GCSE Specification :
CCEA Science : **Single** Award (Non-modular)

Please check that you have chosen the correct specification.

The subject content is organised into 3 teaching and learning sections each relating to a different Attainment Target. The content of these is set out below and for each section the major topics to be covered are listed, together with related guidance notes. The notes provide further detail of the content required but they are not intended to be exhaustive descriptions of the topics to which they relate.

The content should be read in conjunction with the relevant aims and assessment objectives set out in Section 1 of the full specification.

Specification content for the Foundation Tier is laid in normal type.

Specification text content dealing with Higher Tier only is laid out in bold italics.

Questions in Foundation Tier papers will be set only on Foundation Tier content.

Questions in Higher Tier may be set on any part of the specification content.

Living Organisms and Life Processes

The cell		
3.1.1	*The Cell*	
	Know that plants and animals are composed of cells:	pages 8-9
	use a microscope and slide to study the structure and function of a typical plant and animal cell including nucleus, cytoplasm, cell membrane, nuclear membrane, cell wall, chloroplast, permanent vacuole and chromosomes;	8-11
	know the similarities: cytoplasm, nucleus and membranes as features common to most cells;	8-9
	know the differences: cell wall and large vacuole as distinguishing features of most plant cells;	9
	understand that cancer is abnormal cell division.	285
	Specialisation	
	Understand that cells become specialised to carry out different functions to include the root hair, palisade mesophyll cell in plants; sperm cell, ciliated epithelium in animals.	12
Nutrition		
3.1.2	*Plants*	
	Know that photosynthesis is a key process which is essential to life including:	
	that oxygen and starch are produced by photosynthesis;	205-206, 209
	investigations which show that light, carbon dioxide, and chlorophyll are needed for photosynthesis to take place;	207-208
	the word equation for photosynthesis;	205
	factors affecting the rate of photosynthesis.	211-213
3.1.3	***Describe the economic implications in crop production of enhancing environmental factors, for example, carbon dioxide, light intensity, temperature and fertiliser application.***	219-221
3.1.4	*Animals*	
	Diet:	
	know the functions of food – energy, growth and protection;	44

	recall the main dietary sources and role of carbohydrates, fats, proteins, fibre, vitamins (C and D only) minerals (calcium and iron only) and water in a balanced diet;	45-47, 52-53
	be aware of health changes associated with obesity and lack of exercise;	47-50, 95-96
	use simple tests for each of the following, starch (iodine), simple sugar (Benedict's reagent), protein (Biuret test) and vitamin C (DCPIP test);	45-46, 52
	compare energy content of carbohydrates, fats and proteins in different foods;	47-48
	know about variation in energy required, with respect to age, gender, activity.	49-50
3.1.5	*Digestive System*	
	Know the basic function of the digestive system – where large molecules are broken down to simple soluble molecules which are absorbed into and transported by the blood.	57
	Know the structure and functions of the component parts of the digestive system in humans, including: buccal cavity, oesophagus, stomach, small intestine (ileum), large intestine (colon), rectum and anus. Identification of the parts of the human alimentary canal, in relation to ingestion, digestion and egestion, absorption and assimilation.	58-61
3.1.6	Describe the action of amylase, lipase and protease in saliva, gastric, pancreatic and intestinal juice, (specific names of enzymes not required):	31-21, 58-60
	the source and action of bile;	60
	the significance of a large surface area for absorption; folds and villi;	61
	the absorption of water in the colon;	61
	the role of the liver in the assimilation of glucose.	108
Respiration		
3.1.7	*Respiratory System*	
	Know the function of the respiratory system as one of gas exchange (oxygen for carbon dioxide in the lungs); and understand the structure and function of the component parts of the respiratory system, including:	71-77
	identification and function of the major organs of the respiratory system – nasal cavity, trachea, bronchus, bronchioles, lungs, alveolus, diaphragm and ribs and intercostal muscles;	74-77
	mechanism of breathing (the role of the intercostal muscles and diaphragm);	76
	investigation of the composition of inhaled and exhaled air (gas analysis not required).	71-72
Smoking and Health		
3.1.8	Describe how cigarette smoke affects health, including:	
	tar as a trigger for lung cancer;	83-84
	nicotine contributing to heart disease, irregular and increasing heartbeat;	83-84
	carbon monoxide displacement of O_2 in red blood cells;	83
	passive smoking; arguments related to smoking in public places.	84

Transport		
Circulatory System		
3.1.9	Understand the function of the circulatory system – transport of materials, protection and maintaining body temperature – know the structure and functions of the component parts of the circulatory system in humans, including:	88, 110
	structure of the blood: red blood cells (transport of oxygen), white blood cells (defence), plasma (transport of food, waste in solution), platelets (blood clotting);	97-110
	the heart, limited to names of the four chambers and the direction of blood flow; double circulation;	90, 92-93
	blood vessels – arteries carrying blood away from the heart and veins carrying blood to the heart;	89-91
	heart attack as reduced coronary circulation.	95-96
Sensitivity and Response		
3.1.10	Know that behaviour can be explained in terms of receptors, coordinators and effectors, including:	118
	receptors – the eye; structure and function of the conjunctiva, cornea, pupil, iris, lens, retina and optic nerve;	130-131
	skin, including temperature control (details of skin structure not required).	109-110, 126
	coordinators – the simple function of the brain and spinal cord in coordinating responses; a reflex arc; voluntary and reflex actions; reflex arc in terms of sensory association and motor neurones;	119, 121, 123-124, 125
	effectors – the antagonistic action and function of muscles at a joint, limited to the elbow joint.	144
3.1.11	Understand the function and role of hormones in coordination in humans, including:	132
	insulin control of blood sugar levels (diabetes as a condition in which this mechanism breaks down);	108
	adrenaline in preparation for flight or fight.	134, 185-189
Drugs		
3.1.12	Discuss the effects of alcohol, drug and solvent abuse, including:	134, 185-189
	antibodies;	179
	painkillers;	185-186
	stimulants;	186
	depressants;	186
	hallucinogens;	186-187
	on individuals and the cost to society.	134, 185-189

Environment, Reproduction Genetics		
Food Chains and Webs		
3.1.13	Candidates should understand the components of food chains and food webs, including:	
	Sun as a primary source of energy;	335, 362
	producers;	355, 362
	consumers (primary, secondary and tertiary);	355, 363
	decomposers (the role of bacteria and fungi);	355, 370
	nature of energy flow.	362-363
Cycles		
3.1.14	Understand that materials are recycled to maintain the balance in the environment, including:	
	carbon cycle;	369-371
	photosynthesis, respiration, combustion and fossilisation;	371
	nitrogen cycle – cycling of protein to include decay and decomposition, nitrification, nitrogen fixation and denitrification (no specific name of bacteria required).	373
3.1.15	Explain how materials for growth and energy are transferred through an ecosystem, including assigning organisms to their trophic level:	355-363
	energy losses between trophic levels;	360-361
	the advantages of short food chains in relation to the feeding of man.	341, 350, 361
3.1.16	***Understand how food production involves the management of ecosystems to improve the efficiency of energy transfer, including the management of fish stocks, e.g. herring stock in the North sea.***	332-334
3.1.17	Understand how population growth and decline are related to environmental resources including the effects of birth rate, death rate, emigration, immigration, food supply, predation and diseases.	344-345
Reproduction		
Reproductive System		
3.1.18	Know the structure and functions of the component parts of the reproductive systems in humans, including:	157-168
	the male system – testes, scrotum, sperm ducts, prostate gland, urethra and penis;	157
	the female system – ovaries, oviducts, uterus, cervix, vagina and vulva;	158
	fertilisation in the oviduct;	159
	development, by cell division, into a ball of cells which implants in the uterus lining;	160
	the placenta, umbilical cord, amnion and amniotic fluid;	160-161
	birth, limited to contraction of the uterus, dilation of the cervix and rupture of the amniotic membrane.	161
3.1.19	Understand the need for a responsible attitude to sexual behaviour, including:	

	interpersonal relationships;	165-166
	prevention of sexually transmitted diseases – the cause, transmission, treatment and prevention of AIDS and gonorrhoea;	184
	contraception – natural, mechanical, chemical and surgical methods.	164-166
Genetics		
3.1.20	Recall that genetic information is carried in the form of genes on chromosomes in the nucleus of cells, e.g. eye colour and tongue rolling:	272-273
	know that genes are short lengths of DNA.	273
3.1.21	***Understand how genetic information is passed from cell to cell and generation to generation, including:***	
	mitosis; outline in terms of the exact duplication of chromosomes (names of phases and details of DNA replication not required);	275-276
	meoisis as reduction division (diploid to haploid) and as a process which re-assorts the chromosomes (omitting crossing over and names of phases), fertilisation as a means of restoring the diploid number and combining different sets of chromosomes.	277
3.1.22	Understand the principles of a simple monohybrid cross (co-dominance not required). Use of Punnett squares to determine genotype frequencies. Distinction between genotype and phenotype, heterozygous and homozygous, dominant and recessive alleles. ***Use of backcross to determine genotype.***	279-284
3.1.23	Explain the way in which sex is determined in humans. (No detail of sex-linked characters required).	278
Selection		
3.1.24	Know that variation in living organisms has both a genetic and environmental basis, e.g. height in humans.	254-255
3.1.25	Understand that sexual reproduction is a source of genetic variation, while asexual reproduction produces clones.	233-234
3.1.26	***Know that cloning results in genetically identical offspring, for example, cuttings and runners in asexual reproduction in plants, tissue culture and splitting of early embryos in agricultural animals (no details of experimental technique required).***	233-234, 291
3.1.27	Understand how variation and selection may lead to evolution or extinction.	296-306
	natural selection as variation within phenotypes and competition for resources leading to differential survival.	298-301

Materials and Their Uses	

Atomic Structure		page numbers
3.2.1	Understand the terms: elements, compounds, atoms, ions and molecules and their interrelation.	pages 14-15, 71
3.2.2	Describe the structure of atoms and ions in terms of protons, electrons and neutrons; limited to the first 20 elements.	70
3.2.3	State the relative charge and mass of a proton, electron and neutron.	29
3.2.4	Understand the term atomic number and mass number.	31
3.2.5	Distinguish between isotopes, e.g. ^{35}Cl and ^{37}Cl.	33
3.2.6	Describe the formation of an ionic bond in terms of electron transfer and recognise that bond formation is the result of attraction between ions of opposite charge. Examples should include MgO, NaCl and $CaCl_2$.	262-5
3.2.7	Describe the formation of a covalent bond in terms of sharing electron pairs. ***Examples to include, Cl_2, O_2, H_2O and CH_4.***	270-1
3.2.8	***Classify substances in terms of their properties as metallic, ionic, covalent molecular or giant covalent (including diamond and graphite).***	266-7, 272-7, 281, 286
3.2.9	***Explain the properties of typical ionic, covalent (simple and giant) and metallic substances in terms of their chemical bonding and structures.***	266-7, 272-7, 281, 286
Solids, Liquids and Gases		
3.2.10	Give examples which show that gases are compressible and how this characteristic is used in everyday life, e.g. fire extinguishers, aerosol sprays.	319, 65
3.2.11	Explain changes of state, including sublimation and energy changes associated with them and diffusion and dissolving in terms of simple kinetic theory.	6-12, 267
Materials and their Properties		
3.2.12	Relate knowledge of the properties of different classes of man-made materials to everyday use. Specific examples of man-made materials should include:	
	metals – iron, aluminium and copper;	94, 107, 59
	ceramics – pottery and tiles;	
	glass – soda glass and heat resistant glass;	132-3
	plastics – thermosetting, e.g. melamine, bakelite and epoxy resins; thermosoftening, e.g. polythene, PVC and polystyrene;	170-1
	fibres – nylon.	169, 171
	Structures and methods of manufacture are not required unless specifically mentioned in the specification.	
3.2.13	Recognise and know the value of common hazard symbols on containers, i.e: Flammable, toxic, corrosive, explosive, harmful/irritant (distinction between supply symbols, convenience labels and safety signs not required).	379

Composite Materials		
3.2.14	***Evaluate the relative advantages and disadvantages of composite materials, e.g. glass fibre (boats, car bodies), reinforced glass (windows), reinforced concrete (beams), glass – reinforced plastic and bone.***	
3.2.15	***Describe a composite material as one which combines the properties of more than one material to produce a more useful material for particular purposes.***	
3.2.16	Classify substances as elements (metallic and non-metallic), compounds or mixtures and distinguish between them according to their properties.	44-7, 18
Acids and Bases		
3.2.17	Recognise that a base is a metal oxide or hydroxide and that an alkali is a soluble base.	47
3.2.18	Recognise that metal oxides are basic and that non metal oxides are acidic, but understand that there are limitations to different systems of classification, for example, oxide classification in terms of acid/base behaviour.	46-8
3.2.19	Give examples of reactions of acids with metals, bases (including sodium hydroxide and copper(II) oxide) and metal carbonates to form salts. Examples limited to those reactions mentioned elsewhere in the syllabus.	144-6
Chemical Change		
3.2.20	Demonstrate a knowledge that materials can be decomposed by heat, for example:	
	effect of heat on calcium carbonate or copper carbonate;	129
	thermal cracking of hydrocarbons (details of plants not required).	165
3.2.21	Give and recognise examples of simple exothermic and endothermic reactions, e.g. combustion, neutralisation, addition of water to calcium oxide, other reactions as described in the syllabus.	190-1
3.2.22	Describe combustion as the combination of fuels and oxygen to release energy and form oxides: recognise in simple terms the toxic effects of incomplete combustion of fuels; fossil fuel impurities leading to SO_2 pollution and its corrosive effect on building materials; acid rain.	186-7 187 188 188
3.2.23	Explain that pollution such as acid rain, greenhouse gases and toxic waste can be carried across national boundaries and that international agreements are needed to control pollution, e.g. effects in Scandinavia of acid rain originating in other European countries.	188-9
3.2.24	Demonstrate an understanding of the causes of rusting and its economic and environmental implications, and the ways of controlling and preventing the process:	92-3, 95
	rusting as the reaction of iron with a combination of water and air;	92
	rust prevention by painting, greasing or oiling, galvanising, using stainless steel.	93, 95
3.2.25	Relate important oxidation and reduction reactions to everyday examples and ***manufacturing processes*** limited to:	
	rusting, combustion of fuels;	93, 95, 187
	Iron manufacture;	91
	Haber process.	241, 243

3.2.26	***Describe the production of iron in the blast furnace. Outline the essential chemistry and conditions of the process and demonstrate an understanding of the energy factors involved. (Details of the plant not required).***	91
3.2.27	Identify the positive and negative effects of the exploitation of raw materials, including harmful effects on the physical and living environments, limited to:	
	Limestone quarrying;	127
	peat cutting;	
	lignite mining.	
Equations		
3.2.28	Recognise and use symbols for common elements.	14, 43
3.2.29	Use chemical names for simple compounds.	Throughout
3.2.30	Construct simple word equations to describe the range of reactions in the specification.	17, throughout
3.2.31	Give symbolic representations for some elements and deduce the formulae of simple compounds limited to elements both of whose valencies in the compound can be established from their positions in the periodic table; and those groups (hydroxide, sulphate, nitrate, carbonate, hydrogen carbonate, ammonium) whose symbols and valencies are given in the Data Leaflet provided for candidates.	265, 391
3.2.32	Interpret chemical formulae.	15
3.2.33	Represent chemical reactions by balanced symbolic equations.	24-5, throughout
Rates of Reaction		
3.2.34	Describe the qualitative effects of temperature, concentration, particle size, catalysis and, as appropriate, light on the rate of chemical reactions.	199-210
	Give examples of catalysts for specific reactions, e.g. MnO_2 with H_2O_2. ***Catalysts in manufacturing processes (only examples mentioned in the specification).***	208, 57
3.2.35	***Describe quantitative effects of factors which control the rates of reaction.***	199-210
	Quantitative effects are limited to the interpretation of data, e.g. drawing graphs and making predictions about how the rate may change when the factors listed are altered.	199-210
3.2.36	***Relate the factors which control rates of chemical reaction to the practical problems associated with manufacturing processes in industry.***	240-1, 155, 245
The Periodic Table		
3.2.37	Outline the work of Mendeleev in the development of the periodic table.	42-3
3.2.28	Relate the position of selected elements (limited to the first 20 elements) in the periodic table to their electronic structure.	70-1
3.2.39	Demonstrate a knowledge that the periodic table groups together elements with similar properties:	43
	the alkali metals as a group of reactive metals;	50
	the halogens as a group of reactive non-metals.	62
3.2.40	Describe simple trends in the properties of elements within groups (I and VII) and across periods (2 and 3) of the periodic table.	50-1, 62-3

3.2.41	***Use the periodic table to predict the properties of certain unfamiliar elements. Elements limited to groups I and VII and properties to relative atomic mass, atomic size, metallic and non-metallic characteristics, valency and chemical reactivity with oxygen, water and dilute acids as appropriate.***	50-1, 62-3
Metals and their Compounds		
3.2.42	Describe important physical properties of calcium, iron and copper, to include electrical and thermal conductivity, malleability, ductility, lustre, strength and melting point (qualitative treatment).	45
3.2.43	Describe important chemical properties of metals limited to relevant reactions of calcium, iron and copper with oxygen, water/steam and dilute hydrochloric acid.	80-1, 86, 54-5, 56-7
3.2.44	Describe chemical properties of metallic compounds, limited to oxides and hydroxides as bases (CaO, $Ca(OH)_2$ and CuO) and their reactions with water and with dilute hydrochloric acid.	144-6
Non-Metals and their Compounds		
3.2.45	Describe important physical and chemical properties of non-metals, limited to carbon (diamond and graphite), hydrogen, oxygen and sulphur:	272-3, 125, 316, 277
	reactions of hydrogen with oxygen, nitrogen and copper(II) oxide;	125, 241, 243, 368
	reaction of carbon with oxygen to form CO and CO_2;	46, 91
	reaction of sulphur with oxygen;	155
	reactions of carbon dioxide and sulphur dioxide with water.	47
3.2.46	Be able to identify the following common gases using chemical properties: carbon dioxide, hydrogen and oxygen.	318, 125, 316
Water		
3.2.47	Know the physical properties of water and its use as a common solvent including:	296
	use of anhydrous copper(II) sulphate to test for the presence of water.	232
3.2.48	Identify a sample of water as being hard or soft.	302
3.2.49	Describe the effects of hard water on soap and detergents.	302, 307
3.2.50	Recognise methods of water softening, i.e. by boiling, addition of washing soda and by ion exchange.	304-5
3.2.51	Describe the differences between temporary and permanent hardness.	304
3.2.52	Describe the advantages and disadvantages associated with hard water.	302
3.2.53	***Explain in terms of ions the causes and effects of water hardness and outline methods of softening water.***	303-5
3.2.54	***Explain precipitation in terms of ions and relate to processes of separation and purification, e.g. use of washing soda to soften water.***	305
3.2.55	Understand the terms: solvent, solute, solution, saturated, hydrated and dehydrated;	20, 149, TSP
	Recognise the factors affecting solutions, i.e. heat, surface area, stirring, volume of solvent;	149
	Understand the effect of temperature on the solubility of solids and gases in water (qualitative treatment only).	pages 149, 314

Organic Chemistry		
3.2.56	Recall that fossil fuels and biological substances are carbon-based compounds.	159, 178
3.2.57	Recall that oil is a major source of organic chemical and that chemicals obtained from oil are hydrocarbons.	159
3.2.58	Give examples of fossil fuels: natural gas, LPG, petrol, diesel, paraffin, candle wax, peat, lignite, coal, coke. Recognise that fossil fuels are non-renewable resources and describe the combustion of fossil fuels as: fossil fuel + oxygen → carbon dioxide + water + energy.	160, 187, 164
3.2.59	Explain how chemicals are obtained from oil by fractional distillation.	162-4
3.2.60	***Recall the conditions needed to crack fractions obtained from crude oil and understand that cracking involves breaking large hydrocarbon chains into smaller more useful ones, some of which have C to C double bonds.***	165

3.3: Forces and Energy

page numbers in **Physics for You**

Forces and Energy	

Forms of Energy		**page numbers**
3.3.1	Describe energy transfers involving the following forms of energy; chemical, heat, electrical, sound, light, magnetic, nuclear, kinetic and potential (gravitational and strain).	p. 8-9, 108-112
Energy Resources		
3.3.2	Recall that there is a variety of energy resources, to include, oil, gas, coal, nuclear, biomass, wind, wave, solar, geothermal, tidal and hydroelectric and listing which between renewable and non-renewable resources.	p. 11-13, 111-113
3.3.3	Explain how energy sources, such as wind and fossil fuels, are ultimately dependent on the Sun's energy.	p. 111
3.3.4	Understand the contribution of burning fossil fuels to the greenhouse effect.	p. 115
3.3.5	***Evaluate the advantages and disadvantages of using various energy resources to generate electricity. This should take into consideration reliability, how quickly different types of power stations can respond to changes in demand, the cost of building, operating and decommissioning power stations and any additional information, including quantitative information, with which they are provided.***	p. 114-5
Work and Power		
3.3.6	Recall and use the relationship; work = force x distance moved in the same direction as the force, and know that work is measured in joules.	p. 107
3.3.7	Recall and use the formula; power = work done/time taken.	p. 118-9
Conservation of Energy		
3.3.8	Understand that energy is conserved and describe energy changes in terms of the principle of conservation of energy.	p. 108-9, 112
3.3.9	Understand that energy may be dissipated and become less useful and appreciate the role that friction plays in this.	p. 112-3, 92-3
3.3.10	***Recall and use the quantitative relationships for kinetic energy (½ mv^2), gravitational potential energy (mgh) and power, in the context of the conservation of energy.***	p. 116-9
3.3.11	Recall that efficiency is a measure of how much energy is transferred in an intended way and calculate as the ratio of useful output energy to input energy.	p. 112-3, 122
Effects of a Force		
3.3.12	Understand Newton's first law, i.e. that change in movement or direction results from unbalanced forces and that balanced forces produce no change.	p. 77-8
3.3.13	Appreciate that friction is a force that opposes motion.	p. 92-3, 98-9

Moments		Physics for You
3.3.14	Calculate the moment of a force as force times perpendicular distance from the pivot.	p. 100
3.3.15	***State the principle of moments and use it to solve simple problems. Calculations limited to two forces other than that acting at the pivot. Perpendicular distances only will be given.***	p. 101
Centre of Mass		
3.3.16	Understand the term centre of mass and how the stability of an object depends on the position of the centre of mass and the width of its base.	p. 102-5
Motion		
3.3.17	Recall and use the quantitative relationships between average speed, distance and time, including the calculation of average speed from linear distance-time graphs.	p. 130, 134
3.3.18	Distinguish between distance and displacement, speed and velocity; ***Recall and use the quantitative relationships between:*** ***(i) displacement, time and average velocity;*** ***(ii) initial velocity, final velocity, acceleration and time.*** ***(Problems will only be set on motion in one direction. Equations of motion will not be examined).***	p. 134, 130

Waves, Light and Sound		**Physics for You**
Waves		
3.3.19	Understand that waves transfer energy from one point to another.	p. 174
3.3.20	Distinguish between transverse and longitudinal waves in terms of the motion of the particles of the medium.	p. 174
3.3.21	Recall examples of transverse and longitudinal waves.	p. 174 (154)
3.3.22	Describe, using simple wavefront diagrams, how waves are reflected and refracted, restricted to plane wavefronts, plane barriers and plane boundaries. (Geometrical constructions not required).	p. 175-7
3.3.23	Recall the meaning of frequency, wavelength and amplitude of a wave.	p. 175
3.3.24	Recall and use the quantitative relationship between frequency, wavelength and speed of a wave.	p. 175
Sound		
3.3.25	Relate pitch and loudness of sound to its waveform.	p. 234
3.3.26	Recall that the range of human hearing is 20 Hz to 20 kHz and that the upper limited decreases with age.	p. 232
3.3.27	Recall that frequencies greater than 20 kHz are called ultrasound.	p. 232, 230
3.3.28	Recall that sound is reflected so that the angle of incidence = the angle of reflection.	p. 176, 230
3.3.29	Describe some application of echoes and carry out simple calculations on the echo principle.	p. 230, 240
3.3.30	Describe some applications of ultrasound in industry and medicine.	p. 240-1
Light		
3.3.31	Know that the electromagnetic spectrum includes radio waves, microwaves, infrared, visible light, ultraviolet waves, X-rays and gamma rays and be able to arrange them in order of wavelength.	p. 218-221
3.3.32	Describe some uses and dangers of microwaves, infrared and ultraviolet waves in domestic situations.	p. 218-221, 227
3.3.33	Describe some uses of X-rays and gamma rays in medicine.	p. 218, 220, 318, 356

Electricity and Magnetism		Physics for You
Electric Circuits		
3.3.34	Understand the role of conductors, insulators and switches in simple series and parallel circuits.	p. 254-7
3.3.35	Describe the effects of varying the current on bulb brightness, motor speed and heater output.	p. 260-1
3.3.36	Describe and record diagrammatically simple electric circuits.	p. 254-261
3.3.37	Measure current and voltage in series and parallel circuits.	p. 256-258
3.3.38	Recall that in a series circuit the current is the same everywhere.	p. 256
3.3.39	Recall that in a series circuit the sum of the voltages is equal to the voltage across the whole circuit.	p. 262
3.3.40	***Recall that in a parallel circuit the sum of the current in the branches is equal to the current entering the parallel section.***	p. 257
3.3.41	***Recall that voltages across components in parallel are equal.***	p. 263
3.3.42	Calculate the total resistance of resistors in series.	p. 262, 267
3.3.43	Calculate the resistance of two equal resistors in parallel.	p. 263, 267
3.3.44	***Calculate simple combinations of resistors (no more than three resistors which may include two equal resistors in parallel).***	p. 262-3, 267
Ohm's Law		
3.3.45	Plot and interpret voltage – current graphs for metallic conductors at constant temperature.	p. 265
3.3.46	State and use Ohm's law in the form V/I = R, where R is the resistance.	p. 259
Using Electricity		
3.3.47	Understand one-way and two-way switching.	p. 254, 271
3.3.48	Describe how to wire a fused three-pin plug.	p. 254, 271
3.3.49	Understand the functions of live and neutral wires and how the earth wire and fuse protect the user from electric shock.	p. 274-5
3.3.50	Understand how double insulation protects the user.	p. 275
3.3.51	Understand the positioning of switches and fuses on the live side of appliances.	p. 271, 275
3.3.52	Calculate the costs of using electricity from meter readings.	p. 273
3.3.53	Understand the meaning of the kilowatt-hour and calculate the cost of using electrical appliances using their power rating.	p. 273
3.3.54	Describe in outline how electricity is generated in power stations and distributed through the grid.	p. 113, 306, 308-9
Generation and Transmission of Electricity		
3.3.55	Recall that a.c. generators are used in the generation of electricity. (Details of construction not required).	p. 113, 306
3.3.56	***Describe how step-up and step-down transformers are used in the transmission of electricity. Details of construction and turns ration not required.***	p. 308-9
3.3.57	***Understand that stepping up the voltage reduces energy losses in the grid.***	p. 309

Earth and Space		Physics for You
Seasons		
3.3.58	Explain changes in day length, seasonal changes and changes in the elevation of the Sun in terms of the tilt of the Earth's axis and its movement around the sun.	p. 158
Solar system		
3.3.59	Recall the position of the sun and planets within the solar system and how they move relative to each other. Recall, evaluate and discuss the historical evidence for the heliocentric solar system as opposed to the geocentric.	p. 160, worksheet
Gravitation		
3.3.60	***Understand that gravitational force acts towards the centre of every astronomical object and that this force determines the motion of the planets and comets round the sun and satellites round the planets.***	p. 162-3, 168
3.3.61	***Understand the gravitational forces act between all masses and know that the magnitude diminishes with distance and increases with mass.***	p. 162
3.3.62	***Describe the nebular (gas cloud) model for the formation of the solar system.***	p. 163

end of subject content