Cambridge IGCSE Physical Science 0652 (Physics sections only) italic = extended / supplement material	**Page number** in **New** **Physics for You**
1. General Physics	
1.1 Length and time	
-use and describe the use of rules and measuring cylinders to determine a length or a volume	pages 8, 75, 365
-use and describe the use of a mechanical method for the measurement of a small distance	
-use and describe the use of clocks and devices for measuring an interval of time.	9
-measure and describe how to measure a short interval of time (including the period of a pendulum)	9
1.2 Speed, velocity and acceleration	
-define speed and calculate speed from $\frac{\text{total time}}{\text{total distance}}$	122
-plot and interpret a speed/time graph or a distance/time graph	123-126
-recognise from the shape of a speed/time graph when a body is (a) at rest, (b) moving with constant speed, (c) moving with changing speed	124
-distinguish between speed and velocity	122
-recognise linear motion for which the acceleration is constant and calculate the acceleration	124-125
-recognise motion for which the acceleration is not constant	124-125
-calculate the area under a speed/time graph to determine the distance travelled for motion with constant acceleration	125
-demonstrate some understanding that acceleration is related to changing speed	124
-state that the acceleration of free fall for a body near to the Earth is constant	128-129
-describe qualitatively the motion of bodies falling in a uniform gravitational field with and without air resistance (including reference to terminal velocity)	89, 128

1.3 Mass and weight	
-show familiarity with the idea of the mass of a body	pages 9, 68
-state that weight is a force	65
-demonstrate an understanding that mass is a property which 'resists' change in motion	68, 130
-demonstrate understanding that weights (and hence masses) may be compared using a balance	67, 75
-describe, and use the concept of, weight as the effect of a gravitational field on a mass	65, 67, 131
1.4 Density	
-describe an experiment to determine the density of a liquid and of a regularly shaped solid and make the necessary calculation	74-76
-describe the determination of the density of an irregularly shaped solid by the method of displacement	75
1.5 Forces	
(a) Effects of forces -state that a force may produce a change in size and shape of a body	65
-plot extension/load graphs and describe the associated experimental procedure	66
-describe ways in which force may change the motion of a body	69
-take readings from and interpret extension-load graphs (Hooke's law, as such, is not required)	66
-recognise the significance of the term 'limit of proportionality' for an extension-load graph and use proportionality in simple calculations	66
-recall and use the relation between force, mass and acceleration (including the direction)	130-131
(b) Turning effect -describe the moment of a force as a measure of its turning effect and give everyday examples.	90
--perform and describe an experiment (involving vertical forces) to verify that there is no net moment on a body in equilibrium	91
(c) Centre of mass -perform and describe an experiment to determine the position of the centre of mass of a plane lamina.	92-3

-describe qualitatively the effect of the position of the centre of mass on the stability of simple objects.	page 93
1.6 Energy, work and power	
(a) Energy -give examples of energy in different forms, its conversion and conservation and apply the principle of energy conservation to simple examples	10-11, 98, 100-101
-show some understanding of energy of motion and energy of position (i.e. gravitational and strain)	108-109
-describe energy transfer in terms of work done and make calculations involving F x d	97-99
-use the terms kinetic and potential energy in context	108-109
-recall and use the expressions *k.e.= ½ mv2* *p.e. = mgh*	108-109
b) Major sources of energy and alternative sources of energy -describe processes by which energy is converted from one form to another, including reference to:	
(i) chemical/fuel energy (a regrouping of atoms) (ii) energy from water – hydroelectric energy, waves, tides (iii) geothermal energy (iv) nuclear energy (fission of heavy atoms) *(v) solar energy (fusion of nuclei of atoms in the Sun)*	101, 104-106 15, 101, 106 15 349 156
-express a qualitative understanding of efficiency	102
-recall and use the mass/energy equation *E = mc2*	348
(b) Work -relate, without calculation, work done to the magnitude of a force and the distance moved	97
-describe energy changes in terms of work done	99
-recall and use ΔW = Fd = ΔE	97-99
(c) Power -relate, without calculation, power to work done and time taken, using appropriate examples	110
-recall and use the equation P = E/t in simple systems	110-11

2. Thermal Physics	
2.1 Thermal properties	
(a) Thermal expansion of solids, liquids and gases -describe qualitatively the thermal expansion of solids, liquids and gases	page 21
-identify and explain some of the everyday applications and consequences of thermal expansion	22-23
-show an appreciation of the relative order of magnitude of the expansion of solids, liquids and gases	24
(b) Measurement of temperature -appreciate how a physical property which varies with temperature may be used for the measurement of temperature and state examples of such properties	26-27, 31-32
-recognise the need for and identify a fixed point	
-describe the structure and action of liquid-in-glass thermometers	26-27
-apply a given property to the measurement of temperature	
-demonstrate understanding of sensitivity, range and linearity	26, 362
-describe the structure and action of a thermocouple and show understanding of its use for measuring high temperatures and those which vary rapidly	
(c) Melting and boiling -describe melting and boiling in terms of energy input without a change in temperature	53-55
-state the meaning of melting point and boiling point	(27, 53, 55)
-distinguish between boiling and evaporation	(55, 56)
2.2 Transfer of thermal energy	
(a) Conduction -describe experiments to demonstrate the properties of good and bad conductors of heat	44-45
-give a simple molecular account of heat transfer in solids	41
(b) Convection -relate convection in fluids to density changes and describe experiments to illustrate convection	44-45

(c) Radiation -identify infra-red radiation as part of the electromagnetic spectrum *-describe experiments to show the properties of good and bad emitters and good and bad absorbers of infra-red radiation*	pages 46-48, 209
(d) Consequences of energy transfer -identify and explain some of the everyday applications and consequences of conduction, convection and radiation	40-51
3. Properties of waves, including light and sound	
3.1 General wave properties	
-describe what is meant by wave motion as illustrated by vibration in ropes, springs and by experiments using water waves	166-169
-use the term wavefront	168
-give the meaning of speed, frequency, wavelength and amplitude	167
-recall and use the equation $v = f\lambda$	167
-describe the use of water waves to show (i) reflection at a plane surface (ii) refraction due to a change of speed (iii) diffraction produced by wide and narrow gaps	 168 168 169
-interpret reflection, refraction, diffraction using wave theory	168-169
3.2 Light	
(a) Reflection of light -describe the formation, and give the characteristics, of an optical image formed by a plane mirror	176-179
-use the law angle of incidence = angle of reflection	177
-perform simple constructions, measurements and calculations	176-178
(b) Refraction of light -describe the refraction, including angle of refraction, in terms of the passage of light through a parallel sided glass block	184-185
-determine and calculate refractive index using $n = \sin i / \sin r$	185
(c) Thin converging lens -describe the action of a thin converging lens on a beam of light	194-196
-use the term focal length	194
-use and describe the use of a single lens as a magnifying glass	196

(d) Electromagnetic spectrum -describe the main features of the electromagnetic spectrum and state that all e.m. waves travel with the same high speed in vacuo	pages 208-209, (210-7)
-state the approximate value of the speed of electromagnetic waves	209
-use the term monochromatic	
3.3 Sound	
-describe the production of sound by vibrating sources	224
-*describe compression and rarefaction*	225
-state the approximate range of audible frequencies	230
-show an understanding that a medium is required in order to transmit sound waves	225
4. Electricity and magnetism	
4.1 Simple phenomena of magnetism	
-state the properties of magnets	280
-give an account of induced magnetism	(281), 283
-distinguish between ferrous and nonferrous materials	(283)
-describe an experiment to identify the pattern of field lines round a bar magnet	282
-distinguish between the magnetic properties of iron and steel	283
-distinguish between the design and use of permanent magnets and electromagnets	281, 288
4.2 Electrostatics	
Electric charge -describe simple experiments to show the production and detection of electrostatic charges	241
-state that there are positive and negative charges	241
-state that unlike charges attract and that like charges repel	241
-state that charge is measured in coulombs	245
4.3 Electricity	
(a) Current -state that current is related to the flow of charge	245, 249

-show understanding that a current is a rate of flow of charge and recall and use the equation I = Q/t	pages 249, 260
-use and describe the use of an ammeter	250
(b) Electro-motive force -state that the e.m.f. of a source of electrical energy is measured in volts	252
-show understanding that e.m.f. is defined in terms of energy supplied by a source in driving charge round a complete circuit	252, 261
(c) Potential difference -state that the potential difference across a circuit component is measured in volts	252
-use and describe the use of a voltmeter	252
(d) Resistance - recall and use the equation V = IR	253, 255
-describe an experiment to determine resistance using a voltmeter and an ammeter	255
-relate (without calculation) the resistance of a wire to its length and to its diameter	254
-recall and use quantitatively the proportionality between resistance and the length and the inverse proportionality between resistance and cross-sectional area of a wire	254
(e) V/I characteristic graphs -sketch the V/I characteristic graphs for metallic (ohmic) conductors	259
4.4 Electric circuits	
-draw and interpret circuit diagrams containing sources, switches, resistors (fixed and variable), lamps, ammeters, voltmeters, magnetising coils, transformers, bells, fuses and relays	248-255, 268, 320
-draw and interpret circuit diagrams containing diodes as rectifiers	316-317
-understand that the current at every point in a series circuit is the same	250
-recall and use the fact that the sum of the p.d.'s across the components in a series circuit is equal to the total p.d. across the supply	256
-give the combined resistance of two or more resistors in series	256

-state that, for a parallel circuit, the current from the source is larger than the current in each branch	page 251
-recall and use the fact that the current from the source is the sum of the currents in the separate branches of a parallel circuit	251
-state that the combined resistance of two resistors in parallel is less than that of either resistor by itself	257
-calculate the effective resistance of two resistors in parallel	257
4.5 Practical electric circuitry	
(a) Uses of electricity -describe the uses of electricity in heating, lighting (including lamps in parallel), motors	264-265, 268
-recall and use the equations $P = I V$, $E = I V t$ and their alternative forms	266, 261
(b) Safety considerations -state the hazards of (i) damaged insulation (ii) overheating of cables (iii) damp conditions	(268)
4.6 Electromagnetic effects	
(a) Electromagnetic induction *-describe an experiment which shows that a changing magnetic field can induce an e.m.f. in a circuit*	296-297
-state the factors affecting the magnitude of the induced e.m.f.	296
-show understanding that the direction of an induced e.m.f. opposes the change causing it	297
(b) a.c. generator *-describe a rotating-coil generator and the use of slip rings*	298
-sketch a graph of voltage output against time for a simple a.c. generator	299
(c) d.c. motor -state that a current-carrying coil in a magnetic field experiences a turning effect and that the effect is increased by increasing the number of turns on the coil	291-293
-relate this turning effect to the action of an electric motor	291-293
-describe the effect of increasing the current	290-293
(d) Transformer *-describe the construction of a basic iron-cored transformer as used for voltage transformations*	301-302

-show an understanding of the principle of operation of a transformer	pages 301-302
-use the equation (Vp / Vs) = (Np / Ns)	302-303
-recall and use the equation Vp lp = Vs Is (for 100% efficiency)	302
-show understanding of energy loss in cables (calculation not required)	303, 305
-describe the use of the transformer in high-voltage transmission of electricity	303
-advantages of high voltage transmission	303
4.7 Cathode rays and the cathode-ray oscilloscope	
(a) Cathode rays -describe the production and detection of cathode rays	308-311
-distinguish between the direction of electron current and conventional current	249
-describe their deflection in electric fields and magnetic fields	309, 310
-deduce that the particles emitted in thermionic emission are negatively charged	309
-state that the particles emitted in thermionic emission are electrons	308
(b) Simple treatment of cathode-ray oscilloscope -describe in outline the basic structure, and action, of a cathode-ray oscilloscope (detailed circuits are not required)	309-310
-use and describe the use of a cathode-ray oscilloscope to display waveforms	311
-use and describe the use of a c.r.o. to measure p.d.s and short intervals of time (detailed circuits are not required)	311
5. Atomic Physics	
5.1 Radioactivity	
(a) Detection of radioactivity -show awareness of the existence of background radiation	340, 350
-describe the detection of α-particles, β-particles and *γ* -rays (β+ is not included: β-particles will be taken to refer to β-.)	340-341

(b) Characteristics of the three kinds of emission -state that radioactive emissions occur randomly over space and time	page 339
-state, for radioactive emissions: (i) their nature (ii) their relative ionising effects (iii) their relative penetrating abilities	340-341
-describe their deflection in electric fields and magnetic fields	340-341
-interpret their relative ionising effects	340-341
(c) Radioactive decay -state the meaning of radioactive decay, using equations (involving words or symbols) to represent changes in the composition of the nucleus when particles are emitted	344-345
(d) Half-life -use the term half-life in simple calculations which might involve information in tables or decay curves	344, 352
(e) Safety precautions -describe how radioactive materials are handled, used and stored in a safe way	350
5.2 The nuclear atom	
(a) Atomic model -describe the structure of an atom in terms of a nucleus and electrons	342-343
-describe how the scattering of α-particles by thin metal foils provides evidence for the nuclear atom	342
(b) Nucleus -describe the composition of the nucleus in terms of protons and neutrons	342-343
-use the term proton number Z	343
-use the term nucleon number A	343
-use the term nuclide and use the nuclide notation $^{A}X_{B}$	343
(c) Isotopes *-use the term isotope*	343
-give and explain examples of practical applications of isotopes	346-347
end of specification content	