="checkbox"/>
	I can identify the type of decay taking place from a nuclear equation.	<input type="checkbox"/>	I can describe the differences between isotopes.	<input type="checkbox"/>	I can describe the changes in the nucleus that occur during nuclear decay.	<input type="checkbox"/>
	I can state that isotopes are atoms of the same element with different atomic masses.	<input type="checkbox"/>	I can complete decay equations for alpha and beta decay.	<input type="checkbox"/>	I can write full decay equations for example nuclear decays.	<input type="checkbox"/>

Name ..... Class ..... Date .....

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P7.4 More about alpha, beta, and gamma radiation	I can rank the three types of nuclear radiation in order of their penetrating power.	<input type="checkbox"/>	I can describe how the penetrating powers of radiation can be measured.	<input type="checkbox"/>	I can describe in detail how the thickness of a material being manufactured can be monitored by	<input type="checkbox"/>
	I can rank the three types of nuclear radiation in order of their range through air.	<input type="checkbox"/>	I can describe the path of radiation types through a magnetic field.	<input type="checkbox"/>	I can compare the ionisation caused by different types of nuclear radiation.	<input type="checkbox"/>
	I can state that all three types of nuclear radiation are ionising.	<input type="checkbox"/>	I can describe the process of ionisation.	<input type="checkbox"/>	I can evaluate in some detail the risks caused by alpha radiation inside and outside the human body.	<input type="checkbox"/>
P7.5 Activity and half-life	I can state that the activity of a radioactive sample will fall over time.	<input type="checkbox"/>	I can find the ratio of a sample remaining after a given number of half-lives.	<input type="checkbox"/>	I can compare a physical model of decay with the decay of nuclei, noting the limitations of the model.	<input type="checkbox"/>
	I can define half-life in simple terms such as 'the time it takes for half of the material to decay'.	<input type="checkbox"/>	I can state that all atoms of a particular isotope have an identical chance to decay in a fixed time.	<input type="checkbox"/>	I can outline how the age of organic material can be determined by using radioactive dating.	<input type="checkbox"/>
	I can find the half-life of a substance from a graph of count rate (or nuclei remaining) against time with support.	<input type="checkbox"/>	I can plot a graph showing the decay of a sample and use it to determine half-life.	<input type="checkbox"/>	I can calculate the changes in count rate or nuclei remaining by using an exponential decay function.	<input type="checkbox"/>
P7.6 Nuclear radiation in medicine	I can name some medical applications for radioactive substances.	<input type="checkbox"/>	I can explain why alpha, beta, or gamma radiation is chosen for a particular medical application.	<input type="checkbox"/>	I can describe the use of radioactive implants and the hazards associated with the technique.	<input type="checkbox"/>
	I can state that the larger the dose of radiation, the more likely harm will be caused.	<input type="checkbox"/>	I can describe how gamma rays can be used to destroy cancerous cells and the damage they may cause to healthy	<input type="checkbox"/>	I can discuss the factors that need to be taken into account when selecting a medical tracer for a diagnostic test.	<input type="checkbox"/>
	I can describe some precautions used during diagnoses or treatments involving radioactive substances.	<input type="checkbox"/>	I can explain how precautions to reduce exposure to patients and medical staff work.	<input type="checkbox"/>	I can explain how a medical tracer is used including the function of a gamma camera.	<input type="checkbox"/>

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P7.7 Nuclear fission	I can state that nuclear fission is the breaking of a large nucleus to form two smaller nuclei.	<input type="checkbox"/>	I can describe induced nuclear fission in terms of neutron impacts and release.	<input type="checkbox"/>	I can explain how a steady-state induced fission reaction can be maintained.	<input type="checkbox"/>
	I can distinguish between induced fission and spontaneous fission.	<input type="checkbox"/>	I can explain how an escalating induced fission reaction occurs.	<input type="checkbox"/>	I can explain the differences between naturally occurring isotopes and enriched nuclear fuels.	<input type="checkbox"/>
	I can label the key components of a nuclear reactor.	<input type="checkbox"/>	I can outline the function of the moderator, control rods, and coolant.	<input type="checkbox"/>	I can explain the operation of a nuclear fission reactor, including the choices of appropriate materials.	<input type="checkbox"/>
P7.8 Nuclear fusion	I can state that nuclear fusion is the energy releasing process in the Sun.	<input type="checkbox"/>	I can outline the process of nuclear fusion.	<input type="checkbox"/>	I can explain why it is difficult to carry out controlled nuclear fusion on Earth.	<input type="checkbox"/>
	I can state that the Sun fuses (joins together) hydrogen nuclei into helium nuclei.	<input type="checkbox"/>	I can complete a nuclear equation showing simple fusion processes.	<input type="checkbox"/>	I can construct a variety of nuclear equations showing nuclear fusion.	<input type="checkbox"/>
	I can state that very high temperatures and pressures are required for fusion to take place.	<input type="checkbox"/>	I can describe the key design features of a nuclear fusion reactor.	<input type="checkbox"/>	I can compare the operation of a nuclear fission reactor and a nuclear fusion reactor.	<input type="checkbox"/>
P7.9 Nuclear issues	I can identify sources of radiation, including medical and background radiation.	<input type="checkbox"/>	I can compare the risks and damage associated with alpha, beta, and gamma radiation.	<input type="checkbox"/>	I can discuss the risks and benefits of nuclear power compared to other methods of electricity generation.	<input type="checkbox"/>
	I can describe the type of damage caused by large-scale nuclear accidents.	<input type="checkbox"/>	I can describe how damage caused by radioactive material can be reduced.	<input type="checkbox"/>	I can describe and explain the safety precautions that need to take place after a large nuclear accident.	<input type="checkbox"/>
	I can state that nuclear waste is very dangerous and must be stored safely for very long periods of time.	<input type="checkbox"/>	I can discuss the difficulties associated with the handling and storage of nuclear waste.	<input type="checkbox"/>	I can evaluate in detail a variety of storage or disposal solutions for nuclear waste.	<input type="checkbox"/>

Name ..... Class ..... Date .....

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P11.1 Pressure and surfaces	I can state the factors that affect the pressure acting on a surface.	<input type="checkbox"/>	I can describe the effect on the pressure of changing the area of contact or weight acting on a surface.	<input type="checkbox"/>	I can apply the concept of pressure in explaining the effect on a surface in a wide range of contexts.	<input type="checkbox"/>
	I can calculate the pressure caused by an object resting on a surface, given the force and area of contact.	<input type="checkbox"/>	I can calculate forces or areas of contact.	<input type="checkbox"/>	I can perform pressure calculations including conversion of areas and forces with SI multiplier prefixes.	<input type="checkbox"/>
	I can state that pressure can be caused by the action of fluids (liquids and gases) on a surface.	<input type="checkbox"/>	I can use SI prefixes in expressions for pressure as appropriate.	<input type="checkbox"/>	I can estimate uncertainty in values for pressure using experimental data.	<input type="checkbox"/>
P11.2 Pressure in a liquid at rest			I can use the concept of force, mass, and volume to explain why the pressure increases with depth in a liquid.	<input type="checkbox"/>	I can use algebraic techniques to derive the equation $p = h\rho g$ .	<input type="checkbox"/>
			I can calculate the pressure at a point in a liquid using $p = h\rho g$ .	<input type="checkbox"/>	I can rearrange the equation $p = h\rho g$ to solve a range of questions involving the pressure in a liquid.	<input type="checkbox"/>
			I can use the concept of pressure in a liquid to explain a range of structural design features.	<input type="checkbox"/>	I can apply the equation for pressure in a liquid to explain the design of dams or other structures.	<input type="checkbox"/>
P11.3 Atmospheric pressure	I can state that the pressure of the atmosphere decreases with height above the Earth's surface.	<input type="checkbox"/>	I can calculate the forces produced by pressure differences.	<input type="checkbox"/>	I can use the particle model to explain in detail the changes in atmospheric pressure.	<input type="checkbox"/>
	I can state that the density of the atmosphere decreases with height.	<input type="checkbox"/>	I can describe the change in pressure at different heights.	<input type="checkbox"/>	I can explain a range of phenomena in terms of pressure difference.	<input type="checkbox"/>
	I can describe the cause of atmospheric pressure in simple terms.	<input type="checkbox"/>	I can use the equation $p = h\rho g$ to determine pressure in a fluid.	<input type="checkbox"/>	I can explain why the relationship $p = h\rho g$ is not suitable for calculating changes in pressure in the atmosphere over a large change in height.	<input type="checkbox"/>

Name ..... Class ..... Date .....

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P11.4 Upthrust and flotation	<input type="checkbox"/>	I can describe the relationship between Upthrust and weight for floating and submerged objects.	<input type="checkbox"/>	I can calculate the upthrust acting on a submerged object by using the pressure to the upthrust provided.	<input type="checkbox"/>	
	<input type="checkbox"/>	I can compare the density of an object with the density of a liquid to determine whether or not the object will float.	<input type="checkbox"/>	I can use algebraic techniques to show that the weight of liquid displaced is equal to the upthrust provided.	<input type="checkbox"/>	
	<input type="checkbox"/>	I can plan an investigation into the relationship between the average density of an object and the distance it submerges.	<input type="checkbox"/>	I can carry out and evaluate in detail an investigation into the relationship between the average density of an object and the distance it submerges.	<input type="checkbox"/>	

Name ..... Class ..... Date .....

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P12.1 The nature of waves	I can state that waves can transfer energy and information without the transfer of matter.	<input type="checkbox"/>	I can investigate wave motion through a spring model.	<input type="checkbox"/>	I can explain the features of a longitudinal wave in terms of compressions and rarefactions by using a particle model.	<input type="checkbox"/>
	I can identify waves as either transverse or longitudinal.	<input type="checkbox"/>	I can compare transverse and longitudinal waves in terms of direction of vibration and propagation.	<input type="checkbox"/>	I can discuss the features of a transverse wave in terms of particle or field behaviour.	<input type="checkbox"/>
	I can identify waves as either mechanical or electromagnetic.	<input type="checkbox"/>	I can compare electromagnetic and mechanical waves in terms of the need for a medium.	<input type="checkbox"/>	I can compare mechanical waves and their particulate nature with electromagnetic waves and their field	<input type="checkbox"/>
P12.2 The properties of waves	I can outline the derivation of the wave speed equation.	<input type="checkbox"/>	I can outline the derivation of the wave speed equation.	<input type="checkbox"/>	I can explain how the wave speed equation can be derived from fundamental principles.	<input type="checkbox"/>
	I can calculate the period of a wave from its frequency.	<input type="checkbox"/>	I can calculate the period of a wave from its frequency.	<input type="checkbox"/>	I can perform calculations involving rearrangements of the period equation and the wave speed equation.	<input type="checkbox"/>
	I can measure the speed of a water wave.	<input type="checkbox"/>	I can calculate the wave speed from the frequency and wavelength.	<input type="checkbox"/>	I can perform multi-stage calculations linking period, frequency, wave speed, and wavelength.	<input type="checkbox"/>
P12.3 Reflection and refraction			I can describe refraction at a boundary in terms of wavefronts.	<input type="checkbox"/>	I can use a wavefront model to explain refraction and reflection.	<input type="checkbox"/>
			I can describe refraction including the reflected rays.	<input type="checkbox"/>	I can describe the relationship between the angle of incidence and angle of refraction.	<input type="checkbox"/>
			I can explain partial absorption as a decrease in the amplitude of a wave and therefore the energy carried.	<input type="checkbox"/>	I can explain refraction in terms of changes in the speed of waves when they move between one medium and another.	<input type="checkbox"/>

Name ..... Class ..... Date .....

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P12.4 Sound waves	I can state that sound waves are produced when objects vibrate.	<input type="checkbox"/>	I can explain how insulating materials can be used to absorb sound waves.	<input type="checkbox"/>	I can calculate distances between objects by using the concept of echo location.	<input type="checkbox"/>
	I can describe how echoes are produced through the reflection of sound waves.	<input type="checkbox"/>	I can explain why sound waves cannot travel through a vacuum.	<input type="checkbox"/>	I can describe the behaviour of sound waves in terms of vibrations and regions of compression and rarefaction.	<input type="checkbox"/>
	I can describe how the speed of sound in air can be measured.	<input type="checkbox"/>	I can plan an experiment to measure the speed of sound in air.	<input type="checkbox"/>	I can evaluate data from speed of sound experiments to discuss the range of possible speeds for sound.	<input type="checkbox"/>
P12.5 More about sound		<input type="checkbox"/>	I can describe the properties of a sound in terms of amplitude and frequency.	<input type="checkbox"/>	I can outline the structure of the human ear in terms of transfer of waves and vibrations.	<input type="checkbox"/>
		<input type="checkbox"/>	I can identify the range of frequencies that humans can hear.	<input type="checkbox"/>	I can explain why the human ear has a limited range of frequencies it can detect.	<input type="checkbox"/>
		<input type="checkbox"/>	I can measure the frequency of a sound wave using an oscilloscope and the relationship $\text{frequency} = 1/\text{period}$ .	<input type="checkbox"/>	I can compare the propagation of a sound wave in a solid and a gas.	<input type="checkbox"/>
P12.6 The uses of ultrasound		<input type="checkbox"/>	I can compare ultrasound and audible sound waves in terms of frequency.	<input type="checkbox"/>	I can investigate the reflection and absorption of ultrasound waves.	<input type="checkbox"/>
		<input type="checkbox"/>	I can outline some uses of ultrasound in distance measurement.	<input type="checkbox"/>	I can calculate the positions of objects or flaws in metal objects using data from an ultrasound trace.	<input type="checkbox"/>
		<input type="checkbox"/>	I can describe the operation of an ultrasound transducer in terms of partial reflection.	<input type="checkbox"/>	I can compare A- and B-type ultrasound scans.	<input type="checkbox"/>

Name ..... Class ..... Date .....

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P12.7 Seismic waves	<input type="checkbox"/>	I can describe the internal structure of the Earth.	<input type="checkbox"/>	I can explain in detail how the internal structure of the Earth can be determined by waves passing through	<input type="checkbox"/>	
	<input type="checkbox"/>	I can compare the three types of seismic waves (P, S, L) in terms of the speed they travel and whether they are	<input type="checkbox"/>	I can calculate the speed of different types of seismic waves.	<input type="checkbox"/>	
	<input type="checkbox"/>	I can describe the operation of a seismometer.	<input type="checkbox"/>	I can interpret seismographs to determine the difference in speeds of seismic waves.	<input type="checkbox"/>	

Name ..... Class ..... Date .....

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P13.1 The electromagnetic spectrum	I can state that electromagnetic waves transfer energy without transferring matter.	<input type="checkbox"/>	I can describe the relationship between the energy being transferred by an electromagnetic wave and the frequency of the wave.	<input type="checkbox"/>	I can apply the wave model of electromagnetic radiation as a pair of electric and magnetic disturbances that do not require a medium for travel.	<input type="checkbox"/>
	I can identify the position of EM waves in the spectrum in order of wavelength and frequency.	<input type="checkbox"/>	I can calculate the frequency and the wavelength of an electromagnetic wave.	<input type="checkbox"/>	I can use standard form in calculations of wavelength, frequency, and wave speed.	<input type="checkbox"/>
	I can state that all EM waves travel at the same speed in a vacuum.	<input type="checkbox"/>	I can explain why the range of wavelengths detected by the human eye is limited.	<input type="checkbox"/>	I can explain the interactions between an electromagnetic wave and matter.	<input type="checkbox"/>
P13.2 Light, infrared, microwaves, and radio waves	I can state that white light is a part of the EM spectrum and composed of a range of frequencies.	<input type="checkbox"/>	I can describe how a range of electromagnetic waves are used in a variety of scenarios.	<input type="checkbox"/>	I can determine the wavelength of radio waves in air.	<input type="checkbox"/>
	I can list some simple examples of the uses of light, microwaves, and radio waves.	<input type="checkbox"/>	I can explain why a particular wave is suited to its application.	<input type="checkbox"/>	I can describe the interactions between a range of waves and matter, including the effect of absorption.	<input type="checkbox"/>
	I can carry out a practical task to determine the penetrating power of an electromagnetic signal.	<input type="checkbox"/>	I can determine whether the law of reflection applies to a microwave signal.	<input type="checkbox"/>	I can plan, carry out, and evaluate in detail an investigation into the penetrating power of microwaves.	<input type="checkbox"/>

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P13.3 Communications	I can state that radio waves and microwaves are used in communications through the atmosphere.	<input type="checkbox"/>	I can compare the rate of information transfer through optical fibres and radio signals.	<input type="checkbox"/>	I can describe in detail how carrier waves are used in the transfer of information.	<input type="checkbox"/>
	I can state that the higher the frequency of a wave, the greater the rate of data transfer possible.	<input type="checkbox"/>	I can outline the operation of a mobile phone network and the waves used.	<input type="checkbox"/>	I can describe the structure of a radio communication system, including the effect of a radio wave on the current in the receiver.	<input type="checkbox"/>
	I can describe the sub-regions of the radio spectrum.	<input type="checkbox"/>	I can discuss the evidence for mobile phone signals causing damage to humans.	<input type="checkbox"/>	I can discuss the relationship between wavelength data transmission and range to explain why particular frequencies are chosen for particular transmissions.	<input type="checkbox"/>
P13.4 Ultraviolet waves, X-rays, and gamma rays	I can state that high-frequency EM radiation is ionising.	<input type="checkbox"/>	I can describe the penetrating powers of gamma rays, X-rays, and ultraviolet rays.	<input type="checkbox"/>	I can describe in detail the interaction between ionising radiation and inorganic materials.	<input type="checkbox"/>
	I can describe the uses and dangers of UV radiation.	<input type="checkbox"/>	I can compare X-rays and gamma radiation in terms of their origin.	<input type="checkbox"/>	I can compare different regions of the electromagnetic spectrum in terms of their potential harmfulness.	<input type="checkbox"/>
	I can describe the uses and dangers of X-rays and gamma radiation.	<input type="checkbox"/>	I can describe the ionisation of atoms in simple terms.	<input type="checkbox"/>	I can explain how the process of ionisation can lead to cell death or cancer through damage to DNA.	<input type="checkbox"/>
P13.5 X-rays in medicine	I can state some safety procedures that take place during the operation of devices that produce ionising radiation.	<input type="checkbox"/>	I can describe the operation of an X-ray machine.	<input type="checkbox"/>	I can compare the operation of a CT-scanner and that of a simple X-ray device.	<input type="checkbox"/>
	I can describe the formation of an X-ray photograph in terms of absorption or transmission.	<input type="checkbox"/>	I can explain why contrast media can be used during X-rays.	<input type="checkbox"/>	I can evaluate the doses of ionising radiation received in a variety of occupations or medical treatments.	<input type="checkbox"/>
	I can state that X-ray therapy can be used to kill cancerous cells in the body.	<input type="checkbox"/>	I can describe the factors that affect the radiation doses received by people.	<input type="checkbox"/>	I can explain in detail how various safety features reduce exposure to ionising radiation.	<input type="checkbox"/>

# AQA Physics

## GCSE Student Checklist

### P14 Light

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P14.1 Reflection of light	I can state the law of reflection.	<input type="checkbox"/>	I can construct accurate ray diagrams showing the reflection of light rays.	<input type="checkbox"/>	I can draw a ray diagram showing the position of an image in a plane mirror.	<input type="checkbox"/>
	I can describe the properties of an image in a mirror in simple terms and investigate reflection with guidance.	<input type="checkbox"/>	I can explain why some surfaces form images during reflection but other do not.	<input type="checkbox"/>	I can use a ray diagrams to discuss why some surfaces form images during reflection but others do not.	<input type="checkbox"/>
	I can state that a real image can be formed on a screen but a virtual image cannot.	<input type="checkbox"/>	I can investigate the law of reflection through practical techniques.	<input type="checkbox"/>	I can evaluate the data from an investigation to discuss the precision and accuracy of any results.	<input type="checkbox"/>
P14.2 Refraction of light	I can state that the path of a ray of light will change at a boundary between two transparent materials.	<input type="checkbox"/>	I can construct a ray diagram showing the refraction of a ray of light at a boundary between two different media.	<input type="checkbox"/>	I can explain how the refraction of light can cause the depth of a material to appear less than it actually is.	<input type="checkbox"/>
	I can identify the angle of incidence and angle of refraction in a ray diagram.	<input type="checkbox"/>	I can describe the dispersion of white light as it passes through a prism.	<input type="checkbox"/>	I can explain the dispersion of light as it passes through a prism in terms of different changes of speed for different wavelengths of light.	<input type="checkbox"/>
	I can measure the angle of incidence and angle of refraction for a simple refraction.	<input type="checkbox"/>	I can investigate the refraction of light through a glass or Perspex block.	<input type="checkbox"/>	I can analyse the data from a refraction investigation to test different substances to determine whether it fits a suggested relationship.	<input type="checkbox"/>
P14.3 Light and colour	I can describe the visible spectrum as a continuous series of colours or wavelengths.	<input type="checkbox"/>	I can describe the colours of objects in different colours of light.	<input type="checkbox"/>	I can explain the apparent colour of surfaces using the concept of reflection and absorption when illuminated by white light or combinations of primary colours.	<input type="checkbox"/>
	I can explain the colour of objects in white light in terms of reflection of parts of the spectrum.	<input type="checkbox"/>	I can describe how combinations of filters transmit light.	<input type="checkbox"/>	I can describe the effects of combinations of coloured light and filters on the appearance of a variety of coloured objects.	<input type="checkbox"/>
	I can explain the effect of a single filter on white light.	<input type="checkbox"/>	I can determine the appearance of a white object when illuminated by combinations of primary coloured light.	<input type="checkbox"/>	I can determine the apparent colour of a coloured surface when illuminated by different combinations of red, green, and blue light.	<input type="checkbox"/>

Name ..... Class ..... Date .....

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P15.1 Magnetic fields	I can state the names of the poles of a magnet.	<input type="checkbox"/>	I can sketch the shape of a magnetic field around a bar magnet.	<input type="checkbox"/>	I can describe the regions in a magnetic field where magnetic forces are greatest using the idea of field lines.	<input type="checkbox"/>
	I can describe the interaction of magnetic poles (attraction and repulsion).	<input type="checkbox"/>	I can describe how the shape of a magnetic field can be investigated.	<input type="checkbox"/>	I can explain in detail how a magnetism can be induced in some materials.	<input type="checkbox"/>
	I can list some magnetic and non-magnetic metals.	<input type="checkbox"/>	I can compare the Earth's magnetic field to that of a bar magnet.	<input type="checkbox"/>	I can plan in detail how the strength of a magnetic field can be investigated.	<input type="checkbox"/>
P15.2 Magnetic fields of electric current	I can state that the magnetic field produced by a current carrying wire is circular.	<input type="checkbox"/>	I can use the corkscrew rule to determine the direction of the field around a current carrying wire.	<input type="checkbox"/>	I can determine the polarity of the ends of a solenoid from the direction of the current.	<input type="checkbox"/>
	I can describe the effect of increasing the current on the magnetic field around a wire.	<input type="checkbox"/>	I can describe the shape of the field produced by a solenoid.	<input type="checkbox"/>	I can sketch the shape of the field surrounding a solenoid relating this to the direction of the current through the coil.	<input type="checkbox"/>
	I can describe the effect of reversing the direction of the current in the wire.	<input type="checkbox"/>			I can plan a detailed investigation into the factors that affect the strength of the magnetic field around a solenoid.	<input type="checkbox"/>
P15.3 Electromagnets	I can list some electromagnet devices.	<input type="checkbox"/>	I can describe the structure of an electromagnet in simple terms.	<input type="checkbox"/>	I can explain the effect of an iron core on the strength of an electromagnet in terms of the magnetic field.	<input type="checkbox"/>
	I can state some uses of electromagnets.	<input type="checkbox"/>	I can describe the operation of simple devices that use electromagnets.	<input type="checkbox"/>	I can describe in detail the operation of an electric bell.	<input type="checkbox"/>
	I can state the factors which increase the strength of an electromagnet.	<input type="checkbox"/>	I can investigate the factors that affect the strength of an electromagnet.	<input type="checkbox"/>	I can evaluate an experiment into the factors which affect the strength of an electromagnet.	<input type="checkbox"/>

Name ..... Class ..... Date .....

Lesson	Aiming for 4	Aiming for 6		Aiming for 8	
P15.4 The motor effect		I can describe the operation of a moving-coil loudspeaker.	<input type="checkbox"/>	I can describe and explain in detail the operation of a d.c. motor.	<input type="checkbox"/>
		I can apply Fleming's left-hand rule to determine the direction of the force acting on a conductor.	<input type="checkbox"/>	I can perform calculations involving rearrangements of the equation $F = BIl$ .	<input type="checkbox"/>
		I can calculate the force acting on a conductor when it is placed in a magnetic field.	<input type="checkbox"/>	I can investigate the factors that affect the rotation of an electric motor.	<input type="checkbox"/>
P15.5 The generator effect		I can describe electromagnetic induction in a wire.	<input type="checkbox"/>	I can explain why relative movement of a wire through a magnetic field is required to cause induction.	<input type="checkbox"/>
		I can identify the factors that affect the size of an induced current in a wire.	<input type="checkbox"/>	I can independently investigate the magnitude and polarity of a current induced in a solenoid when a magnet is moved in it.	<input type="checkbox"/>
		I can identify the direction of current induced in a solenoid.	<input type="checkbox"/>	I can describe how a changing current in one coil can be used to induce a current in another.	<input type="checkbox"/>
P15.6 The alternating current generator		I can describe the operation of an alternator and microphone in simple terms.	<input type="checkbox"/>	I can describe the output of an alternator, linking this to the position of the coil to the magnetic field and the speed of rotation.	<input type="checkbox"/>
		I can describe the operation of a d.c. generator.	<input type="checkbox"/>	I can describe the operation of a direct current generator and its output.	<input type="checkbox"/>
		I can identify the period and peak output voltage for generators from an oscilloscope trace.	<input type="checkbox"/>	I can explain why the peak voltage of an a.c. generator is produced when the coil is parallel to the magnetic field lines.	<input type="checkbox"/>

Name ..... Class ..... Date .....

Lesson	Aiming for 4	Aiming for 6		Aiming for 8	
P15.7 Transformers		I can describe the structure of a transformer.	<input type="checkbox"/>	I can justify the choice of materials used to construct a transformer.	<input type="checkbox"/>
		I can describe the operation of a transformer in simple terms.	<input type="checkbox"/>	I can describe and explain the operation of a transformer in terms of induction and changes in magnetic fields.	<input type="checkbox"/>
		I can explain why transformers only operate with alternating currents.	<input type="checkbox"/>	I can investigate the effect that changing the ratio of the input and output loops on a transformer has on the change in voltage.	<input type="checkbox"/>
P15.8 Transformers in action		I can use the transformer equation to calculate input or output voltages for a transformer.	<input type="checkbox"/>	I can apply the transformer equation in a wide variety of situations.	<input type="checkbox"/>
		I can calculate the secondary current in a transformer.	<input type="checkbox"/>	I can use the relationship $V_P \times I_P = V_S \times I_S$ to calculate all variables.	<input type="checkbox"/>
		I can measure the efficiency of a transformer.	<input type="checkbox"/>	I can measure the efficiency of a transformer and explain why this may not be 100%.	<input type="checkbox"/>

Name ..... Class ..... Date .....

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P16.1 Formation of the Solar System	I can describe a variety of objects within the Solar System.	<input type="checkbox"/>	I can describe the formation of a protostar and planets.	<input type="checkbox"/>	I can analyse data about the planets to compare them in terms of composition.	<input type="checkbox"/>
	I can use simple data to compare objects in the Solar System.	<input type="checkbox"/>	I can explain why a star radiates light in terms of nuclear fusion.	<input type="checkbox"/>	I can explain why a star in its main sequence maintains a constant radius.	<input type="checkbox"/>
	I can state that the material in a star is pulled together by gravitational forces.	<input type="checkbox"/>	I can describe how evidence for the early solar system is gathered.	<input type="checkbox"/>	I can discuss the methods used to gather evidence for the early solar system and formation of stars.	<input type="checkbox"/>
P16.2 The life history of a star	I can identify the sequence of development for a small star such as the Sun from a diagram.	<input type="checkbox"/>	I can compare the life cycle of small and large stars, identifying the names of the stages.	<input type="checkbox"/>	I can describe changes in the wavelength (colour) and quantity (brightness) of light emitted by stars during various stages of their life-cycle.	<input type="checkbox"/>
	I can state that changes in the fusion processes in a star result in changes in its appearance.	<input type="checkbox"/>	I can describe the formation of 'light' elements by stars in their main sequence.	<input type="checkbox"/>	I can explain, in terms of energy requirements, why elements heavier than iron are produced only in supernovae.	<input type="checkbox"/>
	I can state that the Sun is in its main sequence and is stable.	<input type="checkbox"/>	I can describe the forces that are acting when a star is in its main sequence.	<input type="checkbox"/>	I can describe the features of neutron stars and black holes.	<input type="checkbox"/>
P16.3 Planets, satellites, and orbits	I can compare the orbits of planets, moons, and artificial satellites.	<input type="checkbox"/>	I can state that, for a greater radius of orbit, the object must travel at a slower speed and orbit in a longer period.	<input type="checkbox"/>	I can explain why a centripetal force can change the velocity of an object without changing its speed.	<input type="checkbox"/>
	I can state that, for an object to be moving in an orbit, there must be a gravitational force acting directed at the centre of the orbit.	<input type="checkbox"/>	I can describe the forces acting on an object that cause it to travel in a circular path.	<input type="checkbox"/>	I can explain why the force acting on an object travelling in a circle must be at right angles to the direction of motion and directed towards the centre of the circle.	<input type="checkbox"/>
	I can list some uses of artificial satellites.	<input type="checkbox"/>	I can describe the different orbits of a variety of satellites.	<input type="checkbox"/>	I can explain why a geostationary satellite must be a specific distance from the centre of the Earth.	<input type="checkbox"/>

Name ..... Class ..... Date .....

Lesson	Aiming for 4		Aiming for 6		Aiming for 8	
P16.4 The expanding universe	I can state that the wavelength of a wave is changed by the movement of the source.	<input type="checkbox"/>	I can describe how the frequency or wavelength of a wave can be altered by the movement of the source through the Doppler effect.	<input type="checkbox"/>	I can identify red-shift or blue-shift by comparing emission spectra of objects with those of a non-moving source.	<input type="checkbox"/>
	I can state that a galaxy showing red-shift is moving away from us.	<input type="checkbox"/>	I can compare galaxies in terms of their red-shift and distance from us.	<input type="checkbox"/>	I can identify the relationship between the red-shift of a galaxy and its speed of recession from a data set or graph.	<input type="checkbox"/>
	I can describe the structure of a galaxy as a collection of billions of stars many light years in diameter.	<input type="checkbox"/>	I can state that all galaxies are moving away from each other and that this shows the universe is expanding.	<input type="checkbox"/>	I can explain how red-shift data is used to show that the universe is expanding.	<input type="checkbox"/>
P16.5 The beginning and future of the universe	I can state that the currently accepted model for the early universe is the Big Bang model.	<input type="checkbox"/>	I can discuss why scientists were initially reluctant to accept the Big Bang model.	<input type="checkbox"/>	I can outline recent discoveries that have led to changes in the theories of how the universe will develop.	<input type="checkbox"/>
	I can describe how red-shift provides evidence for expansion of the universe and the Big Bang model.	<input type="checkbox"/>	I can describe the origin of the cosmic microwave background radiation (CMBR).	<input type="checkbox"/>	I can explain in detail how the CMBR supports the Big Bang model.	<input type="checkbox"/>
	I can identify the cosmic microwave background radiation (CMBR) as evidence for the Big Bang model.	<input type="checkbox"/>	I can describe changes in the universe from the time of the Big Bang to the present day.	<input type="checkbox"/>	I can discuss how scientists using new evidence have changed their theories about how the universe has evolved over time and how it will change in the future.	<input type="checkbox"/>