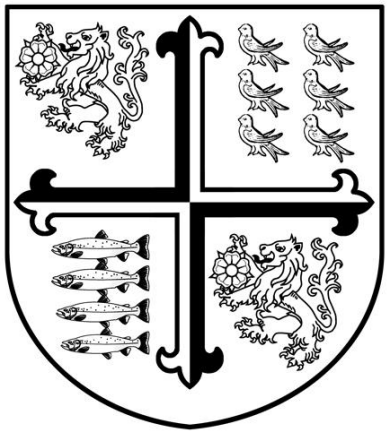

A Level Physics Exam Preparation

Exam Board: Pearson Edexcel

Specification: 9PH0

Specification - A level

Contact details:

Miss T Hunt – thunt@bournemouth-school.org

Curriculum Map – Physics (Teacher A / Year 12)

Topic 2: Mechanics

Mathematical skills developed in topic 2:

- plotting two variables from experimental data
- calculating rate of change from a graph showing a linear relationship
- drawing and using the slope of a tangent to a curve as a measure of rate of change
- distinguishing between instantaneous rate of change and average rate of change
- identifying uncertainties in measurements
- using simple techniques to determine uncertainty when data are combined
- using angles in regular 2D and 3D structures with force diagrams and using sin, cos and tan in physical problems.

Topic 2-1: Mechanics

Assessments during topic 2-1

- Introduction test. Content: This test covers GCSE level forces content and content from the first few weeks of A level. Assessment date: Last week of September
- 2-1 Multiple choice test (MCQ). Length 15-mark / 20 min. Type of questions: Multiple choice questions. Content: This test covers chapter 3. Earliest assessment date: Last week before October half-term

Spec	You should;
	Chapter 3: Rectilinear Motion
9	be able to use the equations for uniformly accelerated motion in one dimension: $v^2=u^2+2as$ $s=ut+1/2at^2$ $v=u+at$ $s=[(u+v)/2]t$
10	be able to draw and interpret displacement-time, velocity-time and acceleration-time graphs
11	know the physical quantities derived from the slopes and areas of displacement-time, velocity-time and acceleration-time graphs, including cases of non-uniform acceleration and understand how to use the quantities
15	understand how to make use of the independence of vertical and horizontal motion of a projectile moving freely under gravity

Topic 2-2: Mechanics

Assessments during topic 2-2

- Teacher assessed task
- CORE PRACTICAL 1: Determine the acceleration of a freely-falling object
- Test 2-2. Length: 40-mark / 45 min. Type of questions: short/long answer past exam qu. Content: specification points within chapter 3-5 (up to spec point 19). Earliest assessment date: Mid-November

	Chapter 4: Momentum
21	understand that momentum is defined as p = mv
22	know the principle of conservation of linear momentum, understand how to relate this to Newton's laws of motion and understand how to apply this to problems in one dimension
	Chapter 5: Forces
12	understand scalar and vector quantities and know examples of each type of quantity and recognise vector notation
13	be able to resolve a vector into two components at right angles to each other by drawing and by calculation
14	be able to find the resultant of two coplanar vectors at any angle to each other by drawing, and at right angles to each other by calculation

16	be able to draw and interpret free-body force diagrams to represent forces on a particle or on an extended but rigid body
17	be able to use the equation ΣF = ma, and understand how to use this equation in situations where m is constant (Newton's second law of motion), including Newton's first law of motion where a = 0, objects at rest or travelling at constant velocity. Use of the term terminal velocity is expected
18	be able to use the equations for gravitational field strength W=mg and g=F/m
19	CORE PRACTICAL 1: Determine the acceleration of a freely-falling object.

Topic 2-3: Mechanics	
<u>Assessments during topic 2-3</u> • 2-3 Multiple choice test (MCQ). Length 15-mark / 20 min. Type of questions: Multiple choice questions. Content: This test covers chapters 3-5. Earliest assessment date: First week of December	
20	know and understand Newton's third law of motion and know the properties of pairs of forces in an interaction between two bodies
23	be able to use the equation for the moment of a force, moment of force = Fx where x is the perpendicular distance between the line of action of the force and the axis of rotation
24	be able to use the concept of centre of gravity of an extended body and apply the principle of moments to an extended body in equilibrium

Topic 2-4: Mechanics	
<u>Assessments during topic 2-4</u> • Test 2-4. Length: 40-mark / 45 min. Type of questions: short/long answer past exam qu. Content: specification points within chapter 3-5 (up to spec point 19). Earliest assessment date: First week after the Christmas holiday	
Chapter 6: Work, Energy and Power	
25	be able to use the equation for work ΔW = FΔs, including calculations when the force is not along the line of motion
26	be able to use the equation $E=1/2mv^2$ for the kinetic energy of a body
27	be able to use the equation ΔEgrav = mgΔh for the difference in gravitational potential energy near the Earth's surface
28	know, and understand how to apply, the principle of conservation of energy including use of work done, gravitational potential energy and kinetic energy
29	be able to use the equations relating power, time and energy transferred or work done; P=E/t and P=W/t
30	be able to use the equations: efficiency = useful energy output/total energy input efficiency = useful power output/ total power input

Topic 5: Waves and the particle nature of light

Mathematical skills developed in topic 5:

- using calculators to handle sin x
- identifying uncertainties in measurements
- using simple techniques to determine uncertainty when data are combined.

Topic 5-1: Waves and the particle nature of light

Assessments during topic 5-1

- CORE PRACTICAL 6: Determine the speed of sound in air using a 2-beam oscilloscope, signal generator, speaker and microphone
- Test 5-1. Length: 40-mark / 45 min. Type of questions: short/long answer past exam qu. Content: specification points within chapter 14 + 15 (up to spec point 74). Earliest assessment date: Second week after spring half-term

Spec	Students should:
	Chapter 14: Types of Waves
59	understand the terms *amplitude, frequency, period, speed* and *wavelength*
60	be able to use the wave equation $v = f\lambda$
61	be able to describe longitudinal waves in terms of pressure variation and the displacement of molecules
62	be able to describe transverse waves
63	be able to draw and interpret graphs representing transverse and longitudinal waves (...)
65	Know and understand what is meant by phase (...)
	Chapter 15: Transmission and Reflection of Waves
64	CORE PRACTICAL 6: Determine the speed of sound in air using a 2-beam oscilloscope, signal generator, speaker and microphone.
68	be able to use the equation for the speed of a transverse wave on a string $v=\sqrt{(T/\mu)}$
71	know and understand that at the interface between medium 1 and medium 2; $n1\sin\theta1 = n2\sin\theta2$ where refractive index is $n = c/v$
72	be able to calculate *critical angle* using $\sin C = 1/n$
73	be able to predict whether total internal reflection will occur at an interface
74	understand how to measure the refractive index of a solid material

Topic 5-2: Waves and the particle nature of light

Assessments during topic 5-2

- Teacher assessed task
- 5-2 Multiple choice test (MCQ). Length 15-mark / 20 min. Type of questions: Multiple choice questions. Content: This test covers chapter 14 + 15. Earliest assessment date: Week before the Easter Holiday

75	understand the term *focal length* of converging and diverging lenses
76	be able to use ray diagrams to trace the path of light through a lens and locate the position of an image
77	be able to use the equation power of a lens $P = 1/f$
78	understand that for thin lenses in combination $P = P1+P2+P3+...$
79	know and understand the terms *real image* and *virtual image*
80	be able to use the equation $(1/u)+(1/v) = (1/f)$ for a thin converging or diverging lens with the real is positive convention
81	know and understand that magnification = image height/object height and $m = v/u$
82	Understand what is meant by *plane polarisation*
88	understand that waves can be transmitted and reflected at an interface between media

89	understand how a pulse-echo technique can provide information about the position of an object and how the amount of information obtained may be limited by the wavelength of the radiation or by the duration of pulses

Year 12 Exam
Content: Topics 2-4 and associated core practical questions Assessment date: After the Easter holiday

Topic 5-3: Waves and the particle nature of light	
Assessments during topic 5-3 • CORE PRACTICAL 7: Investigate the effects of length, tension and mass per unit length on the frequency of a vibrating string or wire • CORE PRACTICAL 8: Determine the wavelength of light from a laser or other light source using a diffraction grating • 5-3 Multiple choice test (MCQ). Length 15-mark / 20 min. Type of questions: Multiple choice questions. Content: This test covers chapter 14 - 16. Earliest assessment date: Last week before summer half-term	
Chapter 16: Superposition of Waves	
63	be able to draw and interpret graphs representing transverse and longitudinal waves including standing/stationary waves
65	know and understand what is meant by *wavefront, coherence, path difference, superposition, interference* and *phase*
66	be able to use the relationship between *phase difference* and *path difference*
67	know what is meant by a *standing/stationary wave* and understand how such a wave is formed, know how to identify nodes and antinodes
69	CORE PRACTICAL 7: Investigate the effects of length, tension and mass per unit length on the frequency of a vibrating string or wire.
83	understand what is meant by *diffraction* and use Huygens' construction to explain what happens to a wave when it meets a slit or an obstacle
84	be able to use $n\lambda = d\sin\theta$ for a diffraction grating
85	CORE PRACTICAL 8: Determine the wavelength of light from a laser or other light source using a diffraction grating.

Topic 5-4: Waves and the particle nature of light	
Assessments during topic 5-4 • Test 5-4. Length: 40-mark / 45 min. Type of questions: short/long answer past exam qu. Content: specification points within topic 5. Earliest assessment date: First week of July	
Chapter 17: Particle Nature of Light	
70	be able to use the equation intensity of radiation $I = P/A$
86	understand how diffraction experiments provide evidence for the wave nature of electrons
87	be able to use the de Broglie equation $\lambda = h/p$
90	understand how the behaviour of electromagnetic radiation can be described in terms of a wave model and a photon model, and how these models developed over time
91	be able to use the equation $E = hf$, that relates the photon energy to the wave frequency
92	understand that the absorption of a photon can result in the emission of a photoelectron
93	understand the terms threshold frequency and work function and be able to use the equation $hf = +1/2mv^2(max)$
94	be able to use the electronvolt (eV) to express small energies

95	understand how the photoelectric effect provides evidence for the particle nature of electromagnetic radiation
96	understand atomic line spectra in terms of transitions between discrete energy levels and understand how to calculate the frequency of radiation that could be emitted or absorbed in a transition between energy levels.

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 B / Year 12)

Topic 3: Electric Circuits

Mathematical skills developed in topic 3:

- substituting numerical values into algebraic equations using appropriate units for physical quantities
- applying the equation y = mx + c to experimental data.

Topic 3-1: Electric Circuits

Assessments during topic 3-1

- Introduction test. Content: This test covers GCSE level electricity content, content from first few weeks of A level and uncertainties. Assessment date: Last week of September
- Teacher assessed task
- 3-1 Multiple choice test (MCQ). Length 15-mark / 20 min. Type of questions: Multiple choice questions. Content: This test covers chapters 7-9. Earliest assessment date: Two weeks before October half-term

Spec	You should:
	Chapter 7: Charge and Current
31	understand that electric current is the rate of flow of charged particles and be able to use the equation; $I=\Delta Q/\Delta t$
34	understand how the distribution of current in a circuit is a consequence of charge conservation
41	be able to use $I = nqvA$ to explain the large range of resistivities of different materials
	Chapter 8: Potential Difference, EMF and Power
32	understand how to use the equation; $V=W/Q$
37	be able to use the equations $P = VI$, $W = VIt$ and be able to derive and use related equations, e.g. $P=I^2R$ and $P=V^2/R$ (continued in chapter 10)
	Chapter 9: Current-Potential Difference Relationships
33	understand that resistance is defined by $R=V/I$ and that Ohm's law is a special case when $I \propto V$ for constant temperature
38	understand how to sketch, recognise and interpret current-potential difference graphs for components, including ohmic conductors, filament bulbs, thermistors and diodes

Topic 3-2: Electric Circuits

Assessments during topic 3-2

- Core practical 2: Determine the electrical resistivity of a material
- Core practical 3: Determine the e.m.f. and internal resistance of an electrical cell
- Test 3-2. Length: 40-mark / 45 min. Type of questions: short/long answer past exam qu. Content: specification points within chapter 7-11. Earliest assessment date: Last week of November

	Chapter 10: Resistance and Resistivity
37	be able to use the equations $P = VI$, $W = VIt$ and be able to derive and use related equations, e.g. $P=I^2R$ and $P=V^2/R$ (continued in chapter 10)
39	be able to use the equation; $R=\rho L/A$
40	CORE PRACTICAL 2: Determine the electrical resistivity of a material.
42	understand how the potential along a uniform current-carrying wire varies with the distance along it
47	understand how changes of resistance with temperature may be modelled in terms of lattice vibrations and number of conduction electrons and understand how to apply this model to metallic conductors and negative temperature coefficient thermistors

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.
Chapter 11: Internal resistance, series and parallel circuits, and the potential divider	
35	understand how the distribution of potential differences in a circuit is a consequence of energy conservation
36	be able to derive the equations for combining resistances in series and parallel using the principles of charge and energy conservation, and be able to use these equations
43	understand the principles of a potential divider circuit and understand how to calculate potential differences and resistances in such a circuit
44	be able to analyse potential divider circuits where one resistance is variable including thermistors and light dependent resistors (LDRs)
45	know the definition of *electromotive force (e.m.f.)* and understand what is meant by *internal resistance* and know how to distinguish between e.m.f. and *terminal potential difference*
46	CORE PRACTICAL 3: Determine the e.m.f. and internal resistance of an electrical cell.

Topic 4: Materials

Mathematical skills developed in topic 4:

- determining the slope of a linear graph
- calculating or estimating, by graphical methods as appropriate, the area between a curve and the x-axis realising the physical significance of the area that has been determined.

Topic 4-1: Materials

Assessments during topic 4-1

- CORE PRACTICAL 4: Use a falling-ball method to determine the viscosity of a liquid
- Test 4-1. Length: 40-mark / 45 min. Type of questions: short/long answer past exam qu. Content: specification points within chapter 12-13. Earliest assessment date: Mid-January

Spec	You should:
Chapter 12: Fluids	
49	be able to use the equation density, ρ = m/V
50	understand how to use the relationship upthrust = weight of fluid displaced
51	a. be able to use the equation for viscous drag (Stokes' Law), F = 6πηrv. b. understand that this equation 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	CORE PRACTICAL 4: Use a falling-ball method to determine the viscosity of a liquid.

Topic 4-2: Materials

Assessments during topic 4-2

- CORE PRACTICAL 5: Determine the Young modulus of a material
- 4-2 Multiple choice test (MCQ). Length 15-mark / 20 min. Type of questions: Multiple choice questions. Content: This test covers chapter 12. Earliest assessment date: Week before spring half-term

Chapter 13: Solid Materials	
53	be able to use the Hooke's law equation, ΔF = kΔx, where k is the stiffness of the object
54	understand how to use the relationships • (tensile or compressive) stress = force/cross-sectional area • (tensile or compressive) strain= change in length/original length • Young modulus = stress/strain

55	a. be able to draw and interpret force-extension and force-compression graphs b. understand the terms *limit of proportionality, elastic limit, yield point, elastic deformation* and *plastic deformation* and be able to apply them to these graphs
56	be able to draw and interpret tensile or compressive stress-strain graphs, and understand the term *breaking stress*
57	CORE PRACTICAL 5: Determine the Young modulus of a material
58	be able to calculate the elastic strain energy in a deformed material sample, using the equation $\Delta E = 1/2F\Delta x$ and from the area under the force-extension graph (The estimation of area and hence energy change for both linear and non-linear force-extension graphs is expected.)

Year 12 Exam
Content: Topics 2-4 and associated core practical questions Assessment date: After the Easter holiday

Topic 6: Further Mechanics

Mathematical skills developed in topic 6;

- translating between degrees and radians
- using trigonometric functions

Topic 6-1: Further Mechanics

Assessments during topic 6-1

- CORE PRACTICAL 9: Investigate the relationship between the force exerted on an object and its change of momentum
- CORE PRACTICAL 10: Use ICT to analyse collisions between small spheres, e.g. ball bearings on a table top
- 6-1 Multiple choice test (MCQ). Length 15-mark / 20 min. Type of questions: Multiple choice questions. Content: This test covers chapters 4 + 18. Earliest assessment date: Last week before the Easter holiday

Spec	You should:
	Chapter 18 (and part of 4) - Collisions
97	understand how to use the equation impulse = $F\Delta t = \Delta p$ (Newton's second law of motion)
98	CORE PRACTICAL 9: Investigate the relationship between the force exerted on an object and its change of momentum.
99	understand how to apply conservation of linear momentum to problems in two dimensions
100	CORE PRACTICAL 10: Use ICT to analyse collisions between small spheres, e.g. ball bearings on a table top.
101	understand how to determine whether a collision is elastic or inelastic
102	be able to derive and use the equation $Ek = p^2/2m$ for the kinetic energy of a non-relativistic particle

Topic 6-2: Further Mechanics	
Assessments during topic 6-2 • Test 6-2. Length: 40-mark / 45 min. Type of questions: short/long answer past exam qu. Content: specification points within chapters 12 + 13. Expected assessment date: Mid-May	
Chapter 19: Motion in a Circle	
103	be able to express angular displacement in radians and in degrees, and convert between these units
104	understand what is meant by *angular velocity* and be able to use the equations $v = \omega r$ and $T = 2\pi/\omega$
105	be able to use vector diagrams to derive the equations for centripetal acceleration $a = v^2/r = r^2\omega$ and understand how to use these equations
106	understand that a resultant force (centripetal force) is required to produce and maintain circular motion
107	be able to use the equations for centripetal force $F = ma = mv^2/r = mr\omega^2$

Topic 9: Thermodynamics	
Mathematical skills developed in topic 9; substituting numerical values into algebraic equations using appropriate units for physical quantities.	
Topic 9-1: Thermodynamics	
Assessments during topic 9-1 • CORE PRACTICAL 12: Calibrate a thermistor in a potential divider circuit as a thermostat • CORE PRACTICAL 13: Determine the specific latent heat of a phase change • 9-1 Multiple choice test (MCQ). Length 15-mark / 20 min. Type of questions: Multiple choice questions. Content: This test covers chapters 27 + 28. Expected assessment date: Two weeks before the end of summer term	
Spec	**You should:**
Chapter 27: Specific Heat Capacity	
144	be able to use the equations $\Delta E = mc\Delta\theta$ (...)
145	CORE PRACTICAL 12: Calibrate a thermistor in a potential divider circuit as a thermostat.
147	understand the concept of *internal energy* as the random distribution of potential and kinetic energy amongst molecules
148	understand the concept of *absolute zero* and how the average kinetic energy of molecules is related to the absolute temperature
Chapter 28: Change of State	
144	be able to use the equations $\Delta E = mc\Delta\theta$ and $\Delta E = L\Delta m$
146	CORE PRACTICAL 13: Determine the specific latent heat of a phase change.
147	understand the concept of *internal energy* as the random distribution of potential and kinetic energy amongst molecules
148	understand the concept of *absolute zero* and how the average kinetic energy of molecules is related to the absolute temperature