

GCSE Specification 1521 – Edexcel Single Award Science

Please check that you have chosen the correct specification.

In both the Double and Single Award, some content is designated for the **higher tier candidates** only. This content is printed in **bold**.

The statements in this Single Award correspond to those in the Double award.

B1 : Humans as organisms

page numbers in **Biology for You**

	Page numbers
• Cell activity	p. 6-40
• Nutrition	p. 44-68
• Blood	p. 85-102
• Nervous coordination	p. 118-131
• Hormonal coordination	p. 132-134
• Maintaining the internal environment	p. 105-117

Cell activity		
<i>Candidates will be assessed on their ability to:</i>		
	• recall that a nucleus, cytoplasm and a cell membrane are present in most animal cells (B1.01)	page 8
	• recognise that the co-ordinated activity of organisms results from the action of cells adapted to different functions; relate the structure of a motor neurone (nerve cell) to its function (B1.04)	12
Nutrition		
In order to meet statutory requirements, candidates following the Welsh National Curriculum should be taught how the presence of starch, sugar and protein in foods can be detected by testing.		44-53
<i>Candidates will be assessed on their ability to:</i>		
	• describe the functions of the mouth, oesophagus (gullet), stomach, small and large intestines, pancreas, liver and gall bladder (B1.05)	55-61
	• understand the role of the muscular wall of the gut in peristalsis (B1.06)	59
	• explain how the structure of villi (large surface area, single layer of cells and capillary network) allows efficient absorption of the soluble products of digestion (B1.07)	p. 61
	• understand the role of bile and of digestive enzymes: bile neutralises stomach acid and emulsifies fats; amylase digests starch to simple sugars; proteases (eg pepsin) digest proteins to amino acids; lipase digests fats to fatty acids and glycerol (B1.08)	60

	<ul style="list-style-type: none"> understand that enzymes are sensitive to temperature and pH; interpret data from experiments relating to digestion (B1.09) 	29-36
Blood		
<i>Candidates will be assessed on their ability to:</i>		
	<ul style="list-style-type: none"> describe the composition of blood: plasma, red blood cells, white blood cells and platelets (B1.10) 	97
	<ul style="list-style-type: none"> understand the roles of these components in: the transport of oxygen, nutrients, carbon dioxide, urea, hormones and thermal energy (heat); combating infection, including the ingestion of micro-organisms and the production of antibodies which destroy micro-organisms; blood clotting (to prevent blood loss and entry of micro-organisms) (B1.11) 	98-100
Nervous coordination		
<i>Candidates will be assessed on their ability to:</i>		
	<ul style="list-style-type: none"> recall that the central nervous system (brain and spinal cord) is linked to sense organs by nerves (B1.20) 	118-120
	<ul style="list-style-type: none"> understand that stimulation of receptors in the sense organs sends electrical impulses along nerves into and then out of the central nervous system, resulting in rapid responses; describe the differences between voluntary and reflex responses (B1.21) 	p. 121-124
	<ul style="list-style-type: none"> describe the pathway taken by electrical impulses along a sensory neurone, a relay neurone and a motor neurone to an effector (muscle or gland); understand the role of transmitter chemicals at synapses; explain the removal of a finger from a hot object (B1.22) 	122-123
	<ul style="list-style-type: none"> describe the role of the iris and pupil, retina and optic nerve in the iris reflex (B1.23) 	130
	<ul style="list-style-type: none"> explain the role of cornea, ciliary body, suspensory ligaments and lens in forming sharp images of near and distant objects on the retina (B1.24) 	130-131
Hormonal coordination		
<i>Candidates will be assessed on their ability to:</i>		
	<ul style="list-style-type: none"> define hormones as chemicals released directly into the blood from glands: testosterone from the testes, oestrogen from the ovaries, progesterone from the ovaries and placenta, follicle stimulating hormone (FSH) and lutenising hormone (LH) from the pituitary gland (B1.25, part) 	132-134
	<ul style="list-style-type: none"> describe the roles of oestrogen and testosterone in promoting secondary sexual characteristics and the production of gametes (B1.27) 	166
	<ul style="list-style-type: none"> explain: <ul style="list-style-type: none"> the role in the menstrual cycle of FSH, oestrogen, LH and progesterone the use of sex hormones in the control and promotion of fertility (B1.28) 	163
	<ul style="list-style-type: none"> describe the roles of adrenaline, released from the adrenal glands, in preparing the body for increased activity (B1.29) 	133

Maintaining the internal environment		
<i>Candidates will be assessed on their ability to:</i>		
	<ul style="list-style-type: none"> define homeostasis as the maintenance of a constant internal environment and understand why this is important (B1.30) 	106-107
	<ul style="list-style-type: none"> explain how sweating and shivering help to maintain constant body temperature (B1.31) 	109-110
	<ul style="list-style-type: none"> explain the role of vasodilation and vasoconstriction in temperature regulation (B1.32) 	110
	<ul style="list-style-type: none"> recall that urea is removed by the kidneys in urine (B1.34) 	111
	<ul style="list-style-type: none"> describe the structure of a nephron to include Bowman's (renal) capsule and glomerulus, coiled tubules, collecting duct, arterioles and capillaries (B1.35) 	112
	<ul style="list-style-type: none"> describe: <ul style="list-style-type: none"> ultrafiltration in Bowman's capsule the composition of glomerular filtrate reabsorption in the coiled tubules (B1.36) 	p. 112
	<ul style="list-style-type: none"> explain the role of ADH in regulating the water content of the blood (B1.37) 	p. 113
	<ul style="list-style-type: none"> understand the roles of skin, stomach acid and blood in defending the body against infection (B1.38) 	178
	<ul style="list-style-type: none"> describe the harmful effects of: <ul style="list-style-type: none"> solvents on the lungs and neurones alcohol on reaction times, behaviour, liver and brain smoking tobacco on the occurrence of bronchitis, emphysema, lung cancer and addiction to nicotine (B1.40) 	185-189
	<ul style="list-style-type: none"> evaluate the use and misuse of drugs, including antibiotics (eg penicillin), pain killers (eg aspirin and heroin), stimulants (eg caffeine and amphetamines), sedatives (eg barbiturates) and the dangers of contracting HIV and hepatitis by the use of intravenous drugs (B1.41) 	184-187

B3 : Variation, inheritance and evolution

page numbers in **Biology for You**

• Variation	p. 255, 272-273, 276-279, 280-285
• Inheritance	278-291
• Evolution	300-305

Variation		
<i>Candidates will be assessed on their ability to:</i>		
	<ul style="list-style-type: none"> recall that the nucleus of a cell contains chromosomes on which genes (units of inherited information) are located (B3.01) 	p. 272-273
	<ul style="list-style-type: none"> understand that: <ul style="list-style-type: none"> variation between individuals arises from genetic and environmental causes and from a combination of both environmental conditions during growth and development cause variation between genetically identical individuals (B3.04) 	255
	<ul style="list-style-type: none"> understand: <ul style="list-style-type: none"> that genes exist in alternative forms (alleles) which cause variation in inherited characteristics the terms dominant and recessive that some alleles cause diseases which can be inherited (B3.05) 	279 280 286-288
	<ul style="list-style-type: none"> recall that: <ul style="list-style-type: none"> chromosomes are present as pairs in body cells and singly in gametes 46 and 23 are the diploid and haploid numbers of chromosomes in human cells (B3.06) 	278 277
	<ul style="list-style-type: none"> understand that division of a cell by mitosis produces two cells which contain identical sets of chromosomes for growth and replacement; interpret diagrams showing the overall behaviour of chromosomes during mitosis (technical terms not required) (B3.07) 	276
	<ul style="list-style-type: none"> understand that division of a cell by meiosis produces four cells, each with half the number of chromosomes for the formation of genetically different haploid gametes during sexual reproduction; interpret simple diagrams and photographs showing stages in meiosis (technical terms not required) (B3.08) 	p. 277
	<ul style="list-style-type: none"> define fertilisation as the fusion of haploid male and female gametes, restoring the diploid number of chromosomes in the zygote; explain the resulting genetic variation in the new generation of individuals (B3.09) 	p. 277

	<ul style="list-style-type: none"> explain that asexual reproduction involves only one parent and gives rise to genetically identical offspring (clones) (B3.10) 	234, 291
	<ul style="list-style-type: none"> recall that a mutation is a change in a gene, DNA or the number of chromosomes in a cell, which leads to genetic variation (B3.11) 	285
	<ul style="list-style-type: none"> understand that many mutations are harmful, some are neutral and a few are beneficial and can increase in the population by natural selection (B3.12) 	285
	<ul style="list-style-type: none"> understand that exposure to ionising radiation (including gamma rays, ultraviolet rays and X-rays) and some chemical mutagens (including chemicals in tobacco) increase the incidence of mutations (B3.13) 	285
Inheritance		
<i>Candidates will be assessed on their ability to:</i>		
	<ul style="list-style-type: none"> recall that the sex of a person is controlled by one pair of chromosomes, XX in a female or XY in a male, and describe the determination of the sex of offspring at fertilisation, using a genetic diagram (B3.14) 	278
	<ul style="list-style-type: none"> describe the mechanism of monohybrid inheritance using a crossing diagram (B3.15) 	282-284
	<ul style="list-style-type: none"> understand how individuals can be homozygous or heterozygous for particular alleles; distinguish between genotype and phenotype (B3.16) 	280-281
	<ul style="list-style-type: none"> predict probabilities of inheritance from parents using genetic diagrams (B3.17) 	282-284
	<ul style="list-style-type: none"> explain family trees showing the inheritance of polydactyly (dominant allele) and cystic fibrosis (recessive allele) (B3.18) 	286
	<ul style="list-style-type: none"> describe some of the implications of the outcome of the Human Genome Project (B3.19) 	291
	<ul style="list-style-type: none"> describe how selective breeding is used to develop crop plants and agricultural animals with desirable characteristics such as resistance to disease and high yields (B3.20) 	290
	<ul style="list-style-type: none"> understand that cloning is used to produce large numbers of identical individuals with desirable characteristics (eg plant cuttings) (B3.21) 	291
	<ul style="list-style-type: none"> describe the ethical implications of selective breeding and cloning (B3.22) 	290-291
	<ul style="list-style-type: none"> describe how the transfer of a required gene from a donor to a recipient, including the use of restriction enzymes and ligase, can produce genetically modified organisms (B3.23) 	289
	<ul style="list-style-type: none"> evaluate the ethical implications of genetic modification (B3.24) 	289
Evolution		
<i>Candidates will be assessed on their ability to:</i>		
	<ul style="list-style-type: none"> understand that fossils provide evidence of evolution (B3.25) 	p. 302-303
	<ul style="list-style-type: none"> describe how inherited variation can lead to evolution or extinction by the process of natural selection (B3.26) 	300-301, 305

B4 : Living organisms in their environment

page numbers in **Biology for You**

<ul style="list-style-type: none"> Humans and the environment 	p. 328-374

Humans and the environment		
<i>Candidates will be assessed on their ability to:</i>		
	<ul style="list-style-type: none"> understand the principles of interdependence, adaptation, competition and predation; explain how these factors influence the distribution and population sizes of organisms in a given terrestrial or aquatic environment (B4.01) 	p. 328-343
	<ul style="list-style-type: none"> describe the impact of human activity on the environment, including the pollution of air and of water; recall the effects of air pollutants (eg sulfur dioxide, carbon monoxide) and of water pollutants (eg sewage, nitrates and phosphates) (B4.02) 	p. 344-349, 374
	<ul style="list-style-type: none"> relate the level of impact on the environment to population size, economic factors and industrial requirements (B4.03) 	330-333, 344-345
	<ul style="list-style-type: none"> describe the effects of deforestation and overfishing; understand the importance of protecting natural populations (B4.04) 	346, 341

C1 : Classifying materials

page numbers in **Chemistry for You**

• Atomic structure	Chapter 3
• Bonding	Chapter 21, 22

Atomic structure	Chapter 3
<i>Candidates will be assessed on their ability to:</i>	
• describe the structure of an atom as a nucleus containing protons and neutrons, surrounded by orbiting electrons arranged in shells (C1.01)	p. 28, 30
• recall the relative mass and relative charge of a proton, a neutron and an electron (C1.02)	p. 29
• understand the terms atomic number, mass number and relative atomic mass (C1.03)	p. 31, 34
• describe the electronic structures of the first twenty elements in the periodic table in terms of numbers of electrons in electron shells, given the atomic numbers (C1.04)	p. 30-1, 70
Bonding	Chapter 21, 22
<i>Candidates will be assessed on their ability to:</i>	
• understand that atoms of different elements can combine to form compounds by the formation of new chemical bonds (C1.07)	p. 16
• understand that ionic bonds can be made by the transfer of electrons to form cations and anions (C1.08)	p. 262-3
• understand that covalent bonds can be made by electron sharing to form molecules (C1.11)	p. 270
• describe the formation, including dot and cross diagrams, of simple molecules including H ₂ , HCl, H ₂ O and CO ₂ (C1.12)	271, Teacher Support Pack

C2 : Changing materials – formulae and equations

page numbers in **Chemistry for You**

• Representing reactions	Throughout

Representing reactions		
<i>Candidates will be assessed on their ability to:</i>		
	• represent chemical reactions by word equations (C2.01)	p. 17
	• recall the formulae of elements and simple compounds in the specification (C2.02)	throughout
	• write simple balanced equations (C2.04)	24-5
	• use the state symbols (s), (l), (g) and (aq) (C2.05)	26

C3 : Patterns of behaviour – in elements and compounds

page numbers in **Chemistry for You**

• The periodic table	Chapter 4
• Noble gases	Chapter 6
• Alkali metals	Chapter 5
• Halogens	Chapter 6
• Chemicals from calcium carbonate	Chapter 11

The periodic table		Chapter 4-6
<i>Candidates will be assessed on their ability to:</i>		
	• recall that there are approximately 100 elements and that all materials are composed of one or more of these (C3.01)	p. 16
	• understand that the periodic table shows elements in order of increasing atomic number, arranged in rows (periods) (C3.02)	p. 42-3
	• recall that elements with similar properties appear in the same vertical column (group) (C3.03)	p. 44

	<ul style="list-style-type: none"> recall the positions of the alkali metals (group 1), the halogens (group 7), and the noble gases (group 0) in the periodic table (C3.04 in part) 	p. 44
	<ul style="list-style-type: none"> understand the connection between the number of outer electrons and the position of an element in the periodic table (C3.05) 	p. 70
	<ul style="list-style-type: none"> understand that the reactions of elements depend upon the arrangement of electrons in their atoms (C3.06) 	p. 70-1
	<ul style="list-style-type: none"> recall that there is a gradual change in the properties of the elements from the top to the bottom of each group (C3.07) 	p. 51, 62, 67, 71
Alkali metals		Chapter 5
<i>Candidates will be assessed on their ability to:</i>		
	<ul style="list-style-type: none"> recall that the alkali metals have comparatively low melting points and boiling points and are softer than other metals (C3.10) 	p. 50
	<ul style="list-style-type: none"> describe the relative reactivity of the alkali metals as exemplified by their reaction with water (C3.11) 	p. 51
	<ul style="list-style-type: none"> recall that common compounds of the alkali metals are soluble in water and that the oxides and hydroxides of the alkali metals are alkaline (pH>7) (C3.12) 	p. 51, 47
Halogens		Chapter 6
<i>Candidates will be assessed on their ability to:</i>		
	<ul style="list-style-type: none"> recall the colours and physical states of the halogens at room temperature (C3.13) 	p. 62
	<ul style="list-style-type: none"> recall that halogens react with metals to form metal halides (C3.14) 	p. 63
	<ul style="list-style-type: none"> recall that halogens react with hydrogen to produce hydrogen halides which dissolve in water to form acidic solutions (pH<7) (C3.15) 	Teacher Support Pack
	<ul style="list-style-type: none"> describe the relative reactivity of the halogens as exemplified by their displacement reactions with halide ions in aqueous solution (C3.16) 	p. 63
	<ul style="list-style-type: none"> describe the use of fluorides in the water supply and in toothpaste, of chlorine in water purification and of iodine as an antiseptic (C3.17) 	p. 64, 103
Chemicals from calcium carbonate		Chapter 11
<i>Candidates will be assessed on their ability to:</i>		
	<ul style="list-style-type: none"> describe the thermal decomposition of calcium carbonate to make calcium oxide and carbon dioxide (C3.23) 	128-9

C4 : Changing materials – useful products

page numbers in **Chemistry for You**

• Useful products from crude oil	Chapter 13, 15
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Useful products from crude oil		Chapter 13
<i>Candidates will be assessed on their ability to:</i>		
	<ul style="list-style-type: none"> recall that hydrocarbons contain carbon and hydrogen only and that crude oil is a mixture of hydrocarbons (C4.11) 	p. 159
	<ul style="list-style-type: none"> describe the fractional distillation of crude oil (C4.12) 	p. 162-4
	<ul style="list-style-type: none"> understand that the larger the hydrocarbon molecule, the higher the boiling point of the hydrocarbon and the less volatile it is at a given temperature (C4.13) 	p. 163-4
	<ul style="list-style-type: none"> recall the uses of the main fractions (gases, petrol, naphtha, kerosene, diesel oil, fuel oil, bitumen) (C4.14) 	p. 164
	<ul style="list-style-type: none"> recall and explain the formation of the products of the complete and incomplete combustion (oxidation) of hydrocarbons, and the possible effect of these on the environment (C4.15) 	p. 187-9
	<ul style="list-style-type: none"> describe how to test for carbon dioxide (using lime water) and water (using cobalt chloride) (C4.16) 	p. 189
	<ul style="list-style-type: none"> explain that cracking involves the breaking down of larger hydrocarbon molecules into smaller, more useful ones, some of which have carbon-carbon double bonds (C4.17) 	p. 165
	<ul style="list-style-type: none"> explain that alkanes are saturated hydrocarbons and that alkenes are unsaturated hydrocarbons (C4.20) 	167
	<ul style="list-style-type: none"> recall that methane is the main constituent of natural gas (C4.21) 	159
	<ul style="list-style-type: none"> recall the formulae of methane, ethane, propane and butane (not methyl propane) and draw the structures of these molecules (C4.22) 	159
	<ul style="list-style-type: none"> recall the formulae of ethene and propene and draw the structures of their molecules (C4.23) 	167
	<ul style="list-style-type: none"> describe how bromine water is used to distinguish between alkanes and alkenes (C4.24) 	167
	<ul style="list-style-type: none"> recall that polymers are large molecules which can be formed by a combination of many smaller molecules (C4.25) 	166
	<ul style="list-style-type: none"> explain how addition polymers are formed from unsaturated monomers (equations required but not conditions and mechanisms) (C4.26) 	168
	<ul style="list-style-type: none"> describe the uses and associated properties of poly(ethene), poly(propene) and poly(chloroethene) (C4.27) 	171

C5 : Patterns of behaviour – in reactions

page numbers in **Chemistry for You**

• Rates of reaction	Chapter 16, 17

Rates of reaction		Chapter 16, 17
<i>Candidates will be assessed on their ability to:</i>		
	• recall that the rates of chemical reactions vary from very fast, explosive reactions to very slow reactions which form no detectable products (C5.01)	p. 199
	• describe experiments to investigate the effect of temperature, concentration and surface area of a solid on the rate of a reaction (C5.02)	200-7
	• interpret the results of such experiments (C5.03)	200-7
	• recall and explain the effect of changes in temperature, concentration and surface area of a solid on a given rate of reaction (C5.04)	200-7
	• understand that reactions can occur when particles collide and that increasing the frequency and energy of collisions increases the rate of the reaction (C5.05)	203
	• describe the effect of a catalyst on a given rate of reaction (C5.06)	208
	• define enzymes as catalysts in biological systems and describe their use in washing powder, and food and drink manufacture (C5.07)	214-17

P1 : Electricity and magnetism

page numbers in **Physics for You**

• Units	Chapters 31, 32
• Mains electricity	Chapter 32
• Energy and potential difference in circuits	Chapter 31
• Electromagnetic induction	Chapter 36


Units	Chapters 31, 32
<i>Candidates will be assessed on their ability to:</i>	
<ul style="list-style-type: none"> use the following units: ampere (A), coulomb (C), ohm (Ω), volt (V), watt (W), kilowatt-hour (kW h) (P1.01) 	pages 259, 266, 267, 272-3
Mains electricity	Chapter 32
<i>Candidates will be assessed on their ability to:</i>	
<ul style="list-style-type: none"> identify the live, neutral and earth conductor in a correctly-wired plug and recall the colour of the insulation used on each conductor (P1.02) 	p. 275
<ul style="list-style-type: none"> recall the hazards of electricity including frayed cables, long cables, damaged plugs, water around sockets and pushing metal objects into sockets (P1.03) 	p. 274-5
<ul style="list-style-type: none"> describe the uses of insulation, double insulation, earthing, fuses and circuit breakers in a range of domestic appliances (P1.04) 	p. 274-5, 301, 312, worksheet
<ul style="list-style-type: none"> recall that electrical heating is used in a variety of ways in domestic contexts (P1.05) 	p. 270-1
<ul style="list-style-type: none"> understand that a current in a resistor results in the electrical transfer of energy and an increase in temperature (P1.06) 	p. 260, 270
<ul style="list-style-type: none"> calculate the energy used by domestic appliances in kilowatt-hours and calculate domestic electricity bills, based on meter readings (P1.08) 	p. 273
<ul style="list-style-type: none"> use the quantitative relationship between energy transferred, current, voltage and time: energy transferred = current \times voltage \times time $E = I \times V \times t$ (P1.09) 	p. 272
<ul style="list-style-type: none"> recall that mains electricity is alternating current (a.c.) and understand the difference between this and the direct current (d.c.) supplied by a cell (P1.10) 	p. 274, 305
Energy and potential difference in circuits	Chapter 31
<i>Candidates will be assessed on their ability to:</i>	
<ul style="list-style-type: none"> explain whether a series or parallel circuit is more appropriate for a range of applications, including domestic lighting (P1.11) 	p. 256-7
<ul style="list-style-type: none"> understand that the current in a series circuit depends on the applied voltage and the number and nature of other components (P1.12) 	p. 256, 262

	<ul style="list-style-type: none"> describe how current varies with voltage in wires, resistors, metal filament lamps and diodes and how this can be investigated experimentally (P1.13) 	p. 261, 265, 322
	<ul style="list-style-type: none"> describe the qualitative effect of changing resistance on the current in a circuit (P1.14) 	p. 255, 260
	<ul style="list-style-type: none"> describe the qualitative variation of resistance of LDRs with illumination and of thermistors with temperature (P1.15) 	p. 265, 325
	<ul style="list-style-type: none"> recall and use the quantitative relationship between voltage, current and resistance: voltage = current \times resistance $V = I \times R$ (P1.16) 	p. 259
Electromagnetic induction		Chapter 36
<i>Candidates will be assessed on their ability to:</i>		
	<ul style="list-style-type: none"> describe the generation of electricity by the rotation of a magnet within a coil of wire and of a coil of wire within a magnetic field and the factors which affect the size of the induced voltage (P1.31) 	p. 304, 306
	<ul style="list-style-type: none"> describe the use of step-up and step-down transformers in the large-scale transmission of electrical energy (P1.33) 	p. 309
	<ul style="list-style-type: none"> recall and use the quantitative relationship between input (primary) and output (secondary) voltages and the turns ratio for a transformer: $\frac{\text{voltage (primary)}}{\text{voltage (secondary)}} = \frac{\text{turns (primary)}}{\text{turns (secondary)}}$ $\frac{V_P}{V_S} = \frac{n_P}{n_S} \quad (\text{P1.34})$ 	p. 308

P3 : Waves

page numbers in **Physics for You**

• Units	Chapter 21
• Properties of waves	Chapter 21
• The electromagnetic spectrum	Chapter 28
• Light and sound	Chaps 23, 25, 29




Units		Chapter 21
<i>Candidates will be assessed on their ability to:</i>		
	• use the following units: hertz (Hz), kilohertz (kHz), megahertz (MHz), metre/second (m/s) (P3.01)	p. 175
Properties of waves		Chapter 21
<i>Candidates will be assessed on their ability to:</i>		
	• describe longitudinal and transverse waves in ropes, springs and water (P3.02)	p. 174
	• state the meaning of amplitude, frequency, wavelength and period of a wave (P3.03)	p. 175
	• recall that waves transfer energy and information without transferring matter (P3.04)	p. 174, 219
	• understand that waves can be diffracted through gaps or when they pass an edge and that the extent of diffraction depends on the wavelength and the physical dimension (P3.08)	p. 177
The electromagnetic spectrum		Chapter 28
<i>Candidates will be assessed on their ability to:</i>		
	• understand that light is part of a continuous electromagnetic spectrum which includes radio, microwave, infra-red, visible, ultraviolet, X-ray and gamma ray radiations and that all these waves travel at the same speed in free space (P3.12)	p. 218-9
	• recall the order of the electromagnetic spectrum in decreasing wavelength and increasing frequency, including the colours of the visible spectrum (P3.13)	p. 216-9
	• recall some uses of electromagnetic radiations including:	
	• radio waves: broadcasting and communications	p. 177, 219, 221, 320, 335
	• microwaves: cooking and satellite transmissions	p. 219, 221, 227, 320
	• infra-red: heaters, grills, night vision and remote controls	p. 48-53, 219, 221, 227
	• visible light: optical fibres and photography	p. 195-7, 200, 219, 206-7
	• ultraviolet: sunbeds, crime prevention and fluorescent lamps	p. 218, 220, 226

	<ul style="list-style-type: none"> • X-rays: observing the internal structure of objects and materials, medical applications 	p. 218, 220, 226, 318
	<ul style="list-style-type: none"> • gamma rays: sterilising food and medical equipment (P3.14) 	p. 218, 220, 356-7
	<ul style="list-style-type: none"> • recall the detrimental effects of excessive exposure of the human body to electromagnetic waves of increasing frequencies including: 	
	<ul style="list-style-type: none"> • microwaves: internal heating of body tissue 	p. 219, 227
	<ul style="list-style-type: none"> • infra-red: skin burns 	p. 219
	<ul style="list-style-type: none"> • ultraviolet: damage to surface cells and blindness 	p. 218, 220
	<ul style="list-style-type: none"> • gamma rays: cancer, mutation (P3.15) 	p. 218, 220
Light and sound		Chaps 23, 25, 29
<i>Candidates will be assessed on their ability to:</i>		
	<ul style="list-style-type: none"> • recall that light waves are transverse waves which can be reflected, refracted and diffracted (P3.16) 	p. 174, 176-7, 184-7, 192
	<ul style="list-style-type: none"> • describe the role of total internal reflection in transmitting information along optical fibres and in prisms (P3.17) 	p. 195-7, 200
	<ul style="list-style-type: none"> • understand the difference between analogue and digital signals (P3.18) 	p. 312, 332
	<ul style="list-style-type: none"> • describe how digital signals can carry more information (P3.19) 	p. 333
	<ul style="list-style-type: none"> • recall that sound waves are longitudinal waves which can be reflected, refracted and diffracted (P3.20) 	p. 174, 177, 229-31, 240, 245
	<ul style="list-style-type: none"> • recall that the frequency range for human hearing is 20 Hz – 20 000 Hz (P3.21) 	p. 232
	<ul style="list-style-type: none"> • understand the nature of ultrasound as high-frequency sound and its applications in scanning, cleaning and range or direction finding (P3.22) 	p. 230, 240-1

P4 : The Earth and beyond

page numbers in **Physics for You**

• The Solar system	Chapter 20
• The rest of the Universe	Chapter 20

The Solar system		Chapter 20
<i>Candidates will be assessed on their ability to:</i>		
	<ul style="list-style-type: none"> interpret physical data on the planets, particularly with regard to their masses and their orbits in the Solar system (P4.01) 	p. 160-1
	<ul style="list-style-type: none"> describe the differences between the orbits of a planet and a moon, and also of a comet, and describe the different types of orbit of satellites around the Earth (P4.02) 	p. 158-9, 162-3, 168-9
	<ul style="list-style-type: none"> understand that the movements and orbits of planets and moons, and of comets and satellites, are determined by gravitational forces (P4.03) 	p. 158-9, 162-3, 168-9
The rest of the Universe		Chapter 20
<i>Candidates will be assessed on their ability to:</i>		
	<ul style="list-style-type: none"> recall that the Sun is one of many millions of stars in a huge group called the Milky Way galaxy (P4.04) 	p. 165
	<ul style="list-style-type: none"> describe the Universe as a system consisting of an enormous number of galaxies and be aware of the search for evidence of extraterrestrial life (P4.05) 	p. 166-7
	<ul style="list-style-type: none"> describe how stars form from very large clouds of hydrogen, helium and dust which collapse under the influence of gravity so that the core becomes hot enough for nuclear reactions to begin (P4.06) 	p. 163-4
	<ul style="list-style-type: none"> recall that small stars, like the Sun, eventually become red giants and later become white dwarfs (P4.07) 	p. 165
	<ul style="list-style-type: none"> describe the 'Big Bang' theory of the origin of the Universe and consider other theories such as the 'steady state' theory (P4.08) 	p. 166, 369
	<ul style="list-style-type: none"> recall evidence for the 'Big Bang' theory, including the different red shifts of light from distant galaxies and the background microwave radiation (P4.09) 	p. 166-7
	<ul style="list-style-type: none"> explain how the future of the Universe depends on the amount of mass present (P4.10) 	p. 166, worksheet

P5 : Energy resources and energy transfer

pages in **Physics for You**

• Units	Chapters 5, 16
• Energy transfer	Chaps 2, 8, 16
• Energy resources and electricity generation	Chapters 2, 16

Units		Chapters 5, 16
<i>Candidates will be assessed on their ability to:</i>		
	<ul style="list-style-type: none"> use the following units: degree Celsius (°C), joule (J), newton (N), watt (W), kilowatt (kW), megawatt (MW) (P5.01) 	29, 107, 118, 138
Energy transfer		Chaps 2, 8, 16
<i>Candidates will be assessed on their ability to:</i>		
	<ul style="list-style-type: none"> describe energy transfers involving the following forms of energy: thermal, light, electrical, sound, movement (kinetic), chemical, nuclear and potential (elastic and gravitational) (P5.02) 	p. 8-9, 42-51, 110-11
	<ul style="list-style-type: none"> understand that energy is conserved (P5.03) 	p. 108-9
	<ul style="list-style-type: none"> recall that efficiency is the proportion of energy transferred to useful work and apply this to everyday situations (P5.04) 	p. 112, 122
	<ul style="list-style-type: none"> describe a variety of everyday and scientific devices and situations, explaining the fate of the input energy in the above terms, including their representation by flow diagrams (Sankey diagrams) (P5.05) 	p. 112-3, 122
	<ul style="list-style-type: none"> describe how insulation is used to reduce energy transfers from buildings and the human body (P5.06) 	p. 44-5, 53
	<ul style="list-style-type: none"> understand that many insulating materials make use of the insulating properties of air that is not free to form convection currents (P5.07) 	p. 44-5, 53
Energy resources and electricity generation		Chapter 2, 16
<i>Candidates will be assessed on their ability to:</i>		
	<ul style="list-style-type: none"> understand a range of energy transfer chains illustrating the environmental implications of generating electricity, including: <ul style="list-style-type: none"> the use of wind and water geothermal resources solar heating systems and electricity production through solar cells fossil fuel reserves nuclear power (P5.14) 	p. 11-13 p. 110-15 p. 52, 113-14 p. 359
	<ul style="list-style-type: none"> describe the advantages and disadvantages of methods of large scale electricity production using a variety of renewable and non-renewable resources (P5.15) 	p. 11-13, 113-15

P6 : Radioactivity

page numbers in **Physics for You**

• Units	Chapter 39
• Radioactivity	Chapter 39

Units	Chapter 39
<i>Candidates will be assessed on their ability to:</i>	
• use the following unit: becquerel (Bq) (P6.01)	p. 360
Radioactivity	Chapter 39
<i>Candidates will be assessed on their ability to:</i>	
• describe the structure of an atom in terms of protons, neutrons and electrons and use symbols such as ${}^{14}_6\text{C}$ to describe particular nuclei (P6.02)	p. 352-3
• understand the terms atomic (proton) number and mass (nucleon) number and explain the existence of isotopes (P6.03)	p. 353
• understand that alpha and beta particles and gamma rays are ionising radiations emitted from unstable nuclei in a random process (P6.04)	p. 350-1
• describe the nature of alpha and beta particles and gamma rays and recall that they may be distinguished in terms of penetrating power and ionising ability	p. 350-1
• describe the effects on the atomic and mass numbers of a nucleus of the emission of each of the three main types of radiation and understand how to complete balanced nuclear equations (P6.06)	p. 355
• understand that ionising radiation can be detected using a photographic film or a Geiger-Müller detector (P6.07)	p. 348-9
• recall the existence of background radiation from the Earth and from space, including the regional variations in the United Kingdom, eg because of radon gas released from rocks (P6.08)	p. 360
• understand that the activity of a radioactive source decreases over a period of time and is measured in becquerels (P6.09)	p. 354, 360
• describe the uses of radioactivity in medical and non-medical tracers, in radiotherapy and in the radioactive dating of archaeological specimens and rocks (P6.12)	p. 356-7, 362
• describe the dangers of ionising radiations including: <ul style="list-style-type: none"> • radiation can cause mutations in living organisms • radiation can damage cells and tissue • the problems arising in the disposal of radioactive waste (P6.13) 	p. 220, 360, 373, worksheet



End of syllabus content