

Curriculum Plans: Year 11 Physics Trilogy

Topic	Knowledge: By the end of the unit students will know:	Skills: What skills will students have developed by the end of this unit?	Key terms: What new key terms and vocabulary will be learnt in this unit?	Summative Assessment: How will pupils be assessed in this unit?
Particle Model of atom	<p>Define density and write down its unit.</p> <p>Describe how to measure the density of a solid object or a liquid.</p> <p>Use the density equation to calculate the mass or the volume of an object or a sample.</p> <p>Describe how to tell from its density if an object will float in water.</p> <p>Describe the different properties of solids, liquids, and gases.</p> <p>Describe the arrangement of particles in a solid, a liquid, and a gas.</p> <p>Explain why gases are less dense than solids and liquids.</p> <p>Explain why the mass of a substance that changes state stays the same.</p> <p>Write down what the melting point of and the boiling point of a substance mean.</p> <p>Describe what you need to do to melt a solid or to boil a liquid.</p> <p>Explain the difference between boiling and evaporation.</p> <p>Use a temperature-time graph to find the melting point or the boiling point of a substance.</p> <p>Describe how increasing the temperature of a substance affects its internal energy.</p> <p>Explain the different properties of a solid, a liquid, and a gas.</p> <p>Describe how the energy of the particles of a substance changes when it is heated.</p>	<p>I can use the density equation in a wide variety of calculations.</p> <p>I can use appropriate significant figures in final answers when measuring density.</p> <p>I can evaluate in detail the experimental measurement of density, accounting for errors in measurements.</p> <p>I can describe the forces acting between particles in a solid, liquid, and gas.</p> <p>I can describe the changes in the energy of individual particles during changes of state.</p> <p>I can explain in detail why the density of a material changes during a change of state, using a particle model.</p> <p>I can describe how the melting and boiling points of a substance can be changed.</p>	<p>Absolute zero: the temperature at which the pressure of a gas drops to zero. It is - 273°C or 0 K.</p> <p>Boiling point: temperature at which a pure substance boils or condenses.</p> <p>Change of state: the changing of matter from one state to another e.g. from solid to liquid.</p> <p>Chemical changes: a change that results in the formation of new substances.</p> <p>Density: mass per unit volume of a substance.</p> <p>Freezing point: the temperature at which a pure substance freezes.</p> <p>Gas pressure: the force on a surface caused by the collisions of gas particles with the surface. Gas pressure acts at right angles to a surface.</p>	<p>HW: Assessed past-paper questions. Kerboodle / Seneca online task(s).</p> <p>Revision: For topic test at end of the topic (PP-style questions, ~40 mins)</p> <p>IS: Textbook spread questions on each topic, to self-assess. Use of online resources including BBC Bitesize, physicandmathstutor.com, Seneca Learning and Kerboodle textbook. Especially check the "Appendices". YouTube channels – Free Science Lessons, Primrose Kitten.</p> <p>S & C: ZigZag AQA GCSE Stretch and Challenge Packs on Teams / SharePoint. BBC Science and Tech news sections</p>

Curriculum Plans: Year 11 Physics Trilogy

	<p>Explain in terms of particles why a gas exerts pressure.</p> <p>Write down what latent heat means as a substance changes its state.</p> <p>Write down what specific latent heat of fusion and of vaporisation mean.</p> <p>Use specific latent heat in calculations.</p> <p>Describe how to measure the specific heat latent heat of ice and of water.</p> <p>Describe how a gas exerts pressure on a surface.</p> <p>Describe how changing the temperature of a gas in a sealed container affects the pressure of the gas.</p> <p>Explain why raising the temperature of a gas in a sealed container affects the pressure of the gas.</p> <p>Describe how to see evidence of gas molecules moving around at random.</p>	<p>I can describe in detail the behaviour of the particles during changes of state.</p> <p>I can evaluate data produced by a heating experiment to discuss the reproducibility of the measurement of a melting point.</p> <p>I can use the concepts of kinetic and potential energy to explain changes in internal energy.</p> <p>I can describe the changes in the size of intermolecular forces during changes of state.</p> <p>I can explain in detail why the pressure of a gas increases as it is heated.</p> <p>I can perform a variety of calculations based on the latent heat equation.</p> <p>I can combine variety of equations to solve problems involving heating.</p> <p>I can evaluate the reproducibility of a measurement of latent heat based on collated data.</p>	<p>Internal energy: the energy of the particles of a substance due to their individual motion and positions.</p> <p>kelvin (K): the unit in the kelvin temperature scale. One kelvin is the same temperature interval as 1°C.</p> <p>kelvin temperature scale: a temperature scale that measures temperatures relative to absolute zero.</p> <p>Kinetic theory: the model that explains the properties of different states of matter in terms of the movement of particles.</p> <p>Latent heat: the energy transferred to or from a substance when it changes its state.</p> <p>Melting point: temperature at which a pure substance melts or freezes (solidifies).</p> <p>pascal (Pa): a unit of pressure . 1 Pa = 1 N/m²</p> <p>Physical change: a change in which no new substances are produced.</p>	<p>(https://www.bbc.co.uk/news, independent research).</p>
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Curriculum Plans: Year 11 Physics Trilogy

		<p>I can describe the linear relationship between changes in temperatures and pressure for a gas.</p> <p>I can explain Brownian motion in terms of particle behaviour and collisions, relating the speeds of smoke particles and air molecules.</p> <p>I can describe in detail how the relationship between the pressure of a gas and its temperature can be investigated.</p> <p>I can explain in terms of particle behaviour why the pressure of a gas increases when its volume decreases.</p> <p>I can calculate the pressure or volume of a gas.</p> <p>I can solve a variety of problems in which gas pressure or volume changes.</p>	<p>Specific heat capacity: the energy needed to raise the temperature of 1kg of a substance by 1 °C.</p> <p>Specific latent heat of fusion, LF: energy needed to melt 1kg of a substance with no change of temperature.</p> <p>Specific latent heat of vaporisation, Lv: energy needed to boil away 1kg of substance with no change of temperature.</p> <p>States of matter: there are three different forms that a substance can be in: solid, liquid or gas. These are the three states of matter.</p> <p>Sublimation: when a solid changes directly to a gas without becoming a liquid first.</p> <p>Temperature: a measure of how hot something is.</p> <p>Thermal energy: a term used to describe energy when it is stored in hot objects. The hotter something is, the more thermal</p>	
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Curriculum Plans: Year 11 Physics Trilogy

			energy it has. It is sometimes called 'heat energy'.	
Atomic Structure	<p>Write down what a radioactive substance is.</p> <p>Write down the types of radiation given out from a radioactive substance.</p> <p>Write down what happens when a radioactive source emits radiation (radioactive decay).</p> <p>Write down the different types of radiation emitted by radioactive sources.</p> <p>Describe how the nuclear model of the atom was established.</p> <p>Explain why the 'plum pudding' model of the atom was rejected.</p> <p>Describe what conclusions were made about the atom from experimental evidence.</p> <p>Explain why the nuclear model was accepted.</p> <p>Write down what an isotope is.</p> <p>Describe how the nucleus of an atom changes when it emits an alpha particle or a beta particle.</p> <p>Represent the emission of an alpha particle from the nucleus.</p> <p>Represent the emission of a beta particle from the nucleus.</p>	<p>I can describe in detail the decay of an unstable nucleus.</p> <p>I can explain the similarities and differences between nuclear radiation and visible light.</p> <p>I can describe the relative penetrating powers of the three types of nuclear radiation.</p> <p>I can compare the plum pudding model, Rutherford model, and Bohr model of the atom in terms of the evidence for each model.</p> <p>I can explain how Rutherford and Marsden's experiment caused a rejection of the plum pudding model.</p> <p>I can describe how the initial evidence for the nuclear model</p>	<p>Activity: the number of unstable atoms that decay per second in a radioactive source.</p> <p>Alpha radiation: alpha particles, each composed of two protons and two neutrons, emitted by unstable nuclei.</p> <p>Atomic number: the number of protons (which equals the number of electrons) in an atom. It is sometimes called the proton number.</p> <p>Background radiation: ionising radiation that is around us all the time from a number</p>	<p>HW: Assessed past-paper questions. Kerboodle / Seneca online task(s).</p> <p>Revision: For topic test at end of the topic (PP-style questions, ~40 mins)</p> <p>IS: Textbook spread questions on each topic, to self-assess. Use of online resources including BBC Bitesize, physicandmathstutor.com, Seneca Learning and Kerboodle textbook. Especially check the "Appendices". YouTube channels – Free Science Lessons, Primrose Kitten.</p> <p>S & C: ZigZag AQA GCSE Stretch and Challenge Packs on Teams / SharePoint. BBC Science and Tech news sections (https://www.bbc.co.uk/news, independent research).</p>

Curriculum Plans: Year 11 Physics Trilogy

	<p>Write down how far each type of radiation can travel in air.</p> <p>Describe how different materials absorb alpha, beta, and gamma radiation.</p> <p>Describe the ionising power of alpha, beta and gamma radiation.</p> <p>Explain why alpha, beta, and gamma radiation are dangerous.</p> <p>Write down what the half-life of a radioactive source means.</p> <p>Write down what the count rate from a radioactive source means.</p> <p>Describe how to choose a radioactive isotope for a particular job.</p> <p>Describe what type of nuclear radiation be used for medical imaging.</p>	<p>was processed and how the model came to be accepted.</p> <p>I can explain why particles are ejected from the nucleus during nuclear decay.</p> <p>I can describe the changes in the nucleus that occur during nuclear decay.</p> <p>I can write full decay equations for example nuclear decays.</p> <p>I can describe in detail how the thickness of a material being manufactured can be monitored by using a beta source.</p> <p>I can compare the ionisation caused by different types of nuclear radiation.</p> <p>I can evaluate in some detail the risks caused by alpha radiation inside and outside the human body.</p>	<p>of sources. Some background radiation is naturally occurring, but some comes from human activities.</p> <p>Beta radiation: beta particles that are high energy electrons created in, and emitted from, unstable nuclei.</p> <p>Control rod: a rod that can be lowered into the core of a nuclear reactor, to absorb neutrons and slow down the nuclear chain reaction.</p> <p>Cosmic rays: charged particles with a high energy that come from stars, neutron stars, black holes and supernovae.</p> <p>Count rate: the number of counts</p>	
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Curriculum Plans: Year 11 Physics Trilogy

		<p>I can compare a physical model of decay with the decay of nuclei, noting the limitations of the model.</p> <p>I can outline how the age of organic material can be determined by using radioactive dating.</p> <p>I can calculate the changes in count rate or nuclei remaining by using an exponential decay function.</p> <p>I can describe the use of radioactive implants and the hazards associated with the technique.</p> <p>I can discuss the factors that need to be taken into account when selecting a medical tracer for a diagnostic test.</p> <p>I can explain how a medical tracer is used including the function of a gamma camera.</p>	<p>per second detected by a Geiger counter.</p> <p>Decay: when a radioactive isotope emits ionising radiation.</p> <p>Decommission: dismantle safely.</p> <p>Fuel rod: a rod containing the nuclear fuel for a nuclear reactor.</p> <p>Gamma radiation: electromagnetic radiation emitted from unstable nuclei in radioactive substances.</p> <p>Geiger-Muller (GM) tube: a device that can detect ionising radiation and is used</p>	
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Curriculum Plans: Year 11 Physics Trilogy

		<p>I can explain how a steady-state induced fission reaction can be maintained.</p> <p>I can explain the differences between naturally occurring isotopes and enriched nuclear fuels.</p> <p>I can explain the operation of a nuclear fission reactor, including the choices of appropriate materials.</p> <p>I can explain why it is difficult to carry out controlled nuclear fusion on Earth.</p> <p>I can construct a variety of nuclear equations showing nuclear fusion.</p> <p>I can compare the operation of a nuclear fission reactor and a nuclear fusion reactor.</p> <p>I can discuss the risks and benefits of nuclear power compared to other</p>	<p>to measure the activity of a radioactive source.</p> <p>Half-life: average time taken for the number of nuclei of the isotope (or mass of the isotope) in a sample to half.</p> <p>Ionisation: any process that in which atoms become charged.</p> <p>Irradiated: an object has been exposed to ionising radiation.</p> <p>Isotopes: atoms with the same number of protons and different number of neutrons.</p> <p>Mass number: the number of protons and neutrons in a nucleus.</p> <p>Nuclear equation: an equation representing a change in an atomic nucleus due to radioactive decay.</p> <p>The atomic numbers</p>	
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Curriculum Plans: Year 11 Physics Trilogy

		<p>methods of electricity generation.</p> <p>I can describe and explain the safety precautions that need to take place after a large nuclear accident.</p> <p>I can evaluate in detail a variety of storage or disposal solutions for nuclear waste.</p>	<p>and mass number must balance.</p> <p>Random: any process that cannot be predicted and can happen at any time is said to be random.</p> <p>Unstable: an unstable nucleus in an atom is one that will decay and give out ionising radiation.</p>	
Electromagnetism	<p>State the force rule for two magnetic poles near each other.</p> <p>Describe the pattern of magnetic field lines around a bar magnet.</p> <p>Describe what induced magnetism is.</p> <p>Explain why steel, not iron, is used to make permanent magnets.</p> <p>Describe the pattern of the magnetic field around a straight wire carrying a current and in and around a solenoid.</p> <p>Describe how the strength and direction of the field varies with position and with the current.</p> <p>Describe what a uniform magnetic field is.</p> <p>Describe what an electromagnet is.</p> <p>Describe how to change the size and reverse the direction of the force on a</p>	<p>I can describe the regions in a magnetic field where magnetic forces are greatest using the idea of field lines.</p> <p>I can explain in detail how a magnetism can be induced in some materials.</p> <p>I can plan in detail how the strength of a magnetic field can be investigated.</p> <p>I can determine the polarity of the ends of a solenoid from the</p>	<p>Electromagnet: an insulated wire wrapped around an iron bar that becomes magnetic when there is a current in the wire.</p> <p>Electromagnetic induction: the process of inducing a potential difference in a wire by moving the wire so it cuts across the lines of force of a magnetic field.</p> <p>Fleming's left-hand rule: a rule that gives the direction of the</p>	<p>HW: Assessed past-paper questions.</p> <p style="padding-left: 20px;">Kerboodle / Seneca online task(s).</p> <p>Revision: For topic test at end of the topic (PP-style questions, ~40 mins)</p> <p>IS: Textbook spread questions on each topic, to self-assess.</p> <p>Use of online resources including BBC Bitesize, physicandmathstutor.com, Seneca Learning and Kerboodle textbook. Especially check the "Appendices".</p>

Curriculum Plans: Year 11 Physics Trilogy

	<p>current-carrying wire in a magnetic field. Explain how a simple electric motor works. Explain what is meant by magnetic flux density. Calculate the force on a current-carrying wire.</p>	<p>direction of the current. I can sketch the shape of the field surrounding a solenoid relating this to the direction of the current through the coil. I can plan a detailed investigation into the factors that affect the strength of the magnetic field around a solenoid. I can explain the effect of an iron core on the strength of an electromagnet in terms of the magnetic field. I can describe in detail the operation of an electric bell. I can evaluate an experiment into the factors which affect the strength of an electromagnet. I can describe and explain in detail the operation of a d.c. motor.</p>	<p>force on a current-carrying wire in a magnetic field according to the direction of the current and the field. Magnetic field: the space around a magnet or a current-carrying wire.</p>	<p>YouTube channels – Free Science Lessons, Primrose Kitten. S & C: ZigZag AQA GCSE Stretch and Challenge Packs on Teams / SharePoint. BBC Science and Tech news sections (https://www.bbc.co.uk/news, independent research).</p>
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Curriculum Plans: Year 11 Physics Trilogy

		<p>I can perform calculations involving rearrangements of the equation $F = BIl$.</p> <p>I can investigate the factors that affect the rotation of an electric motor.</p> <p>I can explain why relative movement of a wire through a magnetic field is required to cause induction.</p> <p>I can independently investigate the magnitude and polarity of a current induced in a solenoid when a magnet is moved in it.</p> <p>I can describe how a changing current in one coil can be used to induce a current in another.</p> <p>I can describe the output of an alternator, linking this to the position of the coil to the magnetic field and the speed of rotation.</p>		
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Curriculum Plans: Year 11 Physics Trilogy

		<p>I can describe the operation of a direct current generator and its output.</p> <p>I can explain why the peak voltage of an a.c. generator is produced when the coil is parallel to the magnetic field lines.</p> <p>I can justify the choice of materials used to construct a transformer.</p> <p>I can describe and explain the operation of a transformer in terms of induction and changes in magnetic fields.</p> <p>I can investigate the effect that changing the ratio of the input and output loops on a transformer has on the change in voltage.</p> <p>I can apply the transformer equation in a wide variety of situations.</p> <p>I can use the relationship $V_P \times I_P =$</p>		
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Curriculum Plans: Year 11 Physics Trilogy

		<p>VS \times IS to calculate all variables. I can measure the efficiency of a transformer and explain why this may not be 100%.</p>		
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