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| **Edexcel Physics (1PI0) from 2016 Topics P1,8&9** | | | | |
| **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 8 – Energy – forces doing work** | Describe the changes involved in the way energy is stored when systems change |  |  |  |
| Draw and interpret diagrams to represent energy transfers |  |  |  |
| Explain that where there are energy transfers in a closed system there is no net change to the total energy in that system |  |  |  |
| Identify the different ways that the energy of a system can be changed through work done by forces, in electrical equipment and in heating |  |  |  |
| Describe how to measure the work done by a force and recall that energy transferred (joule, J) is equal to work done (joule, J) |  |  |  |
| Recall and use the equation: ***E = F × d*** |  |  |  |
| Describe and calculate the changes in energy involved when a system is changed by work done by forces |  |  |  |
| 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*** |  |  |  |
| Explain, using examples, how in all system changes energy is dissipated so that it is stored in less useful ways |  |  |  |
| Explain that mechanical processes become wasteful when they cause a rise in temperature so dissipating energy in heating the surroundings |  |  |  |
| Define power as the rate at which energy is transferred and use examples to explain this definition |  |  |  |
| Recall and use the equation: ***P = E/t*** |  |  |  |
| Recall what one Watt is equal to |  |  |  |
| Recall and use the efficiency equation |  |  |  |
| **Topic 9 – Forces and their effects** | Describe, with examples, how objects can interact with and without contact |  |  |  |
| Explain the difference between vector and scalar quantities using examples |  |  |  |
| **HT ONLY: Use vector diagrams to illustrate resolution of forces, a net force, and equilibrium situations** |  |  |  |
| **HT ONLY: Draw and use free body force diagrams** |  |  |  |
| **HT ONLY: Explain examples of the forces acting on an isolated solid object or a system where several forces lead to a resultant force** |  |  |  |
| Phy ONLY: Describe situations where forces can cause rotation |  |  |  |
| Phy ONLY: Recall and use the equation: moment of a force = force × distance normal to the direction of the force |  |  |  |
| Phy ONLY: Recall and use the principle of moments in situations where rotational forces are in equilibrium |  |  |  |
| Phy ONLY: Explain how levers and gears transmit the rotational effects of forces |  |  |  |
| Explain ways of reducing unwanted energy transfer through lubrication |  |  |  |

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| **Edexcel Physics (1PI0) from 2016 Topics P10 a/b & 11** | | | | |
| **TOPIC** | **Student Checklist** | **R** | **A** | **G** |
| **Topic 10a – Electricity and circuits- part a** | Describe the structure of the atom, limited to the position, mass and charge of protons, neutrons and electrons |  |  |  |
| Draw and use electric circuit diagrams |  |  |  |
| Describe the differences between series and parallel circuits |  |  |  |
| Recall how to measure potential difference using a voltmeter in series and parallel circuits |  |  |  |
| Define potential difference end describe what a volt is |  |  |  |
| Recall and use the equation: ***E = Q × V*** |  |  |  |
| Recall how to measure current using an ammeter in series and parallel circuits |  |  |  |
| Explain what electrical current is |  |  |  |
| Recall and use the equation: ***Q = I × t*** |  |  |  |
| Describe that when a closed circuit includes a source of potential difference there will be a current in the circuit |  |  |  |
| Recall that current is conserved at a junction in a circuit |  |  |  |
| Describe how to use a variable resistor in a circuit |  |  |  |
| Recall and use the equation: ***V = I × R*** |  |  |  |
| Explain why, if two resistors are in series, the net resistance is increased, whereas with two in parallel the net resistance is decreased |  |  |  |
| Calculate the currents, potential differences and resistances in series circuits |  |  |  |
| Explain the design and construction of series circuits for testing and measuring |  |  |  |
| *Core Practical: Construct electrical circuits to: investigate the relationship between, V, I and* R for a resistor and a filament lamp |  |  |  |
| **Topic 10b – Electricity and circuits- part b** | Explain how I varies with V for the following devices and how this relates to R for filament lamps, diodes and fixed resistors |  |  |  |
| Describe how the resistance of a light-dependent resistor(LDR) varies with light intensity |  |  |  |
| Describe how the resistance of a thermistor varies with change of temperature (neg temp thermistors only) |  |  |  |
| Explain how the design and use of circuits can be used to explore the variation of resistance in: filament lamps, diodes, thermistors & LDRs |  |  |  |
| Recall that, when there is an electric current in a resistor, there is an energy transfer which heats the resistor |  |  |  |
| Explain how electrical energy is dissipated when an electrical current does work against electrical resistance |  |  |  |
| Explain the energy transfer when electrical energy is dissipated when an electrical current does work against electrical resistance |  |  |  |
| Explain ways of reducing unwanted energy transfer through low resistance wires |  |  |  |
| Describe the advantages and disadvantages of the heating effect of an electric current |  |  |  |
| Use the equation: ***E = I × V × t*** |  |  |  |
| Describe power as the energy transferred per second and recall that it is measured in watt |  |  |  |
| Recall and use the equation: ***P = E/t*** |  |  |  |
| Explain how the power transfer in any circuit device is related to the potential difference across it and the current in it |  |  |  |
| Recall and use the equations: ***P = I × V*** and P ***= I 2 × R*** |  |  |  |
| Describe how, in different domestic devices, energy is transferred from batteries and a.c. mains motors and heating devices |  |  |  |
| Explain the difference between direct and alternating voltage |  |  |  |
| Describe what direct current (d.c.) is and recall the objects that supply it |  |  |  |
| Describe what alternating current (a.c.) is and recall the frequency and voltage in the UK |  |  |  |
| Explain the difference in function between the live and the neutral mains input wires |  |  |  |
| Explain the function of an earth wire and of fuses or circuit breakers in ensuring safety |  |  |  |
| Explain why switches and fuses should be connected in the live wire of a domestic circuit |  |  |  |
| Recall the potential differences between the live, neutral and earth mains wires |  |  |  |
| Explain the dangers of providing any connection between the live wire and earth |  |  |  |
| Describe, with examples, the relationship between the power ratings for domestic electrical appliances and the changes in energy when used |  |  |  |

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| **Topic 11 – Static electricity** | Phy ONLY: Explain how an insulator can be charged by friction, through the transfer of electrons |  |  |  |
| Phy ONLY: Explain how insulating materials become charged due to the loss or gain of electrons |  |  |  |
| Phy ONLY: Describe the interactions between like charges and unlike charges |  |  |  |
| Phy ONLY: Explain common electrostatic phenomena for movement of electrons, inc: shocks from objects, lightning & attraction by induction |  |  |  |
| Phy ONLY: Explain how earthing removes excess charge |  |  |  |
| Phy ONLY: Explain some of the uses of electrostatic charges in everyday situations |  |  |  |
| Phy ONLY: Describe some of the dangers of sparking in everyday situations |  |  |  |
| Phy ONLY: Define what an electric field is |  |  |  |
| Phy ONLY: Describe the shape and direction of the electric field around a point charge and between parallel plates |  |  |  |
| Phy ONLY: Relate the electrical strength of the field to the concentration of lines |  |  |  |
| Phy ONLY: Explain how the concept of an electric field helps to explain the phenomena of static electricity |  |  |  |

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| **Edexcel Physics (1PI0) from 2016 Topics P12&13** | | | | |
| **TOPIC** | **Student Checklist** | **R** | **A** | **G** |
| **Topic 12 – Magnetism and the motor effect** | Describe the interactions between like and unlike magnetic poles |  |  |  |
| Describe the uses of permanent and temporary magnetic materials including cobalt, steel, iron and nickel |  |  |  |
| Explain the difference between permanent and induced magnets |  |  |  |
| Describe the shape and direction of the magnetic field around bar magnets and for a uniform field |  |  |  |
| Relate the strength of the magnetic field to the concentration of lines |  |  |  |
| Describe the use of plotting compasses to show the shape and direction of the field of a magnet and the Earth’s magnetic field |  |  |  |
| Explain how the behaviour of a magnetic compass is related to evidence that the core of the Earth must be magnetic |  |  |  |
| Describe how to show that a current can create a magnetic effect around a long straight conductor |  |  |  |
| Describe the shape of the magnetic field produced and relating the direction of the magnetic field to the direction of the current |  |  |  |
| Recall that the strength of the field depends on the size of the current and the distance from the long straight conductor |  |  |  |
| Explain how inside a solenoid the fields from individual coils can add together or cancel |  |  |  |
| **HT ONLY: Recall what happens when a current carrying conductor is placed near a magnet experiences in terms of force** |  |  |  |
| **HT ONLY: Explain how magnetic forces are due to interactions between magnetic fields** |  |  |  |
| **HT ONLY: Recall and use Fleming’s left-hand rule to represent the relative directions of the force** |  |  |  |
| **HT ONLY: Use the equation: *F = B× I ×l*** |  |  |  |
| **HT ONLY: Explain how the force on a conductor in a magnetic field is used to cause rotation in electric motors** |  |  |  |
| **Topic 13 – Electromagnetic induction** | **HT & Phy ONLY: Explain how to produce an electric current by the relative movement of a magnet and a conductor in the lab & on a large-scale** |  |  |  |
| **HT & Phy ONLY: Recall the factors that affect the size and direction of an induced potential difference** |  |  |  |
| **HT & Phy ONLY: Describe how the magnetic field produced opposes the original change** |  |  |  |
| **HT & Phy ONLY: Explain how electromagnetic induction is used in alternators to generate alternating current (a.c)** |  |  |  |
| **HT & Phy ONLY: Explain how electromagnetic induction is used in dynamos to generate direct current (d.c.)** |  |  |  |
| **HT & Phy ONLY: Explain the action of the microphone in converting sound waves into variations in current** |  |  |  |
| **HT & Phy ONLY: Explain the action of loudspeakers and headphones in converting current into sound waves** |  |  |  |
| **HT & Phy ONLY: Explain how an alternating current in one circuit can induce a current in another circuit in a transformer** |  |  |  |
| **HT & Phy ONLY: Recall that a transformer can change the size of an alternating voltage** |  |  |  |
| **HT & Phy ONLY: Use the turns ratio equation for transformers to calculate either voltage or number of turns: *Vp/Vs = Np/Ns*** |  |  |  |
| Explain why, in the national grid, electrical energy is transferred at different voltages |  |  |  |
| Explain where and why step-up and step-down transformers are used in the transmission of electricity in the national grid |  |  |  |
| Use the power equation (for transformers with100% efficiency): Vp × Ip =Vs × Is |  |  |  |
| **HT & Phy ONLY: Explain the advantages of power transmission in high voltage cables, using the equations from the spec** |  |  |  |

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| **Edexcel Physics (1PI0) from 2016 Topics P12&13** | | | | |
| **TOPIC** | **Student Checklist** | **R** | **A** | **G** |
| **Topic 14 – Particle model** | Use a simple kinetic theory model to explain the different states of matter |  |  |  |
| Recall and use the equation: ***ρ = m/V*** |  |  |  |
| *Core Practical: Investigate the densities of solid and liquids* |  |  |  |
| Explain the differences in density between the different states of matter in terms of the arrangements of the particles |  |  |  |
| Name and describe the physical changes of state |  |  |  |
| Describe the differences between chemical and physical changes |  |  |  |
| Explain how heating a system will change the energy stored within the system and affect temperature at the state of the material |  |  |  |
| Define the terms specific heat capacity and specific latent heat and explain the differences between them |  |  |  |
| Use the equation: ***ΔQ = m × c × Δ*θ** |  |  |  |
| Use the equation: ***Q = m× L*** |  |  |  |
| Explain ways of reducing unwanted energy transfers through thermal insulation |  |  |  |
| *Core Practical: Investigate the properties of water by determining the specific heat capacity of water for melting ice* |  |  |  |
| Explain the pressure of a gas in terms of the motion of its particles |  |  |  |
| Explain the effect of changing the temperature of a gas on the velocity of its particles and hence on the pressure |  |  |  |
| Describe the term absolute zero, −273 °C, in terms of movement of particles |  |  |  |
| Convert between the kelvin and Celsius scales |  |  |  |
| Phy ONLY: Explain that gases can be compressed or expanded by pressure changes |  |  |  |
| Phy ONLY: Explain that the pressure of a gas produces a net force at right angles to any surface |  |  |  |
| Phy ONLY: Explain the effect of changing the volume of a gas on the rate at which its particles collide with the walls of its container and therefore pressure |  |  |  |
| Phy ONLY: Use the equation: ***P1 × V1 = P2 × V2*** |  |  |  |
| **HT ONLY: Explain why doing work on a gas can increase its temperature, including a bicycle pump** |  |  |  |
| **Topic 15 – Forces and matter** | Explain, using springs and other elastic objects, that stretching, bending or compressing an object requires more than one force |  |  |  |
| Describe the difference between elastic and inelastic distortion |  |  |  |
| Recall and use the equation for linear elastic distortion including calculating the spring constant: ***F = k x x*** |  |  |  |
| Use the equation to calculate the work done in stretching a spring: ***E = ½ k x x2*** |  |  |  |
| Describe the difference between linear and non-linear relationships between force and extension |  |  |  |
| *Core Practical: Investigate the extension and work done when applying forces to a spring* |  |  |  |
| Phy ONLY: Explain why atmospheric pressure varies with height above the Earth’s surface with refer to Earth’s atmosphere |  |  |  |
| Phy ONLY: Describe the pressure in a fluid as being due to the fluid and atmospheric pressure |  |  |  |
| Phy ONLY: Recall that the pressure in fluids causes a force normal to any surface |  |  |  |
| Phy ONLY: Explain how pressure is related to force and area, using appropriate examples |  |  |  |
| Phy ONLY: Recall and use the equation: ***P = F/A*** |  |  |  |
| Phy ONLY: Describe how pressure in fluids increases with depth and density |  |  |  |
| **HT & Phy ONLY: Explain why the pressure in liquids varies with density and depth** |  |  |  |
| **HT & Phy ONLY: Use the equation to calculate the magnitude of pressure in liquids & differences at different depths: *P = h× ρ × g*** |  |  |  |
| **HT & Phy ONLY: Explain why an object in a fluid is subject to an upwards force (upthrust)** |  |  |  |
| **HT & Phy ONLY: Relate upthrust to examples including objects that are fully immersed in a fluid (liquid or gas)** |  |  |  |
| **HT & Phy ONLY: Relate upthrust to examples including objects that are partially immersed in a liquid** |  |  |  |
| **HT & Phy ONLY: Recall that the upthrust is equal to the weight of fluid displaced** |  |  |  |
| **HT & Phy ONLY: Explain the factors influence whether an object will float or sink** |  |  |  |