

Science 9-1 Grades Guidance

This guide is designed to help explain the level that a student is working at using examples of the curriculum that a student should be able to access. This is not a definitive list of the content covered in Years 7-11.

BIOLOGY

UP1	<p>I can name some organs in the body</p> <p>I can state the processes that living things carry out</p> <p>I can name some food groups can list some examples</p> <p>I can classify organisms as plants and animals</p> <p>I can suggest ways to be healthy</p>
UP2	<p>I can state that cells are the fundamental unit "building block" of organisms</p> <p>I can group some organs together that are part of the same organ system</p> <p>I can state some uses of the different nutrient groups</p> <p>I can list some first defences to prevent us from getting ill</p> <p>I can state some environmental factors that cause variation</p>
UP3	<p>I can name some equipment that may be used to observe cells</p> <p>I can state that some muscles may be stronger than others</p> <p>I can names ways that seeds are dispersed</p> <p>I can state that almost all life on Earth depends on photosynthetic organisms</p>
1	<p>I can state that the process by which material moves into and out of cells is diffusion</p> <p>I can list and describe some effects of recreational drugs on behaviour, health and life processes</p> <p>I can describe the levels of organisation within living organisms</p> <p>I can state the role of the immune system</p> <p>I can state the function of the nervous system and name its important components</p>
2	<p>I can list the main parts of cells and identify them from a diagram</p> <p>I can describe the impact of exercise, asthma and smoking on the human gas exchange system</p> <p>I know that the roots, stem and leaves form a plant organ system that transports substances around the plant</p> <p>I can describe what a pathogen is and how pathogens are spread</p> <p>I can describe what happens to heart rate, breathing rate and breath volume during exercise and why these changes occur</p>

3	<p>I can describe the structural adaptations of some animal and plant cells</p> <p>I can describe the stages of the menstrual cycle</p> <p>I can describe which resources animals and plants compete for, and why they do this</p> <p>I can describe what variation is and how it can be caused</p> <p>I can describe how information passes through the nervous system</p>
4	<p>I can compare and contrast aerobic and anaerobic respiration</p> <p>I can outline the process of digesting food</p> <p>I can explain how biomass is lost between trophic levels, including the consequences of this</p> <p>I can explain how a change in an abiotic or biotic factor might affect a community given appropriate data or context</p> <p>I can describe what fossils are, how they are formed and what we can learn from them</p>
5	<p>I can link adaptations of different parts of the digestive system to their functions</p> <p>I can link the importance of photosynthetic organisms to maintaining levels of oxygen and carbon dioxide in the atmosphere</p> <p>I can construct a pyramid of biomass and explain what it represent</p> <p>I can describe how antibiotic-resistant strains of bacteria can arise and spread</p> <p>I can explain some benefits, risks and concerns related to genetic engineering</p>
6	<p>I can explain how ventilation occurs with reference to pressure changes and measuring lung volume</p> <p>I can discuss the importance of insect pollination and plant reproduction, with reference to human food security</p> <p>I can describe aerobic and anaerobic respiration (in plants and yeast cells only) using chemical equations</p> <p>I can describe the body's response when blood glucose concentration is too low</p> <p>I can explain how limiting factors are important to the economics of greenhouses, including data interpretation</p>
7	<p>I can evaluate some methods used to resolve infertility problems</p> <p>I can explain how glucagon interacts with insulin to control blood glucose levels in the body</p> <p>I can describe the functions of adrenaline and thyroxine in the body, and I know where they are produced</p> <p>I can describe the functions of gibberellins and ethene in plants, and the uses of plant hormones in agriculture, horticulture and the food industry</p> <p>I can construct a Punnet square diagram to predict the outcome of a monohybrid cross</p>
8	<p>I can explain how the limiting factors of photosynthesis interact, including graphical interpretation involving two or three factors</p> <p>I can explain how the water level in the body is controlled by ADH</p> <p>I can explain how different hormones interact to control the menstrual cycle and ovulation</p> <p>I can explain the roles of thyroxine and adrenaline in the body as negative feedback systems</p> <p>I can explain the process of genetic engineering, to include knowledge of enzymes and vectors</p>
9	<p>I can describe how monoclonal antibodies are produced</p> <p>I can explain and use inverse proportion in the context of photosynthesis</p>

CHEMISTRY

UP1	<p>I can state that chemicals can be dangerous and can recognise some common hazard symbols</p> <p>I can state that air is needed for substances to burn</p> <p>I can list examples of solids, liquids and gases</p>
UP2	<p>I can state that there are different types of rocks</p> <p>I can state that there are different types of acids and alkalis</p> <p>I can name the 3 states of matter and state that they can change from one state to another</p> <p>I can state that the Earth is made up of resources that can be used</p> <p>I can state that all materials are made of atoms</p>
UP3	<p>I can list the changes of states and describe how they may occur</p> <p>I can state that during chemical reactions reactants become products</p> <p>I can state that all elements currently known may be found listed in the periodic table</p> <p>I can state that some materials (particularly metals) are more reactive than others</p> <p>I can list human activities that impact on the climate by producing carbon dioxide</p>
1	<p>I can name and describe the properties of the three states of matter</p> <p>I can list examples of atoms, elements and compounds</p> <p>I can describe pure substances and mixtures, including dissolved substances</p> <p>I can list some human activities that produce greenhouse gases</p> <p>I can give some examples of natural resources and describe how they are used by humans</p>
2	<p>I can identify simple techniques for separating mixtures and select appropriate techniques for separating given mixtures</p> <p>I can list the properties of metals and non-metals and I can describe how these properties make them suitable for different uses</p> <p>I can state that the pH scale is a measure of acidity and that a pH of 7 is neutral, a pH of less than 7 is acidic and a pH of greater than 7 is alkaline</p> <p>I can state the relative masses of protons, neutrons and electrons and describe the distribution of mass in an atom</p> <p>I can state that everything is made of atoms, which are the smallest part of an element that can exist, and all elements are shown in the periodic table</p>
3	<p>I can explain the properties of the three states of matter with reference to the particle model</p> <p>I can represent compounds using chemical formulae</p> <p>I can name some greenhouse gases and describe how they cause an increase in Earth's temperature</p> <p>I can state that mass is conserved and explain why, including describing balanced equations in terms of conservation of mass</p> <p>I can explain that Earth's resources are finite, and they are processed to provide energy and materials for consumption, and I can give examples of finite and renewable resources</p>

4	<p>I can link group number and electron structure to explain the patterns of reactivity for Group 1 and Group 7 in the periodic table</p> <p>I can explain how simple techniques for separating mixtures work</p> <p>I can discuss the importance of water quality for human life, including defining potable (drinkable) water</p> <p>I can define a pure substance and identify pure substances and mixtures from data about melting and boiling points</p> <p>I can use collision theory to explain changes in the rate of reaction, including discussing activation energy</p>
5	<p>I can explain changes of state with reference to the energy levels of particles and whether a chemical reaction is exothermic or endothermic</p> <p>I can explain the differences in properties of different materials with reference to their structure and suggest uses for materials based on their properties</p> <p>I can describe how electrons fill energy levels in atoms, and I can represent the electron structure of elements using diagrams and numbers</p> <p>I can describe chromatography, including the terms stationary phase and mobile phase, and identify pure substances using paper chromatography</p> <p>I can describe the three main types of bonds: ionic bonds, covalent bonds and metallic bonds in terms of electrostatic forces and the transfer or sharing of electrons</p>
6	<p>I can discuss and suggest methods that may be used to extract metals more reactive than carbon</p> <p>I can discuss the efficacy of recycling</p> <p>I can write balanced half equations and ionic equations</p> <p>I can discuss the different types of polymers and how their composition affects their properties, including thermosoftening polymers</p> <p>I can identify addition polymers and monomers from diagrams and from the presence of the functional group $-C=C-$ in the monomers, and I can draw diagrams to represent the formation of an addition polymer from a given alkene monomer and vice versa</p>
7	<p>I can describe how alkenes can be used to make polymers by addition polymerisation</p> <p>I can describe the reactions at the electrodes during electrolysis as oxidation and reduction reactions and write balanced half equations for these reactions</p> <p>I can state that chemical amounts are measured in moles (mol) and explain what a mol is with reference to relative formula mass and Avogadro's constant</p> <p>I can use and explain the terms dilute and concentrated and weak and strong in relation to acids</p> <p>I can explain what sustainable development is and discuss the role chemistry plays in sustainable development, including improving agricultural and industrial processes</p>
8	<p>I can explain and predict the effect of a change in concentration of reactants or products, temperature, or pressure of gases on the equilibrium of a reaction</p> <p>I can discuss the limitations of particle theory</p> <p>I can use the relative formula mass of a substance to calculate the number of moles in a given mass of the substance</p> <p>I can evaluate alternative methods for extracting metals</p> <p>I can describe how to carry out titrations of strong acids and alkalis and calculate quantities in titrations involving concentrations in mol/dm³ and g/dm³</p>
9	<p>I can explain the effect of limiting the quantity of a reactant on the amount of products in terms of moles or masses in grams</p> <p>I can calculate the gradient of a tangent to the curve on the graph of the quantity of product formed or reactant used against time and use this as a measure of the rate of reaction at a specific time</p> <p>I can apply the principles of dynamic equilibrium to the Haber process and discuss the trade-off between the rate of production and the position of equilibrium and explain how this impacts the commercial use of the Haber process</p>

PHYSICS

UP1	<p>I can name some of the planets in the Solar System</p> <p>I can describe the dangers of electricity</p>
UP2	<p>I can list some energy resources</p> <p>I can list some sources of energy</p> <p>I can state some different methods of generating electricity</p>
UP3	<p>I can state that energy is stored in food and fuel</p> <p>I can state that speed is a measurement of how fast an object is moving</p> <p>I can list some forces</p> <p>I can state that white light is a mixture of colours</p> <p>I can state that light travels very fast, at the speed of light</p>
1	<p>I can state that energy is always conserved</p> <p>I can describe simple changes in motion</p> <p>I can state that forces act as a push or a pull, are either contact or non-contact, forces may occur when two objects interact and they are measured in newtons</p> <p>I can state that waves transfer energy. I can state that waves may be reflected, refracted, dispersed or experience superposition</p> <p>I can state that an electrical circuit must be complete and include a power source, wires and a component for electricity to flow</p>
2	<p>I can describe several situations where energy is transferred</p> <p>I can identify some common components of electrical circuits from the circuit symbol, and give their names</p> <p>I can describe weight as the force an object experiences due to a gravitational field pulling on it</p> <p>I can identify scalar quantities, and describe vector quantities as those with both magnitude and an associated direction, representing them with arrows</p> <p>I can identify the National Grid as a system of cables and transformers linking power stations to consumers</p>
3	<p>I can describe and explain how thermal energy is transferred by conduction, in terms of particles</p> <p>I can describe what balanced forces are and explain when a force is balanced or unbalanced. I can describe what a resultant force is</p> <p>I can list the main renewable and non-renewable energy resources, and define a renewable energy resource as one that is replenished as it is used</p> <p>I can define amplitude, wavelength, frequency, period and wave speed, and identify them where appropriate on diagrams</p> <p>I can define electrons, neutrons, protons, isotopes and ions</p>

4	<p>I can compare and contrast energy efficiencies and I can evaluate appliances in terms of their energy efficiency</p> <p>I can explain some applications of increasing or decreasing pressure and I can explain the effects of pressure on an object in terms of particles</p> <p>I can describe the penetration through materials, the range in air and the ionising power for alpha particles, beta particles and gamma rays</p> <p>I can state that all bodies, no matter what temperature, emit and absorb infrared radiation, and that the hotter the body, the more infrared radiation it radiates in a given time</p> <p>I can explain why some energy resources are more reliable than others, explaining patterns and trends in their use</p>
5	<p>I can calculate electrical power when given current and potential difference</p> <p>I can calculate a resultant force</p> <p>I can explain how we see different colours, with reference to the colour of the object and the colour of the light available</p> <p>I can calculate and explain the amount of energy transferred by electrical work by recalling and applying the equations: [$E = Pt$] and [$E = QV$]</p> <p>I can explain, qualitatively, the red-shift of light from galaxies that are receding, and how this red-shift changes with distance from Earth</p>
6	<p>I can relate the equation for speed to the application of sound waves</p> <p>I can use calculations of density to predict whether an object will float or sink</p> <p>I can explain why the change of each galaxy's speed with distance is evidence of an expanding universe</p> <p>I can apply knowledge of the uses of radiation to evaluate the best sources of radiation to use in a given situation</p> <p>I can state examples of the uses of each group of electromagnetic radiation, explaining why each type of electromagnetic wave is suitable for its applications</p>
7	<p>I can apply Hooke's Law to the measurement of forces using a force meter</p> <p>I can use free body diagrams, and accurate vector diagrams to scale, to resolve multiple forces and show magnitude and direction of the resultant, or represent one force as two component forces at right angles</p> <p>I can solve problems for circuits which include resistors in series using the concept of equivalent resistance</p> <p>I can explain how the concept of an electric field helps to explain the non-contact force between charged objects as well as other electrostatic phenomena such as sparking</p> <p>I can interpret and draw heating and cooling graphs that include changes of state, recognising and representing that internal energy can continue to increase when the temperature doesn't</p>
8	<p>I can use free body diagrams to qualitatively describe examples where several forces act on an object, and explain how that leads to a single resultant force or no force</p> <p>I can explain why the pressure at a point in a fluid increases with the height of the column of fluid above that point and with the density of the fluid, and calculate differences in pressure at different depths in a liquid</p> <p>I can explain why an object floats or sinks, with reference to its weight, volume and the upthrust it experiences</p> <p>I can explain that an object falling from rest through a fluid due to gravity reaches its terminal velocity when its increased speed creates a drag force, which is equal to its weight</p> <p>I can suggest and explain ways to increase the efficiency of an intended energy transfer</p>
9	<p>I can suggest further questions that may arise from results of Physics investigations and data analysis and evaluation</p> <p>I can evaluate Physics investigations taking into account data analysis</p>