AS AND A LEVEL PHYSICS

Switching from OCR B to Edexcel

This document is designed to help you compare the existing 2008 OCR Physics B (Advancing Physics) specification (H159 / H559) with the new 2015 Edexcel Physics specification.

The document gives an overview, at the topic level, of where the material covered in the existing OCR Physics B 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 OCR 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

OCR B "Advancing Physics" (2008)	Edexcel Physics (2015)
AS Unit G491: *Physics in Action* – Module 1: **Communication** PA 1.1 Imaging & signalling	**Topic 5: Waves and particle nature of light** Spec ref(s): 60, 71, 75, 76, 77, 79, 80, 81 and 82
AS Unit G491: *Physics in Action* – Module 1: **Communication** PA 1.2 Sensing	**Topic 3: Electric circuits** Spec ref(s): 31, 32, 33, 36, 37, 38, 43, 44 and 45
AS Unit G491: *Physics in Action* – Module 2: **Designer materials**	**Topic 4: Materials** Spec ref(s): 54, 55, 56 and 57
AS Unit G492: *Understanding Processes, Experimentation and Data Handling* – Module 1: **Waves & Quantum Behaviour**	**Topic 5: Waves and particle nature of light** Spec ref(s): 65, 67, 83, 84, 86, and 91
AS Unit G492: *Understanding Processes, Experimentation and Data Handling* – Module 2: **Space, Time & Motion**	**Topic 2: Mechanics** Spec ref(s): 9, 10, 11, 12, 13, 14, 15, 17, 25, 26, 27 and 29
A2 Unit G494: *Rise and Fall of the Clockwork Universe* – Module 1: **Models & rules** RF 1.1 Creating models	**Topic 7: Electric and magnetic fields** Spec ref(s): 116, 117, 118 and 120 **Topic 11: Nuclear radiation** Spec ref(s): 173 **Topic 13: Oscillations** Spec ref(s): 181, 182, 183, 184, 185, 186, 188, 189, and 190
A2 Unit G494: *Rise and Fall of the Clockwork Universe* – Module 1: **Models & rules** RF 1.2 Out into space	**Topic 2: Mechanics** Spec ref(s): 20, 21, 22 and 27 **Topic 6: Further mechanics** Spec ref(s): 99, 105 and 107 **Topic 12: Gravitational fields** Spec ref(s): 175, 176, 177 and 178
A2 Unit G494: *Rise and Fall of the Clockwork Universe* – Module 1: **Models & rules** RF 1.3 Our place in the universe	**Topic 10: Space** Spec ref(s): 157 and 162
A2 Unit G494: *Rise and Fall of the Clockwork Universe* – Module 2: **Matter in extremes** RF 2.1 Matter: very simple	**Topic 9: Thermodynamics** Spec ref(s): 144, 147, 148, 149 and 150
A2 Unit G494: *Rise and Fall of the Clockwork Universe* – Module 2: **Matter in extremes** RF 2.2 Matter: hot or cold	N/A
A2 Unit G495: *Field & Particle Pictures* – Module 1: **Fields** FP 1.1 Electromagnetic machines	**Topic 7: Electric and magnetic fields** Spec ref(s): 121, 122, 123, 124, 125 and 127
A2 Unit G495: *Field & Particle Pictures* – Module 1: **Fields** FP 1.2 Charge & field	**Topic 7: Electric and magnetic fields** Spec ref(s): 108, 109, 110, 111, 112, 113, 114 and 115
A2 Unit G495: *Field & Particle Pictures* – Module 2: **Fundamental Particles** FP 2.1 Probing deep into matter	**Topic 5: Waves and particle nature of light** Spec ref(s): 96 **Topic 7: Electric and magnetic fields** Spec ref(s): 122 **Topic 8: Nuclear and particle physics** Spec ref(s): 130, 131, 133, 135, 137, 139 and 140
A2 Unit G495: *Field & Particle Pictures* – Module 2: **Fundamental Particles** FP 2.2 Ionising radiation & risk	**Topic 11: Nuclear radiation** Spec ref(s): 164, 166, 167, 168, 172 and 173

In-depth comparison

Edexcel Physics (2015)	OCR B (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 G492: *Understanding Processes, Experimentation and Data Handling* – Module 2: **Space, Time & Motion** A2 Unit G494: *Rise and Fall of the Clockwork Universe* – Module 1: **Models & rules** RF 1.2 Out into space	23. moment of a force 24. centre of gravity 30. energy efficiency	AS Unit G492: *Understanding Processes, Experimentation and Data Handling* – Module 2: **Space, Time & Motion** 3 (vii) power = Fv
Topic 3: Electric circuits	AS Unit G491: *Physics in Action* – Module 1: **Communication** PA 1.2 Sensing AS Unit G491: *Physics in Action* – Module 2: **Designer materials**	34. current and conservation of charge 35. pd and conservation of energy 41. use I = nqvA, large range of resistivities of different materials 42. how pd along a uniform current carrying wire with distance along it 47. thermistors 48. LDRs	AS Unit G491: *Physics in Action* – Module 1: **Communication** PA 1.2 Sensing 1 (iii) & 2 (i) conductance AS Unit G491: *Physics in Action* – Module 2: **Designer materials** 1 (ii) simple electrical behaviour (metals, semiconductors and insulators). Mobile charge carriers 3 (i) conductance, G = ▽A/l
Topic 4: Materials	AS Unit G491: *Physics in Action* – Module 2: **Designer materials**	49. density, p = m/V 50. upthrust = weight of fluid displaced 51. Stokes's law, F=6π↑rv 58. elastic strain energy, ΔE_{el} = ½ FΔx	AS Unit G491: *Physics in Action* – Module 2: **Designer materials** 1 (iv) structure of classes of materials; ceramics, polymers, composites 2 (v) images showing structures of materials

Topic 5: Waves and particle nature of light	AS Unit G491: *Physics in Action* – Module 1: **Communication** PA 1.1 Imaging & signalling AS Unit G492: *Understanding Processes, Experimentation and Data Handling* – Module 1: **Waves & Quantum Behaviour**	68. speed of a transverse wave on a string $v = \nearrow T/u$ 70. Intensity, $I = P/A$ 71. refraction $n_1 \sin\theta_1 = n_2 \sin\theta_2$ 72. critical angle $\sin C = 1/n$ 73. total internal reflection 74. refractive index 78. thin lenses in combination $P = P_1 + P_2 + P_3 + \ldots$ 87. de Broglie equation, $\lambda = h/p$ 89. pulse-echo techniques 90. e.m. radiation; wave model and photon model 92. photoelectron 93. $hf = \varphi + \frac{1}{2} mv^2_{max}$ 94. eV 95. photoelectric effect, evidence for the particle nature of light	AS Unit G491: *Physics in Action* – Module 1: **Communication** PA 1.1 Imaging & signalling 1 (ii) storage of images in a computer as an array of numbers etc 1 (iii) digitising a signal 2 (i) pixel, bit, byte etc 3 (v) $I = \log_2 N$ 3 (vi) rate of trans of digital information = samples per sec x bits per sample 3 (vii) max bits per sample $b = \log_2(V_{total}/V_{noise})$ AS Unit G492: *Understanding Processes, Experimentation and Data Handling* – Module 1: **Waves & Quantum Behaviour** 1 (iii) measurement of speed of light, difficulties in terms of measurement 1 (vii) quanta have a certain probability of arrival
Topic 6: Further mechanics	A2 Unit G494: *Rise and Fall of the Clockwork Universe* – Module 1: **Models & rules** RF 1.2 Out into space	97. impulse, $F\Delta t = \Delta p$ 101. elastic and inelastic collisions 102. kinetic energy of a non-relativistic particle $E_k = p^2/2m$ 103. express angular displacement in radians and degrees 104. understand angular velocity and use the equations $v = \omega r$ and $T = 2\pi/\omega$ 106. centripetal force	N/A

Topic 7: Electric and magnetic fields	A2 Unit G494: *Rise and Fall of the Clockwork Universe* – Module 1: **Models & rules** RF 1.1 Creating models A2 Unit G495: *Field & Particle Pictures* – Module 1: **Fields** FP 1.1 Electromagnetic machines A2 Unit G495: *Field & Particle Pictures* – Module 1: **Fields** FP 1.2 Charge & field A2 Unit G495: *Field & Particle Pictures* – Module 2: **Fundamental Particles** FP 2.1 Probing deep into matter	128. frequency, period, peak value and root mean square value – alternating currents and pd 129. $V_{rms} = \frac{V_0}{\nearrow 2}$ $I_{rms} = \frac{I_0}{\nearrow 2}$	A2 Unit G495: *Field & Particle Pictures* – Module 1: **Fields** FP 1.1 Electromagnetic machines 1 (ii) motor 1 (v) simple linked electric and magnetic circuits 2 (i) eddy currents 2 (ii) graphs of variations of currents, flux and induced emf 3 (i) $\frac{V_1}{V_2} = \frac{N_1}{N_2}$ *ideal transformer* $\frac{I_1}{I_2} = \frac{N_1}{N_2}$ *ideal transformer*
Topic 8: Nuclear and particle physics	A2 Unit G495: *Field & Particle Pictures* – Module 2: **Fundamental Particles** FP 2.1 Probing deep into matter	132. thermionic emission 134. charged particle in a magnetic field, r = P/BQ 136. high energies needed to investigate the structure of nucleons 138. MeV, GeV etc 141. particles and antiparticles 142. laws of conservation; baryon number, lepton number etc	N/A
Topic 9: Thermodynamics	A2 Unit G494: *Rise and Fall of the Clockwork Universe* – Module 2: **Matter in extremes** RF 2.1 matter: very simple	152. derive and use ½ m < c^2 > 3/2 kT 153. black body radiator 154. Stefan-Boltzmann law L= ∇AT^4	A2 Unit G494: *Rise and Fall of the Clockwork Universe* – Module 2: **Matter in extremes** RF 2.1 matter: very simple 1 (i) energy transfer producing a change in temperature

		155. Wien's law λ_{max} T = 2.90 x 10^{-3} mK	1 (v) random walk of molecules in a gas: distance gone in N steps related to↗N 2 (ii) by sketching and interpreting; relationships between p, V, N and T for an ideal gas
Topic 10: Space	A2 Unit G494: *Rise and Fall of the Clockwork Universe* – Module 1: **Models & rules** RF 1.3 Our place in the universe	156. $I = \frac{L}{4\pi d^2}$ 157. trigonometric parallax 158. astronomical distances, standard candles etc 159. sketch a simple Hertzsprung-Russell diagram 160. Hertzsprung-Russell diagram and life cycle of stars 163. age and fate of the universe and dark matter	A2 Unit G494: *Rise and Fall of the Clockwork Universe* – Module 1: **Models & rules** RF 1.3 Our place in the universe 1 (i) use of radar type measurements to determine distances within the solar system 1 (ii) effect of relativistic time dilation using relativistic factor $\gamma = \frac{1}{\nearrow 1-v^2/c^2}$ 1 (iii) measurement of relative velocities by radar observation 1 (iv) cosmological microwave background 2 (i) logarithmic scales of magnitudes of quantities: distance, size, mass, energy, power, brightness 3 (ii) distances and relative velocities from radar type measurements
Topic 11: Nuclear radiation	A2 Unit G494: *Rise and Fall of the Clockwork Universe* – Module 1: **Models & rules** RF 1.1 Creating models	165. atomic mass unit, u 170. nuclear equations	A2 Unit G495: *Field & Particle Pictures* – Module 2: **Fundamental Particles** FP 2.2 Ionising radiation & risk 3 (ii) absorbed dose in Gray = energy deposited per unit mass

	A2 Unit G495: *Field & Particle Pictures* – Module 2: **Fundamental Particles** FP 2.2 Ionising radiation & risk		3 (iii) effective dose in Sievert = absorbed dose in Gray x quality factor
Topic 12: Gravitational fields	A2 Unit G494: *Rise and Fall of the Clockwork Universe* – Module 1: **Models & rules** RF 1.2 Out into space	N/A	A2 Unit G494: *Rise and Fall of the Clockwork Universe* – Module 1: **Models & rules** RF 1.2 Out into space 2 (i) force, kinetic and potential energy, momentum, gravitational field, gravitational potential, equipotential surface 2 (ii) graphs showing gravitational potential as area under a gravitational field versus distance graph 2 (iii) graphs showing force as related to the tangent of a graph of gravitational potential energy versus distance 2 (iv) diagrams of gravitational fields and the corresponding equipotential surfaces 3 (ii) no work is done when the force is perpendicular to the velocity
Topic 13: Oscillations	A2 Unit G494: *Rise and Fall of the Clockwork Universe* – Module 1: **Models & rules** RF 1.1 Creating models	N/A	N/A