AVANTI GRANGE SECONDARY SCHOOL

Subject: KS4 Physics Years 9, 10 and 11

Vision and Intent

The Science curriculum at Avanti Grange nurtures **curious, knowledgeable, and logical problem solvers**. We want students to develop the confidence to question the world around them, to think critically about information, and to use scientific principles to solve a wide range of problems. By embedding the skills of enquiry, analysis, and evaluation across Biology, Chemistry, and Physics, we prepare students not only for academic success but also for life as informed citizens in a scientific and technological society.

Our aim is for students to:

- Develop secure knowledge of key scientific ideas and models.
- Build practical and investigative skills through hands-on enquiry.
- Apply logical reasoning to explain natural phenomena.
- Revisit and deepen ideas across KS3 and KS4, ensuring progression and mastery.

Curriculum Map

Year	Autumn Half Term 1	Autumn Half Term 2	Spring Half Term 1	Spring Half Term 2	Summer Half Term 1	Summer Half Term 2
9	**1 Biology: Genetics and variation** Students study heredity through chromosomes, genes, and DNA, learning about key scientists, Punnett squares, and inheritance. They explore genetic disorders, variation, natural selection, extinction, biodiversity, and the role of gene banks in conservation.	**2 Chemistry: Patterns of reactivity** Students study chemical reactions, build a reactivity series, explore salts, catalysts, and investigate qualitative energy changes in exothermic and endothermic processes. **3 Physics: Magnetism and electromagnets** Students study magnetism, poles, and field lines, exploring Earth's magnetism, electromagnets, electric fields, and principles of D.C. motors and currents.	**GCSE Biology 1: Cell Biology, Adaptations, cell specialization and microscopes** Students deepen understanding of life processes and adaptations in extreme conditions, studying plant and animal cell structures with microscopes. They define tissues, organs, and systems, calculate magnification, and link specialised cell structure to function. Antiseptics, antibiotics, diffusion,	osmosis, and effects of sugar and salt solutions on tissue mass, reinforcing links between cell biology and practical experimentation. **GCSE Chemistry 1: Atomic structure and Periodicity** Students explore atomic models, isotopes, and subatomic particles to see how scientific ideas evolve with evidence. They distinguish elements and compounds through atomic structure and bonding, and practise balanced chemical equations.	By studying electron arrangements, they explain periodic trends in Groups 1, 7, and transition metals, while laboratory work develops skills in chemical reactions and separation techniques to produce pure salts. **GCSE Physics 1: Energy** Students revisit energy stores and transfers using KEG MINCE (Kinetic, Elastic, Gravitational, Magnetic, Internal, Nuclear, Chemical, Electrostatic)	and HERM (Heating, Electrical, Radiation, Mechanical), applying calculations to physical, chemical, and biological systems. They study fossil fuel limitations, renewable and non-renewable energy, the National Grid, and the second law of thermodynamics, linking science to global challenges like climate change.

Year	Autumn Half Term 1	Autumn Half Term 2	Spring Half Term 1	Spring Half Term 2	Summer Half Term 1	Summer Half Term 2
10	**GCSE Physics 1: Energy** Complete and primary energy sources, the National grid, the second Law of thermodynamics and link the science of Climate change to challenges like energy security. **GCSE Physics 2: Electricity** Students study static electricity, exploring charge transfer, non-contact forces, and electric fields. In circuits, they use standard symbols, equations (Q=It, P=IV, E=Pt), and Ohm's law to understand current, resistance, and power.	They investigate thermistors, LDRs, and mains electricity, learning how the National Grid transfers energy efficiently using transformers for safe, large-scale distribution. **GCSE Physics 3: Particle Model of Matter** Students learn gas particles move randomly, with temperature linked to average kinetic energy. They study pressure changes from heating, volume changes, and collisions with container walls. Boyle's law (pV = constant) explains pressure–volume relationships.	Work on gases transfers energy, raising internal energy and temperature, as seen when compressing air in a bicycle pump. **GCSE Physics 4: Atomic Structure** Students learn atomic structure, isotopes, and ion formation. They study radioactive decay (alpha, beta, and gamma), and neutron emissions, measured by activity (Bq) and dose (Sv). Nuclear equations illustrate decay effects on mass and charge.	Students balance equations and evaluate radiation applications, considering risks and benefits, while understanding natural and artificial background radiation sources. **GCSE Physics 5: Forces** Students study scalar and vector forces, motion graphs, and Newton's laws, applying equations like F=ma and W=F×s. They explore momentum conservation, stopping distances, rotation, fluid pressure, and Hooke's law.	Topics include work, moments, elasticity, and energy storage, enabling analysis of motion, forces, and real-world applications such as braking, safety, and structural design. Momentum (p=mv) is conserved in closed systems. Stopping distance depends on thinking and braking distances, influenced by speed and conditions. Forces cause rotation, with moments calculated as M=F×d. Pressure in fluids follows p=F/A and increases with depth (p=hpg).	**GCSE Physics 6: Waves** Students learn waves transfer energy without matter, distinguishing transverse and longitudinal types. They study amplitude, wavelength, frequency, and speed (v=fλ). Applications include sound transmission, hearing range, ultrasound imaging, and seismic analysis. Waves' interactions, such as reflection, absorption, transmission, and refraction, explain lenses, colour perception, and practical uses in medicine, industry, and understanding Earth's structure through seismic evidence.
Year	**Autumn Half Term 1**	**Autumn Half Term 2**	**Spring Half Term 1**	**Spring Half Term 2**	**Summer Half Term 1**	**Summer Half Term 2**
11	**GCSE Physics 7: Magnetism and Electromagnetism** Students study magnetism, learning poles, attraction, and repulsion as non-contact forces. They explore permanent and induced magnets, magnetic fields, and Earth's magnetism. Current in wires creates fields, enhanced in solenoids and electromagnets.	Applications include motors, speakers, and generators, with F=BIl explaining the motor effect. Transformers demonstrate electromagnetic principles in efficient National Grid power transmission. **GCSE Physics 8: Space Physics** Students study the solar system, galaxies, and gravity's role in orbits and	satellite stability. They explore star formation, fusion, and life cycles, including supernovae creating heavy elements. Red-shift evidence supports the Big Bang and expanding universe. Current research highlights accelerating expansion, with unresolved questions about dark matter and dark energy shaping modern cosmology.	**GCSE Physics : Application of Knowledge** Development of physical investigative skills, and critical thinking. Students review their practical work, problem-solving, and real-world applications. Practise of assessments to evaluate knowledge, application, and analytical skills, ensuring students can interpret data, evaluate evidence, and refine scientific methods.	**Revision** **Final preparation for external GCSE exams.**	**External GCSE exams**