Homelink Physics IGCSE

This document is broken down into key sections which can be accessed by the following links:

Teaching and assessment outline

Year 10: We aim to finish 1 General physics, 2 Thermal physics and 3 Properties of waves, including light and sound in the first year.

1 General physics September through till December
2 Thermal physics December through till February
3 Properties of waves February till May (June can be revision / Preparation for year 11 topics)

Year 11: We aim to finish 4 Electricity and magnetism and 5 Atomic Physics. This should leave us with plenty of time to revise for the final exams.

4 Electricity and magnetism September through till November
5 Atomic Physics November through till February

Students studying IGCSE physics are expected to complete a minimum of 2 hours homework per week rising to 3 depending on the difficulty of the work being covered.

Equipment required:

Pencil, pen, ruler, rubber, protractor, compass, scientific calculator, access to a computer and Internet connection.

Note: Failure to bring said equipment will result in deduction of marks from internal assessment.

Year 10 Term 1 General Physics

Please note that this contains both the extended and core material. Extended material is highlighted.

Topic	Learning outcomes	Week Number
Length and time	Use and describe the use of rules and measuring cylinders to determine a length or a volume. Use and describe the use of clocks and devices for measuring an interval of time. Use and describe the use of a mechanical method for the measurement of a small distance measure and describe how to measure a short interval of time (including the period of a pendulum).	Week 1 and 2
Speed, velocity and acceleration	Define speed and calculate speed from total distance total time Plot and interpret a speed/time graph or a distance/time graph Recognise from the shape of a speed/time graph when a body is (a) at rest, (b) moving with constant speed, (c) moving with changing speed. Calculate the area under a speed/time graph to determine the distance travelled for motion with constant acceleration. Demonstrate some understanding that acceleration is related to changing speed. State that the acceleration of free fall for a body near to the Earth is constant. Distinguish between speed and velocity Recognise linear motion for which the acceleration is constant and calculate	Week 3 and 4

	the acceleration. Recognise motion for which the acceleration is not constant. Describe qualitatively the motion of bodies falling in a uniform gravitational field with and without air resistance (including reference to terminal velocity).	
Mass and weight	Show familiarity with the idea of the mass of a body. State that weight is a force. Demonstrate understanding that weights (and hence masses) may be compared using a balance. Demonstrate an understanding that mass is a property which 'resists' change in motion. Describe, and use the concept of, weight as the effect of a gravitational field on a mass.	Week 5
Density	Describe an experiment to determine the density of a liquid and of a regularly shaped solid and make the necessary calculation. Describe the determination of the density of an irregularly shaped solid by the method of displacement and make the necessary calculation.	Week 6
Forces: Effects of forces	State that a force may produce a change in size and shape of a body. Plot extension/load graphs and describe the associated experimental procedure. Describe the ways in which a force may change the motion of a body. Find the resultant of two or more forces acting along the same line. Interpret extension/load graphs. State Hooke's Law and recall and use the expression F = kx. Recognise the significance of the term 'limit of proportionality' for an	Week 7 and 8

	extension/load graph. Recall and use the relation between force, mass and acceleration (including the direction). Describe, qualitatively, motion in a curved path due to a perpendicular force ($F = mv^2/r$ is not required).	
Turning effect and conditions for equilibrium	Describe the moment of a force as a measure of its turning effect and give everyday examples. Describe, qualitatively, the balancing of a beam about a pivot. State that, when there is no resultant force and no resultant turning effect, a system is in equilibrium. Perform and describe an experiment (involving vertical forces) to verify that there is no net moment on a body in equilibrium. Apply the idea of opposing moments to simple systems in equilibrium.	Week 9
Centre of mass	Perform and describe an experiment to determine the position of the centre of mass of a plane lamina. Describe qualitatively the effect of the position of the centre of mass on the stability of simple objects.	Week 10
Scalars and vectors	Demonstrate an understanding of the difference between scalars and vectors and give common examples. Add vectors by graphical representation to determine a resultant. Determine graphically a resultant of two vectors.	
Energy, work and power	Demonstrate an understanding that an object may have energy due to its motion or its position, and that energy may be transferred and stored. Give examples of energy in different forms, including kinetic, gravitational, chemical, strain, nuclear, internal, electrical, light and sound. Give examples of the conversion of energy from one form to another and	Week 11

	of its transfer from one place to another. Apply the principle of energy conservation to simple examples. Recall and use the expressions k.e.= ½ mv^2 and p.e. = mgh.	
Energy resources	Describe how electricity or other useful forms of energy may be obtained from (i) chemical energy stored in fuel (ii) water, including the energy stored in waves, in tides and in water behind hydroelectric dams (iii) geothermal resources (iv) nuclear fission (v) heat and light from the Sun. Show an understanding that energy is released by nuclear fusion in the Sun. Show a qualitative understanding of efficiency.	Week 12 and 13
Work	Relate, without calculation, work done to the magnitude of a force and distance moved. Describe energy changes in terms of work done. Recall and use ΔW = Fd = ΔE.	Week 14
Power	Relate, without calculation, power to work done and time taken, using appropriate examples. Recall and use the equation *P* = *E/t* in simple *P* = *E/t* in simple systems.	

Pressure	Relate, without calculation, pressure to force and area, using appropriate examples. Describe the simple mercury barometer and its use in measuring atmospheric pressure. Relate, without calculation, the pressure beneath a liquid surface to depth and to density, using appropriate examples. Use and describe the use of a manometer. Recall and use the equation p= F/A. Recall and use the equation p= hdg.= F/A.	Week 15
Internal Assessment (50%)	**Test 1 (measurements) 10%** **Test 2 (forces and motion) 10%** **In class bookwork 10%** **Attitude / behaviour 10%** **Energy Resources Poster 10%**	
Final Exam	50% from final exam covering all general physics topics.	Week 16

Year 10 Term 2 Thermal physics

Please note that this contains both the extended and core material. Extended material is highlighted.

Topic	Learning outcomes	Week Number
States of matter	State the distinguishing properties of solids,liquids and gases.	Week 1
Molecular model	Describe qualitatively the molecular structure of solids, liquids and gases. Interpret the temperature of a gas in terms of the motion of its molecules. Describe qualitatively the pressure of a gas in terms of the motion of its molecules. Show an understanding of the random motion of particles in a suspension as evidence for the kinetic molecular model of matter. Describe this motion (sometimes known as Brownian motion) in terms of random molecular bombardment. Relate the properties of solids, liquids and gases to the forces and distances between molecules and to the motion of the molecules. Show an appreciation that massive particles may be moved by light, fast-moving molecules.	Week 2
Evaporation	Describe evaporation in terms of the escape of more energetic molecules from the surface of a liquid. Relate evaporation and the consequent cooling. Demonstrate an understanding of how temperature, surface area and draught over a surface influence evaporation.	Week 3
Pressure changes	Describe qualitatively the effect of a change of temperature on the pressure of a gas at constant volume.	Week 4

	Recall and use the equation pV = constant at constant temperature.	
Thermal expansion of solids, liquids and gases	Describe qualitatively the thermal expansion of solids, liquids and gases. Identify and explain some of the everyday applications and consequences of thermal expansion. Describe qualitatively the effect of a change of temperature on the volume of a gas at constant pressure. Show an appreciation of the relative order of magnitude of the expansion of solids, liquids and gases.	Week 5
Measurement of temperature	Appreciate how a physical property which varies with temperature may be used for the measurement of temperature and state examples of such properties. Recognise the need for and identify fixed points. Describe the structure and action of liquid-in-glass thermometers. Demonstrate understanding of sensitivity, range and linearity. Describe the structure of a thermocouple and show understanding of its use for measuring high temperatures and those which vary rapidly.	Week 6
Thermal capacity	Relate a rise in temperature of a body to an increase in internal energy. Show an understanding of the term thermal capacity. Describe an experiment to measure the specific heat capacity of a substance.	Week 7
Melting and boiling	Describe melting and boiling in terms of energy input without a change in temperature. State the meaning of melting point	Week 8

	and boiling point. Describe condensation and solidification. Distinguish between boiling and evaporation Use the terms latent heat of vaporisation and latent heat of fusion and give a molecular interpretation of latent heat. Describe an experiment to measure specific latent heats for steam and for ice.	
Conduction, convection and radiation	Describe experiments to demonstrate the properties of good and bad conductors of heat. Relate convection in fluids to density changes and describe experiments to demonstrate this. Identify infra-red radiation as part of the electromagnetic spectrum. Give a simple molecular account of the heat transfer in solids. Describe experiments to show the properties of good and bad emitters and good and bad absorbers of infra-red radiation.	Week 9
Consequences of energy transfer		
Revision		Week 10
Internal assessment	Test 'Kinetic model' **10%** Test 'Thermal Properties' **10%** Test 'Thermal Energy Transfer' **10%** Poster of Thermal Energy **10%** Class work **5%** Attitude / behaviour / lateness **5%**	
Final Exam	50% from final exam covering all thermal physics and general physics topics.	Week 11

Year 10 Term 3 Light Properties of waves, inc light and sound

Please note that this contains both the extended and core material. Extended material is highlighted.

Topic	Learning outcomes	Week Number
General wave properties	Describe what is meant by wave motion as illustrated by vibration in ropes, springs and by experiments using water waves. Use the term wavefront. Give the meaning of speed, frequency, wavelength and amplitude. Distinguish between transverse and longitudinal waves and give suitable examples. Describe the use of water waves to show (i) reflection at a plane surface (ii) refraction due to a change of speed (iii) diffraction produced by wide and narrow gaps Give the meaning of the term wavefront. Recall and use the equation $v = f\lambda$. Interpret reflection, refraction and diffraction using wave theory.	1 and 2
Reflection of light	Describe the formation, and give the characteristics, of the image in a plane mirror. Use the law angle of incidence = angle of reflection. Perform simple constructions, measurements and calculations.	Week 3
Refraction of light	Describe an experimental demonstration of the refraction of light. Use the terminology for the angle of incidence i and angle of refraction r and describe the passage of light through parallel-sided transparent material. Give the meaning of critical angle. Describe internal and total internal reflection. Recall and use the definition of	Week 4

	refractive index n in terms of speed. Recall and use the equation sin i/sin r = n. Describe the action of optical fibres.	
Converging lenses	Describe the action of a thin converging lens on a beam of light. Use the terms principal focus and focal length. Draw ray diagrams to illustrate the formation of a real image by a single lens. Draw ray diagrams to illustrate the formation of a virtual image by a single lens. Use and describe the use of a single lens as a magnifying glass. Use and describe the use of a single lens as a magnifying glass.	Week 5
Dispersion of light	Give a qualitative account of the dispersion of light as illustrated by the action on light of a glass prism.	Week 6
electromagnetic spectrum	Describe the main features of the electromagnetic spectrum and state that all e-m waves travel with the same high speed in vacuo. State the approximate value of the speed of electromagnetic waves. Use the term monochromatic.	Week 7
Sound	Describe the production of sound by vibrating sources. Describe the longitudinal nature of sound waves. State the approximate range of audible frequencies. Show an understanding that a medium is required in order to transmit sound waves. Describe an experiment to determine the speed of sound in air. Relate the loudness and pitch of sound waves to amplitude and frequency. Describe how the reflection of sound may produce an echo.	Week 8

	Describe compression and rarefaction. State the order of magnitude of the speed of sound in air, liquids and solids.	
Internal assessment	Test Light waves **10%** Test Sound **10%** Test Lens / EM Spectrum **10%** Electromagnetic Spectrum Poster **10%** Class work **5%** Attitude / Behaviour / lateness **5%**	
Final Exam	**50%** from final exam covering all year 10 topics.	Week 9

Year 11 Term 1 Electricity and magnetism

Please note that this contains both the extended and core material. Extended material is highlighted.

Topic	Learning outcomes	Week Number
Simple phenomena of magnetism	State the properties of magnets. Give an account of induced magnetism. Distinguish between ferrous and non-ferrous materials. Describe methods of magnetisation and of demagnetisation. Describe an experiment to identify the pattern of field lines round a bar magnet. Distinguish between the magnetic properties of iron and steel. Distinguish between the design and use of permanent magnets and electromagnets.	Week 1
		Week 2
		Week 3
Electrical quantities: Electric charge, Current, Electro-motive force, Potential difference, Resistance, Electrical Energy	Describe simple experiments to show the production and detection of electrostatic charges. State that there are positive and negative charges. State that unlike charges attract and that like charges repel. Describe an electric field as a region in which an electric charge experiences a force. Distinguish between electrical conductors and insulators and give typical examples. State that current is related to the flow of charge. Use and describe the use of an ammeter. State that the e.m.f. of a source of	Week 4
		Week 5

	electrical energy is measured in volts. State that the potential difference across a circuit component is measured in volts. Use and describe the use of a voltmeter. State that resistance = pd/current and understand qualitatively how changes in p.d. or resistance affect current. Recall and use the equation R = V/I. Describe an experiment to determine resistance using a voltmeter and an ammeter. Relate (without calculation) the resistance of a wire to its length and to its diameter. Show understanding that a current is a rate of flow of charge and recall and use the equation I = Q/t. Distinguish between the direction of flow of electrons and conventional current. Show understanding that e.m.f. is defined in terms of energy supplied by a source in driving charge round a complete circuit. Recall and use quantitatively the proportionality between resistance and the length and the inverse proportionality between resistance and crosssectional area of a wire. Recall and use the equation P = IV and E = Ivt.	Week 6 Week 7 Week 8 Week 9
Electrical circuits: Circuit diagrams, Series and parallel circuits, Action and use of circuit components, Digital electronics, Dangers of electricity	Draw and interpret circuit diagrams containing sources, switches, resistors (fixed and variable), lamps, ammeters, voltmeters, magnetising coils, transformers, bells, fuses, relays. Understand that the current at every point in a series circuit is the same. Give the combined resistance of two or more resistors in series. State that, for a parallel circuit, the current from the source is larger than the current in each branch.	Week 10, 11 and 12

	State that the combined resistance of two resistors in parallel is less than that of either resistor by itself. State the advantages of connecting lamps in parallel in a lighting circuit. Describe the action of a variable potential divider (potentiometer). Describe the action of thermistors and light dependent resistors and show understanding of their use as input transducers Describe the action of a capacitor as an energy store and show understanding of its use in time delay circuits. Describe the action of a relay and show understanding of its use in switching circuits. State the hazards of (i) damaged insulation (ii) overheating of cables (iii) damp conditions. Show an understanding of the use of fuses and/or circuit-breakers. Draw and interpret circuit diagrams containing diodes and transistors. Recall and use the fact that the sum of the p.d.s. across the components in a series circuit is equal to the total p.d.s. across the supply. Recall and use the fact that the current from the source is the sum of the currents in the separate branches of a parallel circuit. Calculate the effective resistance of two resistors in parallel. Describe the action of a diode and show understanding of its use as a rectifier. Describe the action of a transistor as an electrically operated switch and show understanding of its use in switching circuits. Recognise and show understanding of circuits operating as light sensitive switches and temperature operated alarms (using a relay or a transistor). Explain and use the terms digital and analogue.	

	State that logic gates are circuits containing transistors and other components. Describe the action on NOT, AND, OR, NAND and NOR gates. Design and understand simple digital circuits combining several logic gates. State and use the symbols for logic gates (the American ANSIY 32.14 symbols will be used).	
Electromagnetic effects: electromagnetic induction, a.c generator, transformer, the magnetic effect of a current, force on a current-carrying conductor, d.c. motor	Describe an experiment which shows that a changing magnetic field can induce an e.m.f. in a circuit. Describe a rotatingcoil generator and the use of slip rings. Sketch a graph of voltage output against time for a simple a.c. generator. Describe the construction of a basic iron-cored transformer as used for voltage transformations. Recall and use the equation (Vp/Vs) = (Np/Ns). Describe the use of the transformer in high voltage transmission of electricity. Give the advantages of high voltage transmission. Describe the pattern of the magnetic field due to currents in straight wires and in solenoids. Describe applications of the magnetic effect of current, including the action of a relay. Describe an experiment to show that a force acts on a current-carrying conductor in a magnetic field, including the effect of reversing (i) the current, (ii) the direction of the field. State that a current-carrying coil in a magnetic field experiences a turning effect and that the effect is increased by increasing the number of turns on the coil. Relate this turning effect to the action of an electric motor. State the factors affecting the magnitude of an induced e.m.f.	Week 13 and 14

	Show understanding that the direction of an induced e.m.f. opposes the change causing it. Describe the principle of operation of a transformer. Recall and use the equation VpIp = VsIs (for 100% efficiency). Discuss the energy loss in cables. State the qualitative variation of the strength of the magnetic field over salient parts of the pattern. Describe the effect on the magnetic field of changing the magnitude and direction of the current. Describe an experiment to show the corresponding force on beams of charged particles. State and use the relative directions of force, field and current. Describe the effect of increasing the current.	
Cathode ray oscilloscopes: Cathode rays, Simple treatment of cathode-ray oscilloscope	Describe the production and detection of cathode rays. Describe their deflection in electric fields. State that the particles emitted in thermionic emission are electrons. Describe in outline the basic structure, and action, of a cathode-ray oscilloscope (detailed circuits are not required). Use and describe the use of a cathode-ray oscilloscope to display waveforms.	Week 15
Internal assessment	Test 'Electric current and resistance' **10%** Test 'Electric Circuits' **10%** Test 'EM Effects' **10%** Poster 'Electricity and Magnetism' **10%** Class work **5%** Attitude / Behaviour / Lateness **5%**	
Final Examination	50% from final exam covering all IGCSE physics topics.	Week 16

Year 11 Term 2 Atomic physics

Please note that this contains both the extended and core material. Extended material is highlited.

Topic	Learning outcomes	Week Number
The nuclear atom: atomic model, nucleus, isotopes.	Describe the structure of an atom in terms of a nucleus and electrons. Describe the composition of the nucleus in terms of protons and neutrons. Use the term proton number (= atomic number), Z, use the term nucleon number (= mass number), A, use the term nuclide and nuclide notation. Describe how the scattering of alph aparticles by thin metal foils provides evidence for the nuclear atom. Use the term isotope Give and explain examples of practical applications of isotopes	1 2 3 4 5
Radioactivity: Detection of radioactivity, Characteristics of the three kinds of emission	Show awareness of the existence of background radioactivity. Describe the detection of α-particles, β-particles and γ-rays. State that radioactive emissions occur randomly over space and time. State, for radioactive emissions: (i) their nature (ii) their relative ionising effects (iii) their relative penetrating abilities. State the meaning of radioactive decay, using equations (involving words or symbols) to represent changes in the composition of the nucleus when particles are emitted. Use the term halflife in simple calculations which might involve information in tables or decay curves. Describe their deflection in electric fields and magnetic fields. Interpret their relative ionising effects.	6 7 8

	Describe how the scattering of alpha particles by thin metal foils provides evidence for the nuclear atom. Use the term isotope Give and explain examples of practical applications of isotopes	9
Radioactive decay, Half-life safety precautions	Describe how radioactive materials are handled, used and stored in a safe way.	10
Internal assessment	Test 'Atomic physics' 10% Test 'ElectroMagnetism' 10% Test 'Electricity' 10% Test 'General Physics' 10% Class work 5% Attitude / Behaviour / Lateness 5%	
Final Exam	50% from final exam covering all physics topics.	11

Year 11 Term 3 Revision

Students have 4 lessons a week. 2 lessons will be used to review topics from years 10 & 11 then the other 2 lessons will be spent doing diagnostic teaching using long answer and multiple choice questions to identify misconceptions and weaknesses.

Appendix 1 (useful sites)

Name	Comments
BBC bitesize	Good starting point for home-works etc but not enough detail for "A" grade work
S-cool	Very good detail
CIE site	Exam papers mark schemes (its not cheating)
IGCSE Physics revision guide	Revision guide you can read online good for definitions
Free exam papers	Fantastic free site with all papers and mark schemes
Simulations	These simulations allow you to really get a feel of physics. If a picture says a thousand words then a simulation says a million words.
Khan academy	Excellent site with lots of videos explaining science and maths concepts