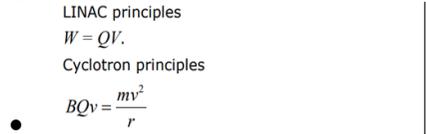


## Curriculum Map Year 13 - Physics

Topic Name	Term	Content / skills developed with link to NC / exam board subject content (if applicable)	Reflection on previous learning	Progress to future learning	Global Citizenship links	Qatar National Identity links
Impulse momentum theorem	1	<ul style="list-style-type: none"> <li>Understand Conservation of linear momentum. Collision problems in two dimensions. Elastic and inelastic collisions.</li> <li>Use of <math>E = P^2/2m</math> for the kinetic energy of a nonrelativistic particle.</li> </ul>	AS physics Principle of conservation of linear momentum	Use ICT to analyse collisions between small spheres, e.g. ball bearings on a tabletop	prepare for future challenges  <b>Pride Perseverance and Responsibility</b>	<b>Sustainability:</b> responsibility and creativity. <b>Conscious thinking</b> about my <b>Actions</b>
Circular Motion	1	<p>. use of vector diagrams to derive equations for centripetal acceleration.</p> <p>3. Understand and use of <math>a = v^2/r</math>, <math>F = mv^2/r</math></p>	AS Physics Centre of gravity	Horizontal circles; banked tracks  Simple vertical circles.	prepare for future challenges <b>Pride Independence and Dedication</b>	<b>Sustainability:</b> responsibility and creativity. <b>Conscious thinking</b> about my <b>Actions</b>
Electric Field  Electrostatic phenomena and electric charge.	1	<p>1 understand Radial and uniform electric fields</p> <p>2. Force between point charges.</p> <p>3. Use of equations in electric field</p> <p><math>E = V/d</math>, <math>F= q E</math>,</p>	iGCSE Static electricity	Experimental verification of Coulomb's law.  Investigate equipotential across an electric field.	prepare for future challenges  <b>Pride Responsibility and Independence</b>	<b>Sustainability:</b> self-esteem and participation. <b>Conscious thinking</b> about my <b>Actions</b>

Capacitance	1	<ul style="list-style-type: none"> <li>1. Define capacitance, <math>C = Q/V</math></li> <li>2. Energy stored by a capacitor derived from the area under a graph of potential difference against charge stored</li> <li>3. Understand and use <math>W = \frac{1}{2} QV</math></li> <li>4. Charge and discharge capacitor through fixed resistor to obtain exponential decay curve <math>Q = Q_0 e^{-t/RC}</math> for capacitor discharge</li> <li></li> </ul>	AS Physics Electric circuits	<p>Use an oscilloscope or data-logger to display and analyse the potential difference (p.d.) across a capacitor as it charges and discharges through a resistor.</p> <p>Investigate both charging and discharging circuits.</p>	<p>prepare for future challenges</p> <p><b>Pride Dedication and Engagement</b></p>	<p><b>Sustainability:</b> responsibility and creativity. <b>Conscious thinking</b> about my <b>Actions</b></p>
Magnetic Fields  Magnetic field line patterns Right hand grip rule Demonstrate motor effect	1	<ul style="list-style-type: none"> <li>Magnitude of B defined by <math>F = BIl</math> (for wire, <math>F = Bqv</math> for charged particles). Application to motors, moving coil meters and loudspeakers.</li> <li></li> </ul> <p>Magnetic flux density B, flux <math>\phi</math> and flux linkage <math>N\phi</math></p> <p>Origins of EM induction</p> <p>Faraday's law, <math>\mathcal{E} = \frac{-d(N\phi)}{dt}</math>.</p> <p>Lenz's law and energy conservation.</p>	iGCSE Magnetism and Electromagnetism	To Investigate the force on a current carrying wire in a magnetic field.	<p>prepare for future challenges</p> <p><b>Pride</b></p>	<p><b>Sustainability:</b> responsibility and creativity. <b>Conscious thinking</b> about my <b>Actions</b></p>

<p>Fleming's left-hand rule.</p> <p>Electromagnetic induction</p>					<p><b>Perseverance and Independence</b></p>	
<p>Nuclear Physics</p> <p>LINAC principles.</p> <p>Cyclotron principles</p>	<p><b>1</b></p>	<p>1. Structure of the atom  2. Rutherford scattering experiment  3. High energy scattering experiments</p> <p>LINAC principles  <math>W = QV</math>.  Cyclotron principles</p> <p><math>BQv = \frac{mv^2}{r}</math></p> 	<p>iGCSE Radioactivity  A2 Circular Motion</p>	<p>Computer simulation of Rutherford's experiment.</p> <p>Use of the CERN website to illustrate the LINAC and Cyclotron.</p>		<p><b>Sustainability:</b> responsibility and creativity.  <b>Conscious thinking</b> about my <b>Actions</b></p>
<p>Particle Physics</p> <p>Principles of cloud, bubble &amp; spark chambers, ionisation detectors.</p> <p>Particle collisions: interpretation in terms of conservation laws.</p>	<p><b>1</b></p>	<p><b>Creation and annihilation of matter and antimatter particles</b></p> <p><math>\Delta E = c^2 \Delta m</math></p> <p><b>Non-SI units of MeV and GeV (energy) and MeV/c<sup>2</sup>, GeV/c<sup>2</sup> (mass)</b></p> <p>be able to apply conservation of charge, energy and momentum to interactions between particles and interpret particle tracks</p>	<p>Conservation laws</p>	<p>Use bubble chamber images and a variety of interactions to illustrate particle collisions.</p>	<p>prepare for future challenges</p> <p><b>Pride: Independence</b></p>	<p><b>Sustainability</b> Participation.  <b>Conscious thinking</b> about my <b>Actions</b></p>

The standard model	1	<p>Understand the standard Quark and Lepton model And the symmetry of model predicted the top quark</p> <p>Be able to write and interpret particle equation.</p>	Radioactive decay Equation	<b>Particle model Theory</b>	prepare for future challenges  <b>Pride: independence</b>	<b>Sustainability:</b> Participation. <b>Conscious thinking</b> about my <b>Actions</b>
Thermodynamics	1	<ul style="list-style-type: none"> <li>• be able to use the equations <math>\Delta E = mc\Delta\theta</math> and <math>\Delta E = L\Delta m</math></li> <li>• be able to use the equation <math>pV = NkT</math> for an ideal gas</li> <li>• be able to derive and use the equation <math>\frac{1}{2}m\langle c^2 \rangle = \frac{3}{2}kT</math></li> </ul>	iGCSE Ideal Gas equation	Determine the specific latent heat of a phase change.	prepare for future challenges  <b>Pride: independence</b>	<b>Sustainability:</b> responsibility and creativity. <b>Conscious thinking</b> about my <b>Actions</b>
Nuclear Decay	1	<ul style="list-style-type: none"> <li>• Nuclear binding energy</li> <li>• Mass deficit, <math>\Delta E = \Delta m c^2</math></li> <li>• Background radiation</li> <li>• Nature and properties of alpha, beta, and gamma radiation be able to determine the half-lives of radioactive isotopes graphically and be able to use the equations for radioactive decay activity <math>A = \lambda N</math>, <math>\frac{dN}{dt} = -\lambda N</math>, <math>\lambda = \frac{\ln 2}{t_{1/2}}</math>, <math>N = N_0 e^{-\lambda t}</math> and <math>A = A_0 e^{-\lambda t}</math> and</li> <li>• derive and use the corresponding log equations.</li> </ul>	iGCSE Radioactivity	Computer simulation to produce a radioactive decay curve.	prepare for future challenges  <b>Pride Dedication and Engagement</b>	<b>Sustainability:</b> self-esteem and participation. <b>Conscious thinking</b> about my <b>Actions</b>

<p>5 Oscillations Resonance</p>	<p><b>2</b></p>	<p>be able to use the equations <math>a = -\omega^2 x</math>, <math>x = A \cos \omega t</math>, <math>v = -A \omega \sin \omega t</math>, <math>a = -A \omega^2 \cos \omega t</math>, and <math>T = \frac{1}{f} = \frac{2\pi}{\omega}</math> and <math>\omega = 2\pi f</math> as applied to a simple</p> <ul style="list-style-type: none"> <li>• harmonic oscillator be able to use equations for a simple harmonic oscillator <math>T = 2\pi \sqrt{\frac{m}{k}}</math>, and a simple pendulum <math>T = 2\pi \sqrt{\frac{l}{g}}</math></li> </ul> <hr/> <ul style="list-style-type: none"> <li>• Understand Resonance, free and forced oscillations.</li> </ul>	<p>iGCSE Waves</p>	<p>Be able to draw and interpret displacement – time and velocity – time graph.</p>	<p>prepare for future challenges</p> <p><b>Pride Dedication and Engagement</b></p>	<p><b>Sustainability:</b> responsibility and creativity. <b>Conscious thinking</b> about my <b>Actions</b></p>
<p>Astrophysics and cosmology Gravitational Field</p>	<p><b>2</b></p>	<ul style="list-style-type: none"> <li>• Concept of a gravitational field.</li> <li>• Radial gravitational field of the Earth Inverse square law Newton’s law of gravitation <math>F = Gm_1m_2/r^2</math></li> <li>• Derive and use the equation <math>g = \Gamma\mu/r^2</math> for the gravitational field due to a point mass</li> <li>• <math>V</math> gravitation = - GM/r for a radial gravitational field Comparison of electric and gravitational fields</li> <li>• Application to satellite orbits</li> </ul>	<p>iGCSE Astrophysics</p>	<p>Equipotential surfaces – compared to map ‘contour lines.</p>	<p>prepare for future challenges</p> <p><b>Pride Perseverance and Independence</b></p>	<p><b>Sustainability:</b> responsibility and creativity. <b>Conscious thinking</b> about my <b>Actions</b></p>

<p>Black bodies</p> <p>Stefan-Boltzmann law</p> <p>Wien's law</p> <p>Trigonometric parallax.</p> <p>Standard candles</p>	<p><b>2</b></p>	<ul style="list-style-type: none"> <li>• Use of equation <math>L = \sigma AT^4</math></li> <li>• 2. <math>\lambda_{\text{max}}T = 2.90 \times 10^{-3} \text{ m K}</math></li> <li>• 3. Intensity inverse square law <math>I = L / 4 \pi d^2</math></li> <li>• A simple Hertzsprung-Russell diagram and its relation to the life cycle of stars Main sequence stars, white dwarfs, and red giants.</li> </ul>	<p>iGCSE Astrophysics</p>	<p>Investigate the inverse square law with lamps and LDR</p>	<p>prepare for future challenges</p> <p><b>Pride Dedication and Engagement</b></p>	<p><b>Sustainability:</b> responsibility and creativity. <b>Conscious thinking</b> about my <b>Actions</b></p>
<p>Doppler effect for em-radiation.</p> <p>Red Shift</p> <p>Hubble's Law</p>	<p><b>2</b></p>	<p>be able to use the equations for redshift</p> $z = \frac{\Delta\lambda}{\lambda} \approx \frac{\Delta f}{f} \approx \frac{v}{c}$ <p>for a source of electromagnetic radiation moving relative to an observer and <math>v = H_0 d</math> for objects at cosmological distances</p> <hr/>	<p>iGCSE Cosmology</p>	<p>Use of spectra from different galaxies.</p>	<p>prepare for future challenges</p> <p><b>Pride: independence</b></p>	<p><b>Sustainability:</b> responsibility and creativity. <b>Conscious thinking</b> about my <b>Actions</b></p>