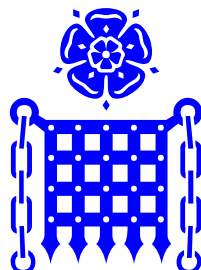


# EMANUEL SCHOOL



## AQA GCSE PHYSICS Double Award Syllabus

***For exams in June 2004***

1. This is the complete syllabus for double award physics for **foundation** and **higher** tier.
2. Find out the tier for which you have been entered. If you are entered for the *higher tier* you must also know all the material in the *foundation tier* in addition to the material in the higher tier.
3. Some of the material in this syllabus was covered year 8 and year 9. Make sure that you are familiar with it. See the right hand column for further information. You will have an opportunity to go over some of this work in class during final revision in the Summer term, 2003
4. The written paper in physics contributes 26.6% of total marks towards the Double Award.
5. Coursework contributes 20% of total mark.

**Section 1**  
**ENERGY**

Energy (yr 8 & 9)

TOPIC	FOUNDATION TIER	HIGHER TIER
<p><i>Energy 1</i> <b>Energy resources</b> <i>Yr. 8</i></p>	<ol style="list-style-type: none"> <li>The Sun is the original source of most of the Earth's energy resources</li> <li>How energy is transferred from the Sun to coal.</li> <li>How energy is transferred from the Sun to wind</li> </ol>	
<p><i>Energy 2</i> <b>Renewable energy resources</b> <i>Yr. 8</i></p>	<ol style="list-style-type: none"> <li>Renewable energy resources are those that will not run out, limited to               <ol style="list-style-type: none"> <li>biomass, especially wood</li> <li>food supplies</li> <li>solar heating &amp; solar electricity</li> <li>running water (hydro power)</li> <li>tidal</li> <li>wave power</li> <li>wind power</li> </ol> </li> </ol>	
<p><i>Energy 3</i> <b>Non-renewable energy resources</b> <i>Yr. 8</i></p>	<ol style="list-style-type: none"> <li>Non-renewable energy resources are those that are finite:               <ol style="list-style-type: none"> <li>fossil fuels: coal, oil &amp; natural gas</li> <li>nuclear fuels</li> <li>geothermal (due to radioactive decay)</li> </ol> </li> </ol>	
<p><i>Energy 4</i> <b>Conservation</b> <i>Yr. 9</i></p>	<ol style="list-style-type: none"> <li>You should know that most current energy resources are finite (i.e. will run out)</li> <li>You should know about the environmental problems associated with the use of fossil fuels and nuclear fuels</li> <li>Advantages /disadvantages of each energy resource for generation of electricity.</li> </ol>	
<p><i>Energy 5</i> <b>Energy transfers</b> <i>Yr. 9</i></p>	<ol style="list-style-type: none"> <li>Energy transfers to and from the following forms               <ol style="list-style-type: none"> <li>chemical</li> <li>elastic/strain</li> <li>electrical</li> <li>gravitational potential energy</li> <li>heat/internal/thermal</li> <li>radiant (light &amp; infrared radiation)</li> <li>kinetic (movement)</li> <li>nuclear</li> <li>sound</li> </ol> </li> </ol>	
<p><i>Energy 6</i> <b>Work and energy</b> <i>Yr. 9</i></p>	<ol style="list-style-type: none"> <li>Transfer of energy is the result of work done.</li> <li>The joule (J) as the unit of energy and of work</li> <li>You should be able to recall and use of the quantitative relationships:               <p>work done (J) = energy transferred (J)</p> <ol style="list-style-type: none"> <li><i>work done (J) = force (N) × distance moved in the direction of the force (m)</i></li> </ol> </li> </ol>	
<p><i>Energy 7</i> <b>Efficiency</b> <i>Yr. 9</i></p>	<ol style="list-style-type: none"> <li>In energy transfer the useful energy output is always less than the energy input</li> <li>Efficiency = useful energy output/ total energy input</li> <li>Application to devices that transfer energy, including               <ol style="list-style-type: none"> <li>tungsten filament light bulb</li> <li>low energy light bulbs</li> <li>electric kettles</li> <li>electric motors</li> </ol> </li> </ol>	

ENERGY (yr 9)

TOPIC	FOUNDATION TIER	HIGHER TIER
<p><i>Energy 8</i> <b>Thermal energy</b> <i>Yr. 9</i></p>	<ol style="list-style-type: none"> <li>1. Thermal energy is a transfer of energy as a result of differences in temperature.</li> <li>2. Thermal energy flows from hot to cold</li> <li>3. The degree Celsius (<math>^{\circ}\text{C}</math>) as the unit of temperature</li> <li>4. The joule (J) is the unit of energy</li> </ol>	
<p><i>Energy 9</i> <b>Conduction</b> <i>Yr. 9</i></p>	<ol style="list-style-type: none"> <li>1. Conduction of heat energy is the result of the vibration of particles in a solid.</li> <li>2. Metals are good conductors of thermal energy</li> <li>3. Non-metallic substances, including trapped gas, are poor conductors of thermal energy</li> </ol>	<p><i>Metals are specially good conductors of thermal energy because they have free electrons which move through the metal quickly transferring energy to the atoms through collisions.</i></p>
<p><i>Energy 10</i> <b>Convection</b> <i>Yr. 9</i></p>	<ol style="list-style-type: none"> <li>1. Convection is the movement of more energetic particles in liquids and gases.</li> <li>2. The cause of convection currents in liquids and gases is changes in density, resulting in ocean currents and winds</li> </ol>	
<p><i>Energy 11</i> <b>Radiation</b> <i>Yr. 9</i></p>	<ol style="list-style-type: none"> <li>1. Radiation is the transfer of energy by infrared radiation which can pass through a vacuum and be absorbed or reflected.</li> <li>2. Factors that affect absorption and emission of radiant energy, limited to               <ol style="list-style-type: none"> <li>(i) temperature</li> <li>(ii) surface conditions (shiny/matt and light/dark)</li> </ol> </li> </ol>	
<p><i>Energy 12</i> <b>Reducing heat losses</b> <i>Yr. 9</i></p>	<ol style="list-style-type: none"> <li>1. Ways of reducing energy transfer from hotter objects to colder objects, limited to               <ol style="list-style-type: none"> <li>(i) vacuum flask</li> <li>(ii) cavity wall insulation</li> <li>(iii) loft insulation</li> <li>(iv) double glazing</li> <li>(v) thick curtains</li> </ol> </li> </ol>	

ENERGY (yr 10)

TOPIC	FOUNDATION TIER	HIGHER TIER
<p>Energy 14 <b>Kinetic energy</b> Yr. 10</p>	<p>1. Kinetic energy is the energy of motion You should know that the speed and hence the kinetic energy of a car affects its stopping distance</p> <p>2. You must be able to use the quantitative relationship <b><math>k.e. = 1/2 m v^2</math></b> where <math>m</math> is the mass(in kg) of the moving object and <math>v</math> its velocity (in m/s)</p>	
<p>Energy 15 <b>Gravitational potential energy</b> Yr. 10</p>	<p>Gravitational potential energy (g.p.e.) is energy due to position You must be able to use the quantitative relationship <b><math>\Delta g.p.e. = m g \Delta h</math></b> where <math>m</math> is the mass(in kg) of the object, <math>g</math> is the acceleration due to gravity (in <math>m/s^2</math>) and <math>\Delta h</math> is the change in height (in m) when the object moves vertically up or down.</p>	
<p>Energy 16 <b>Power</b> Yr. 10</p>	<p>1. Power is the rate of doing work 2. The watt (W) as the unit of power 3. You should be able to use the quantitative relationship <b><math>P = W/t</math> or <math>(F \times d)/t</math></b></p>	
<p>Energy 17 <b>Using energy resources</b> Yr. 10</p>	<p>1. Principles of using energy resources in the production of electricity, limited to (i) solar panels (ii) pumped storage reservoirs (iii) tidal barrages (iv) wave machines (v) wind turbines (vi) gas / coal and oil power stations (vii) nuclear power stations [You will <b>not</b> be expected to give technical details of power generating plants]</p>	

**Section 2**

**FORCE**

Force (yr 9)

TOPIC	FOUNDATION TIER	HIGHER TIER
<p><i>Forces 1</i> <b>Speed and velocity</b> <i>Yr. 9</i></p>	<ol style="list-style-type: none"> <li>Distance-time graphs to represent distance travelled against time for uniform motion.</li> <li>Calculation of speed from distance-time graphs.</li> <li>Recall and use the relationship: <math>v = s/t</math></li> <li>Average speed, <math>v</math>, is total distance covered, <math>s</math>, divided by total time taken to cover distance, <math>t</math>.</li> <li>Units of speed in metres/second (m/s) if distance is measured in metres, time in seconds.</li> <li>Interpretation of distance/time graphs for acceleration</li> </ol>	
<p><i>Forces 2</i> <b>Gravity</b> <i>Yr. 9</i></p>	<ol style="list-style-type: none"> <li>The difference between mass and weight.</li> <li>Weight of an object is the force of gravity acting on its mass.</li> <li>Mass is measured in kilograms (<b>kg</b>), weight (a force) in newtons (<b>N</b>).</li> <li>Gravity is a force of attraction between objects and depends upon their mass and the distance between them.</li> <li>Acceleration of all freely falling objects in a vacuum near the Earth's surface is the same due to the Earth's gravitational field.</li> </ol>	

FORCE (yr 10)

TOPIC	FOUNDATION TIER	HIGHER TIER
<p><i>Forces 6</i> <b>Acceleration</b> <i>Yr. 10</i></p>	<ol style="list-style-type: none"> <li>1. Velocity is the speed of an object in a particular direction at a particular moment</li> <li>2. Acceleration is the rate of change of velocity.</li> <li>3. Represent constant velocity <i>and</i> acceleration on distance/time <i>and</i> velocity/time graphs.</li> <li>4. Recall and use the quantitative relationship: <math display="block">a = (v-u)/t</math></li> </ol>	<p><i>Calculation of distance travelled, velocity and acceleration from velocity/time graph.</i></p>
<p><i>Forces 7</i> <b>Force</b> <i>Yr. 10</i></p>	<ol style="list-style-type: none"> <li>1. Newton's <b>first law</b> of motion: the velocity of a moving object is unchanged when acted upon by balanced forces.</li> <li>2. Newton's <b>second law</b> of motion: the velocity of a moving object is changed (i.e. it accelerates) when acted upon by unbalanced forces.</li> <li>3. Newton's <b>third law</b> of motion: forces exerted by two interacting bodies on each other are equal and opposite.</li> <li>4. The unit of force is the newton. (<b>N</b>)</li> <li>5. Acceleration depends on the mass of the object and the force applied.</li> </ol>	<p><i>Recall and use the quantitative relationship:</i> <math display="block">F = m \times a</math> <i>where F = force in Newtons</i> <i>m = mass in kilograms</i> <i>a = acceleration in m/s<sup>2</sup></i></p>
<p><i>Forces 8</i> <b>Friction</b> <i>Yr. 10</i></p>	<ol style="list-style-type: none"> <li>1. Effect of friction on motion, limited to a falling parachute and the friction between a tyre and the road.</li> <li>2 Terminal velocity is the constant velocity reached by falling objects in air and other fluids.</li> <li>3 Factors affecting terminal velocity, limited to:               <ol style="list-style-type: none"> <li>(i) air resistance (drag)</li> <li>(ii) the shape of an object.</li> </ol> </li> </ol>	
<p><i>Forces 9</i> <b>Stopping distance</b> <i>Yr. 10</i></p>	<ol style="list-style-type: none"> <li>1. Factors affecting stopping distances, limited to               <ol style="list-style-type: none"> <li>(i) speed of vehicle</li> <li>(ii) reaction time of driver</li> <li>(iii) force applied by the braking system</li> <li>(iv) friction between wheels and surface (skidding)</li> </ol>               (see also kinetic energy)             </li> </ol>	

**Section 3**  
**ELECTRICITY**

TOPIC	FOUNDATION TIER	HIGHER TIER
<i>Electricity 1</i> <b>Static electricity</b> <i>Yr. 8</i>	<ol style="list-style-type: none"> <li>Objects can become charged due to friction.</li> <li>The cause of negative or positive charge is the transfer of electrons to or from insulators.</li> <li>Repulsion between charged bodies is a result of the interaction between similar charges</li> <li>Attraction between charged bodies is a result of the interaction between dissimilar charges</li> </ol>	
<i>Electricity 2</i> <b>Circuits</b> <i>Yr. 8</i>	<ol style="list-style-type: none"> <li>In an electrical circuit electrical energy is transferred from batteries and other sources to other components.</li> <li>You must be able to recognise and use standard electrical symbols in circuit diagrams for components in series and in parallel.</li> <li>Advantages and disadvantages of light bulbs wired in series and in parallel</li> </ol> <p>[You are expected to be able draw circuit diagrams involving the following symbols: open/closed switch, cell(s), ammeter, voltmeter, lamp, resistor, variable resistor and diode, thermistor, LDR &amp; fuse]</p>	
<i>Electricity 3</i> <b>Electrostatics</b> <i>Yr. 10</i>	<ol style="list-style-type: none"> <li>Flow of electrons between unbalanced charged objects, limited to               <ol style="list-style-type: none"> <li>lightning sparks</li> <li>'static' sparks on clothing</li> </ol> </li> <li>The dangers of movement of electrons between objects with unbalanced charges, limited to               <ol style="list-style-type: none"> <li>high voltage cables</li> <li>electric shock</li> <li>ignition of flammable vapours</li> </ol> </li> </ol>	
<i>Electricity 4</i> <b>Uses of electrostatic charge</b> <i>Yr. 10</i>	<ol style="list-style-type: none"> <li>The action of a photocopier &amp; inkjet printer explained in terms of forces between charged bodies.</li> </ol>	
<i>Electricity 5</i> <b>Electric Current</b> <i>Yr. 10</i>	<ol style="list-style-type: none"> <li>An electric current is a flow of electrons or ions</li> <li>Distinction between a.c. &amp; d.c.</li> <li>Electrolysis: positive ions to cathode, negative ions to anode.</li> <li>An ammeter is used to measure current in series and parallel circuits</li> <li>An ammeter must be in series with components in a circuit.</li> <li>The unit of electric current (<math>I</math>) is the ampere (A)</li> </ol>	<ul style="list-style-type: none"> <li>Unit of electric charge (<math>Q</math>) is the coulomb (C)</li> </ul> <p>Recall and use:</p> <ul style="list-style-type: none"> <li>Electric current is defined as the rate of charge transfer</li> </ul> $Q = I \times t$
<i>Electricity 6</i> <b>Voltage</b> <i>Yr. 10</i>	<ol style="list-style-type: none"> <li>A voltmeter is used to measure potential difference (i.e. voltage) in series and parallel circuits.</li> <li>A voltmeter must be used in parallel with a component in a circuit.</li> <li>Using a CRO to measure a.c. &amp; d.c. frequency and voltage.</li> <li>The unit of potential difference (p.d.) is the volt (V)</li> </ol>	<p>Recall and use:</p> <ul style="list-style-type: none"> <li>Voltage is energy transferred per unit charge</li> </ul> $V = W/Q$

ELECTRICITY (yr 10)

TOPIC	FOUNDATION TIER	HIGHER TIER
<i>Electricity 7</i> <b>Heating effect of an electric current</b> <i>Yr. 10</i>	<ol style="list-style-type: none"> <li>The heating effect of an electrical current in a resistor is due to the transfer of energy that occurs when electrical charge flows through it.</li> <li>Use of the heating effect of an electrical current in circuits, limited to these devices:               <ol style="list-style-type: none"> <li>hair-dryers</li> <li>immersion heaters</li> <li>light bulbs</li> </ol> </li> </ol>	
<i>Electricity 8</i> <b>Electrical resistance</b> <i>Yr. 10</i>	<ol style="list-style-type: none"> <li>The change in the current in an electrical circuit is the result of a change in resistance and/or voltage within the circuit.</li> <li>The unit of resistance (<math>R</math>) is the ohm (<math>\Omega</math>)</li> <li>Recall and use of the definition of resistance: <math>R = V/I</math></li> </ol>	
<i>Electricity 9</i> <b>Circuits</b> <i>Yr. 10</i>	<ol style="list-style-type: none"> <li>Series circuit: total resistance of resistors in series is equal to sum of all resistors in circuit. Total p.d. across circuit is sum of p.d.'s across individual resistors.</li> <li>Parallel circuit: p.d. across resistors in parallel is the same for all resistors, total current through circuit is sum of currents through individual components.</li> </ol>	
<i>Electricity 10</i> <b>Current/p.d. relationships</b> <i>Yr. 10</i>	<ol style="list-style-type: none"> <li>Results and experimental details of investigations into the variation of current with voltage in the following devices:               <ol style="list-style-type: none"> <li>resistors</li> <li>wires made of different metals</li> <li>filament lamps</li> <li>diodes</li> </ol> </li> </ol>	<i>For the higher tier you will also have to know about the variation of current in</i> <i>(i) thermistors</i> <i>(ii) LDRs</i>
<i>Electricity 11</i> <b>Electrical Power</b> <i>Yr. 10</i>	<ol style="list-style-type: none"> <li>Electrical power is the rate of transfer of electrical energy (J/s)</li> <li><math>P = V \times I</math> (<i>Recall and use</i>)</li> <li>The unit of electrical power is the watt.</li> </ol>	
<i>Electricity 12</i> <b>Paying for electricity</b> <i>Yr. 10</i>	<ol style="list-style-type: none"> <li>Domestic supply in U.K is a.c. at 50Hz and 230 V</li> <li>Calculation of the cost of using electrical energy using the quantitative relationships: units (kW h) = power (kW) x time (h) cost of electricity supplied (p) = energy transferred (kW h) x price per unit (pence/kW h)</li> <li>The kilowatt-hour (kWh) is a unit of electrical energy transferred.</li> </ol>	
<i>Electricity 13</i> <b>Fuses</b> <i>Yr. 10</i>	<ol style="list-style-type: none"> <li>The function of a fuse in domestic circuits.</li> <li>Selecting the appropriate fuse for a given appliance using <math>V = IR</math> and <math>P = VI</math></li> <li>Action of circuit breakers (resetable fuses) in domestic electrical circuits.</li> </ol>	
<i>Electricity 14</i> <b>Plugs</b> <i>Yr. 10</i>	<ol style="list-style-type: none"> <li>Functions of live, neutral and earth wires in plugs</li> <li>Position of live, neutral and earth terminals in plug.</li> <li>Colours of insulation sheathing for live, neutral and earth wires.</li> <li>Role of the fuse in plugs.</li> </ol>	
<i>Electricity 15</i> <b>Insulation and earthing</b> <i>Yr. 10</i>	<p>Protection to users of electrical equipment, limited to</p> <ol style="list-style-type: none"> <li>insulation in wiring and electrical appliances</li> <li>earthing of electrical appliances</li> <li>double insulation</li> <li>fuses</li> <li>residual circuit breakers</li> </ol>	

**Section 4**  
**WAVES**

TOPIC	FOUNDATION TIER	HIGHER TIER
<p><i>Waves 1</i> <b>Light</b> <i>Yr. 8</i></p>	<ol style="list-style-type: none"> <li>Visible light is a small part of the electromagnetic spectrum. It is the only part of the e.m. spectrum that we can see with our eyes.</li> <li>You should know that light:               <ol style="list-style-type: none"> <li>travels in straight lines</li> <li>travels at a finite speed through a uniform medium</li> <li>can travel through a vacuum</li> <li>can be reflected &amp; refracted</li> </ol> </li> </ol>	
<p><i>Waves 2</i> <b>Reflection</b> <i>Yr. 8</i></p>	<ol style="list-style-type: none"> <li>Reflection of light is the change in direction of the beam light when it strikes a surface or mirror</li> <li>You should know the law of reflection and be able to apply it in a variety of situations: <i>angle of incidence (i) = angle of reflection (r)</i></li> </ol>	
<p><i>Waves 3</i> <b>The electromagnetic spectrum</b> <i>Yr. 9</i></p>	<ol style="list-style-type: none"> <li>The electromagnetic spectrum is the name given to the entire range of frequencies and wavelengths of electromagnetic (e.m.) waves               <ol style="list-style-type: none"> <li>All e.m. waves are the same form of radiant energy.</li> <li>All e.m. can travel through a vacuum.</li> <li>All e.m. waves travel at the same speed through vacuum (they all travel at the speed of light, 300,000,000m/s)</li> <li>Object that absorb e.m. radiation become hotter.</li> </ol> </li> <li>You should know the names of the different parts of the e.m. spectrum, and their relative position in the electromagnetic spectrum. These are : radio waves, microwaves, infrared waves, visible light, ultraviolet waves, X-rays, gamma rays</li> <li>Spectrum of white light.</li> </ol>	
<p><i>Waves 4</i> <b>Characteristics of waves</b> <i>Yr. 10</i></p>	<ol style="list-style-type: none"> <li>Waves transfer energy but not matter.</li> <li>All regular waves have a frequency, a wavelength and and amplitude.               <ol style="list-style-type: none"> <li>Frequency (f) is the number of waves produced per second. The unit of frequency is the hertz (Hz)</li> <li>Wavelength is the distance (in metres) between consecutive crests (or troughs) in a transverse wave</li> <li>The amplitude of a transverse wave is the maximum displacement from the mean position in of the wave.</li> </ol> </li> <li>You must be able to recall and use the wave equation: <b><math>C = f \times \lambda</math></b></li> <li>All waves can be reflected, refracted and diffracted.</li> </ol>	
<p><i>Waves 5</i> <b>Longitudinal and transverse waves</b> <i>Yr. 10</i></p>	<p>Examples of longitudinal waves and transverse waves:</p> <ol style="list-style-type: none"> <li>sound (longitudinal wave)</li> <li>light (transverse wave)</li> <li>water (transverse wave)</li> <li>ropes (transverse wave)</li> <li>springs (either transverse or longitudinal waves)</li> </ol>	

WAVES (yr 10)

TOPIC	FOUNDATION TIER	HIGHER TIER
<p><i>Waves 6</i> <b>Refraction</b> <i>Yr. 10</i></p>	<ol style="list-style-type: none"> <li>1. Refraction of light is the change in direction of a wave when it passes from one medium to another.</li> <li>2. The cause of refraction is the change in the speed of the wave when it passes from one medium to another</li> <li>3. Refraction of light: you must be able to draw diagrams showing the path of a narrow beam of light when it refracts as it travels from air to glass or water. (You will not be asked to carry out calculations involving refraction)</li> </ol>	
<p><i>Waves 7</i> <b>Total internal reflection</b> <i>Yr. 10</i></p>	<ol style="list-style-type: none"> <li>1. You should know what total internal reflection is and the conditions in which it occurs.</li> <li>2. You should know that total internal reflection occurs when the critical angle is exceeded. (you will not be asked to carry out calculations involving total internal reflection)</li> <li>3. Uses of total internal reflection, limited to:               <ol style="list-style-type: none"> <li>(i) optical fibres</li> <li>(ii) reflecting prisms</li> </ol> </li> </ol>	
<p><i>Waves 8</i> <b>Diffraction</b> <i>Yr. 10</i></p>	<ol style="list-style-type: none"> <li>1. Diffraction occurs when waves pass through a narrow gap or move past an object. Waves spread beyond the gap or into the shadow of an object when the wavelength about the same as the object's size.</li> <li>2. Diffraction is a property of both light and sound waves.</li> <li>3. Diffraction increases with increasing wavelength.</li> <li>4. Consequences of diffraction applied to sound waves &amp; radio signals</li> </ol>	
<p><i>Waves 9</i> <b>Uses and dangers of e.m. waves</b> <i>Yr. 10</i></p>	<ol style="list-style-type: none"> <li>1. Effects of absorption of electromagnetic energy:               <ol style="list-style-type: none"> <li>(i) heating</li> <li>(ii) inducing a.c. of same frequency as incident wave.</li> </ol> </li> <li>2. Uses of microwaves, infrared waves and ultraviolet waves in domestic situations, limited to               <ol style="list-style-type: none"> <li>(i) cooking</li> <li>(ii) remote control</li> <li>(iii) sun-tanning</li> </ol> </li> <li>3. Dangers of microwaves, infrared waves and ultraviolet waves, limited to               <ol style="list-style-type: none"> <li>(i) heating effects</li> <li>(ii) sunburn</li> </ol> </li> <li>4. Uses of X-rays and gamma rays in medicine, limited to               <ol style="list-style-type: none"> <li>(i) X-ray photography</li> <li>(ii) sterilisation of medical instruments</li> <li>(iii) destruction of cells in cancer treatment.</li> </ol> </li> </ol>	
<p><i>Waves 10</i> <b>Signals</b> <i>Yr. 10</i></p>	<ol style="list-style-type: none"> <li>1. Definitions of analogue &amp; digital signals.</li> <li>2. Examples of analogue and digital signals.</li> <li>3. Deterioration of signals with distance &amp; 'noise'.</li> <li>4. Advantage of digital signals over analogue signals.</li> </ol>	

WAVES (yr 10)

TOPIC	FOUNDATION TIER	HIGHER TIER
<p><i>Waves 11</i> <b>Sound waves</b> <i>Yr. 10</i></p>	<ol style="list-style-type: none"> <li>1. Sound is the vibration of a medium. It is a longitudinal wave.</li> <li>2. You must know that sound has the following properties:               <ol style="list-style-type: none"> <li>(i) Sound travels at a finite speed through a uniform medium</li> <li>(ii) Its speed depends on the density of the medium</li> <li>(iii) Sound can't travel through a vacuum</li> <li>(iv) Sound can be reflected, refracted &amp; diffracted.</li> </ol> </li> <li>3. An echo is the reflection of sound waves.</li> <li>4. Due to diffraction sounds can be heard in the shadow of obstacles such as buildings.</li> </ol>	
<p><i>Waves 12</i> <b>Measuring sound</b> <i>Yr. 10</i></p>	<ol style="list-style-type: none"> <li>1. Amplitude is a measure of the energy carried by the wave</li> <li>2. Amplitude of a sound is a measure of its loudness</li> <li>3. Frequency is a measure of the pitch of a sound</li> </ol>	
<p><i>Waves 13</i> <b>Microphones &amp; loudspeakers</b> <i>Yr. 10</i></p>	<ol style="list-style-type: none"> <li>1. Use of microphones and loudspeakers, limited to microphones changing sound waves into a varying electric current and loudspeakers changing the current back into sound</li> <li>2. Use of the cathode ray oscilloscope (CRO) to display patterns of regular sound waves.</li> </ol>	
<p><i>Waves 14</i> <b>Ultrasound</b> <i>Yr. 10</i></p>	<ol style="list-style-type: none"> <li>1. Ultrasound are sound waves with a frequency above the audible frequency range (i.e. more than 20,000 Hz)</li> <li>2. Uses of ultrasound, limited to:               <ol style="list-style-type: none"> <li>(i) fetal imaging in obstetrics</li> <li>(ii) determining the depth of water by echo-sounding,</li> <li>(iii) in industry for cleaning &amp; quality control.</li> </ol> </li> </ol>	
<p><i>Waves 15</i> <b>Seismic waves</b> <i>Yr. 11</i></p>	<ol style="list-style-type: none"> <li>1. Some seismic waves are longitudinal (called P waves) and some are transverse (called S waves). They are created in the Earth by vibrations due to earthquakes.</li> <li>2. The Earth has a layered structure with a core, a mantle surrounding the core, and a thin solid crust.</li> <li>3. The composition and nature of each layer.</li> </ol>	<ol style="list-style-type: none"> <li>1. <i>Properties of S and P waves.</i></li> <li>2. <i>Evidence for the Earth's internal structure from seismic wave patterns.</i></li> </ol>
<p><i>Waves 15</i> <b>Tectonics</b> <i>Yr. 11</i></p>	<ol style="list-style-type: none"> <li>1. Lithosphere is made up of plates that move relative to one another due to convection within the mantle.</li> <li>2. Nature of earthquakes and volcanoes &amp; their unpredictability.</li> <li>3. Details of Wegener's theory of continental drift and why geologists found it difficult to accept.</li> </ol>	<ol style="list-style-type: none"> <li>1 <i>Relative movement of tectonic plates are the cause of subduction, volcanoes, sea floor spreading.</i></li> <li>2 <i>Evidence for continental drift from periodic magnetic reversals</i></li> </ol>

**Section 5**  
**ELECTROMAGNETS**

TOPIC	FOUNDATION TIER	HIGHER TIER
<i>Electromagnets 1</i> <b>Permanent magnets</b> Yr. 8	<ul style="list-style-type: none"> <li>Like magnetic poles repel, unlike magnetic poles attract</li> <li>A magnetic field as a space in which a permanent magnet or a conductor carrying an electric current experiences a force</li> <li>Know the patterns of magnetic field lines around a bar magnet, a single wire and a solenoid.</li> </ul>	
<i>Electromagnets 2</i> <b>Electromagnets</b> Yr. 11	<ul style="list-style-type: none"> <li>You must know how an electromagnet is constructed</li> <li>Uses of electromagnets, limited to lifting magnets &amp; relay [You will <b>not</b> be expected to draw the parts or circuits for a relay from memory but may be expected to interpret diagrams of these]</li> </ul>	
<i>Electromagnets 3</i> <b>Motor principle</b> Yr. 11	<p>The principle of a simple d.c. motor explained as an interaction between the magnetic force due to a current-carrying wire and an external magnetic field.</p> <p>You must know how to use Fleming's left-hand rule to predict the direction of movement of a current-carrying wire in a magnetic field.</p> <p>[Note: You will not be expected to draw the parts and circuits for a d.c. motor from memory but you may be expected to interpret diagrams of electric motors]</p>	
<i>Electromagnets 4</i> <b>Electromagnetic induction</b> Yr. 11	<ol style="list-style-type: none"> <li>Electromagnetic induction is the induction of a voltage and/or current when there is relative movement between a conductor and a magnetic field and when the magnetic field through a coil changes</li> <li>The dynamo principle is the production of a voltage and/or current in a coil when there is relative movement between it and a magnetic field</li> <li>Use of generators in the production of mains electricity</li> </ol>	<p><i>You must know how to use the dynamo principle to explain the construction and performance of a.c. dynamos and generators.</i></p> <p><i>[You will <b>not</b> be expected to draw the parts or circuits]</i></p>
<i>Electromagnets 5</i> <b>Alternating &amp; direct currents</b> Yr. 11	<p>Comparison between alternating current (a.c.) and direct current (d.c.), limited to:</p> <ol style="list-style-type: none"> <li>direction of current flow</li> <li>traces on a cathode ray oscilloscope</li> </ol>	
<i>Electromagnets 6</i> <b>Transformers</b> Yr. 11	<ol style="list-style-type: none"> <li>A transformer is a device for stepping up or stepping down alternating voltages</li> <li>The part played by transformers in the production and distribution of mains electricity</li> </ol>	<p><i>Construction of a transformer, limited to</i></p> <ol style="list-style-type: none"> <li>primary (input) coil (coil 1)</li> <li>laminated iron core</li> <li>secondary (output) coil (coil 2)</li> </ol> <p><i>You will have to recall and use of the quantitative relationship</i></p> $V_1/V_2 = N_1/N_2$
<i>Electromagnets 7</i> <b>Transmission of electricity</b> Yr. 11	<ol style="list-style-type: none"> <li>Use of transformers and cables in the efficient distribution of electrical power over long distances</li> <li>Problems and solutions in power transmission, limited to <ol style="list-style-type: none"> <li>high voltage</li> <li>low current</li> <li>thickness of cables</li> <li>reduction of heat loss</li> </ol> </li> </ol>	

**Section 6**  
**RADIOACTIVITY**

TOPIC	FOUNDATION TIER	HIGHER TIER
<i>Radioactivity 1</i> <b>Structure of the atom</b> <i>Yr. 11</i>	<ol style="list-style-type: none"> <li>1. Rutherford scattering experiment.</li> <li>2. relative mass &amp; charge of proton, electron &amp; neutron.</li> <li>3. Distinction between an elements &amp; an isotope.</li> </ol>	
<i>Radioactivity 2</i> <b>Characteristics of radioactivity</b> <i>Yr. 11</i>	<ol style="list-style-type: none"> <li>1. Radioactivity is the spontaneous emission of energy from atomic nuclei.</li> <li>2. Radioactivity is the result of the breakdown of unstable nuclei</li> <li>3. Radioactivity is a random process unaffected by physical or chemical factors</li> <li>4. Use of Geiger-Müller (GM) tube and counter and photographic film to detect and measure radiation.</li> </ol>	
<i>Radioactivity 3</i> <b>Background radiation</b> <i>Yr. 11</i>	<ol style="list-style-type: none"> <li>1. Natural background radiation due to               <ol style="list-style-type: none"> <li>(i) radioactivity of naturally occurring <i>isotopes</i> in rocks at the surface or within the Earth</li> <li>(ii) radiation from space</li> </ol> </li> <li>2. The effect of human activity on background radiation</li> </ol>	
<i>Radioactivity 4</i> <b>Types of emission</b> <i>Yr. 11</i>	<ol style="list-style-type: none"> <li>1. Alpha (<math>\alpha</math>) particles are emissions with low penetrating power blocked by paper</li> <li>2. Beta (<math>\beta</math>) particles are emissions with moderate penetrating power blocked by thin sheets of aluminium</li> <li>3. Gamma (<math>\gamma</math>) radiation is an emission with high penetrating power blocked by concrete/lead Gamma radiation is part of the electromagnetic spectrum and has very high frequency</li> </ol>	<ul style="list-style-type: none"> <li>• <i>An alpha particle is a helium nucleus emitted by an unstable nucleus</i></li> <li>• <i>A Beta particle is a high energy electrons by an unstable nucleus</i></li> <li>• <i>Transformation of nucleus following decay.</i></li> </ul>
<i>Radioactivity 5</i> <b>Half-life</b> <i>Yr. 11</i>	Definition of Half-life.	<ul style="list-style-type: none"> <li>• <i>Calculating half-life.</i></li> <li>• <i>Use of half-life in dating organic materials and rocks.</i></li> </ul>
<i>Radioactivity 6</i> <b>Effects of radiation</b> <i>Yr. 11</i>	Harmful effects of radiation on living organisms, limited to cell damage as a cause of cancers.	
<i>Radioactivity 7</i> <b>Uses of radioactivity</b> <i>Yr. 11</i>	<ol style="list-style-type: none"> <li>1. Use of radioactive isotopes               <ol style="list-style-type: none"> <li>(i) quality control in industry</li> <li>(ii) in treatment of cancers</li> </ol> </li> <li>2. Social, economic and environmental problems associated with an increase in the use of radioactive materials.</li> </ol>	<i>tracers in medicine and in industry</i>
<i>Radioactivity 8</i> <b>Nuclear energy</b> <i>Yr. 11</i>		<i>Nuclear fission</i>

**Section 7**  
**ASTRONOMY**

ASTRONOMY (yr 8 & 9)

TOPIC	FOUNDATION TIER	HIGHER TIER
<p><i>Astronomy 1</i> <b>The solar system</b> Yr. 8</p>	<ul style="list-style-type: none"> <li>The solar system consists of               <ol style="list-style-type: none"> <li>a central star, the Sun</li> <li>the planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto</li> <li>moons orbiting planets</li> </ol>               [You will be expected to recall the order of the planets from the Sun outwards]             </li> </ul>	<p><i>For the higher tier you must also know about the nature of asteroids &amp; comets</i></p>
<p><i>Astronomy 2</i> <b>The solar system</b> Yr. 8</p>	<ul style="list-style-type: none"> <li>A simple model to show the relative positions of               <ol style="list-style-type: none"> <li>the Earth and the Moon</li> <li>the Earth and the Sun</li> <li>the Sun and other planets in the solar system</li> </ol> </li> </ul>	<p><i>For the higher tier you must also know where asteroids &amp; comets are to be found, and how their orbital motion about the Sun differs from that of planet.</i></p>
<p><i>Astronomy 3</i> <b>The Sun</b> Yr. 9</p>	<ol style="list-style-type: none"> <li>Stars are sources of light, infrared and other forms of electromagnetic radiation.</li> <li>The Sun is a star.</li> </ol>	
<p><i>Astronomy 4</i> <b>Planets</b> Yr. 9</p>	<ol style="list-style-type: none"> <li>Planets are non-luminous bodies orbiting stars, i.e. they don't emit light, though they do emit infrared. They are seen because they reflect light.</li> <li>The orbits of the planets in the solar system are slightly elliptical (Mercury &amp; Pluto have very elliptical orbits), and these orbits all lie in the same plane (except for that of Pluto), with the Sun more or less at the centre (an ellipse doesn't have a centre).</li> </ol>	
<p><i>Astronomy 5</i> <b>Satellites</b> Yr. 9</p>	<ol style="list-style-type: none"> <li>Natural satellites are non-luminous bodies orbiting planets.</li> </ol>	
<p><i>Astronomy 6</i> <b>The Earth</b> Yr. 9</p>	<ol style="list-style-type: none"> <li>Rotation of the Earth on its axis is the cause of               <ol style="list-style-type: none"> <li>day and night</li> <li>the apparent nightly movement of the stars</li> </ol> </li> <li>An Earth year is the time taken for the Earth to orbit the Sun</li> <li>Tilt of the Earth's axis relative to its plane of orbit as the reason for               <ol style="list-style-type: none"> <li>length of daylight time</li> <li>seasonal changes</li> </ol> </li> </ol>	

ASTRONOMY (yr11)

TOPIC	FOUNDATION TIER	HIGHER TIER
<p><i>Astronomy 7</i> <b>Artificial satellites</b> <i>Yr. 11</i></p>	<p>1. Uses of artificial satellites, limited to (i) observation of the Earth (ii) weather monitoring</p>	<ul style="list-style-type: none"> <li><i>Use of artificial satellites in the exploration of the solar system.</i></li> <li><i>Principle and use of geostationary satellites, limited to communication systems</i></li> </ul>
<p><i>Astronomy 8</i> <b>Theories about the solar system</b> <i>Yr. 11</i></p>	<p>1. Theories of how people in different ages have believed the universe was organised, and the reasons for those views limited to: (i) the geocentric theory of the universe (ii) the heliocentric theory of the universe [You will <b>not</b> be expected recall specific ideas about these views]</p>	
<p><i>Astronomy 9</i> <b>Gravitational forces</b> <i>Yr. 11</i></p>	<p>1. The movement of planets, moons, comets and satellites is determined by gravitational forces between bodies.</p>	<p><i>You should know the factors that affect the size of the gravitational force between bodies: i.e. the effect on the gravitational force between two bodies of their masses, and their distance apart.</i></p>
<p><i>Astronomy 10</i> <b>Evolution of Stars</b> <i>Yr. 11</i></p>		<p><i>Stages in the evolution of a star</i> <i>(i) a huge volume of gas and dust is drawn together by gravity.</i> <i>(ii) the g.p.e. of this gas &amp; dust is gradually converted into random k.e. (i.e. into thermal energy)</i> <i>(iii) the increase of thermal energy eventually triggers thermonuclear reactions &amp; the star is born</i> <i>(iv) when all the hydrogen in the core is used up the star expands into a red giant</i> <i>(iv) the red giant finally collapses and becomes a white dwarf</i></p>
<p><i>Astronomy 11</i> <b>Evolution of the Universe</b> <i>Yr. 11</i></p>		<p><i>The outlines of the Big Bang theory as an explanation for the creation and expansion of the Universe.</i></p>