

Physics Unit 1

Physics 1a: Energy and Electricity	Physics Unit 1			
	Syllabus point (text abridged)	Boardworks presentations		
		GCSE Science	Additional Science	Separate Sciences
11.1 How is heat (thermal energy) transferred and what factors affect the rate at which heat is transferred?	To evaluate ways in which heat is transferred in and out of bodies and ways to reduce the rates of these transfers	Heat Transfer		
	Thermal (infra red) radiation is the transfer of energy by electromagnetic waves	Heat Loss and Insulation Infrared and Visible Waves		
	All bodies emit and absorb thermal radiation	Heat Transfer Heat Loss and Insulation		
	The hotter a body, the more energy it radiates	Heat Transfer Heat Loss and Insulation		
	Dark, matt surfaces are good absorbers and good emitters of radiation	Heat Transfer		
	Light, shiny surfaces are poor absorbers and poor emitters of radiation	Heat Transfer		
	The transfer of energy by conduction and convection involves particles: how this transfer takes place	Heat Transfer		
	Under similar conditions, different materials transfer heat at different rates	Heat Transfer		
	The shape and dimensions of a body affect the rate at which it transfers heat	Heat Transfer		
The bigger the temperature difference between a body and its surroundings, the faster the rate at which heat is transferred	Heat Transfer			

Physics Unit 1

Physics Unit 1					
Physics 1a: Energy and Electricity	11.2 What is meant by the efficient use of energy?	Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
		To describe the intended energy transfers/transformations and the main energy wastages that occur with a range of devices	Energy Efficiency		
		To calculate the efficiency of a device using: Efficiency = $\frac{\text{Useful energy transferred by the device}}{\text{Total energy supplied to the device}}$	Energy Efficiency		
		To evaluate the effectiveness and cost effectiveness of methods used to reduce energy consumption	Heat Loss and Insulation		
		Energy cannot be created or destroyed. It can only be transformed from one form to another form	Energy Efficiency		
		When energy is transferred and/or transformed only part of it may be usefully transferred/transformed	Energy Efficiency		
		Energy which is not transferred/transformed in a useful way is 'wasted'	Energy Efficiency		
		Wasted energy and energy which is usefully transferred/transformed are eventually transferred to their surroundings, which become warmer	Energy Efficiency		
		Energy becomes increasingly spread out and becomes more difficult to use for further energy transformations	Energy Efficiency		
		The greater the percentage of the energy that is usefully transformed in a device, the more efficient the device is	Energy Efficiency		

Physics Unit 1

Syllabus point (text abridged)

Boardworks presentations

**GCSE
Science**

**Additional
Science**

**Separate
Sciences**

Physics 1a: Energy and Electricity

11.3 Why are electrical devices so useful?

To compare and contrast the particular advantages and disadvantages of using different electrical devices for a particular application

**Energy
Efficiency**

Calculate the amount of energy transferred from the mains:

$$\text{energy transferred (kilowatt-hour, kWh)} = \text{power (kilowatt, kW)} \times \text{time (hour, h)}$$

**Electricity to
the Home**

Calculate the cost of energy transferred from the mains using:

$$\text{total cost} = \text{number of kilowatt-hours} \times \text{cost per kilowatt-hour}$$

**Electricity to
the Home**

Examples of energy transformations in electrical devices

**Energy
Efficiency**
**Electricity to
the Home**

Examples of everyday electrical devices designed to bring about particular energy transformations

**Energy
Efficiency**

The amount of electrical energy a device transforms depends on how long the appliance is switched on, and the rate at which the device transforms energy

The power of an appliance is measured in watts (W) or kilowatts (kW)

**Electricity to
the Home**

Energy is normally measured in joules (J)

Heat Transfer

Electricity is transferred from power station to consumers along the National Grid

**Mains
Electricity**

Transformers

The uses of step-up and step-down transformers in the National Grid

**Mains
Electricity**

Transformers

Increasing voltage (potential difference) reduces current, and hence reduces energy loss in the cables

Transformers

Physics Unit 1

Physics Unit 1					
Physics 1a: Energy and Electricity	11.4 How should we generate the electricity we need?	Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
		To compare and contrast the particular advantages and disadvantages of using different energy sources to generate electricity	Non-Renewable Energy Resources Renewable Energy - Solar and Thermal Renewable Energy - Wind and Water	Nuclear Energy	
		In most power stations an energy source heats water. The steam produced drives a generator via a turbine.	Non-Renewable Energy Resources	Nuclear Energy	
		Common energy sources include coal, oil and gas, which are burnt to produce heat, and uranium/plutonium, in which nuclear fission produces heat	Non-Renewable Energy Resources		
		Energy from renewable energy sources can be used to drive turbines directly	Renewable Energy - Solar and Thermal Renewable Energy - Wind and Water		
		Renewable energy sources used in this way include wind, waves and tides, and hydroelectric schemes	Renewable Energy - Wind and Water		
		Electricity can be produced directly from the Sun's radiation using solar cells	Renewable Energy - Solar and Thermal		
		In some volcanic areas hot water and steam rise to the surface. The steam can be tapped and used to drive turbines. This is geothermal energy	Renewable Energy - Solar and Thermal		
		Different energy resources have different effects on the environment. These include air, noise and visual pollution, and the destruction of habitats	Non-Renewable Energy Resources		
		The advantages and disadvantages of using fossil fuels, nuclear fuels and renewable energy sources to generate electricity. These include the cost of building power stations, the start-up time of power stations, the reliability of the energy source, the relative cost of energy generated and the location in which the energy is needed	Non-Renewable Energy Resources Renewable Energy - Solar and Thermal Renewable Energy - Wind and Water	Nuclear Energy	

Physics Unit 1

Physics Unit 1					
Physics 1b: Radiation and the Universe	11.5 What are the uses and hazards of the waves that form the electromagnetic spectrum?	Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
		To evaluate the possible hazards associated with the use of different types of electromagnetic radiation	Electromagnetic Waves Ionizing Radiation		
		To evaluate methods to reduce exposure to different types of electromagnetic radiation	Electromagnetic Waves Ionizing Radiation		
		Electromagnetic radiation travels as waves and moves energy from one place to another	Electromagnetic Waves		
		All types of electromagnetic waves travel at the same speed through a vacuum (space)	Electromagnetic Waves		
		The electromagnetic spectrum is continuous but the wavelengths within it can be grouped into types of increasing wavelength and decreasing frequency: – gamma rays, X-rays, ultraviolet rays, visible light, infra red rays, microwaves and radio waves	Electromagnetic Waves		
		Different wavelengths of electromagnetic radiation are reflected, absorbed or transmitted differently by different substances and types of surface	Electromagnetic Waves		
		When radiation is absorbed the energy it carries makes the substance which absorbs it hotter and may create an alternating current with the same frequency as the radiation	Infrared and Visible Waves		
		Different wavelengths of electromagnetic radiation have different effects on cells. Some pass through soft tissue without being absorbed, some produce heat, some may cause cancerous changes and some may kill cells. The effects depend on the type of radiation and the size of the dose	Electromagnetic Waves Ionizing Radiation		
		The uses and the hazards associated with the use of each type of radiation in the electromagnetic spectrum	Electromagnetic Waves Ionizing Radiation		
		Radiowaves, microwaves, infra red and visible light can be used for communication	Radio Waves and Microwaves Infrared and Visible Waves Digital Communications		Waves
		Microwaves can pass through the Earth's atmosphere and are used to send information to and from satellites and within mobile phone networks	Radio Waves and Microwaves		

	Infra red and visible light can be used to send signals along optical fibres and so travel in curved paths	Infrared and Visible Waves		Reflection and Refraction
	Communication signals may be analogue (continuously varying) or digital (only on and off). Digital signals are less prone to interference and can be processed by computers	Digital Communications		
	Electromagnetic waves obey the wave formula: Wave speed = frequency x wavelength (metre/seconds, m/s) (hertz, Hz) (metre, m)	Wave Properties		Waves

Physics Unit 1					
	Syllabus point (text abridged)	Boardworks presentations			
		GCSE Science	Additional Science	Separate Sciences	
Physics 1b: Radiation and the Universe	11.6 What are the uses and dangers of emissions from radioactive substances?	To evaluate the possible hazards associated with the use of different types of nuclear radiation	Ionizing Radiation Radioactivity Electromagnetic Waves		
		To evaluate measures that can be taken to reduce exposure to nuclear radiations	Ionizing Radiation Radioactivity		
		To evaluate the appropriateness of radioactive sources for particular uses, including as tracers, in terms of the type(s) of radiation emitted and their half-lives	Ionizing Radiation Radioactivity	Radioactive Decay	
		The basic structure of an atom is a small central nucleus composed of protons and neutrons surrounded by electrons	Radioactivity	Radioactive Decay	
		The atoms of an element always have the same number of protons, but each isotope has a different number of neutrons		Radioactive Decay	
		Some substances constantly give out radiation from their nuclei. These substances are said to be radioactive	Radioactivity		
		Identification of an alpha particle as a helium nucleus, a beta particle as an electron from the nucleus and gamma radiation as electromagnetic radiation	Radioactivity	Radioactive Decay	
		Properties of alpha, beta and gamma radiation limited to their relative ionizing power, their penetration through materials and their range in air	Radioactivity	Radioactive Decay	
		Alpha and beta radiations are deflected by both electric and magnetic fields but gamma radiation is not	Radioactivity		
		The uses of, and the dangers associated with, each type of nuclear radiation	Radioactivity		
The half-life of a radioactive isotope is defined as the time it takes for the number of nuclei of the isotope in a sample to halve or the time it takes for the count rate from a sample containing the isotope to fall to half its initial level		Radioactive Decay			

Physics Unit 1					
Physics 1b: Radiation and the Universe	11. 7 What do we know about the origins of the Universe and how it continues to change?	Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
		Compare and contrast the advantages and disadvantages of using different types of telescopes on Earth and in space, to make observations on and deductions about the universe	Gravity and Space		
		If a wave source is moving relative to an observer there will be a change in the observed wavelength and frequency			
		There is a red-shift in light observed from distant galaxies. The further away galaxies are, the bigger the red-shift	The Universe		
		How the observed red-shift provides evidence that the universe is expanding and supports the 'big bang' theory	The Universe		
		Observations of the solar system and the galaxies in the universe can be carried out on the Earth or from space	Gravity and Space The Universe		Lenses
		Observations are made with telescopes that may detect visible light or other electromagnetic radiations	Gravity and Space		Lenses

Physics Unit 2

Physics Unit 2					
	Syllabus point (text abridged)	Boardworks presentations			
		GCSE Science	Additional Science	Separate Sciences	
Physics 2	12.1 How can we describe the way things move?	Construct distance-time graphs for a body moving in a straight line, when the body is stationary or moving with a constant speed		Speed and Acceleration	
		Construct velocity-time graphs for a body moving with a constant velocity or a constant acceleration		Speed and Acceleration	
		HT: Calculate the speed of a body from the slope of a distance-time graph		Speed and Acceleration	
		HT: Calculate the acceleration of a body from the slope of a velocity-time graph		Speed and Acceleration	
		HT: Calculate the distance travelled by a body from a velocity-time graph		Speed and Acceleration	
		The slope of a distance-time graph represents speed		Speed and Acceleration	
		The velocity of a body is its speed in a given direction		Speed and Acceleration	Forces and Motion
		The acceleration of a body is given by: <div style="display: flex; align-items: center; justify-content: center; gap: 20px;"> acceleration (m/s²) = $\frac{\text{change in velocity (m/s)}}{\text{time taken for change (s)}}$ </div>		Speed and Acceleration	
		The slope of a velocity-time graph represents acceleration		Speed and Acceleration	
		Area under a velocity-time graph equals distance travelled		Speed and Acceleration	

Physics Unit 2

Syllabus point (text abridged)

Boardworks presentations

**GCSE
Science**

**Additional
Science**

**Separate
Sciences**

12.2 How do we make things speed up or slow down?

To draw and interpret velocity-time graphs for bodies that reach terminal velocity, including a consideration of the forces acting on the body

Laws of Motion

To calculate the weight of a body using:

$$\text{weight (N)} = \text{mass (kg)} \times \text{gravitational field strength (N/kg)}$$

Gravity and Space

Whenever two bodies interact, the forces they exert on each other are equal and opposite

Laws of Motion

A number of forces acting on a body may be replaced by a single force, which has the same effect on the body as the original forces all acting together. This is the resultant force

Laws of Motion

Forces and Motion

If the resultant force acting on a stationary body is zero, the body will remain stationary

Laws of Motion

Forces and Motion

If the resultant force acting on a stationary body is not zero, the body will accelerate in the direction of the resultant force

Laws of Motion

Forces and Motion

If the resultant force acting on a moving body is zero, it will continue to move at the same speed, in the same direction

Laws of Motion

Forces and Motion

If the resultant force acting on a moving body is not zero, the body will accelerate in the direction of the resultant force

Laws of Motion

Forces and Motion

$$\text{resultant force (newton, N)} = \text{mass (kilogram, kg)} \times \text{acceleration (metre/second}^2\text{, m/s}^2\text{)}$$

Laws of Motion

Forces and Motion

When a vehicle travels at a steady speed, the frictional forces balance the driving force

Laws of Motion

The greater the speed of a vehicle, the greater the braking force needed to stop it in a certain distance

Speed and Acceleration

The stopping distance of a vehicle depends on the distance it travels during the driver's reaction time and the distance it travels under the braking force

Speed and Acceleration

Reaction time can be affected by tiredness, drugs and alcohol

Speed and Acceleration

A vehicle's braking distance can be affected by adverse road and weather conditions and poor condition of the vehicle

Speed and Acceleration

The faster a body moves through a fluid, the greater the frictional force which acts on it

A body falling through a fluid will initially accelerate due to the force of gravity. Eventually the resultant force on the body will be zero and it will fall at its terminal velocity

Physics Unit 2

Physics Unit 2					
Physics 2	12.3 What happens to the movement energy when things speed up or slow down?	Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
		To discuss the transformation of kinetic energy to other forms of energy in particular situations	Energy Efficiency	Energy and Movement	
		When a force causes a body to move through a distance, energy is transferred and work is done		Work and Power	
		Work done = energy transferred		Work and Power	
		work done = force applied x distance moved in direction of force (joule, J) (newton, N) (metre, m)		Work and Power	
		Work done against friction is mainly transformed into heat		Laws of Motion	
		Elastic potential is the energy stored in an object when work is done on the object to change its shape		Energy and Movement	
		The kinetic energy of a body depends on its mass and speed		Energy and Movement	
		HT: Calculate kinetic energy using the equation: $\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times \text{speed}^2$ (J) (kg) (m/s) ²		Energy and Movement	

Physics Unit 2

Physics Unit 2					
Physics 2	12.4 What is momentum?	Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
		To use the conservation of momentum (in one dimension) to calculate the mass, velocity or momentum of a body involved in a collision or explosion			Forces and Motion
		To use the ideas of momentum to explain safety features		Momentum	
		momentum = mass × velocity (kg m/s) (kg) (m/s)		Momentum	Forces and Motion
		Momentum has both magnitude and direction		Momentum	Forces and Motion
		When a force acts on a body that is moving, or able to move, a change in momentum occurs		Momentum	Forces and Motion
		Momentum is conserved in any collision/explosion, provided no external forces act on the colliding/exploding bodies		Momentum	Forces and Motion
		HT: Force, change in momentum and time taken for the change are related by the equation: force = $\frac{\text{change in momentum (kg (m/s))}}{\text{time taken for the change (s)}}$ (N)		Momentum	

Physics Unit 2

Physics Unit 2					
Physics 2	12.5 What is static electricity, how can it be used and what is the connection between static electricity and electric currents?	Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
		To explain the dangers of static electricity and the precautions taken to ensure safe discharge		Static Electricity	
		To explain how static electricity can be useful		Static Electricity	
		When certain insulating materials are rubbed against each other they become electrically charged. Negatively charged electrons are rubbed off one material onto the other		Static Electricity	
		The material that gains electrons becomes negatively charged. The material that loses electrons is left with an equal positive charge		Static Electricity	
		When two electrically charged bodies are brought together they exert a force on each other		Static Electricity	
		Two bodies that carry the same type of charge repel. Two bodies that carry different types of charge attract		Static Electricity	
		Electrical charges can move easily through some substances e.g. metals		Static Electricity	
		The rate of flow of electrical charge is called the current		Static Electricity	
		A charged body can be discharged by connecting it to earth with a conductor. Charge then flows through the conductor		Static Electricity	
		HT: The greater the charge on an isolated body, the greater the potential difference between the body and earth. If the potential difference is high enough a spark may jump between the body and any earthed conductor nearby		Static Electricity	
		Electrostatic charges can be useful, for example, in photocopiers and smoke precipitators		Static Electricity	

Physics Unit 2

Syllabus point (text abridged)

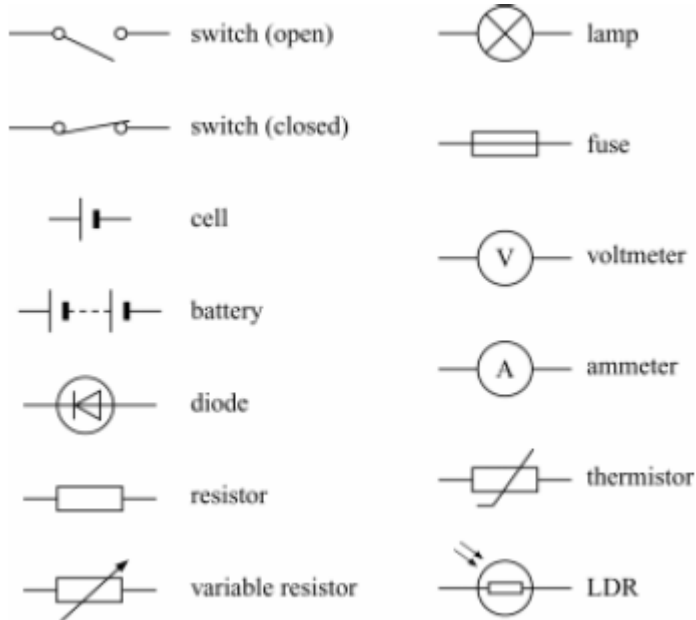
Boardworks presentations

GCSE
Science

Additional
Science

Separate
Sciences

To interpret and draw circuit diagrams using standard symbols. The following standard symbols should be known:



Electric
Circuits

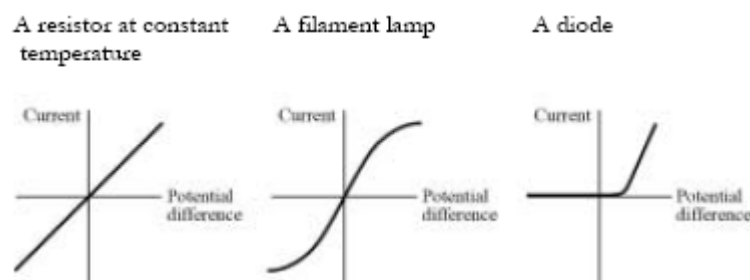
Controlling
Current and
Voltage

To apply the principles of basic electrical circuits to practical situations

Electric
Circuits

Electrical
Safety

V-I graphs are used to show how the current through a component varies with the potential difference across it:



Resistance
and
Resistors

Controlling
Current and
Voltage

Diodes and
Capacitors

The current through a resistor (at a constant temperature) is directly proportional to the potential difference across it

Resistance
and
Resistors

Controlling
Current and
Voltage

$$\begin{array}{ccccc} \text{potential difference} & = & \text{current} & \times & \text{resistance} \\ \text{(volt, V)} & & \text{(ampere, A)} & & \text{(ohm, } \Omega \text{)} \end{array}$$

Resistance
and
Resistors

Controlling
Current and
Voltage

The resistance of a component can be found by measuring the current through and potential difference across the component

Resistance
and
Resistors

The resistance of a filament lamp increases as the temperature of the filament increases

Resistance
and
Resistors

Controlling
Current and
Voltage

12.6 What does the current through an electrical circuit depend on?

Physics 2

<p>The current through a diode flows in one direction only. The diode has a very high resistance in the reverse direction</p>		<p>Resistance and Resistors</p>	<p>Controlling Current and Voltage Diodes and Capacitors</p>
<p>The resistance of a light-dependent resistor (LDR) decreases as light intensity increases</p>			<p>Controlling Current and Voltage</p>
<p>The resistance of a thermistor decreases as the temperature increases</p>			<p>Controlling Current and Voltage</p>
<p>The current through a component depends on its resistance. The greater the resistance, the smaller the current for a given potential difference across the component</p>		<p>Resistance and Resistors</p>	
<p>The potential difference provided by cells connected in series is the sum of the potential difference of each cell</p>		<p>Resistance and Resistors</p>	
<p>For components connected in series:</p> <ul style="list-style-type: none"> – the total resistance is the sum of the resistance of each – there is the same current through each component – the total potential difference of the supply is shared between the components 		<p>Resistance and Resistors</p>	
<p>For components connected in parallel:</p> <ul style="list-style-type: none"> – the potential difference across each component is the same – the total current through the whole circuit is the sum of the currents through the separate components 		<p>Resistance and Resistors</p>	

Physics Unit 2

Syllabus point (text abridged)

Boardworks presentations

**GCSE
Science**

**Additional
Science**

**Separate
Sciences**

12.7 What is mains electricity and how can it be used safely?

To recognise errors in the wiring of a three-pin plug

Electrical
Safety

To recognise dangerous practice in the use of mains electricity

Electrical
Safety

To compare potential differences of d.c. supplies and the peak potential differences of a.c. supplies from diagrams of oscilloscope traces

**Mains
Electricity**

HT: To determine the period, and hence the frequency, of a supply from diagrams of oscilloscope traces

**Mains
Electricity**

Cells and batteries supply current which always passes in the same direction. This is called direct current (d.c.)

**Mains
Electricity**

An alternating current (a.c.) is one which is constantly changing direction. Mains electricity is an a.c. supply. In the UK it has a frequency of 50 cycles per second (50 hertz)

**Mains
Electricity**

UK mains supply is about 230 volts

**Mains
Electricity**

Most electrical appliances are connected to the mains using cable and a three-pin plug

Electrical
Safety

The structure of electrical cable

Electrical
Safety

The structure of a three-pin plug

Electrical
Safety

Correct wiring of a three-pin plug

Electrical
Safety

If an electrical fault causes too great a current, the circuit should be switched off by a fuse or a circuit breaker

Electrical
Safety

When the current in a fuse wire exceeds the rating of the fuse, it will melt, breaking the circuit

Electrical
Safety

Appliances with metal cases are usually earthed

Electrical
Safety

The earth wire and fuse protect the appliance and the user

Electrical
Safety

HT: The live terminal of the mains supply alternates between positive and negative with respect to the neutral terminal

Electrical
Safety

HT: The neutral terminal stays at a potential close to zero with respect to earth

Electrical
Safety

Physics Unit 2

Physics Unit 2					
Physics 2	12.8 Why do we need to know the power of electrical appliances?	Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
		To calculate the current through an appliance from its power and the potential difference of the supply, and from this determine the size of fuse needed	Electricity to the Home Mains Electricity	Electrical Safety	
		Electric current is the rate of flow of charge		Resistance and Resistors	Controlling Current and Voltage
		When an electrical charge flows through a resistor, electrical energy is transformed into heat energy		Resistance and Resistors	
		The rate at which energy is transformed is called the power: power = $\frac{\text{energy transferred (joule, J)}}{\text{time (second, s)}}$ (watt, W)		Work and Power	
		Power, potential difference and current are related by: power = current × potential difference (watt, W) (ampere, A) (volt, V)	Electricity to the Home		Transformers
		HT: Energy transformed, potential difference and charge are related by the equation: energy transformed = potential difference × charge (joule, J) (volt, V) (coulomb, C)			
		HT: The amount of electrical charge that flows is related to current and time by the equation: charge = current × time (coulomb, C) (ampere, A) (second, s)			

Physics Unit 2

	Syllabus point (text abridged)	Boardworks presentations		
		GCSE Science	Additional Science	Separate Sciences
		Physics 2	12.9 What happens to radioactive substances when they decay?	
	Radioactive Decay Atomic Structure (GCSE Additional Chemistry)			
	Radioactive Decay Atomic Structure (GCSE Additional Chemistry)			
	Radioactive Decay Atomic Structure (GCSE Additional Chemistry)			
	Radioactive Decay Atomic Structure (GCSE Additional Chemistry)			
	Radioactive Decay Atomic Structure (GCSE Additional Chemistry)			
	Radioactive Decay Atomic Structure (GCSE Additional Chemistry)			
	Radioactive Decay Atomic Structure (GCSE Additional Chemistry)			
	Radioactivity			

Physics Unit 2				
	Syllabus point (text abridged)	Boardworks presentations		
		GCSE Science	Additional Science	Separate Sciences
Physics 2	12.10 What are nuclear fission and nuclear fusion?		Nuclear Energy	
	Sketch a labelled diagram to illustrate how a chain reaction may occur		Nuclear Energy	
	There are two fissionable substances in common use in nuclear reactors, uranium 235 and plutonium 239		Nuclear Energy	
	Nuclear fission is the splitting of an atomic nucleus		Nuclear Energy	
	For fission to occur the uranium 235 or plutonium 239 nucleus must first absorb a neutron		Nuclear Energy	
	The nucleus undergoing fission splits into two smaller nuclei and 2 or 3 neutrons and energy is released		Nuclear Energy	
	The neutrons may go on to start a chain reaction		Nuclear Energy	
	Nuclear fusion is the joining of two atomic nuclei to form a larger one		Nuclear Energy	Stars
Nuclear fusion is the process by which energy is released in stars		Nuclear Energy	Stars	

Physics Unit 3

Physics Unit 3					
	Syllabus point (text abridged)	Boardworks presentations			
		GCSE Science	Additional Science	Separate Sciences	
Physics 3	13.2 What keeps bodies moving in a circle?	Identify which force(s) provide(s) the centripetal force in a given situation.			Orbits
	Interpret data on bodies moving in circular paths.			Orbits	
	When a body moves in a circle it continuously accelerates towards the centre of the circle. This acceleration changes the direction of motion of the body, not its speed.			Orbits	
	The resultant force causing this acceleration is called the centripetal force.			Orbits	
	The direction of the centripetal force is always towards the centre of the circle.			Orbits	
	The centripetal force needed to make a body perform circular motion increases as: <ul style="list-style-type: none"> – the mass of the body increases – the speed of the body increases – the radius of the circle decreases. 			Orbits	

Physics Unit 3

Physics Unit 3					
Physics 3	13.3 What provides the centripetal force for planets and satellites?	Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
		Interpret data on planets and satellites moving in orbits that approximate to circular paths.			Orbits
		The Earth, Sun, Moon and all other bodies attract each other with a force called gravity.	Gravity and Space		Orbits
		The bigger the masses of the bodies the bigger the force of gravity between them.	Gravity and Space		Orbits
		As the distance between two bodies increases, the force of gravity between them decreases.			Orbits
		The orbit of any planet is an ellipse (slightly squashed circle), with the Sun at one focus.			Orbits
		Gravitational force provides the centripetal force that allows planets and satellites to maintain their circular orbits.			Orbits
		The further away an orbiting body is, the longer it takes to make a complete orbit.			Orbits
		To stay in orbit at a particular distance, smaller bodies, including planets and satellites, must move at a particular speed around larger bodies.			Orbits
		Communications satellites are usually put into a geostationary orbit above the equator.			Orbits
		Monitoring satellites are usually put into a low polar orbit.			Orbits

Physics Unit 3

Physics 3	Physics Unit 3			
	Syllabus point (text abridged)	Boardworks presentations		
		GCSE Science	Additional Science	Separate Sciences
13.4 What do mirrors and lenses do to light?	Construct ray diagrams to show the formation of images by plane, convex and concave mirrors			Reflection and Refraction
	Construct ray diagrams to show the formation of images by diverging lenses and converging lenses			Lenses
	Explain the use of a converging lens as a magnifying glass and in a camera			Lenses
	Calculate the magnification produced by a lens or mirror using the formula: magnification = $\frac{\text{image height}}{\text{object height}}$			Lenses
	The normal is a construction-line perpendicular to the reflecting/refracting surface at the point of incidence.			Reflection and Refraction
	The angle of incidence is equal to the angle of reflection.			Reflection and Refraction
	The nature of an image is defined by its size relative to the object, whether it is upright or inverted relative to the object and whether it is real or virtual.			Reflection and Refraction
	The nature of the image produced by a plane mirror.			Reflection and Refraction
	The nature of the image produced by a convex mirror.			Reflection and Refraction
	The nature of the image produced by a concave mirror for an object placed at different distances from the mirror.			Reflection and Refraction
	Refraction at an interface.	Infrared and Visible Waves		Reflection and Refraction
	Refraction by a prism.			Reflection and Refraction
	The nature of the image produced by a diverging lens.			Lenses
	The nature of the image produced by a converging lens for an object placed at different distances from the lens.			Lenses
The use of a converging lens in a camera to produce an image of an object on a detecting device (e.g. film).			Lenses	

Physics Unit 3					
	Syllabus point (text abridged)	Boardworks presentations			
		GCSE Science	Additional Science	Separate Sciences	
Physics 3	13.5 What is sound?	Compare the amplitudes and frequencies of sounds from diagrams of oscilloscope traces.			Waves
		Sound is caused by mechanical vibration: it travels as a wave.	Wave Properties		Waves
		Sounds from 20-20,000 Hz can be detected by the human ear.			Waves
		Sound cannot travel through a vacuum.			Waves
		The pitch of a note increases as the frequency increases.			Waves
		The volume of a note increases as the amplitude of the wave increases.			Waves
		The quality of a note depends upon the waveform.			Waves
		Sound waves can be reflected and refracted.			Waves

Physics Unit 3					
	Syllabus point (text abridged)	Boardworks presentations			
		GCSE Science	Additional Science	Separate Sciences	
Physics 3	13.6 What is ultrasound and how can it be used?	Compare the amplitudes and frequencies of ultrasounds from diagrams of oscilloscope traces.			Waves
		HT: To determine the distance between interfaces in various media from diagrams of oscilloscope traces.			Waves
		Electronic systems can be used to produce ultrasound waves which have a frequency higher than the upper limit of hearing for humans.			Waves
		Ultrasound waves are partially reflected when they meet a boundary between two different media. The time taken for the reflections to reach a detector is a measure of how far away such a boundary is.			Waves
		Ultrasound waves can be used in industry for cleaning and quality control.			Waves
		Ultrasound waves can be used in medicine for pre-natal scanning.			Waves

Physics Unit 3				
	Syllabus point (text abridged)	Boardworks presentations		
		GCSE Science	Additional Science	Separate Sciences
Physics 3 13.7 How can electricity be used to make things move?	Explain how the motor effect is used in simple devices.		Motors and Generators	
	When a conductor carrying an electric current is placed in a magnetic field, it may experience a force.		Motors and Generators	
	The size of the force can be increased by: – increasing the strength of the magnetic field – increasing the size of the current.		Motors and Generators	
	The conductor will not experience a force if it is parallel to the magnetic field.		Motors and Generators	
	The direction of the force is reversed if either the direction of the current or the direction of the magnetic field is reversed.		Motors and Generators	

Physics Unit 3				
	Syllabus point (text abridged)	Boardworks presentations		
		GCSE Science	Additional Science	Separate Sciences
Physics 3 13.8 How do generators work?	HT: Explain, from a diagram, how an a.c. generator works, including the purpose of the slip rings and brushes.		Motors and Generators	
	If an electrical conductor ‘cuts’ through magnetic field lines, an electrical potential difference is induced across the ends of the conductor.		Motors and Generators	Transformers
	If a magnet is moved into a coil of wire, an electrical potential difference is induced across the ends of the coil.	Electricity to the Home	Motors and Generators	Transformers
	If the wire is part of a complete circuit, a current is induced in the wire.	Electricity to the Home	Motors and Generators	Transformers
	If the direction of motion or the polarity of the magnet is reversed, the direction of the induced potential difference and the induced current is reversed.		Motors and Generators	Transformers
	The generator effect also occurs if the magnetic field is stationary and the coil is moved.		Motors and Generators	Transformers
	The size of the induced potential difference increases when: – the speed of the movement increases – the strength of the magnetic field increases – the number of turns on the coil increases – the area of the coil is greater.		Motors and Generators	Transformers

Physics Unit 3

Physics Unit 3					
Physics 3	13.9 How do transformers work?	Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
		Determine which type of transformer should be used for a particular application.			Transformers
		The basic structure of the transformer.	Mains Electricity		Transformers
		An alternating current in the primary coil produces a changing magnetic field in the iron core and hence in the secondary coil. This induces an alternating potential difference across the ends of the secondary coil.			Transformers
		HT: The potential difference (p.d.) across the primary and secondary coils of a transformer is calculated by the equation: $\frac{\text{p.d. across primary}}{\text{p.d. across secondary}} = \frac{\text{number of turns on primary}}{\text{number of turns on secondary}}$			Transformers
		In a step-up transformer the potential difference across the secondary coil is greater than the potential difference across the primary coil.	Mains Electricity		Transformers
		In a step-down transformer the potential difference across the secondary coil is less than the potential difference across the primary coil.	Mains Electricity		Transformers
		The uses of transformers in the National Grid.	Mains Electricity		Transformers

Physics Unit 3

Physics Unit 3					
Physics 3	13.10 What is the life history of stars?	Syllabus point (text abridged)	Boardworks presentations		
			GCSE Science	Additional Science	Separate Sciences
		Explain how stars are able to maintain their energy output for millions of years			Stars
		HT: Explain why the early Universe contained only hydrogen but now contains many different elements.			Stars
		Our Sun is one of the billions of stars in the Milky Way galaxy.	The Universe		Stars
		The Universe is made up of billions of galaxies.	The Universe		Stars
		Stars form when enough dust and gas from space is pulled together by gravitational attraction. Smaller masses may also form and be attracted by a larger mass to become planets.	The Universe		Stars
		Gravitational forces balance radiation pressure to make a star stable.			Stars
		A star goes through a life cycle (limited to the life cycle of Sun-sized stars and stars much larger than the Sun).	The Universe		Stars
		HT: Fusion processes in stars produce all naturally occurring elements. These elements may be distributed throughout the Universe by a supernova.			Stars