AQA GCSE Combined Science: Trilogy
Topic Checklists

6.3 Particle Model of Matter

6.3.1 Changes of State and the Particle Model				
Topic	**Success Criteria**	**Progress**		
Density of Materials	I can recall and apply the correct equation to calculate the density of an object.			
	I can rearrange the equation linking density, mass and volume to calculate the mass or volume of an object.			
	I can use the particle model to explain the different states of matter.			
	I can use the particle model to explain differences in density.			
	I can recognise and draw simple diagrams to model the difference between solids, liquids and gases.			
	I can describe how to use appropriate apparatus to make and record the measurements needed to determine the densities of regular solid objects and liquids (required practical activity 17).			
	I can calculate the volume of regular solid objects and liquids (required practical activity 17).			
	I can describe how to use appropriate apparatus to make and record the measurements needed to determine the densities of irregularly shaped objects using a displacement technique (required practical activity 17).			
Changes of State	I can describe the different changes of state.			
	I can describe what happens to the mass of a substance when it changes state.			
	I can explain why a change of state is different to a chemical change.			

6.3.2 Internal Energy and Energy Transfers				
Topic	**Success Criteria**	**Progress**		
Internal Energy	I can describe where energy is stored inside a system.			
	I can give a definition for internal energy.			
	I can explain how heating affects the energy stored within a system.			
	I can explain the effects that heating can have on a system.			
Temperature Changes in a System and Specific Heat Capacity	I can describe what affects the temperature increase of a system.			
	I can calculate the energy change involved when the temperature of a material changes by applying the correct equation from the physics equation sheet.			
Changes of State and Specific Latent Heat	I can give a definition for specific latent heat.			
	I can distinguish between the specific latent heat of fusion and the specific latent heat of vaporisation.			
	I can describe what happens to the energy transferred to a substance as it changes state.			
	I can calculate the energy change involved when a substance changes state by applying the correct equation from the physics equation sheet.			
	I can interpret heating and cooling graphs that include changes of state.			
	I can distinguish between specific heat capacity and specific latent heat.			

6.3.3 Particle Model and Pressure				
Topic	**Success Criteria**	**Progress**		
Particle Motion in Gases	I can describe the motion of the molecules of a gas.			
	I can describe how the temperature of a gas is related to the average kinetic energy of the molecules.			
	I can explain how the motion of the molecules in a gas is related to its temperature.			
	I can explain how the motion of the molecules in a gas is related to its pressure.			

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6.4 Atomic Structure

6.4.1 Atoms and Isotopes				
Topic	**Success Criteria**	**Progress**		
The Structure of an Atom	I can state the radius of an atom.			
	I can describe how the radius of a nucleus compares to the radius of an atom.			
	I can describe the basic structure of an atom.			
	I can state the charge of the nucleus of an atom.			
	I can state the charge of an electron.			
	I can describe how electrons are arranged in atoms.			
	I can describe how electron arrangements may change with the absorption of electromagnetic radiation.			
	I can describe how electron arrangements may change with the emission of electromagnetic radiation.			
Mass Number, Atomic Number and Isotopes	I can describe how the number of electrons in an atom relates to the number of protons in the nucleus.			
	I can explain why atoms have no overall electrical charge.			
	I can describe how the number of protons in an atom of an element relates to its atomic number.			
	I can describe how the number of protons and neutrons in an atom relates to its mass number.			
	I can give a definition for the term 'isotope'.			
	I can explain how atoms turn into positive ions.			
	I can identify the difference between isotopes given appropriate information.			

Topic	Success Criteria	Progress		
The Development of the Model of the Atom	I can describe what atoms were thought to be like before the discovery of the electron.			
	I can describe the difference between the plum pudding model of the atom and the nuclear model of the atom.			
	I can describe how the results from the alpha particle scattering experiment led to the nuclear model.			
	I can describe how Niels Bohr adapted the nuclear model.			
	I can describe how developments in scientific methods led to the discovery of protons and neutrons.			
	I can describe how the experimental work of James Chadwick led to the development of the nuclear model.			

6.4.2 Atoms and Nuclear Radiation				
Topic	**Success Criteria**	**Progress**		
Radioactive Decay and Nuclear Radiation	I can describe what is meant by radioactive decay.			
	I can describe what is meant by the activity of an unstable nuclei.			
	I can describe what is meant by the count–rate of an unstable nuclei.			
	I can describe four types of nuclear radiation.			
	I can describe the penetration of alpha, beta and gamma radiation through materials.			
	I can describe the range of alpha, beta and gamma radiation in air.			
	I can describe the ionising power of alpha, beta and gamma radiation.			
	I can evaluate the best sources of radiation to use in a given situation.			
Nuclear Equations	I can represent alpha radiation in a nuclear equation.			
	I can represent beta radiation in a nuclear equation.			
	I can describe how alpha decay affects the mass and charge of the nucleus.			
	I can describe how beta decay affects the mass and charge of the nucleus.			
	I can describe how gamma decay affects the mass and charge of the nucleus.			
	I can balance the atomic numbers and mass numbers in nuclear equations to show single alpha and beta decay.			
Half–Lives and the Random Nature of Radioactive Decay	I know that radioactive decay is random.			
	I can give a definition for half–life in terms of number of nuclei or the count–rate.			
	I can explain the concept of half–life and how it is related to the random nature of radioactive decay.			
	I can determine the half–life of a radioactive isotope from given information.			
	(HT only) I can calculate the net decline, expressed as a ratio, in a radioactive emission after a given number of half–lives.			

Topic	Success Criteria	Progress		
Radioactive Contamination	I can describe what is meant by radioactive contamination.			
	I can explain what is meant by irradiation.			
	I can compare the hazards associated with contamination and irradiation.			
	I can suggest how to manage the use of radioactive sources during irradiation to protect against hazards.			
	I can explain why the findings of studies into the effects of radiation on humans should be published and shared with other scientists.			

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6.1 Energy

6.1.1 Energy Changes in a System, and the Ways Energy Is Stored before and after Such Changes				
Topic	**Success Criteria**	**Progress**		
Energy Stores and Systems	I can state what is meant by a system.			
	I can describe all the changes involved in the way energy is stored when a system changes, for common situations.			
	I can calculate the changes in energy involved when a system changes by: • heating; • work done by forces; • work done when a current flows.			
	I can use calculations to show how the overall energy in a system is redistributed when the system is changed.			
Changes in Energy	I can recall and apply the correct equation to calculate the amount of energy associated with a moving object.			
	I can rearrange the equation linking kinetic energy, mass and speed to calculate the mass or speed of a moving object.			
	I can calculate the amount of energy associated with a stretched spring by applying the correct equation from the physics equation sheet.			
	I can rearrange the equation linking elastic potential energy, extension and spring constant to calculate the extension or spring constant of a stretched spring.			
	I can recall and apply the correct equation to calculate the amount of energy associated with an object raised above ground level.			
	I can rearrange the equation linking gravitational field strength, gravitational potential energy, height and mass to calculate the mass or height of an object or the strength of the gravitational field the object is in.			
Energy Changes in Systems	I can calculate the amount of energy stored in or released from a system as its temperature changes by applying the correct equation from the physics equation sheet.			
	I can rearrange the equation linking change in thermal energy, mass, specific heat capacity and temperature change to calculate the mass, specific heat capacity or temperature change of an object.			
	I can define the specific heat capacity of a substance.			
	I can describe an investigation to determine the specific heat capacity of one or more materials (required practical activity 14).			

Topic	Success Criteria	Progress		
Power	I can define power.			
	I can recall and apply the correct equation to calculate power from the amount of energy transferred and time.			
	I can rearrange the equation linking energy transferred, power and time to calculate the energy transferred or time.			
	I can recall and apply the correct equation to calculate power from work done and time.			
	I can rearrange the equation linking power, time and work done to calculate the work done or time.			
	I can state the energy transferred in joules per second in watts.			
	I can give examples to illustrate the definition of power.			

6.1.2 Conservation and Dissipation of Energy				
Topic	**Success Criteria**	**Progress**		
Energy Transfers in a System	I can describe the conservation of energy, with reference to transfer, storage, dissipation, creation and destruction.			
	I can describe how energy transfers in a closed system affect the total energy of the system.			
	I can describe, with examples, how energy is dissipated when a system changes.			
	I can explain ways of reducing unwanted energy transfers including the use of lubrication or thermal insulation.			
	I can describe how the thermal conductivity of a material affects the energy transfer by conduction across the material.			
	I can describe how the rate of cooling of a building is affected by the thickness and thermal conductivity of its walls.			
Efficiency	I can recall and apply the correct equation to calculate efficiency as a decimal or a percentage from the useful output energy transfer and the total input energy transfer.			
	I can rearrange the equation linking efficiency, total input energy transfer and useful output energy transfer to calculate the total input energy transfer or useful output energy transfer.			
	I can recall and apply the correct equation to calculate efficiency as a decimal or a percentage from the useful power output and the total power input.			
	I can rearrange the equation linking efficiency, total power input and useful power output to calculate the total power input or useful power output.			
	(HT only) I can describe ways to increase the efficiency of an intended energy transfer.			

6.1.3 National and Global Energy Resources				
Topic	**Success Criteria**	**Progress**		
National and Global Energy Resources	I can name the main energy resources available for use on Earth.			
	I can describe what is meant by a renewable energy resource.			
	I can distinguish between energy resources that are renewable and energy resources that are non–renewable.			
	I can compare the ways that different energy resources are used, including for transport, electricity generation and heating.			
	I can explain why some energy resources are more reliable than others.			
	I can describe the environmental impact arising from the use of different energy resources.			
	I can explain patterns and trends in the use of energy resources.			
	I can give reasons why science does not always have the power to deal with the environmental issues arising from the use of energy resources.			

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6.2 Electricity

6.2.1 Current, Potential Difference and Resistance				
Topic	**Success Criteria**	**Progress**		
Standard Circuit Diagram Symbols	I can recognise and draw the standard symbols for: • switch (open) • switch (closed) • cell • battery • diode • resistor • variable resistor • LED • lamp • fuse • voltmeter • ammeter • thermistor • LDR			
	I can draw and interpret circuit diagrams.			
Electrical Charge and Current	I can state what is needed for electrical charge to flow in a circuit.			
	I can give a definition for electric current and describe what its size tells us about electrical charge.			
	I can recall and apply the correct equation to calculate charge flow.			
	I can rearrange the equation linking charge flow, current and time to calculate current or time.			
	I can compare the value of the current at any point in a single closed loop.			
Current, Resistance and Potential Difference	I can describe how the resistance and potential difference affect the current through a component.			
	I can recall and apply the correct equation to calculate the potential difference across a component.			
	I can rearrange the equation linking current, potential difference and resistance to calculate current or resistance.			
	I can use circuit diagrams to set up and check appropriate circuits to investigate the factors affecting the resistance of electrical circuits (required practical activity 15).			

Topic	Success Criteria	Progress		
Resistors	I can describe how the current through an ohmic conductor is related to the potential difference across the resistor.			
	I can describe what happens to the resistance of an ohmic conductor as the current through it changes.			
	I can describe how the current through a filament lamp is related to the potential difference across the resistor.			
	I can describe what happens to the resistance of a filament lamp as the temperature of the filament increases.			
	I can represent the relationship between the current through a diode and the potential difference across the resistor on a graph.			
	I can describe how the current flows through a diode.			
	I can describe what happens to the resistance of a diode when current flows in the reverse direction.			
	I can describe how the resistance of a thermistor changes as the temperature increases.			
	I can describe how thermistors can be used to control a circuit.			
	I can explain how the resistance of an LDR changes as light intensity changes.			
	I can describe how LDRs can be used to control a circuit.			
	I can explain the design and use of a circuit to measure the resistance of a component by measuring current through, and potential difference across, a component.			
	I can recognise and draw graphs that represent the relationship between the current and potential difference for: • an ohmic conductor; • a filament lamp; • a diode.			
	I can 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 (required practical activity 16).			

6.2.2 Series and Parallel Circuits				
Topic	**Success Criteria**	**Progress**		
Series and Parallel Circuits	I can state the two ways of joining electrical components in a circuit.			
	I can describe the current through components connected in series.			
	I can describe the potential difference across components connected in series.			
	I can describe the total resistance of two components connected in series and represent this as an equation.			
	I can describe the potential difference across components connected in parallel.			
	I can describe the current through components connected in parallel.			
	I can describe the total resistance of two components connected in parallel.			
	I can use circuit diagrams to construct and check series and parallel circuits that include a variety of common circuit components.			
	I can describe the difference between series and parallel circuits.			
	I can explain qualitatively why adding resistors in series increases the total resistance while adding resistors in parallel decreases the total resistance.			
	I can explain the design and use of dc circuits for measurement and testing purposes.			
	I can calculate the currents, potential differences and resistances in dc series circuits.			
	I can solve problems for circuits which include resistors in series using the concept of equivalent resistance.			

6.2.3 Domestic Uses and Safety				
Topic	**Success Criteria**	**Progress**		
Direct and Alternating Potential Difference	I can state whether mains electricity is an ac or dc supply.			
	I can recall the frequency of the UK mains electricity supply.			
	I can recall the potential difference of the UK mains electricity supply.			
	I can explain the difference between direct and alternating potential difference.			
Mains Electricity	I can recall the colour of the live wire in a three–core cable.			
	I can recall the colour of the neutral wire in a three–core cable.			
	I can recall the colour of the earth wire in a three–core cable.			
	I can state the purpose of the live wire.			
	I can state the purpose of the neutral wire.			
	I can state the purpose of the earth wire.			
	I can recall the potential difference between the live wire and earth.			
	I can explain that a live wire may be dangerous even when a switch in the mains circuit is open.			
	I can solve problems for circuits which include resistors in series using the concept of equivalent resistance.			

6.2.4 Energy Transfers				
Topic	**Success Criteria**	**Progress**		
Power	I can explain how the power transfer in a circuit device is related to the potential difference across it and the current through it.			
	I can recall and apply the equation linking current, potential difference and power to calculate the power transfer in a circuit device.			
	I can rearrange the equation linking current, potential difference and power to calculate the current or potential difference in a circuit device.			
	I can recall and apply the equation linking current, power and resistance to calculate the power transfer in a circuit device.			
	I can rearrange the equation linking current, power and resistance to calculate current or resistance in a circuit device.			
Energy Transfers in Everyday Appliances	I can explain how the power transfer in a circuit device is related to the energy transferred over a given time.			
	I can describe what affects the amount of energy an appliance transfers.			
	I can describe how different domestic appliances transfer energy from batteries or ac mains to electric motors or heating devices.			
	I can describe how charge causes work to be done in a circuit.			
	I can recall and apply the equation linking energy transferred, power and time to calculate the amount of energy transferred by electrical work.			
	I can rearrange the equation linking energy transferred, power and time to calculate the power or time.			
	I can recall and apply the equation linking charge flow, energy transferred and potential difference to calculate the amount of energy transferred by electrical work.			
	I can rearrange the equation linking charge flow, energy transferred and potential difference to calculate the charge flow or potential difference.			
	I can describe, with examples, the relationship between power ratings for domestic electrical appliances and the changes in stored energy when they are in use.			

Topic	Success Criteria	Progress		
The National Grid	I can name the parts that make up the National Grid.			
	I can describe the purpose of the National Grid.			
	I can explain the purpose of step–up transformers.			
	I can explain the purpose of step–down transformers.			
	I can explain why the National Grid system is an efficient way to transfer energy.			
	(HT only) I can apply the correct equation from the physics equation sheet linking the potential difference and current through the primary and secondary coils of a transformer.			