AS AND A LEVEL PHYSICS

Switching from AQA to Edexcel

This document is designed to help you compare the existing 2008 AQA Physics A specification (2450) with the new 2015 Edexcel Physics specification.

The document gives an overview, at the topic level, of where the material covered in the existing AQA Physics A specification can be found in the new Edexcel Physics specification. The following tables then give a more detailed breakdown of the Edexcel specification, and highlights areas of difference. These will help you see where material that you currently teach in the AQA specification is not present in the Edexcel specification; or where the Edexcel specification incorporates material that is new to you.

As a general overview, the 2015 Edexcel Physics specification is split into a number of topics. At AS, these topics are: Working as a Physicist, Mechanics, Electric Circuits, Materials and Waves & the Particle Nature of Light. In the second year of the A level, the topics are: Further Mechanics, Electric & Magnetic Fields, Nuclear & Particle Physics, Thermodynamics, Space, Nuclear Radiation, Gravitational Fields and Oscillations.

The course can also be taught using a context-led form approach, as exemplified by the Salters Horners (SHAP) approach. This approach considers applications that draw on areas of physics, and moves on to the underlying laws, theories and models of physics. Both the SHAP approach and the concept approach to the specification involve the same specification statements at AS and A level, but the SHAP approach groups these statements into topics a different way.

As well as great physics within the specification, there are other ways in which we can help support your teaching on our new A level Physics specification. Our free support includes:

- additional sets of question papers
- Results Plus, now with Mock Analysis service
- Exam Wizard, our online bank of past paper questions
- Getting Started Guides, with course planners
- “Getting Ready to Teach” events
- documents to help deliver the mathematics and practical aspects of the specification
- worksheets for each “core practical” in the specification

Overview of content

AQA A Physics (2008)	Edexcel Physics (2015)
AS Unit 1 (PHYA1) *Particles, Quantum Physics and Electricity*	
3.1.1 Particles and Radiation	Topic 8: Nuclear and particle physics Spec ref(s): 130, 135 - 138, 140, 141, 142, 143, 170 Topic 5: Waves and particle nature of light Spec ref(s): 91
3.1.2 Electromagnetic Radiation and Quantum Phenomena	Topic 5: Waves and particle nature of light Spec ref(s): 86, 87, 92 - 96
3.1.3 Current electricity	Topic 3: Electric circuits Spec ref(s): 31 - 39, 42 – 48 Topic 7: Electric and magnetic fields Spec ref(s): 119, 128, 129
AS Unit 2 (PHYA2) *Mechanics, Materials and Waves*	
3.2.1 Mechanics	Topic 2: Mechanics Spec ref(s): 9 – 17, 20, 23 - 30
3.2.2 Materials	Topic 4: Materials Spec ref(s): 49, 53 - 58
3.2.3 Waves	Topic 5: Waves and particle nature of light Spec ref(s): 59 – 63, 65 - 67, 71 – 74, 82 - 85
AS Unit 3 *Investigative and Practical Skills*	
Route T / Route X	Now assessed in two ways – directly by teachers and indirectly by examination papers

A level Unit 4 (PHYA4) *Fields and Further Mechanics*	
3.4.1 Further Mechanics	Topic 6: Further mechanics Spec ref(s): 97 – 101, 104 – 107 Topic 13: Oscillations Spec ref(s): 181 - 190
3.4.2 Gravitation	Topic 2: Mechanics Spec ref(s): 18 Topic 12: Gravitational fields Spec ref(s): 174 - 180
3.4.3 Electric Fields	Topic 7: Electric and magnetic fields Spec ref(s): 108 - 115
3.4.4 Capacitance	Topic 7: Electric and magnetic fields Spec ref(s): 116 - 120
3.4.5 Magnetic Fields	Topic 7: Electric and magnetic fields Spec ref(s): 121 – 127 Topic 8: Nuclear and particle physics Spec ref(s): 133 - 134

3.5 A level Unit 5 (PHY5A – 5D) *Nuclear Physics, Thermal Physics and an Optional Topic*	
3.5.1 Radioactivity	Topic 8: Nuclear and particle physics Spec ref(s): 131 Topic 11: Nuclear radiation Spec ref(s): 168 - 173
3.5.2 Nuclear Energy	Topic 11: Nuclear radiation Spec ref(s): 164 - 167
3.5.3 Thermal Physics	Topic 9: Thermodynamics Spec ref(s): 144 - 152
Option 5A *Astrophysics*	
A1.1 Lenses	Topic 5: Waves and particle nature of light Spec ref(s): 75, 76, 80, 81
A1.2 Non-optical Telescopes	N/A
A1.3 Classification of Stars	Topic 10: Space Spec ref(s): 156, 158 – 160 Topic 9: Thermodynamics Spec ref(s): 153 - 155
A1.4 Cosmology	Topic 10: Space Spec ref(s): 161 - 163
Option 5B *Medical Physics*	
B2.1 Physics of the Eye	Topic 5: Waves and particle nature of light Spec ref(s): 77, 78, 80, 81
B2.2 Physics of the Ear	N/A
B2.3 Biological Measurement	N/A
B2.4 Non-ionising Imaging	Topic 5: Waves and particle nature of light Spec ref(s): 72, 73, 88, 89
B2.5 X-ray Imaging	N/A
Option 5C *Applied Physics*	
C3.1 Rotational Dynamics	N/A
C3.2 Thermodynamics and Engines	N/A
Option 5D *Turning Points in Physics*	
D4.1 The Discovery of the electron	Topic 8: Nuclear and particle physics Spec ref(s): 132 – 134 Topic 4: Materials Spec ref(s): 51
D4.2 Wave-particle Duality	Topic 5: Waves and particle nature of light Spec ref(s): 86, 87, 90 - 93, 95
D4.3 Special Relativity	N/A
A level Unit 6 *Investigative and Practical Skills*	
Route T / Route X	Now assessed in two ways – directly by teachers and indirectly by examination papers

In-depth comparison

Edexcel Physics (2015)	AQA A (2008)	What's new for you	What do you no longer teach
Topic 1: Working as a physicist		This topic is not intended to be taught as a discrete topic. The knowledge and skills specified here should pervade the entire course.	
Topic 2: Mechanics	**AS Unit 2 (PHYA2)** *Mechanics, Materials and Waves* *3.2.1* **A level Unit 4 (PHYA4)** *Fields and Further Mechanics* *3.4.1*	12. recognise vector notation 14. find the resultant of two coplanar vectors at any angle to each other 18. determine the acceleration of a freely-falling object 24. apply the principle of moments to an extended body in equilibrium 22. understand how to relate the principle of conservation of linear momentum to Newton's laws of motion	
Topic 3: Electric circuits	**AS Unit 1 (PHYA1)** *Particles, Quantum Physics and Electricity* *3.1.3*	36. be able to derive the equations for combining resistances in series and parallel using the principles of charge and energy conservation 38. current-potential difference graphs for diodes 41. be able to use $I = nqvA$ to explain the large range of resistivities of different materials 48. understand how changes of resistance with illumination may be modelled in terms of the number of conduction electrons and understand how to apply this model to LDRs	• Superconductivity

Topic 4: Materials	**AS Unit 2 (PHYA2)** *Mechanics, Materials and Waves* *3.2.2*	50. understand how to use the relationship upthrust = weight of fluid displaced 51. understand that Stokes' Law* applies only to small spherical objects moving at low speeds with *laminar flow* (or in the absence of *turbulent flow*) and that viscosity is temperature dependent 52. use a falling-ball method to determine the viscosity of a liquid	* NB Stokes' Law is covered in Option 5D
Topic 5: Waves and particle nature of light Spec ref(s): 59 – 82 & 88 – 89	**AS Unit 2 (PHYA2)** *Mechanics, Materials and Waves* *3.2.3*	65. know and understand what is meant by *wavefront* 66. be able to use the relationship between *phase difference* and *path difference* 68. be able to use the equation for the speed of a transverse wave on a string 70. be able to use the equation intensity of radiation $I = P/A$ 74. understand how to measure the refractive index of a solid material	• Two source interference patterns • Derivation of $d\sin\theta = n\lambda$
	A Level Unit 5B (PHA5B) *Medical Physics* *B.2.1 and B.2.4* This option covers Edexcel Topic 5, spec refs 75 – 81 & 88 - 89	78. understand that for thin lenses in combination $P = P1+P2+P3+\ldots$ 79. know and understand the terms *real image* and *virtual image* 80. be able to use the thin lens equation for a converging or diverging lens with the real is positive convention	• Structure and sensitity of the eye • Rods and cones • Defects of vision and correction • Physics of the ear • Biological measurement (ECG) • Ultrasound, fibre optics, endoscopy, MR scanning • X-ray imaging

Topic 5: Waves and particle nature of light Spec ref(s): 83 – 87 & 90 – 96	**AS Unit 1 (PHYA1)** *Particles, Quantum Physics and Electricity* *3.1.2*		
	A Level Unit 5D (PHA5D) *Turning Points in Physics* *B.2.1 and B.2.4* This option covers Edexcel Topic 5, spec refs 86 – 87, 90 – 92		• Most other aspects of Unit 5D, such as special relativity
Topic 6: Further mechanics	**A level Unit 4 (PHYA4)** *Fields and Further Mechanics* *3.4.1*	99. understand how to apply conservation of linear momentum to problems in two dimensions 102. be able to derive and use the equation relating the momentum and kinetic energy of a non-relativistic particle 103. be able to express angular displacement in radians and in degrees, and convert between these units 105. be able to use vector diagrams to derive the equations for centripetal acceleration	
Topic 7: Electric and magnetic fields	**A level Unit 4 (PHYA4)** *Fields and Further Mechanics* *3.4.5*		• Work done as mass times change in potential, relation between field strength and potential gradient • Electromagnetic induction in a coil rotating in a magnetic field • Transformers

Topic 8: Nuclear and particle physics	**AS Unit 1 (PHYA1)** *Particles, Quantum Physics and Electricity* *3.1.1*	132. understand that electrons are released in the process of thermionic emission and how they can be accelerated by electric and magnetic fields ***NB this is covered in Unit 5D*** 133. understand the role of electric and magnetic fields in particle accelerators and detectors 134. be able to derive and use the equation for the motion of a charged particle in a magnetic field 135. be able to apply conservation of charge, energy and momentum to interactions between particles and interpret particle tracks 136. understand why high energies are required to investigate the structure of nucleons 137. be able to use the equation $\Delta E = c2\Delta m$ in situations involving the creation and annihilation of matter and antimatter particles 138. be able to use MeV and GeV (energy) and MeV/c^2, GeV/c^2 (mass) and convert between these and SI units 139. understand situations in which the relativistic increase in particle lifetime is significant	• Stable & Unstable Nuclei • Particle Interactions • Strong and Weak interactions • Strangeness • Inverse square law for Gamma radiation • Nuclear Instability • Nuclear Radius • Nuclear Reactors – Induced fission operations & Safety

Topic 9: Thermodynamics	**A level Unit 5 (PHY5A – 5D)** *Nuclear Physics, Thermal Physics* *3.5.3*	147. understand the concept of *internal energy* as the random distribution of potential and kinetic energy amongst molecules 152. be able to derive the kinetic theory equation	• Gas laws • Molar mass and molecular mass
	A Level Unit 5A (PHA5A) *Astrophysics* *A.1.3* This option covers Edexcel Topic 9, spec refs 153 – 155		• Classification of stars • Apparent and absolute magnitude • Use of stellar spectral classes • Supernovae, neutron stars and black holes
Topic 10: Space	**A Level Unit 5A (PHA5A)** *Astrophysics* *A.1.3* *A.1.4*	156. be able to use the equation relating intensity, distance and luminosity 157. understand how astronomical distances can be determined using trigonometric parallax 158. understand how astronomical distances can be determined using measurements of intensity received from standard candles	• Quasars
Topic 11: Nuclear radiation	**A level Unit 5 (PHY5A – 5D)** *Nuclear Physics, Thermal Physics* *3.5.1*	167. understand the mechanism of nuclear fusion and the need for very high densities of matter and very high temperatures to bring about and maintain nuclear fusion 170. be able to write and interpret nuclear equations given the relevant particle symbols	

Topic 12: Gravitational fields	**A level Unit 4 (PHYA4)** *Fields and Further Mechanics 3.4.2*	177. be able to derive the equation for the gravitational field due to a point mass	♠ Work done as mass times change in potential, relation between field strength and potential gradient
Topic 13: Oscillations	**A level Unit 4 (PHYA4)** *Fields and Further Mechanics 3.4.1*		♠ Phase difference between driver and driven displacements