

## Students aiming for 7+ in Science should be able to...

### Remember

- Remember Key and detailed facts of **any area within Science**
- They always use appropriate terminology in answers (key words and phrases)
- They can explain the relationship between scientific advances, their ethical implications and the benefits and risks associated with them

### Applying knowledge

- They **always** apply knowledge effectively in a **wide range** of contexts.
- They can **always** use theories to make **detailed** explanations of events.
- They **always** make effective use of data to support evidence.
- They can **consistently rearrange** equations in calculations.

### Analyse and evaluate

- They evaluate information **from a wide range of sources systematically** to develop arguments and explanations.
- They **consistently** draw **detailed, evidence-based** conclusions.
- They can **consistently** spot causes of error and uncertainty in data or experimental procedures.

### Scientific literacy

- They know the unit and/or symbol of **every** quantity.
- **Faultless** spelling and correct use of punctuation, sentences, capital letters and paragraphs.

# Physics

## Unit 1 – Paper 1

- 1. Conservation and dissipation of energy**  
(energy stores, conservation of energy, energy and work, gravitational potential energy, kinetic energy, energy dissipation, energy and efficiency, electrical appliances, energy and power)
- 2. Energy transfer by heating**  
(conduction, *infrared radiation*, specific heat capacity, insulating buildings)
- 3. Energy resources**  
(energy demands, energy from wind and water, power from the Sun and Earth, energy and the environment)
- 4. Electric circuits**  
(*electrical charges*, current and charge, potential difference and resistance)
- 5. Electricity in the home**  
(alternating current, cables and plugs, electrical power and potential difference, electrical current and energy transfers, appliances and efficiency)
- 6. Molecules and matter**  
(density, states and matter, changes of states, internal energy, specific latent heat, gas pressure- temperature *and pressure*)
- 7. Radioactivity**  
(atoms and radiation, discovery of the nucleus, changes in the nucleus, alpha, beta and gamma radiation, activity and half-life, *nuclear radiation in medicine, nuclear fission, nucleus fusion*)

## Unit 2 – Paper 2

- 8. Forces in balance**  
(vectors and scalars, forces between objects, resultant forces, *moments, levers and gears*, centre of mass, *moments and equilibrium, parallelogram of forces, resolution of forces*)
- 9. Motion**  
(speed and distance-time graphs, velocity and acceleration, analysing motion graphs)
- 10. Force and motion**  
(force and acceleration, weight and terminal velocity, forces and braking, **momentum**, *conservation of momentum, impact forces, safety first*, forces and elasticity)
- 11. Force and pressure**  
(*pressure and surfaces, pressures in a liquid at rest, atmospheric pressure, upthrust and flotation*)
- 12. Wave properties**  
(properties of waves, **reflection, refraction**, *sound waves, uses of ultrasound, seismic waves*)
- 13. Electromagnetic waves**  
(electromagnetic spectrum, light, infrared, microwaves, radio waves, communications, ultraviolet waves, x-rays and gamma rays, x-rays in medicine)
- 14. Light**  
(*reflection of light, refraction, light and colour, lenses*)
- 15. Electromagnetism**  
(magnetic fields, magnetic fields of electric currents, *electromagnets in devices, the motor effect, the generator effect, alternating-current generator, transformers*)
- 16. Space**  
(*formation of the Solar System, life history of a star, planets, satellites and orbits, expanding universe, beginning and future of the Universe*)



# Biology

## Unit 1 – Paper 1

- 1. Cell structure and transport**  
(microscopes, animal and plant cells, eukaryotic and prokaryotic cells, specialisation in cells, diffusion, osmosis, osmosis in plants, active transport, exchanging materials)
- 2. Cell division**  
(mitosis, growth and differentiation, stem cells)
- 3. Organisation and the digestive system**  
(tissues and organs, human digestive system, chemistry of food, catalysts and enzymes, factors affecting enzyme action, digestion, making digestion efficient)
- 4. Organising Animals and plants**  
(blood, blood vessels, heart, helping the heart, breathing and gas exchange, tissues and organs in plants, transport systems in plants, evaporation and transpiration)
- 5. Communicable diseases**  
(pathogens, disease, *growing and preventing bacteria*, preventing infections, viruses, bacteria, fungi, white blood cells, *plant disease and response*)
- 6. Preventing and treating disease**  
(vaccination, antibiotics, discovering and developing drugs, *monoclonal antibodies*)
- 7. Non-communicable diseases**  
(non-communicable diseases, cancer, smoking, diet, alcohol and carcinogens)
- 8. Photosynthesis**  
(photosynthesis, uses of glucose, **making the most of photosynthesis**)
- 9. Respiration**  
(aerobic, exercise, anaerobic, metabolism and the liver)

## Unit 2 – Paper 2

- 10. The human nervous system**  
(principles of homeostasis, structure and function of nervous system, reflex actions, *brain, eye and problems*)
- 11. Hormonal coordination**  
(homeostasis, nervous system, diabetes, **negative feedback**, human reproduction, **menstrual cycle**, artificial control of fertility, **infertility treatments**, *plant hormones*)
- 12. Homeostasis in action**  
(*Controlling body temperature, removing waste products, human kidney, dialysis, kidney transplants*)
- 13. Reproduction**  
(types of reproduction, meiosis, *advantages/disadvantages of sexual and asexual reproduction*, DNA and the genome, *protein synthesis, gene expression and mutation*, inheritance, inherited disorders, screening)
- 14. Variation and Evolution**  
(variation, natural selection, selective breeding, genetic engineering, *cloning, adult cell cloning*, ethics)
- 15. Genetics and evolution**  
(*genetics, evolution, Darwin, speciation*, evidence, extinction, antibiotic resistant bacteria, classification)
- 16. Adaptations, interdependence and competition**  
(communities, distribution and abundance, competition, adaptations)
- 17. Organising an ecosystem**  
(*feeding relationships*, materials cycling, carbon cycle, *rates of decomposition*)
- 18. Biodiversity and ecosystems**  
(population explosion, land and water pollution, air pollution, deforestation and peat destruction, global warming, maintaining biodiversity, *trophic levels, biomass, food security, food production efficiency, sustainable food production*)



# Chemistry

## Unit 1 – Paper 1

- 1. Atomic structure**  
(atoms, chemical equations, separating mixtures, fractional distillation and paper chromatography, history of atom, atoms, ions, isotopes, electronic structures)
- 2. The periodic table**  
(development of periodic table, electronic structure and periodic table, group 1, group 7, *transition elements*)
- 3. Structure and bonding**  
(states of matter, ionic bonding, giant ionic structures, covalent bonding, structure of simple molecules, giant covalent structures, fullerenes and graphene, bonding in metals, giant metallic structures, *nanoparticles*)
- 4. Chemical calculations**  
(relative masses and moles, **equations and calculations, from masses to balanced equations**, *yield of a chemical reactions, atom economy*, expressing concentrations, *titrations and calculations, volumes of gases*)
- 5. Chemical changes**  
(reactivity series, displacement reactions, extracting metals, salts from metals, neutralisation and the pH scale, **strong and weak acids**)
- 6. Electrolysis**  
(electrolysis, changes at the electrodes, extraction of aluminium, electrolysis of aqueous solutions)
- 7. Energy changes**  
(exothermic and endothermic reactions, reaction profiles, **bond energy calculations**, *chemical cells and batteries, fuel cells*)

## Unit 2 – Paper 2

- 8. Rates and equilibrium**  
(Rates of reaction, collision theory and surface area, temperature, concentration and pressure, catalysts, reversible reactions, energy and reversible reactions, dynamic equilibrium, **altering conditions**)
- 9. Crude oil and fuels**  
(hydrocarbons, fractional distillation, combustion, cracking)
- 10. Organic reactions**  
(*reactions of alkenes, structure of alcohols, carboxylic acids and esters, reactions and uses of alcohols*)
- 11. Polymers**  
(*addition polymerisation, condensation polymerisation, natural polymers, DNA*)
- 12. Chemical analysis**  
(pure substances and mixtures, analysing chromatograms, testing for gases, *tests for positive ions, tests for negative ions, instrumental analysis*)
- 13. The Earth's atmosphere**  
(history of atmosphere, evolving atmosphere, greenhouse gases, global climate change, atmospheric pollutants)
- 14. The Earth's resources**  
(finite and renewable resources, drinking water, treating waste water, **extracting metals from ores**, life cycle assessments, reduce, reuse, recycle)
- 15. Using our resources**  
(*rusting, useful alloys, properties of polymers, glass, ceramics and composites, making ammonia- Haber process, economics of Haber process, making fertilisers in the lab and industry*)

