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Physics Department – Curriculum Intent

Overview of KS4 Curriculum			
Subject: GCSE Physics **(Triple)** **Exam Board:** AQA **Head of Department:** Mr R Murray			
	Year 9	**Year 10**	**Year 11**
Autumn Term	All students begin learning GCSE Physics content in Year 9. Only topics common to both the Combined and Triple Science pathways are taught in Year 9. Students select which science pathway they wish to pursue at GCSE in Year 10 Working Scientifically 1 – SI Units, prefixes and formulas Working Scientifically 2 – Investigating weight and mass Working Scientifically 3 – Investigating Hooke's Law 1 Working Scientifically 4 – Investigating Hooke's Law 2 Working Scientifically 5 – Investigating Density Lesson 1 Working Scientifically 6 – Investigating Density Lesson 2 **Working Scientifically – Assessment** P1.1 Changes in energy Stores P1.2 Conservation of Energy P1.3 Energy and Work P1.4 Gravitational Potential Energy stores P1.5 Kinetic Energy and Elastic Energy Stores P1.6 Energy Dissipation	P4.1 Electrical charges and fields P4.2 Current and Charge P4.3 Potential Difference and Resistance P4.4 Component Characteristics P4.5 Series Circuits P4.6 Parallel Circuits **Chapter 4 Assessment** P5.1 Alternating Current P5.2 Cables and Plugs P5.3 Electric power and Potential difference P5.4 Electrical currents and energy transfer P5.5 Appliances and efficiency **Chapter 5 Assessment** P6.1 Density P6.2 States of Matter P6.3 Changes of State P6.4 Internal energy P6.5 Specific latent Herat P6.6 Gas Pressure and Temperature P6.7 Gas Pressure and Volume **Chapter 6 Assessment** **Career Links:** Electrical Engineer, Electrician, Telecommunications, Gas Engineer	P11.1 Pressure and surfaces P11.2 Pressure in a liquid at rest P11.3 Atmospheric pressure P11.4 Upthrust and flotation **Chapter 11 Assessment** P12.1 The nature of waves P12.2 The properties of waves P12.3 Reflection and refraction P12.4 More about waves P12.5 Sound Waves P12.6 The uses of ultrasound P12.7 Seismic Waves **Chapter 12 Assessment** P13.1 The electromagnetic spectrum P13.2 Light, Infrared, microwaves and radiation P13.3 Communications P13.4 Ultraviolet waves, X-rays and Gamma rays P13.5 X- rays in Medicine **Chapter 13 Assessment** **Career Links:** Radiologist, Radiographer, Medicine, Midwife
Spring Term	P1.7 Energy and efficiency P1.8 Electrical appliances P1.9 Energy and Power **Chapter 1 Assessment** P2.1 Energy Transfer by conduction P2.2 Infrared radiation P2.3 More about infrared radiation P2.4 Specific Heat Capacity P2.5 Heating and insulating buildings **Chapter 2 Assessment**	P7.1 Atoms and Radiation P7.2 The Discovery of the Nucleus P7.3 Changes in the nucleus P7.4 More about Alpha, Beta and Gamma Radiation P7.5 Activity and Half Life P7.6 Nuclear radiation in medicine P7.7 Nuclear fission P7.8 Nuclear Fusion P7.9 Nuclear issues **Chapter 7 Assessment**	P14.1 Reflection of Light P14.2 Refraction of Light P14.3 Light and colour P14.4 Lenses P14.5 Using Lenses **Chapter 14 Assessment** **Career Links:** Optometrist, Lighting Engineer

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		Career Links: Nuclear Physicist, Radiologist, Carbon Dating P8.1 Vectors and Scalars P8.2 Forces between Objects P8.3 Resultant Forces P8.4 Moments at work P8.5 More about levers and Gears P8.6 Centre of mass P8.7 Moments and equilibrium P8.8 The parallelogram of forces P8.9 Resolution of Forces **Chapter 8 Assessment** **Career Links:** Mechanical Engineer, Mechanic, Pilot,	P15.1 Magnetic Fields P15.2 Magnetic Fields of electric currents P15.3 Electromagnets in devices P15.4 The motor effect P15.5 The generator effect P15.6 Alternating – current generator P15.7 Transformers P15.8 Transformers in action **Chapter 15 Assessment** P16.1 Formation of the Solar system P16.2 The life history of a star P16.3 Planets, satellites and orbits P16.4 The expanding Universe P16.5 The beginning and Future of the Universe **Career Links:** Astrophysicist, Electrical Engineer
Summer Term	P3.1 Energy Demands P3.2 Energy from wind and water P3.3 Power from the Sun and the Earth P3.4 Energy and the environment P3.5 Big Energy issues **Chapter 3 Assessment** **Career Links:** Careers linked to the energy industry (power stations, green energy technologies), building surveyors.	P9.1 Speed and Distance- Time Graphs P9.2 Velocity and Acceleration P9.3 More about velocity – time graphs P9.4Analysing Motion Graphs **Chapter 9 Assessment** P10.1 Forces and Acceleration P10.2 Weight and Terminal Velocity P10.3 Forces and Braking P10.4 Momentum P10.5 Using conservation of momentum P10.6 Impact Forces P10.7 Safety First P10.8 Forces and Elasticity **Chapter 10 Assessment**	Chapter 16 Assessment Revision

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Overview of KS4 Curriculum			
Subject: GCSE Physics **(Combined)** **Exam Board:** AQA			
	Year 9	**Year 10**	**Year 11**
Autumn Term	All students begin learning GCSE Physics content in Year 9. Only topics common to both the Combined and Triple Science pathways are taught in Year 9. Students select which science pathway they wish to pursue at GCSE in Year 10 Working Scientifically 1 – SI Units, prefixes and formulas Working Scientifically 2 – Investigating weight and mass Working Scientifically 3 – Investigating Hooke's Law 1 Working Scientifically 4 – Investigating Hooke's Law 2 Working Scientifically 5 – Investigating Density Lesson 1 Working Scientifically 6 – Investigating Density Lesson 2 **Working Scientifically – Assessment** P1.1 Changes in energy Stores P1.2 Conservation of Energy P1.3 Energy and Work P1.4 Gravitational Potential Energy stores P1.5 Kinetic Energy and Elastic Energy Stores P1.6 Energy Dissipation	P4.1 Current and Charge P4.2 Potential Difference and Resistance P4.3Component Characteristics P4.4 Series Circuits P4.5 Parallel Circuits **Chapter 4 Assessment** P5.1 Alternating Current P5.2 Cables and Plugs P5.3 Electric power and Potential difference P5.4 Electrical currents and energy transfer P5.5Appliances and efficiency **Chapter 5 Assessment** **Career Links:** Electrical Engineer, Electrician, Telecommunications, Gas Engineer	P10.1 Forces and Acceleration P10.2 Weight and Terminal Velocity P10.3 Forces and Braking P10.4 Momentum P10.5 Forces and Elasticity **Chapter 10 Assessment** P11.1 The Nature of Waves P11.2 The Properties of Waves P11.3 Reflection and Refraction P11.4 More about waves **Chapter 11 Assessment** **Career Links:** Optometrist, Lighting Engineer
Spring Term	P1.7 Energy and efficiency P1.8 Electrical appliances P1.9 Energy and Power **Chapter 1 Assessment** P2.1 Energy Transfer by conduction P2.2 Infrared radiation P2.3 More about infrared radiation P2.4 Specific Heat Capacity P2.5 Heating and insulating buildings **Chapter 2 Assessment**	P6.1 Density P6.2 States of Matter P6.3 Changes of State P6.4 Internal energy P6.5 Specific latent Herat P6.6 Gas Pressure and Temperature **Chapter 6 Assessment** P7.1 Atoms and Radiation P7.2 The Discovery of the Nucleus P7.3 Changes in the nucleus P7.4 More about Alpha, Beta and Gamma Radiation P7.5 Activity and Half Life **Chapter 7 Assessment** **Career Links:** Nuclear Physicist, Radiologist, Carbon Dating	P12.1 The electromagnetic spectrum P12.2 Light, infrared, microwaves and radio waves P12.3 Communications P12.4 Ultraviolet waves, X-rays and Gamma Rays P12.5 X-Rays in medicine **Chapter 12 Assessment** P13.1 Magnetic Fields P13.2 Magnetic fields of electric currents P13.3 The Motor effect **Chapter 13 Assessment** **Career Links:** Astrophysicist, Electrical Engineer, Electrician

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Summer Term	P3.1 Energy Demands P3.2 Energy from wind and water P3.3 Power from the Sun and the Earth P3.4 Energy and the environment P3.5 Big Energy issues **Chapter 3 Assessment** **Career Links:** Careers linked to the energy industry (power stations, green energy technologies), building surveyors.	P8.1 Vectors and Scalars P8.2 Forces between Objects P8.3Resultant Forces P8.4 Centre of Mass P8.5 The Parallelogram of Forces P8.6 Resolution of Forces **Chapter 8 Assessment** P9.1 Speed and Distance- Time Graphs P9.2 Velocity and Acceleration P9.3 More about velocity – time graphs P9.4Analysing Motion Graphs **Chapter 9 Assessment** **Career Links:** Mechanical Engineer, Mechanic, Pilot,	**Revision**

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Overview of KS5 Curriculum				
Subject: A Level Physics		**Exam Board:** AQA		
	Year 12		**Year 13**	
	Teacher A	**Teacher B**	**Teacher A**	**Teacher B**
Autumn Term	0.1 Prefixes 0.2 SI Units 0.3 Significant Figures 0.4 Plotting graphs 0.5 Analysing graphs 0.6 Absolute uncertainties 0.7 Percentage uncertainties 0.8 Accuracy and Precision 1.1. Inside the Atom 1.2 Stable and unstable nuclei 1.3 Photons 1,4 Particles and antiparticles 1.5 Particle interactions 2.1 The particle zoo 2.2 Particle sorting 2.3 Leptons at work 2.4 Quarks and antiquarks 2.5 Conservation rules 3.1 The Photoelectric effect 3.2 More about photoelectricity 3.3 Collision of electrons with atoms 3.4 Energy Levels in atoms 3.5 Energy levels and Spectra 3.6 Wave –Particle duality	Electricity 12.1 Current and Charge 12.2 Potential difference and Power 12.3 Resistance 12.4 Components and their characteristics 13.1 Circuit rules 13.2 More about resistance 13.3 Electromotive force and internal resistance 13.4 More about circuit calculations 13.5 the potential divider	19.1 Internal energy and temperature 19.2 Specific heat capacity 19.3 Change of state 20.1 The experimental gas laws 20.2 The ideal gas law 20.3 The Kinetic Theory of gases 24.1 Current-carrying conductors in a magnetic field 24.2 Moving charges in a magnetic field 24.3 Charged particles in circular orbits 25.1 Generating electricity 25.2 The laws of electromagnetic induction 25.3 The alternating current generator 25.4 Alternating current and power 25.5 Transformers	21.1 Gravitational field strength 21.2 Gravitational Potential 21.3 Newtons law of gravitation 21.4 Planetary fields 21.5 Satellite motion 22.1 Field Patterns 22.2 Electric field strength 22.3 Electric potential 22.4 Coulomb's law 22.5 Point charges 22.6 Comparing electric fields and gravitational fields 23.1 Capacitance 23.2 Energy stored in a charged capacitor 23.4 Charging and discharging a capacitor through a fixed resistor Dielectrics
Spring Term	4.1 Waves and vibrations 4.2 Measuring Waves 4.3 Wave Properties1 4.4 Wave Properties 2 4.5 Stationary and progressive waves 4.6 More about stationary waves on strings 4.7 Using Oscilloscopes 5.1 Refraction of light	6.1 Vectors and Scalars 6.2 Balanced forces 6.3 The principle of moments 6.4 More on moments 6.5 Stability 6.6 Equilibrium rules 6.7 Statics calculations 7.1 Speed and velocity 7.2 Acceleration	26.1 The discovery of the nucleus 26.2 The properties of alpha, beta and gamma radiation 26.3 More about alpha, beta and gamma 26.4 The dangers of radioactivity 26.5 Radioactive decay 26.7 Radioactive isotopes in use 26.8 More about decay modes 26.9 Nuclear radius	28.1.1Thermionic emission 28.1.2 Electrons in Electric and magnetic fields 28.1.3 Specific charge 28.1.4 Millikan's experiment 28.2.1 Theories of light 28.2.2 Electromagnetic waves 28.2.3 Photoelectricity

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	5.2 More about refraction 5.3 Total internal reflection 5.4 Double slit interference 5.5 More about interference 5.6 Diffraction 5.7 The diffraction grating	7.3 Motion along a straight line 7.4 Free fall 7.5 Motion graphs 7.6 Calculations on motion along a straight line 8.1 Force and acceleration 8.2 Using F=Ma 8.3 Terminal Speed 8.4 On the Road 8.5 Vehicle Safety 9.1 Momentum and impulse 9.2 Impact forces 9.3 Conservation of momentum 9.4 Elastic and inelastic collisions 9.5 Explosions 10.1 Work and energy 10.2 Kinetic Energy and Potential energy 10.3 Power 10.4 Energy and efficiency	27.1 Energy and mass 27.2Binding energy 27.3 Fission and fusion 27.4 The thermal nuclear reactor	28.3.1Michelson-Morrley experiment 28.3.2 Energy and mass
Summer Term	17.1 Uniform Circular motion 17.2 Centripetal acceleration 17.3 On the Road 17.4 At the fairground 18.1 Oscillations 18.2 The principle of Simple Harmonic Motion 18.3 More about sine waves 18.4 Application of Simple harmonic motion 18.5 Energy and Simple harmonic motion 16.6 Forced vibrations and resonance	11.1 Density 11.2 Springs 11.3 Deformation of solids 11.4 More about stress and strain 0.9 - Error bars on graphs 0.10 - Graphs- Gradients and areas 0.11 - Practicing skills and Working Scientifically skills	Revision	Revision

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Curriculum Rationale:
The Physics department at Urmston Grammar are well versed at teaching the AQA specification and using these exam materials. We have been teaching AQA for a very long time; 2 members of staff recently marked for AQA

Urmston Grammar School is a selective school and to keep the curriculum challenging and engaging, GCSE is taught from Year 9. This allows time to focus on the more challenging topics later in the GCSE course and also to develop 'Working Scientifically' skills at a higher GCSE standard. The sequencing broadly follows the same order as the AQA textbook, as this is more student friendly. It is also a very logical approach to the course, whereby fundamental principles are taught early in Year 9 and are built upon later in Year 10 and 11.

We begin our GCSE course with a practical and 'Working Scientifically' skills topic. It is important students know the basic practical skills and basic Physics prefixes/SI units from the start as future lessons build on this knowledge. Questions throughout the Physics course will use prefixes, SI units and ask students to analyse data. Starting with Practical Physics also promotes high levels of engagement from early on. The energy topics will build on work from KS3. This is also a sensible area to focus on in Year 9 as the energy topic has almost exactly the same content for both Combined and Triples science given that student do not select their Science pathway for GCSE until Year 10.

The GCSE course continues with more complex practical and 'Working Scientifically' skills being developed in Year 10. Some topics taught at this point require a higher level of Maths knowledge not taught in Maths lessons until the end of KS3 (for example, rearranging more complex equations such as $P=I^2R$)
Assessment throughout Year 9 and Year 10 is used as an opportunity to revisit and embed prior learning to aid long term retention of knowledge and skills. Some topics in Y11 require Maths knowledge that students are not taught in Maths lessons until Y10 (for example rearranging more complex equations such as $V^2-u^2=2as$, and velocity vs time t graphs and distance vs time graphs). Using gradients to calculate spring constant in the forces topic uses Maths skills developed later in KS4.

At A Level, fundamental concepts and 'Working Scientifically' skills are taught in the introductory module taught by Teacher A. This ensures that all students are up to scratch with the relevant Maths skills and students that need support are highlighted form the start. Starting with particles helps with engagement and bridges the gap between GCSE and A Level. The electricity topic reinforces previous knowledge and builds depth.
The Mechanics topic is covered in the second half of Year 12 as a similar module is taught in Maths and many students will find the topic easier if they have already developed the basic Maths skills. Likewise, the Waves topic is taught later on in Year 12 as it requires higher level Maths skills. The most challenging topics are tackled in Year 13 as these require the highest level of Maths, knowledge of Logarithms and they also build on prior Physics knowledge. The Optional module 'Turning Points in Physics' has been chosen as it builds and recaps previous topics. This module is taught last as it also aids students with their revision.