1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 112 – 116 have been reported but not fully authenticated						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

* The Lanthanides (atomic numbers 58 – 71) and the Actinides (atomic numbers 90 – 103) have been omitted.

Relative atomic masses for **Cu** and **Cl** have not been rounded to the nearest whole number.

HT = Higher Tier only equations

kinetic energy = 0.5 × mass × (speed)^2	$E_k = \frac{1}{2} m v^2$
elastic potential energy = 0.5 × spring constant × (extension)^2	$E_e = \frac{1}{2} k e^2$
gravitational potential energy = mass × gravitational field strength × height	$E_p = m g h$
change in thermal energy = mass × specific heat capacity × temperature change	$\Delta E = m c \Delta\theta$
power = $\frac{\text{energy transferred}}{\text{time}}$	$P = \frac{E}{t}$
power = $\frac{\text{work done}}{\text{time}}$	$P = \frac{W}{t}$
efficiency = $\frac{\text{useful output energy transfer}}{\text{total input energy transfer}}$	
efficiency = $\frac{\text{useful power output}}{\text{total power input}}$	
charge flow = current × time	$Q = I t$
potential difference = current × resistance	$V = I R$
power = potential difference × current	$P = V I$
power = (current)^2 × resistance	$P = I^2 R$
energy transferred = power × time	$E = P t$
energy transferred = charge flow × potential difference	$E = Q V$
density = $\frac{\text{mass}}{\text{volume}}$	$\rho = \frac{m}{V}$

	thermal energy for a change of state = mass × specific latent heat	$E = m L$
	For gases: pressure × volume = constant	$p V = constant$
	weight = mass × gravitational field strength	$W = m g$
	work done = force × distance (along the line of action of the force)	$W = F s$
	force = spring constant × extension	$F = k e$
	moment of a force = force × distance (normal to direction of force)	$M = F d$
	$\text{pressure} = \frac{\text{force normal to a surface}}{\text{area of that surface}}$	$p = \frac{F}{A}$
HT	**pressure due to a column of liquid = height of column × density of liquid × gravitational field strength**	$p = h \rho g$
	distance travelled = speed × time	$s = v t$
	$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$	$a = \frac{\Delta v}{t}$
	(final velocity)^2 – (initial velocity)^2 = 2 × acceleration × distance	$v^2 - u^2 = 2 a s$
	resultant force = mass × acceleration	$F = m a$
HT	**momentum = mass × velocity**	$p = m v$
HT	$\textbf{force} = \frac{\textbf{change in momentum}}{\textbf{time taken}}$	$F = \frac{m \Delta v}{\Delta t}$
	$\text{period} = \frac{1}{\text{frequency}}$	$T = \frac{1}{f}$
	wave speed = frequency × wavelength	$v = f \lambda$
	$\text{magnification} = \frac{\text{image height}}{\text{object height}}$	
HT	**force on a conductor (at right angles to a magnetic field) carrying a current = magnetic flux density × current × length**	$F = B I l$
HT	$\frac{\textbf{potential difference across primary coil}}{\textbf{potential difference across secondary coil}} = \frac{\textbf{number of turns in primary coil}}{\textbf{number of turns in secondary coil}}$	$\frac{V_p}{V_s} = \frac{n_p}{n_s}$
HT	**potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil**	$V_p I_p = V_s I_s$

Y11 GCSE Combined Science Topic List: Paper I

Biology Paper I

Cell Biology
- Cell structures
- Cell division
- Diffusion & Osmosis

Organisation
- Cells, tissues & organs
- Digestion & enzymes
- Heart and circulation
- Leaf structure

Infection & Response
- Communicable disease
- Non-communicable disease
- Preventing disease
- Vaccines & antibiotics
- Developing drugs

Bioenergetics
- Photosynthesis
- Respiration

Chemistry Paper I

Atoms & the Periodic Table
- Atomic structure
- Structure of the PT
- Properties of group 1, 7 and 0 elements

Bonding & Structure
- Electron configuration
- Covalent bonding
- Ionic bonding

Chemical Calculations
- Relative molecular formula
- Moles
- Concentrations

Chemical Change
- Acids, metals and bases
- Reactivity series
- Neutralisation
- Electrolysis

Energy Changes
- Exothermic reactions
- Endothermic reaction
- Reaction profiles

Physics Paper I

Energy
- Energy stores
- Energy pathways
- Efficiency

Electricity
- Electrical circuits
- Circuit symbols
- Current, resistance and potential difference

Particle Theory
- States of matter
- Specific heat capacity
- Specific latent heat
- Density

Atoms & Radiation
- Atomic structure
- History of the atom
- Alpha, beta and gamma radiation
- Uses and dangers of radiation

Y11 GCSE Combined Science Topic List: Paper II

Biology Paper II

Homeostasis & Response
- Homeostasis
- Reflexes
- Hormones
- The menstrual cycle

Inheritance, Variation & Evolution
- Inheritance & reproduction
- Variation
- Genetics

Ecology
- Adaptations
- Competition
- Biodiversity
- Food chains
- Cycling materials

Chemistry Paper II

Rates of Reaction
- Factors affecting rates
- Measuring rates
- Equilibrium & reversible reactions

Organic Chemistry
- Fuels & combustion
- Alkanes & alkenes
- Distillation
- Cracking

Chemical Analysis
- Mixtures and formulations
- Separation techniques
- Gas tests

Earth's Atmosphere
- Evolution of Earth's atmosphere
- Global warming & climate change

Using Resources
- Reduce, reuse, recycle
- Life cycle assessments

Physics Paper II

Forces
- Identifying forces
- Resolving forces (H)
- Forces and motion
- Velocity / time graphs
- Acceleration / time graphs
- Newtons laws of motion
- Momentum

Waves
- Wave properties
- Wave calculations
- Refraction
- Electromagnetic waves
- The EM spectrum

Magnets & Electromagnets
- Magnets & magnetic fields
- Electromagnets
- Fleming's Left Hand Rule & the Motor Effect
- Solenoids

Y11 GCSE Separate Science Topic List: Paper I

Biology Paper I

All content listed on the combined science topic list, with the addition of the following topics;

Cell Biology
- *No extra content*

Organisation
- *No extra content*

Infection & Response
- Growing bacteria
- Preventing bacterial growth
- Plant disease and plant defences

Bioenergetics
- *No extra content*

Chemistry Paper I

All content listed on the combined science topic list, with the addition of the following topics;

Atoms & the Periodic Table
- Transition metals

Bonding & Structure
- Nanoparticles
- Applications of nanoparticles

Chemical Calculations
- Yields
- Atom economy
- Titrations
- Gas volumes

Chemical Change
- *No extra content*

Energy Changes
- Chemical cells & batteries
- Fuel cells

Physics Paper I

All content listed on the combined science topic list, with the addition of the following topics;

Energy
- Infrared Radiation

Electricity
- Electrical charges

Particle Theory
- Gas pressure and volume

Atoms & Radiation
- Nuclear radiation in medicine
- Nuclear fission
- Nuclear fusion
- Nuclear issues

Y11 GCSE Separate Science Topic List: Paper II

Biology Paper II

All content listed on the combined science topic list, with the addition of the following topics;

Homeostasis & Response
- The brain
- The eye
- Eye health
- Plant hormones
- Controlling body temperature
- The kidneys

Inheritance, Variation & Evolution
- Gene expression and mutation
- Cloning
- History of genetics

Ecology
- Rates of decomposition
- Trophic levels
- Biomass
- Food production & security

Chemistry Paper II

All content listed on the combined science topic list, with the addition of the following topics;

Rates of Reaction
- *No extra content*

Organic Chemistry
- Reactions of alkenes
- Structures and uses of alcohols, carboxylic acids & esters
- Polymers and polymerisation

Chemical Analysis
- Testing for ions
- Instrumental analysis

Earth's Atmosphere
- *No extra content*

Using Resources
- Rusting
- Alloys, ceramics & composites
- Haber process & fertilisers

Physics Paper II

All content listed on the combined science topic list, with the addition of the following topics;

Forces
- Moments
- Gears and levers
- Conservation of momentum
- Impact forces & safety
- Pressure, upthrust and floatation

Waves
- Sound, ultrasound and seismic waves
- Reflection, refraction, colour and lenses

Magnets & Electromagnets
- Generators & transformers

Space Physics
- The Solar System
- Stars
- Planets & orbits
- The history of the Universe