# West Park School

# Combined Science

# GCSE Examination Summer 2025

In readiness for your GCSE examinations in Science you must **LEARN** and **REVISE** the following content and skills:

## Biology: Paper 1

**Cell Biology**
Cell structure - animal, plant and bacterial cells.
Cell specialisation and differentiation.
Microscopy – light and electron microscopes.
Cell division – Chromosomes, mitosis and the cell cycle, stem cells.
Transport in cells – Diffusion, osmosis and active transport.
**Organisation:**
Principles of organisation – cells, tissues, organs, organ systems.
The human digestive system.
The heart, blood vessels, blood and coronary heart disease.
Health issues including the effect of lifestyle on health.
Cancer – benign and malignant tumours.
**Plant Tissues, Organs and Systems**
Plant tissues – epidermal tissue, palisade and spongy mesophyll and xylem and phloem.
Plant organs e.g. leaves and plant organ systems.
**Infection and Response**
Communicable (infectious) disease – bacteria, viruses, protists and fungi.
Antibiotics and painkillers – uses of these types of drug and the problems associated with antibiotic resistance.
Human defence systems and vaccination.
Discovery and development of drugs – the stages used to develop and test new drugs. Traditional drugs and their origins.
**Bioenergetics**
Photosynthesis – the equation, rate, limiting factors and use of glucose.
Respiration – types of respiration (aerobic and anaerobic), the equations, the purpose of respiration and uses of the energy generated.
The body's response to exercise and metabolism.

## Required Practical Activities:

**Microscopy**
Use a light microscope to observe, draw and label a selection of plant and animal cells. A magnification scale must be included.
**Osmosis**
Investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue.
**Enzymes**
Investigate the effect of pH on the rate of reaction of amylase enzyme.
Students should use a continuous sampling technique to determine the time taken to completely digest a starch solution at a range of pH values. Iodine reagent is to be used to test for starch every 30 seconds.
Temperature must be controlled by use of a water bath or electric heater.
**Food Tests**
Use qualitative reagents to test for a range of carbohydrates, lipids and proteins. To include: Benedict's test for sugars; iodine test for starch; and Biuret reagent for protein.
**Photosynthesis**
Investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism such as pondweed.

# Chemistry: Paper 1

**Atomic Structure and the Periodic Table**
Atoms, elements, compounds and mixtures.
The development of the model of the atom.
Subatomic particles.
The development of the periodic table.
Properties and trends of groups in the periodic table.
**Structure and Bonding**
Ionic, covalent and metallic bonding.
The states of matter and state symbols.
Properties of matter e.g. polymers, alloys.
Giant covalent compounds and fullerenes.
**Chemical calculations**
Conservation of mass and balanced chemical equations.
Relative formula mass and moles.
Apparent changes in mass, chemical measurements and limiting reactants.
Reacting masses (recipe) calculations. (HT only).
Concentrations of solutions.
**Chemical Changes**
The reactivity series, metal extraction, oxidation and reduction.
Reactions of acids with metals, alkalis and bases.
Making salts.
The pH scale and neutralisation.
Strong and weak acids (HT only).
Electrolysis – molten ionic compounds, aqueous solutions, extraction of metals.
Half-equations (HT only).
**Energy Changes**
Exothermic and endothermic reactions and reaction profiles.
Bond energy calculations (HT only).

## Required Practical Activities:

**Making salts**
Preparation of a pure, dry sample of a soluble salt from an insoluble oxide or carbonate, using a Bunsen burner to heat dilute acid and a water bath or electric heater to evaporate the solution.

**Electrolysis**
Investigate what happens when aqueous solutions are electrolysed using inert electrodes.
This should be an investigation involving developing a hypothesis.

**Temperature changes**
Investigate the variables that affect temperature changes in reacting solutions, eg acid plus metals, acid plus carbonates, neutralisations, displacement of metals.

# Physics: Paper 1

**Energy**
Energy stores and systems and changes in energy.
Power and efficiency.
Renewable and finite energy sources.
**Electricity**
Current, potential difference, resistance and electrical charge.
Circuit symbols and circuit drawing.
Resistors and IV graphs.
Series and parallel circuits.
Mains electricity – Inc. wiring a plug and energy transfers in everyday electrical appliances.

The National Grid.

**Particles**

Changes of state and density.
Internal energy, specific heat capacity and specific latent heat.
The particle model and kinetic theory.

**Radioactivity**

The structure if an atom, mass number, atomic structure and isotopes.
The development of the model of the atom (common content with chemistry).
Radioactive decay, nuclear radiation, decay equations and half-lives.
Radioactive contamination and safety.

## Required Practical Activities:

**Specific heat capacity**

Investigation to determine the specific heat capacity of one or more materials.
The investigation will involve linking the decrease of one energy store (or work done) to the increase in temperature and subsequent increase in thermal energy stored.

**Resistance**

Use circuit diagrams to set up and check appropriate circuits to investigate the factors affecting the resistance of an electrical circuit.
This should include: the length of a wire (at constant temperature); combinations of resistors in series and parallel.

**I-V characteristics**

Use circuit diagrams to construct appropriate circuits to investigate the I-V characteristics of a variety of circuit elements including a filament lamp, a diode and a resistor at constant temperature.

**Density**

Volume should be determined from the dimensions of regularly shaped objects and by a displacement technique for irregularly shaped objects.
Dimensions to be measured using appropriate apparatus such as a ruler, micrometre or Vernier callipers.

# Biology: Paper 2

**Homeostasis and Response**

Homeostasis – Homeostasis and negative feedback.
The nervous system – Receptors, neurones, coordinators and effectors.
Synapses and reflexes – Synapses, reflexes and the reflex arc.
Investigating reaction time – Reaction time RPA.
The endocrine system – Hormones, glands and their functions.
Controlling blood glucose – Insulin, glucagon and types 1 and 2 diabetes.
Puberty and the menstrual cycle – Secondary sexual characteristic, the menstrual cycle and hormones controlling it.
Controlling fertility – Hormonal and non-hormonal methods of contraception, IVF and increasing fertility.
Adrenaline and thyroxine – adrenaline, thyroxine and negative feedback.

**Inheritance, variation and evolution**

DNA – Chromosomes, DNA, genes and the genome.
Reproduction – Sexual and asexual reproduction, fertilisation.
Meiosis – Gametes and cell division by meiosis.
X and Y chromosomes – Sex chromosomes, inheritance of sex and genetic diagrams.
Genetic diagrams – Single gene inheritance, genetic diagrams, offspring ratios and interpreting family trees.
Inherited disorders – cystic fibrosis, polydactyly and screening for genetic disorders.
Variation – Genetic variation, environmental variation, variation caused by both genes and the environment and mutations.
Evolution – Natural selection, Darwin, speciation and extinction.
Selective breeding – The process of selective breeding and its drawbacks.
Genetic engineering – The process of genetic engineering and its pros and cons.
Fossils – What fossils are and how they are formed.
Antibiotic resistant bacteria – The evolution of antibiotic resistance.
Classification – Systems of classification, changes to classification over time, binomial system and evolutionary trees.

**Ecology**

Competition – Ecology, why organisms compete and interdependence.
Abiotic and biotic factors – Abiotic and biotic factors and examples of each.

Adaptations – Structural, behavioural and functional adaptations and extremophiles.
Food chains – Food chains and predator-prey cycles.
Using quadrats – Measuring the distribution of species, Quadrats RPA and calculating population cycles.
Using transects – Sampling using transects RPA and estimating percentage coverage of a quadrat.
The water cycle – Processes involving the cycling of water on Earth.
The carbon cycle – Decay and the carbon cycle.
Biodiversity and waste management – The importance of biodiversity and human waste production.
Global warming – Global warming and the biological effects.
Deforestation and land use – Land use, deforestation and the destruction of peat bogs.
Maintaining ecosystems and biodiversity – Programmes to maintain biodiversity and conflicting pressures with maintaining biodiversity.

## Required Practical Activities:

**Field investigations**

Measure the population size of a common species in a habitat. Use sampling techniques to investigate the effect of a factor on the distribution of this species.

# Chemistry: Paper 2

**Rates of Reaction**

Calculating the rate of a chemical reaction.
Factors affecting the rate of reaction – concentration of reactants in solution, surface area of solids, pressure of gases and temperature.
Collision theory, activation energy and catalysts.
Reversible reactions.
Equilibrium and the effect of changing conditions on equilibrium. (HT Only)

**Organic Chemistry**

Crude oil, hydrocarbons and alkanes
Fractional distillation – the process and products.
Properties of hydrocarbons.
Cracking and alkenes.

**Chemical Analysis**

Pure substances – in chemistry and everyday language.
Formulations – definitions and examples.
Chromatography – simple chromatography and calculating $R_f$ values.
Identifying common gases.

**The Earth's Atmosphere**

The proportions of different gases in the atmosphere.
The composition of the Earth's early atmosphere.
How and why Earth's atmosphere has changed over time.
Greenhouse gases and how human activities contribute to an increase in greenhouse gases in the atmosphere.
Global climate change.
Carbon footprints.
Atmospheric pollutants from fuels and their effects.

**The Earth's Resources**

Using the Earth's resources and sustainable development.
Potable water.
Waste Water Treatment.
Phytomining and bioleaching (HT only).
Life Cycle Assessments.
Reducing the use of resources.

## Required Practical Activities:

**Rates of reaction**

Investigate how changes in concentration affect the rates of reactions by a method involving measuring the volume of a gas produced and a method involving a change in colour or turbidity.

This should be an investigation involving developing a hypothesis.

**Chromatography**

Investigate how paper chromatography can be used to separate and tell the difference between coloured substances. Students should calculate Rf values.

**Water purification**

Analysis and purification of water samples from different sources, including pH, dissolved solids and distillation.

## Physics: Paper 2

**Forces**

Forces and their interactions (gravity, resultant forces).
Work done and energy transfer.
Forces and elasticity (Hooke's law and elastic potential energy).
Forces and motion – (velocity, acceleration, distance – time graphs, velocity – time graphs, Newton's 3 laws of motion, stopping distance).
Momentum.

**Waves**

Waves in air, fluids and solids.
Types of waves.
Properties of waves.
Electromagnetic waves.

**Magnetism and electromagnetism**

Permanent and induced magnetism (poles of a magnet).
Magnetic forces and fields.
Electromagnetism.
The motor effect.
Fleming's left hand rule.
Electric motors.

### Required Practical Activities:

**Force and Extension**

Investigate the relationship between force and extension for a spring.

**Acceleration**

Investigate the effect of varying the force on the acceleration of an object of constant mass and the effect of varying the mass of an object on the acceleration produced by a constant force.

**Waves**

Make observations to identify the suitability of apparatus to measure the frequency, wavelength and speed of waves in a ripple tank and waves in a solid and take appropriate measurements.

**Radiation and absorption**

Investigate how the amount of infrared radiation absorbed or radiated by a surface depends on the nature of that surface.

## Assessment Objectives and Skills

In the examinations you will be expected to address the following assessment objectives:
AO1: Demonstrate knowledge and understanding of: scientific ideas; scientific techniques and procedures.
AO2: Apply knowledge and understanding of: scientific ideas; scientific techniques and procedures.
AO3: Analyse information and ideas to: interpret and evaluate; make judgements and draw conclusions; develop and improve experimental procedures.
Extended response – all examinations will include a number of "long answer" questions.
Maths – you will be expected to show basic mathematical skills in all exams. Biology papers will include at least 10% mathematical content, chemistry papers 20% and physics 30%.
RPA – There will be at least one question about a required practical activity in each examination.