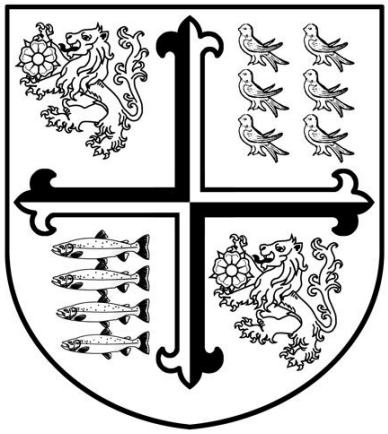

A Level Physics Exam Preparation

Exam Board: Pearson Edexcel

Specification: 9PH0

Specification - A level

Contact details:

Miss T Hunt – thunt@bournemouth-school.org

Curriculum Map – Physics (Teacher A / Year 13)

Topic 8: Nuclear and Particle Physics

Mathematical skills developed in topic 8;

- using appropriate units in calculations

Topic 8-1: Nuclear and Particle Physics

Assessments during topic 8-1

- 8-1 Multiple choice test (MCQ). Length 15-mark / 20 min. Type of questions: Multiple choice questions. Content: This test covers chapter 25. Earliest assessment date: Third week of September

Spec	You should:
	Chapter 25: Particle Physics
139	understand situations in which the relativistic increase in particle lifetime is significant (use of relativistic equations not required)
140	know that in the standard quark-lepton model particles can be classified as: • baryons (e.g. neutrons and protons) which are made from three quarks • mesons (e.g. pions) which are made from a quark and an antiquark • leptons (e.g. electrons and neutrinos) which are fundamental particles • photons and that the symmetry of the model predicted the top quark
141	know that every particle has a corresponding antiparticle and be able to use the properties of a particle to deduce the properties of its antiparticle and vice versa
142	understand how to use laws of conservation of charge, baryon number and lepton number to determine whether a particle interaction is possible
143	be able to write and interpret particle equations given the relevant particle symbols.

Topic 8-2: Nuclear and Particle Physics

Assessments during topic 8-2

- Test 8-2. Length: 40-mark / 45 min. Type of questions: short/long answer past exam qu. Content: specification points within chapters 24 + 25. Expected assessment date: Two weeks before October half-term

	Chapter 24: Electrons and Nuclei
130	understand what is meant by nucleon number (mass number) and proton number (atomic number)
131	understand how large-angle alpha particle scattering gives evidence for a nuclear model of the atom and how our understanding of atomic structure has changed over time
132	understand that electrons are released in the process of thermionic emission and how they can be accelerated by electric and magnetic fields
133	understand the role of electric and magnetic fields in particle accelerators (linac and cyclotron) and detectors (general principles of ionisation and deflection only)
134	be able to derive and use the equation $r = \frac{p}{BQ}$ for 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 $\Delta E = c^2 \Delta m$ in situations involving the creation and annihilation of matter and antimatter particles
138	be able to use MeV and GeV (energy) and MeV/c2, GeV/c2 (mass) and convert between these and SI units

Topic 12: Gravitational Fields

Mathematical skills developed in topic 12;

- sketching relationships which are modelled by y = k/x, and y = k/x2

Assessments during topic 12

- Teacher assessed task on gravitational fields
- Test 12. Length: 40-mark / 45 min. Type of questions: short/long answer past exam qu. Content: specification points within chapter 12. Expected assessment date: Mid-November

Spec	You should:
	Chapter 20: Gravitational Fields
174	understand that a gravitational field (force field) is defined as a region where a mass experiences a force
175	understand that gravitational field strength is defined as g = F/m and be able to use this equation
176	be able to use the equation $F = \frac{Gm_1m_2}{r^2}$ (Newton's law of universal gravitation)
177	be able to derive and use the equation g= $\frac{Gm}{r^2}$ for the gravitational field due to a point mass
178	be able to use the equation $V = -\frac{Gm}{r}$ for a radial gravitational field
179	be able to compare electric fields with gravitational fields (done at end of electric fields)
180	be able to apply Newton's laws of motion and universal gravitation to orbital motion.

Topic 11: Nuclear Radiation

Mathematical skills developed in topic 11;

- applying the concepts underlying calculus (but without requiring the explicit use of derivatives or integrals) by solving equations involving rates of change, for example. $\Delta x / \Delta t = -\lambda x$
- using a graphical method or spreadsheet modelling and understanding probability in the context of radioactive decay.

Assessments during topic 11

- Core practical 15: Investigate the absorption of gamma rays by lead
- 11 Multiple choice test (MCQ). Length 15-mark / 20 min. Type of questions: Multiple choice questions. Content: This test covers chapter 26. Expected assessment date: Third week of January

Spec	You should:
	Chapter 26: Nuclear Decay
164	understand the concept of nuclear binding energy and be able to use the equation $\Delta E = c^2 \Delta m$ in calculations of nuclear mass (including mass deficit) and energy
165	use the atomic mass unit (u) to express small masses and convert between this and SI units
166	understand the processes of nuclear fusion and fission with reference to the binding energy per nucleon curve
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
168	understand that there is background radiation and how to take appropriate account of it in calculations
169	understand the relationships between the nature, penetration, ionising ability and range in different materials of nuclear radiations (alpha, beta and gamma)
170	be able to write and interpret nuclear equations given the relevant particle symbols
171	**CORE PRACTICAL 15: Investigate the absorption of gamma radiation by lead.**
172	understand the spontaneous and random nature of nuclear decay

173	be able to determine the half-lives of radioactive isotopes graphically and be able to use the equations for radioactive decay: activity $A = \lambda N$, $\frac{dN}{dt} = -\lambda N$, $\lambda = \frac{ln2}{T_{1/2}}$, $N = N_0 e^{-\lambda t}$ and $A = A_0 e^{-\lambda t}$ and derive and use the corresponding log equations.

Mock Exam 1
This will take place during the teaching of topic 11 Content assessed: Paper 1 content and associated paper 3 questions Topics in paper 1: 1, 2, 3, 6, 7 and 8 Assessment date: After the Christmas holiday, during year 13 mock exam period

Topic 13: Oscillations

Mathematical skills developed in topic 13;

- Sketching relationships that are modelled by y = sin x, y = cos x.

Assessments during topic 11

- Core practical 16: Determine the value of an unknown mass using the resonant frequencies of known masses on a spring
- Teacher assessed task on oscillations

Spec	You should:
	Chapter 32: Oscillations
181	understand that the condition for simple harmonic motion is F = − kx, and hence understand how to identify situations in which simple harmonic motion will occur
182	be able to use the equations $a = -\omega^2 x$, $x = A\cos(\omega t)$, $v = -A\omega \sin(\omega t)$, $a = -A\omega^2 \cos(\omega t)$, and $T = \frac{2\pi}{f} = \frac{2\pi}{\omega}$ and $\omega = 2\pi f$ as applied to a simple harmonic oscillator
183	be able to use equations for a simple harmonic oscillator $T = 2\pi\sqrt{\frac{m}{k}}$, and a simple pendulum $T = 2\pi\pi\sqrt{\frac{l}{g}}$
184	be able to draw and interpret a displacement–time graph for an object oscillating and know that the gradient at a point gives the velocity at that point
185	be able to draw and interpret a velocity–time graph for an oscillating object and know that the gradient at a point gives the acceleration at that point
186	understand what is meant by resonance
187	**CORE PRACTICAL 16: Determine the value of an unknown mass using the resonant frequencies of the oscillation of known masses.**
188	understand how to apply conservation of energy to damped and undamped oscillating systems
189	understand the distinction between free and forced oscillations
190	understand how the amplitude of a forced oscillation changes at and around the natural frequency of a system and know, qualitatively, how damping affects resonance
191	understand how damping and the plastic deformation of ductile materials reduce the amplitude of oscillation.

Mock Exam 2
Content assessed: Paper 2 content and associated paper 3 questions Topics in paper 2: 1, 4, 5, 9, 10, 11, 12 and 13 Assessment date: Two weeks before Easter holiday, during year 13 mock exam period

Curriculum Map – Physics (Teacher B / Year 13)

Topic 9: Thermodynamics

Mathematical skills developed in topic 9;
substituting numerical values into algebraic equations
using appropriate units for physical quantities.

Topic 9-2: Thermodynamics

Assessments during topic 9-2

- CORE PRACTICAL 14: Investigate the relationship between pressure and volume of a gas at fixed temperature
- Test 9-2. Length: 40-mark / 45 min. Type of questions: short/long answer past exam qu. Content: specification points within chapters 27-29. Earliest assessment date: Last week of September

Spec	You should:
	Chapter 29: Gas laws and Kinetic Energy
149	be able to derive and use the equation pV=(1/3)Nm<c^2> using the kinetic theory model
150	be able to use the equation pV = NkT for an ideal gas
151	CORE PRACTICAL 14: Investigate the relationship between pressure and volume of a gas at fixed temperature.
152	be able to derive and use the equation 1/2m<c^2>=3/2kT

Topic 7: Electric and Magnetic Fields

Mathematical skills developed in topic 7;

- sketching relationships which are modelled by y = k/x, and y = k/x2
- using logarithmic plots to test exponential and power law variations
- interpreting logarithmic plots and sketching relationships that are modelled by y = e-x

Topic 7-1: Electric and Magnetic Fields

Assessments during topic 7-1

- Teacher assessed task on electric fields
- 7-1 Multiple choice test (MCQ). Length 15-mark / 20 min. Type of questions: Multiple choice questions. Content: This test covers chapter 26. Earliest assessment date: Last week before October half-term

Spec	You should:
	Chapter 21: Electric Fields
108	understand that an electric field (force field) is defined as a region where a charged particle experiences a force
109	understand that electric field strength is defined as E = F /Q and be able to use this equation
110	be able to use the equation $F = \frac{Qq}{4\pi\varepsilon_0 r^2}$, for the force between two charges
111	be able to use the equation $E = \frac{Q}{4\pi\varepsilon_0 r^2}$ for the electric field due to a point charge
112	know and understand the relation between electric field and electric potential
113	be able to use the equation E =V/d for an electric field between parallel plates
114	be able to use $V = \frac{Q}{4\pi\varepsilon_0 r}$ for a radial field
115	be able to draw and interpret diagrams using field lines and equipotentials to describe radial and uniform electric fields

Topic 7-2: Electric and Magnetic Fields	
Assessments during topic 7-2 • CORE PRACTICAL 11: Display and analyse the potential difference across a capacitor as it discharges through a resistor • Test 7-2. Length: 40-mark / 45 min. Type of questions: short/long answer past exam qu. Content: specification points within chapters 21 + 22. Earliest assessment date: Mid-November	
Chapter 22: Capacitance	
116	understand that capacitance is defined as C=Q/V and be able to use this equation
117	be able to use the equation $W = \frac{1}{2}QV$ for the energy stored by a capacitor, be able to derive the equation from the area under a graph of potential difference against charge stored and be able to derive and use the equations $W = \frac{1}{2}CV^2$ and $W = \frac{\frac{1}{2}Q^2}{C}$
118	be able to draw and interpret charge and discharge curves for resistor capacitor circuits and understand the significance of the time constant RC
119	CORE PRACTICAL 11: 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.
120	be able to use the equation $Q = Q_0 e^{-\frac{t}{RC}}$ and derive and use related equations for exponential discharge in a resistor-capacitor circuit, V= $V_0 e^{-\frac{t}{RC}}$, and I= $I_0 e^{-\frac{t}{RC}}$ and the corresponding log equations

Topic 7-3: Electric and Magnetic Fields	
Assessments during topic 7-3 • Teacher assessed task on magnetic fields	
Chapter 23: Magnetic Fields	
121	understand and use the terms magnetic flux density B, flux ϕ and flux linkage Nϕ
122	be able to use the equation $F = Bqv\sin\theta$ and apply Fleming's left-hand rule to charged particles moving in a magnetic field
123	be able to use the equation $F = BIl\sin\theta$ and apply Fleming's left-hand rule to current carrying conductors in a magnetic field
124	understand the factors affecting the e.m.f. induced in a coil when there is relative motion between the coil and a permanent magnet
125	understand the factors affecting the e.m.f. induced in a coil when there is a change of current in another coil linked with this coil
126	understand how to use Lenz's law to predict the direction of an induced e.m.f., and how the prediction relates to energy conservation
127	understand how to use Faraday's law to determine the magnitude of an induced e.m.f. and be able to use the equation that combines Faraday's and Lenz's laws $\varepsilon = -\frac{d(N\phi)}{dt}$
128	understand what is meant by the terms frequency, period, peak value and root-mean-square value when applied to alternating currents and potential differences
129	be able to use the equations $V_{rms} = \frac{V_0}{\sqrt{2}}$ $I_{rms} = \frac{I_0}{\sqrt{2}}$

Mock Exam 1
Content assessed: Paper 1 content and associated paper 3 questions Topics in paper 1: 1, 2, 3, 6, 7 (not 7-3) and 8 Assessment date: After the Christmas holiday, during the year 13 mock assessment period

Topic 10: Space

Mathematical skills developed in topic 10;

- Using approximations
- sketching relationships which are modelled by $y = k/x^2$

Topic 10-1: Space

Assessments during topic 10-1

- Teacher assessed task on astrophysics
- 10-1 Multiple choice test (MCQ). Length 15-mark / 20 min. Type of questions: Multiple choice questions. Content: This test covers chapter 30. Earliest assessment date: Last week before February half-term

Spec	You should:
	Chapter 30: Astrophysics
153	understand what is meant by a black body radiator and be able to interpret radiation curves for such a radiator
154	be able to use the Stefan-Boltzmann law equation $L = \sigma A T^4$ for black body radiators
155	be able to use Wien's law equation λ_{max}T = 2.898 x 10-3 m K for black body radiators.
156	be able to use the equation, intensity I = L/(4πd^2) where L is luminosity and d is distance from the source
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 (objects of known luminosity)
159	be able to sketch and interpret a simple Hertzsprung-Russell diagram that relates stellar luminosity to surface temperature
160	understand how to relate the Hertzsprung-Russell diagram to the life cycle of stars

Topic 10-2: Space

Chapter 31: Cosmology

Assessment during topic 10-2

- Teacher assessed task on astrophysics

161	understand how the movement of a source of waves relative to an observer/detector gives rise to a shift in frequency (Doppler effect)
162	be able to use the equations for redshift z = Δλ/λ ≈ Δf/f ≈ v/c for a source of electromagnetic radiation moving relative to an observer and v = H_0d for objects at cosmological distances
163	understand the controversy over the age and ultimate fate of the universe associated with the value of the Hubble constant and the possible existence of dark matter.

Mock Exam 2

Content assessed: Paper 2 content and associated paper 3 questions
Topics in paper 1: 1, 4, 5, 9, 10, 11, 12, 13
Assessment date: Two weeks before Easter holiday, during the year 13 mock assessment period