



GCSE Science Knowledge Checklists

Contents					
Page	Topic	Complete?	Page	Topic	Complete?
2	B1		7	C6	
2	B2		7	C7	
2	B3		7	C8	
3	B4		8	C9	
3	B5		8	C10	
3	B6		9	P1	
4	B7		9	P2	
5	C1		10	P3	
5	C2		10	P4	
5	C3		10	P5	
6	C4		11	P6	
6	C5		12	P7	

Topic B1 Cell Biology Revision guide pages 24-42

Key subject knowledge	R	A	G
I can understand the difference between prokaryotes and eukaryotes and describe the function of the structures within cells.			
I can explain the process of differentiation. How it is different in plant and animal cells			
I can understand how microscopes have altered through time and be able to calculate magnification.			
I can explain where chromosomes are located and what they do.			
I can explain the stages involved in mitosis and the cell cycle.			
I can explain the differences in animal and plant stem cells and explain the process of cloning using stem cells.			
I can explain the processes of diffusion, osmosis and active transport in cells.			

Topic B2 Principles of organisation Revision Guide pages 24-42

Subject Knowledge	R	A	G
I can state that cells are the basic building blocks of all living organisms and can describe an example of an organ system such as the digestive system.			
I can describe the nature of enzyme molecules and relate their activity to metabolism, temperature and pH changes.			
I am able to use the 'lock and key theory'			
I know the structure and functioning of the human heart and lungs, and can explain the roles of the three types of blood vessels.			
I know the functions of red blood cells, platelets and white blood cells.			
I am able to evaluate the advantages and disadvantages of treating cardiovascular diseases by drugs, mechanical devices or transplant.			
I can describe the relationship between health and disease and explain how lifestyle choices affect them.			
I can describe cancer as the result of changes in cells that lead to uncontrolled growth and division			
I can explain how the structures of plant tissues are related to their functions.			

Topic B3 Infection & Response Revision Guide pages 43-49

Key subject knowledge	R	A	G
I can explain how diseases caused by viruses, bacteria, protists and fungi are spread in animals and plants. I can explain how the spread of diseases can be reduced or prevented.			
I can explain what a pathogen is and how each type (virus, bacteria, fungi, protest) can infect cells and cause damage.			
I can explain in detail the symptoms, causes and treatment of the following diseases: measles, HIV, Tobacco mosaic virus, <i>Salmonella</i> , gonorrhoea, Rose black spot, malaria			
I can explain the defence systems of the body, including the role of skin, nose, trachea/bronchi, stomach as well as the role of the white blood cells if a pathogen gets into the body			
I can explain how a vaccination works and how antibiotics work, including the problem with antibiotic resistance.			
I can describe the process of discovery and development and trials of new medicines. I can compare these stages in traditional drugs (digitalis, aspirin and penicillin) to modern ones. I can describe the differences between preclinical and clinical trials.			

B4: Bioenergetics Revision Guide Pages 50-57

Key subject knowledge	R	A	G
I can describe Photosynthesis using a balanced word equation and explain how factors affect the rate of it. I can also calculate the rate of Photosynthesis and list the uses of the glucose produced			
HIGHER only – I know that there is interaction of limiting factors on rate of photosynthesis. I can determine what the limiting factor of photosynthesis is, by interpreting graphs. I can use the inverse square law of light intensity			
I can describe the difference between aerobic and anaerobic respiration, including word and symbol equations and explain the changes that happen in the body during exercise			
HIGHER only –I can explain the role of the liver in converting lactic acid back to glucose and how oxygen debt is created and how to remove it.			
I can explain what metabolism is (sum of all chemical reactions in a cell or body) and give examples of some metabolic processes.			

Topic B5 Homeostasis and response Revision guide pages 58-67

Key subject knowledge	R	A	G
I can explain what the term homeostasis means and give examples in the human body –body temperature, water levels			
I can describe the basic features of the automatic control systems –both nervous and chemical.			
I can describe and explain the structure and function of the human nervous system.			
I can describe and explain the structure and function of the human endocrine (hormonal) system.			
I can explain how we control our blood glucose concentration and consequences if the system goes wrong. HIGHER only – I can explain what happens if blood glucose levels are too low and how glucagon reacts with insulin in a negative feedback cycle.			
I can describe the effect of the hormones involved in the menstrual cycle. To include FSH, LH, Oestrogen and progesterone. HIGHER only –I can explain how these hormones interact together. HIGHER only -I can interpret graphs showing hormone levels during the menstrual cycle			
I can evaluate the different methods of contraception –both hormonal and non-hormonal. HIGHER only – I can explain the role of hormones in treating infertility and evaluate the success rate of fertility treatments.			
HIGHER only – I can explain the term negative feedback using the examples of adrenaline and thyroxine levels in the body.			

Topic B6 Inheritance, Variation and Evolution Revision guide pages 68-82

Key subject knowledge	R	A	G
I can explain the difference between asexual and sexual reproduction.			
I can explain meiosis and how variation occurs due to meiosis and in fertilisation.			
I can explain the structure of DNA and the difference between a gene and a genome. I can explain the importance of understanding the human genome.			
I can use the genetic terms correctly to explain how characteristics are inherited, Including predicting the probability of a single gene cross. I can complete a Punnett square diagram.			
I can construct a Punnett square diagram and make predictions using the theory of probability.			
I can explain the cause of the following genetic diseases –polydactyly and cystic fibrosis.			
I know how the sex of a baby is determined. I can prove it using genetic crosses.			
I can explain what variation is and where it comes from, Including the role of mutations.			
I can explain the process of evolution and the role of natural selection. I can explain how new species can be formed.			

I can explain the process and impact of selective breeding on crops and domesticated animals. I can explain problems associated with inbreeding			
I can explain the outline stages involved in genetic engineering. I can explain the potential benefits and risks of the process in agriculture and medicine. HIGHER only I can describe the main steps of genetic engineering in detail, including the role of vectors.			

B7: Ecology Revision Guide pages 83-95

Key subject knowledge	R	A	G
I can explain the terms ecosystem, habitat, community and interdependence. I can identify factors that animals and plant compete for within a habitat or community.			
I can identify what abiotic factors are and how changes in them can affect organisms in a community.			
I can identify what biotic factors are and how changes in them can affect organisms in a community.			
I can explain how organisms are adapted to a range of different habitats. Including how extremophiles are adapted to their environment.			
I can draw food chains. I know that all food chains start with a producer.			
I can use a range of methods (transects and quadrats) to work out the distribution and abundance of organisms in an ecosystem.			
I can recognise the flow of food from producer to tertiary consumers and identify predators and prey and how the numbers of them rise and fall in a cycle.			
I can recall how materials are recycled using examples of the carbon and water cycles.			
BIOLOGY only – I can explain factors that affect the decay of living material and be able to calculate rate changes and interpret data on decay. I can describe the optimum conditions for a compost heap and how a biogas generator works.			
BIOLOGY only-I can evaluate the impact of environmental changes (temperature, water availability, composition of atmospheric gases) on the distribution of species in an ecosystem.			
I can explain what biodiversity is and the importance of us maintaining a good level of biodiversity for the future. I can explain examples of how we are reducing the negative effects of humans on ecosystems and biodiversity.			
I can explain the consequences of the rapid growth in the human population, e.g. more resources being used, more waste produced. I can identify sources of pollution.			
I can describe the ways in which humans are using the land and the impact this is having on the environment, to include deforestation and global warming.			

Topic C1 Atomic Structure & Periodic Table Revision Guide pages 96-11

Key subject knowledge	R	A	G
I can recall that Atoms are the smallest part of an element. Elements are represented on the Periodic Table by symbols.			
I can name compounds given formula and write word and balanced symbol equations. <i>I can write half and ionic equations (HT)</i>			
I can explain what a mixture is and the 5 physical separation processes			
I can explain the major developments in our understanding of the structure of the atom.			
I can draw the structure of an atom, recall the relative charges of electrons, protons and neutrons and relate size and scale of an atom to everyday objects.			
I can recall that the atomic number is the proton number in an atom. This identifies the element.			
I can recall the relative masses of protons, electrons & neutrons. Know that the mass number is number of protons & neutrons.			
I can recall what an isotope is and be able to calculate % abundance. Explain what relative atomic mass is.			
I can draw the electron arrangement of atoms for the first 20 elements in the Periodic Table.			
I can recall how the Periodic Table is arranged and be able to relate position of an element to number of electrons it has and the number of electron shells			
I can explain the major developments in how the Periodic Table was produced			
I can identify the position of metals and non-metals on Periodic Table and differences between them.			
I can recall the reactions of group 0 linked to atomic structure and be able to predict properties			
I can recall the reactions of group 1 linked to atomic structure and be able to predict properties			
I can recall the reactions of group 7 linked to atomic structure and be able to predict properties			

Topic C2 Bonding, structure, and the properties of matter Revision Guide pages 112-122

Key Subject Knowledge	R	A	G
I can state and explain the three types of chemical bonds.			
I can explain the structure and properties of ionic compounds			
I can explain the structure and properties of covalent compounds			
I can use dot and cross diagrams, and describe the limitations of dot and cross, ball and stick, and 2D / 3D diagrams.			
I can describe / explain metallic bonding and why metals are good conductors			
I can use a simple model to represent the three states of matter.			
I can use particle theory to explain melting, boiling, freezing and condensing.			
I can describe how the amount of energy affects changes in states of matter, and the strength of the forces between particles.			
I can include appropriate state symbols in chemical equations.			
I can relate the properties of giant covalent structures to the bonds between atoms and recognise these from models.			
I can recognise diagrams for substances such as small molecules, polymers, and giant structures.			
I can explain why alloys are harder than pure metals and relate this to their structures.			
I can describe the structures of diamond & graphite.			
I can recognise graphene and fullerenes from diagrams of their bonding and structure			

Topic C3 Quantitative chemistry Revision Guide pages 123-128

Key Subject Knowledge	R	A	G
I can explain the law of conservation of mass.			
I can balance symbol chemical equations.			
I can explain why mass will change if a reactant or product is a gas.			

I can calculate relative formula mass (M_r).			
I can explain how the mass of one mole of a substance (g) relates to relative formula mass (M_r).			
I can calculate the mass of a solute in a given volume of solution of known concentration.			
<u>Higher only</u> - I can explain the Avogadro constant.			
<u>Higher only</u> - I understand why measurements of amounts (moles) can apply to atoms, molecules, ions, electrons, formulae, and equations.			
<u>Higher only</u> - I can use relative formula mass (M_r) to calculate the number of moles in a given mass of that substance and vice versa.			
<u>Higher only</u> - I can calculate the masses of reactants and products from a balanced symbol equation and the mass of a given reactant or product.			
<u>Higher only</u> - I can explain the effect of a limiting quantity of a reactant on the amount of products it is possible to obtain (amounts in moles or masses).			
<u>Higher only</u> - I can explain how the mass of a solute and the volume of a solution is related to the concentration of the solution.			

Topic C4 Chemical changes Revision guide pages 129-137

Key Subject Knowledge	R	A	G
I can explain reduction / oxidation in terms of loss / gain of oxygen.			
I can recall and describe the reactions, of metals with water or acids to place these metals in order of reactivity. To deduce an order of reactivity of metals based on experimental results and explain it's related to the metal forming its positive ion			
I can interpret or evaluate specific metal extraction processes when given appropriate information. I can predict products from given reactants			
I can predict the type of salt produced between an acid and an alkali depending on the acid used; the positive ions in the base, alkali or carbonate.			
I can describe how to make pure, dry samples of named soluble salts and use the formulae of common ions to deduce the formulae of salts			
I can describe the use of universal indicator or a wide range indicators to measure the approximate pH of a solution.			
I can use the pH scale to identify acidic or alkaline solutions.			
I am able to predict the products of the electrolysis of binary ionic compounds in the molten state and explain why a mixture is used as the electrolyte			
Explain why the positive electrode must be continually replaced.			
I am able to predict the products of the electrolysis of aqueous solutions containing a single ionic compound.			
(HT only) I can explain in terms of gain or loss of electrons, that these are redox reactions and identify which species are oxidised and which are reduced in given chemical equations.			
(HT only) I can write half equations for the reactions occurring at the electrodes during electrolysis, including balancing.			
(HT only) I can calculate the chemical quantities in titrations involving concentrations in mol/dm ³ or g/dm ³			
(HT only) I can use and explain the terms dilute and concentrated, weak and strong, in relation to acids.			
(HT only) I can describe neutrality and relative acidity in terms of the effect on hydrogen ion concentration / pH			

Topic C5 Chemistry – Energy changes Revision guide pages 138-141

Key Subject Knowledge	R	A	G
I understand that energy is conserved in a chemical reaction.			
I can distinguish between endothermic and exothermic reactions and evaluate its uses			
I can draw simple reaction profiles showing the relative energies of reactants and products.			

I can use reactions profiles to identify if a reaction is endothermic or exothermic.			
I can explain activation energy.			
Higher only – I can relate the energy changes in a chemical reaction to the breaking of bonds and the forming of new bonds.			
Higher only – I can calculate the energy transferred in chemical reactions using bond energies supplied.			

Topic C6 Rate & extent of chemical change Revision guide pages 142-149

Key subject knowledge	R	A	G
I can calculate the rate of a reaction using the quantity of product or reactant. I can state the unit of rate as g/s or g/cm ³ Higher tier – I can use the quantity of reactants in terms of moles and units are mol/s			
I can recall the factors which affect the rate of reaction: concentration, pressure(gases), surface area, temperature and use of catalysts			
I can use the collision theory to explain how factors affect the rate of reaction. I know what activation energy is.			
I can predict and explain (using the collision theory) how increasing the concentration , pressure or surface area increases the reaction rate as there are more frequent collisions.			
I can predict and explain (using the collision theory) how increasing the temperature increases the frequency of collisions and makes the reaction more energetic, so increasing the rate.			
I can predict and explain the effects of changing the size of pieces of solid reacting in terms of surface area to volume ratio			
I can explain the difference between catalysts and enzymes.			
I can draw a reaction profile of a reaction with and without a catalyst. I can show that catalysts reduce the amount of activation energy.			
I can identify reversible reactions and recall they have an endothermic and exothermic direction.			
I can explain what an equilibrium is for a chemical reaction.			
Higher tier only I can explain how an equilibrium responds to changes in conditions. I can make predictions using Le Chatelier's principle			
Higher tier only I can explain what will happen if the concentration, temperature or pressure of the products or reactants is increased or decreased in an equilibrium.			

Topic C7 Organic Chemistry Revision guide pages 150-152

Key Subject Knowledge	R	A	G
I can name the first 4 alkanes, including their chemical and displayed formula			
I can describe the process of complete combustion and balanced a symbol equation for complete combustion of an alkane			
I can state the components of crude oil, describe its uses and properties			
I can describe the process of fractional distillation and cracking and explain why it is a useful			
I can describe how to test for an alkene and describe how they are different from alkanes in terms of properties and uses			

Topic C8 Chemical Analysis Revision guide pages 153-156

Key Subject Knowledge	R	A	G
I understand the term pure in terms of chemistry and everyday life			
I understand what a melting and boiling point are and how these are used to distinguish pure and impure substances.			
I understand the term formulation and how to identify formulations from products			

I can use the technique of chromatography to separate substances and explain how the process works. Including the calculation of R _f value			
I can identify the test and result for hydrogen, oxygen, carbon dioxide and chlorine gas.			

Topic C9 Chemistry of the Atmosphere Revision guide pages 157-160

Key Subject Knowledge	R	A	G
I can name the gases in the current atmosphere and their approximate percentages			
I can describe the stages in the evolution of the atmosphere			
I can explain how microorganisms added oxygen to the atmosphere			
I can explain how the greenhouse effect works and name the greenhouse gases			
I can describe the links between increasing carbon dioxide and climate change and relate this to possible future consequences			
I can describe what a carbon footprint is and explain why it can be difficult to measure			
I can state how to reduce my carbon footprint			
I can name the common air pollutants and describe their effects on the environment and on health			
I can describe the processes that release the air pollutants and give examples of methods for reducing air pollution			

Topic C10 Using Resources Revision Guide pages 161-166

Key subject knowledge	R	A	G
I can recall what humans use resources for and can explain the difference between finite, renewable and non-renewable resources			
I recognise that chemistry plays an important role in sustainable development as it provides new products in a sustainable way.			
I can state the meaning of potable water and explain how it can be sterilised.			
I can explain why developing countries might use the method of desalination			
I can explain the purpose of each stage in sewage treatment. I can comment on the relative ease of obtaining potable water from waste, ground and salt water			
Higher tier only- I can explain the different ways used to extract the limited sources of metals e.g. phytomining and bioleaching. I can evaluate how useful each method is, given appropriate information.			
I can explain the stages involved in life cycle assessments. I understand that this is not a purely objective process and LCAs can be used to bias people's opinions of products.			
I can explain the different ways of reusing and recycling different resources. I can evaluate the ways of reducing the use of limited resources, given appropriate information.			

Key Subject Knowledge	R	A	G
I can describe the way energy is stored when a system changes and how energy is conserved and transferred including giving examples how we can reduce the energy being wasted			
I can recall and apply the equation for kinetic energy, elastic potential energy and gravitational potential energy			
I can apply the equation for specific heat capacity			
I can recall and apply the equation for power using energy transfer and for power using work done, giving examples comparing the power of different machines			
I can explain how thermal conductivity effects the rate of energy transfer			
I can recall and apply the equations for efficiency and describe ways to increase efficiency			
I can list the main energy resources and explain their different uses including explaining trends in use of energy			
I can distinguish between renewable and non-renewable energy and their effects on the environment			

Topic P2 Electricity Revision Guide page 179-190

Key subject knowledge	R	A	G
I can correctly draw and use standard electrical symbols, describe the conditions required for an electrical charge to flow and recall and use the equation for measuring charge flowing in a circuit			
I can describe the relationship between current, resistance and potential difference in a circuit and use the correct units for measuring electricity			
I can use the terms potential difference and voltage appropriately and explain the difference between a fixed and variable resistor			
I can use graphs to show the relationship between current and potential difference under different resistive loads and use the graphs to show if circuit components are linear or non-linear and how it relates to their function and properties			
I can describe the function and use of LDRs, LEDs, lamps, diodes, thermistors			
I can explain and draw the design of a circuit to measure resistance from current and potential difference across a component			
I can show and construct examples of series and parallel circuits explaining the properties of each			
I can explain the differences between direct and alternating current			
I can describe the properties and function of the 3 wires in a plug including the dangers of a live wire			
I can recall and apply both of the equations for electrical power and describe how different domestic appliances transfer energy			
I can recall and apply both of the equations describing energy transfer by electrical work and can explain how the power rating of an appliance measures the changes in stored energy during use			
I can explain how the national grid efficiently moves electricity around the country and briefly explain how transformers work and why they are used			

Topic P3 Particle Model of Matter Revision Guide page 191-194

Key subject knowledge	R	A	G
I can define the term density, calculate the density of a material from its mass and volume and explain how the density of materials can be found experimentally			
I can explain the particle model of matter, link the particle model of matter to density and explain how a material can change state including the differences between chemical and physical changes			
I can explain how all substances have stored internal energy and how heat can impact this, explaining the difference between temperature and heat			
I can describe the term specific heat capacity and specific latent heat and rearrange and use the equations			
I can explain the motion of particles in gases using the particle model of matter describing how gases exert forces on the walls of their containers and explaining how changing temperature effects this			

Topic P4: Atomic Structure Revision Guide pages 195-200

Key subject knowledge	R	A	G
I can describe the basic structure of the atom including the differences between protons, electrons and neutrons and make comparisons in sizes between the nucleus and the atom			
I can define the terms isotope and ion and explain how the proton number defines the element			
I can describe how our working model of the atom has changed over time and recall the influence of specific scientific discoveries by Dalton, Thompson, Rutherford, Bohr and Chadwick			
I can explain why some elements are radioactive and describe the properties of the three different types of ionising radiation			
I can complete nuclear decay equations for alpha, beta and gamma decay, explain the random nature of radioactivity and describe the key term half-life			
I can use a graph to calculate half-life and explain some uses for radioactive materials and how knowledge of half-lives can inform the choice of radiation type			
I can explain the dangers of radioactive materials and how to handle them properly and define the terms contamination and irradiation			

Topic P5 Forces Revision guide pages 201-217

Key Subject Knowledge	R	A	G
I can define scalar and vector and describe the differences			
I can explain using examples the differences between contact and non-contact forces and calculate resultant forces			
I can recall and apply the equation for weight and explain the difference between weight and mass			
I can use free body diagrams to quantify the resultant force and describe how any force can be resolved into two components at right angles			
I can construct scale vector diagrams to show resultant forces (HT)			
I can recall and apply the equation for work done			
I can convert between Newton-meters and joules and define what a joule is			
I can explain how forces can result in elastic and inelastic deformation and recall and apply the equation for force and extension			

I can explain the difference between elastic and inelastic stretching or compression and apply the equation for elastic potential energy			
I can explain the difference between distance and displacement			
I can recall and apply the equation for speed as a scalar quantity using the correct units and recall the typical speeds of common events			
I can explain the difference between velocity and speed and explain how circular motion has a constant speed but changing velocity			
I can construct a distance-time graph and calculate speed from it			
I can recall and apply the equation for average acceleration and give examples of everyday accelerations with estimations of size			
I can construct a velocity-time graph and calculate the displacement and acceleration			
I can apply the equation for uniform acceleration			
I can recall the magnitude of acceleration due to gravity and explain terminal velocity			
I can state, explain and apply Newton's three laws of motion			
I can describe what a stopping distance is and explain the factors which will effect braking distances			
I can explain what typical human reaction times are, how they can be measured and interpret/evaluate data			
I can recall and apply the equation for momentum and explain the law of the conservation of momentum (HT)			

Topic P6 Waves Revision Guide pages 218-226

Key subject knowledge	R	A	G
I can describe the difference between and give examples of longitudinal and transverse waves			
I can explain that it is the wave that travels and not the materials			
I can describe a wave in terms of its amplitude, frequency and period			
I can apply the equation for the period of the wave			
I can recall and apply the equation for wave velocity			
I can describe how to measure wave speed in air and water			
I can explain that waves can be reflected, absorbed or transmitted at boundaries			
I can list and describe the main parts of the EM spectrum			
I can construct ray diagrams to explain diffraction (HT)			
I can describe the relationship between radio waves and AC currents (HT)			
I can explain how changes in an atom can produce EM waves			
I can explain the dangers of ionising radiation			
I can state that ionising radiation is measured in Sieverts			
I can describe the practical applications of the main parts of the EM spectrum			

Topic P7 Magnets & Electromagnetism Revision guide pages 227-231

Key subject knowledge	R	A	G
I can describe the basic properties of magnets and where a magnetic field is strongest			
I can explain the differences between permanent and induced magnets			
I can describe the relationship between magnets and magnetic materials including examples of magnetic materials			
I can explain what a magnetic field is plot the magnetic field pattern using a compass			
I can explain the relationship between a compass and the Earth's magnetic field			
I can draw the magnetic field around a bar magnet and label the direction of flux			
I can explain how current can create a magnetic field and how to change the strength of the magnetic field including how solenoids work			
I can construct and describe the operation of an electromagnet			
I can explain the motor effect			
I can recall and use Fleming's left hand rule			
I can recall what can affect the size of the force on a conductor			
I can apply the equation for force from magnetic flux density, current and length			
I can describe the function of an electric motor (HT)			
I can explain how the force on a conductor leads to the rotation of a coil (HT)			