| Edexcel Physics (1PI0) from 2016 Topics P1&2 | | | | |
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| **Topic** | **Student Checklist** | **R** | **A** | **G** |
| **Topic 1 – Key concepts** | Recall and use the SI unit for physical quantities, as listed in the specification | | | |
| | Recall and use multiples and sub-multiples of units, including giga (G), mega (M), kilo (k), centi (c), milli (m), micro (μ) and nano (n) | | | |
| | Be able to convert between different units, including hours to seconds | | | |
| | Use significant figures and standard form where appropriate | | | |
| **Topic 2 – Motion and forces** | Describe what scalar and vector quantities are and explain the differences | | | |
| | Recall vector and scalar quantities, including: displacement/distance, velocity/speed, acceleration, force, weight/mass, momentum and energy | | | |
| | Define what velocity is | | | |
| | Recall and use the equations: (average) speed (metre per second, m/s) = distance (metre, m) ÷ time (s) | | | |
| | Recall and use the equation: distance travelled (metre, m) = average speed (metre per second, m/s) × time (s) | | | |
| | Analyse distance/time graphs including determination of speed from the gradient | | | |
| | Recall and use the equation: ***a=(v-u)/t*** | | | |
| | Use the equation: $v^2 - u^2 = 2 \times a \times x$ | | | |
| | Analyse velocity/time graphs to: compare acceleration from gradients qualitatively | | | |
| | Analyse velocity/time graphs to: calculate the acceleration from the gradient (for uniform acceleration only) | | | |
| | Analyse velocity/time graphs to: determine distance travelled using area between the graph line and the axis (for uniform acceleration only) | | | |
| | Describe a range of laboratory methods for determining the speeds of objects such as the use of light gates | | | |
| | Recall some typical speeds encountered in everyday experience for wind and sound, and for walking, running, cycling and other transportation systems | | | |
| | Recall Newton's first law and use it where the resultant force on a body is zero | | | |
| | Recall Newton's first law and use it where the resultant force is not zero | | | |
| | Recall and use Newton's second law as: ***F = m x a*** | | | |
| | Define weight, recall and use the equation: ***W = m x g*** | | | |
| | Describe how weight is measured | | | |
| | Describe the relationship between the weight of a body and the gravitational field strength | | | |
| | *Core Practical: Investigate the relationship between force, mass and acceleration by varying the masses added to trolleys* | | | |
| | **HT ONLY: Explain that an object moving in a circular orbit at constant speed has a changing velocity** | | | |
| | **HT ONLY: Explain that for motion in a circle there must be a resultant force known as a centripetal force that acts towards the centre of the circle** | | | |
| | **HT ONLY: Explain that inertial mass is a measure of how difficult it is to change the velocity of an object** | | | |
| | Recall and apply Newton's third law both to equilibrium situations | | | |
| | **HT ONLY: Recall and apply Newton's third law collision interactions and relate it to the conservation of momentum in collisions** | | | |
| | **HT ONLY: Define momentum, recall and use the equation: *p = m x v*** | | | |
| | **HT ONLY: Describe examples of momentum in collisions** | | | |
| | **HT ONLY: Use Newton's second law as: *F = (mv - mu)/t*** | | | |
| | Explain methods of measuring human reaction times and recall typical results | | | |
| | Recall what the stopping distance of a vehicle is the sum of | | | |
| | Explain that the stopping distance of a vehicle is affected by a range of factors and name the factors | | | |
| | Describe the factors that could affect a driver's reaction time | | | |
| | Explain the dangers caused by large decelerations | | | |
| | **HT ONLY: Estimate the forces involved in typical situations on a public road due to decelerations** | | | |
| | Estimate how the distance required for a road vehicle to stop in an emergency varies over a range of typical speeds | | | |
| | Carry out calculations on work done to show the dependence of braking distance for a vehicle on initial velocity squared | | | |

| Edexcel Physics (1PI0) from 2016 Topics P3,4&5 | | | | |
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| **Topic** | **Student Checklist** | **R** | **A** | **G** |
| **Topic 3 – Conservation of energy** | Recall and use the equation to calculate the change in gravitational PE when an object is raised above the ground: ***ΔGPE = m× g ×Δh*** | | | |
| | Recall and use the equation to calculate the amounts of energy associated with a moving object: ***KE = ½ × m × v²*** | | | |
| | Draw and interpret diagrams to represent energy transfers | | | |
| | Explain what is meant by conservation of energy | | | |
| | Analyse the changes involved in the way energy is stored when a system changes for an object projected upwards or up a slope | | | |
| | Analyse the changes involved in the way energy is stored when a system changes for a moving object hitting an obstacle | | | |
| | Analyse the changes involved in the way energy is stored when a system changes for an object being accelerated by a constant force | | | |
| | Analyse the changes involved in the way energy is stored when a system changes for a vehicle slowing down | | | |
| | Analyse the changes involved in the way energy is stored when a system changes for bringing water to a boil in an electric kettle | | | |
| | Explain that where there are energy transfers in a closed system there is no net change to the total energy in that system | | | |
| | Explain that mechanical processes become wasteful when they cause a rise in temperature so dissipating energy in heating the surroundings | | | |
| | Explain, using examples, how in all system changes energy is dissipated so that it is stored in less useful ways | | | |
| | Explain ways of reducing unwanted energy transfer including through lubrication, thermal insulation | | | |
| | Describe the effects of the thickness and thermal conductivity of the walls of a building on its rate of cooling qualitatively | | | |
| | Recall and use the equation: efficiency = useful energy transferred / total energy supplied | | | |
| | **HT ONLY: Explain how efficiency can be increased** | | | |
| | Describe the main energy sources available for use on Earth and compare the ways in which both renewable and non-renewable sources are used | | | |
| | Explain patterns and trends in the use of energy resources | | | |

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| **Topic 4 – Waves** | Recall that waves transfer energy and information without transferring matter | | | |
| | Describe evidence that with water and sound waves it is the wave and not the water or air itself that travels | | | |
| | Define and use the terms frequency and wavelength as applied to waves | | | |
| | Use the terms amplitude, period, wave velocity and wavefront as applied to waves | | | |
| | Describe the difference between longitudinal and transverse waves by referring to sound, electromagnetic, seismic and water waves | | | |
| | Recall and use both the equations for all waves: $v = f \times \lambda$ and $v = x/t$ | | | |
| | Describe how to measure the velocity of sound in air and ripples on water surfaces | | | |
| | **HT ONLY: Calculate depth or distance from time and wave velocity** | | | |
| | Describe the effects of reflection, refraction, transmission, absorption of waves at material interfaces | | | |
| | Explain how waves will be refracted at a boundary in terms of the change of direction | | | |
| | **HT ONLY: Explain how waves will be refracted at a boundary in terms of the change of speed** | | | |
| | **HT ONLY: Recall that different substances may absorb, transmit, refract or reflect waves in ways that vary with wavelength** | | | |
| | **HT ONLY: Describe the processes which convert wave disturbances between sound waves and vibrations in solids** | | | |
| | **HT ONLY: Explain why processes that convert wave disturbances only work over a limited frequency range** | | | |
| | **HT ONLY: Use the process that converts wave disturbances to explain the way the human ear works** | | | |
| | **HT ONLY: Recall the frequency of ultrasound and state its units** | | | |
| | **HT ONLY: Explain uses of ultrasound and infrasound** | | | |
| | Describe how changes, if any, in velocity, frequency and wavelength, in the transmission of sound waves from one medium to another are inter-related | | | |
| | *Core Practical: Investigate the suitability of equipment to measure the speed, frequency and wavelength of a wave in a solid and a fluid* | | | |

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| **Topic 5 – Light and the electromagnetic spectrum** | Explain, with the aid of ray diagrams, reflection, refraction and total internal reflection (TIR), including the law of reflection and critical angle | | | |
| | Explain the difference between specular and diffuse reflection | | | |
| | Explain how colour of light is related to differential absorption at surfaces and transmission of light through filters | | | |
| | Relate the power of a lens to its focal length and shape | | | |
| | Use ray diagrams to show the similarities and differences in the refraction of light by converging and diverging lenses | | | |
| | Explain the effects of different types of lens in producing real and virtual images | | | |
| | Recall that all electromagnetic waves are transverse, that they travel at the same speed in a vacuum | | | |
| | Explain, with examples, that all electromagnetic waves transfer energy from source to observer | | | |
| | *Investigate refraction in rectangular glass blocks in terms of the interaction of electromagnetic waves with matter* | | | |
| | Recall the main groupings of the continuous electromagnetic spectrum | | | |
| | Describe the electromagnetic spectrum | | | |
| | Recall that our eyes can only detect a limited range of frequencies of electromagnetic radiation | | | |
| | **HT ONLY: Recall that different substances may absorb, transmit, refract or reflect electromagnetic waves in ways that vary with wavelength** | | | |
| | Explain the effects of differences in the velocities of electromagnetic waves in different substances | | | |
| | Explain that all bodies emit radiation, that the intensity and wavelength distribution of any emission depends on their temperature | | | |
| | **HT ONLY: Explain that for a body to be at a constant temperature it needs to radiate the same average power that it absorbs** | | | |
| | **HT ONLY: Explain what happens to a body if the average power it radiates is less or more than the average power that it absorbs** | | | |
| | **HT ONLY: Explain how the temperature of the Earth is affected by factors controlling the balance between incoming radiation and radiation emitted** | | | |
| | *Core Practical: Investigate how the nature of a surface affects the amount of thermal energy radiated or absorbed* | | | |
| | Recall that the potential danger associated with an electromagnetic wave increases with increasing frequency | | | |
| | Describe the harmful effects on people of excessive exposure to electromagnetic radiation | | | |
| | Describe some uses of electromagnetic radiation | | | |
| | **HT ONLY: Recall that radio waves can be produced by, or can themselves induce, oscillations in electrical circuits** | | | |
| | Recall that changes in atoms and nuclei can generate radiations over a wide frequency range and be caused by absorption of a range of radiations | | | |

| Edexcel Physics (1PI0) from 2016 Topics P6a/b&7 | | | | |
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| **Topic** | **Student Checklist** | **R** | **A** | **G** |
| **Topic 6a– Radioactivity - part a** | Describe the structure of the atom | | | |
| | Recall the typical size (order of magnitude) of atoms and small molecules | | | |
| | Describe the structure of nuclei of isotopes | | | |
| | Define the term isotope | | | |
| | Recall the relative masses and relative electric charges of protons, neutrons, electrons and positrons | | | |
| | Recall that in an atom the number of protons equals the number of electrons and is therefore neutral | | | |
| | Recall that in each atom its electrons orbit the nucleus at different set distances from the nucleus | | | |
| | Explain that electrons change orbit when there is absorption or emission of electromagnetic radiation | | | |
| | Explain how atoms may form positive ions | | | |
| | Recall that alpha, β–, β+, gamma rays and neutron radiation are emitted from unstable nuclei in a random process | | | |
| | Recall that alpha, β–, β+ and gamma rays are ionising radiation | | | |
| | Explain what is meant by background radiation | | | |
| | Describe the origins of background radiation from Earth and space | | | |
| | Describe methods for measuring and detecting radioactivity limited to photographic film and a Geiger–Müller tube | | | |
| | Recall what alpha, beta and gamma radiation are made up of | | | |
| | Compare alpha, beta and gamma radiations in terms of their abilities to penetrate and ionise | | | |
| | Describe how and why the atomic model has changed over time including reference to the different models and scattering experiments | | | |
| | Describe the process of β– and β+ decay | | | |
| | Explain the effects on the atomic (proton) number and mass (nucleon) number of radioactive decays (α, β, γ and neutron emission) | | | |
| | Recall that nuclei that have undergone radioactive decay often undergo nuclear rearrangement with a loss of energy as gamma radiation | | | |

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| Topic 6b– Radioactivity - part b | Use given data to balance nuclear equations in terms of mass and charge | | | |
| | Describe how the activity of a radioactive source decreases over a period of time | | | |
| | Recall that the unit of activity of a radioactive isotope is the Becquerel, Bq | | | |
| | Explain what half life of a radioactive isotope is | | | |
| | Explain that it cannot be predicted when a particular nucleus will decay but half-life enables the activity of a very large number of nuclei to be predicted | | | |
| | Use the concept of half-life to carry out simple calculations on the decay of a radioactive isotope, including graphical representations | | | |
| | Describe uses of radioactivity in: the home, industry and medicine | | | |
| | Describe the dangers of ionising radiation in terms of tissue damage and possible mutations and relate this to the precautions needed | | | |
| | Explain how the dangers of ionising radiation depend on half-life and relate this to the precautions needed | | | |
| | Explain the precautions taken to ensure the safety of people exposed to radiation, including limiting the dose | | | |
| | Describe the differences between contamination and irradiation effects and compare the hazards associated with these two | | | |
| | Phy ONLY: Compare and contrast the treatment of tumours using radiation applied internally or externally | | | |
| | Phy ONLY: Explain some of the uses of radioactive substances in diagnosis of medical conditions, including PET scanners and tracers | | | |
| | Phy ONLY: Explain why isotopes used in PET scanners have to be produced nearby | | | |
| | Phy ONLY: Evaluate the advantages and disadvantages of nuclear power for generating electricity | | | |
| | Phy ONLY: Recall that nuclear reactions, including fission, fusion and radioactive decay, can be a source of energy | | | |
| | Phy ONLY: Explain the fission of U-235 | | | |
| | Phy ONLY: Explain the principle of a controlled nuclear chain reaction | | | |
| | Phy ONLY: Explain how the chain reaction is controlled in a nuclear reactor, including the action of moderators and control rods | | | |
| | Phy ONLY: Describe how thermal (heat) energy from the chain reaction is used in the generation of electricity in a nuclear power station | | | |
| | Phy ONLY: Recall that the products of nuclear fission are radioactive | | | |
| | Phy ONLY: Describe nuclear fusion | | | |
| | Phy ONLY: Explain the difference between nuclear fusion and nuclear fission | | | |
| | Phy ONLY: Explain why nuclear fusion does not happen at low temperatures and pressures | | | |
| | Phy ONLY: Relate the conditions for fusion to the difficulty of making a practical and economic form of power station | | | |

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| **Topic 7 – Astronomy** | Phy ONLY: Explain how and why both the weight of any body and the value of g differ between the surface of the Earth and the surface of other bodies in space | | | |
| | Phy ONLY: Recall what our solar system consists of | | | |
| | Phy ONLY: Recall the names and order, in terms of distance from the Sun, of the eight planets | | | |
| | Phy ONLY: Describe how ideas about the structure of the Solar System have changed over time | | | |
| | Phy ONLY: Describe the orbits of moons, planets, comets and artificial satellites | | | |
| | Phy ONLY: Explain for circular orbits how the force of gravity can lead to changing velocity of a planet but unchanged speed | | | |
| | Phy ONLY: Explain how, for a stable orbit, the radius must change if orbital speed changes (qualitative only) | | | |
| | Phy ONLY: Compare the Steady State and Big Bang theories | | | |
| | Phy ONLY: Describe evidence supporting the Big Bang theory, limited to red-shift and the cosmic microwave background (CMB) radiation | | | |
| | Phy ONLY: Recall that as there is more evidence supporting the Big Bang theory than the Steady State theory | | | |
| | Phy ONLY: Describe that if a wave source is moving relative to an observer there will be a change in the observed frequency and wavelength | | | |
| | Phy ONLY: Describe the red-shift in light received from galaxies at different distances away from the Earth | | | |
| | Phy ONLY: Explain why the red-shift of galaxies provides evidence for the Universe expanding | | | |
| | Phy ONLY: Explain how both the Big Bang and Steady State theories of the origin of the Universe both account for red-shift of galaxies | | | |
| | Phy ONLY: Explain how the discovery of the CMB radiation led to the Big Bang theory becoming the currently accepted model | | | |
| | Phy ONLY: Describe the evolution of stars of similar mass to the Sun | | | |
| | Phy ONLY: Explain how the balance between thermal expansion and gravity affects the life cycle of stars | | | |
| | Phy ONLY: Describe the evolution of stars with a mass larger than the Sun | | | |
| | Phy ONLY: Describe how methods of observing the Universe have changed over time including why some telescopes are located outside the Earth's atmosphere | | | |