| Year Group: 13 | Subject: Physics | Term: Autumn 2021 |
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| Topic | Key Learning points | Assessment |
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| **Topic 7**<br>**Electric fields** | *End Point: To understand the concepts involved in electric fields*<br>define an electric field use the equation for electric field strength<br>• describe the concept of a uniform electric field use the equation for uniform electric field strength between parallel plates<br>• describe the experimental set-up which Robert Millikan used to determine the charge on an electron<br>• define radial electric fields draw and interpret diagrams of electric fields<br>• describe the relationship between electric field strength and electric potential<br>• use the equations relating to field strength and potential for radial electric fields make calculations of the electrostatic force between charged particles verify Coulomb's law experimentally.<br>• describe how capacitors can be used in a circuit to store charge<br>• use the equation for capacitance, $C = \frac{Q}{V}$<br>use the equations for energy stored on a capacitor.<br>• draw and interpret charge and discharge curves for capacitors<br>• describe the significance of the time constant, *RC*<br>• use the equations for exponential discharge in a capacitor resistor circuit<br>• derive and use capacitor discharge equations in terms of current and voltage, and the corresponding logarithmic equations.<br>• define the terms magnetic flux density, *B*, magnetic flux, *Φ*, and flux linkage, *NΦ*<br>calculate flux, flux density and flux linkage.<br>• apply Fleming's left hand rule to current-carrying conductors in a magnetic field<br>• use the equation $F = BIL \sin\theta$, for a current-carrying conductor in a magnetic field<br>• apply Fleming's left-hand rule to charged particles moving in a magnetic field<br>use the equation $F = Bqv \sin\theta$, for a charged particle moving in a magnetic field.<br>• describe the factors affecting the e.m.f. induced in a coil when there is relative motion between the coil and a permanent magnet<br>• describe how Lenz's law can predict the direction of an induced e.m.f. as a consequence of energy conservation | Students will be formatively assessed during each topic by past paper questions completed in lesson time. Also practice mocks based on content covered<br>• Students will complete homework assignments as ongoing assessment of understanding.<br>• Teachers will provide students with targeted feedback, based on their test performance.<br>At the end of the term students will have a summative assessment. This will be a 90-mark exam paper which will be marked by their teacher. |

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| | define Faraday's law, and be able to use the equation $\varepsilon = \frac{-\mathrm{d}(N\Phi)}{\mathrm{d}t}$.<br>• define the terms frequency, period, peak value and root-mean-square value when applied to alternating currents and potential differences<br>• use the equations $V_{\text{rms}} = \frac{V_0}{\sqrt{2}}$ and $I_{\text{rms}} = \frac{I_0}{\sqrt{2}}$<br>describe the factors affecting the e.m.f. induced in a coil when there is a change in another coil linked with this coil. | |
| **Topic :8 Particles** | *End Point: To understand the mechanisms that are involved thermodynamics and particle Physics*<br>• describe what is meant by nucleon number (mass number) and proton number (atomic number)<br>• explain how large-angle alpha particle scattering gives evidence for a nuclear atom<br>Describe how our understanding of atomic structure has changed over time.<br>• explain that electrons are released in thermionic emission<br>• describe how electrons can be accelerated by electric and magnetic fields<br>Explain why high energies are required to investigate the structure of nucleons.<br>• describe the roles of electric and magnetic fields in particle accelerators<br>• derive and use the equation $r = \frac{p}{BQ}$ for a charged particle in a magnetic field<br>• explain why high energies are required to investigate the structure of the nucleus.<br>• describe the roles of electric and magnetic fields in particle detectors<br>• apply conservation of charge, energy and momentum to interactions between particles and interpret particle tracks<br>• Discuss the role of the LHC in particle physics research<br>Explain why high energies are required to investigate the structure of the nucleus.<br>• use the equation $\Delta E = c^2 \Delta m$ in situations involving the creation and annihilation of matter and anti-matter particles<br>use and convert between MeV, GeV and $\frac{\text{MeV}}{c^2}$, $\frac{\text{GeV}}{c^2}$.<br>• define leptons and quarks in the Standard Model | |

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| | ● describe that the symmetry of the Standard Model predicted the existence of top quark<br>● explain that every particle has an anti-particle<br>● deduce the properties of particles and their anti-particles<br>● define baryons, mesons and photons in the Standard Model Explain why high energies are required to investigate fundamental particles.<br>● use the laws of conservation of charge, baryon number and lepton number to determine whether a particle interaction is possible<br>● write and interpret particle equations given the relevant particle symbols<br>● describe situations in which the relativistic increase in particle lifetime is significant. | |
| **Topic 9 thermodynamics** | **Topic 9 thermodynamics**<br>define the concept of absolute zero and explain how the average kinetic energy of molecules is related to the absolute temperature<br>● identify the differences between scales of temperature measurement<br>● explain how a thermistor can be calibrated in a potential divider circuit to act as a thermostat<br>● define the concept of internal energy as the random distribution of potential and kinetic energies amongst molecules<br>use the equation $\frac{1}{2}m<c^2>=\frac{3}{2}kT$.<br>● define the concepts of specific heat capacity and specific latent heat for phase changes<br>● use the equations $\Delta E = mc\Delta\theta$ and $\Delta E = L\Delta m$<br>Describe what is meant by black body radiator.<br>● define the concept of an ideal gas and explain the relationships between its pressure, temperature and volume<br>● use the equation $pV = NkT$ for an ideal gas<br>● define the concept of an ideal gas and explain the relationships between its pressure, temperature and volume<br>● use the equation for an ideal gas<br>● derive and use the equation $pV = \frac{1}{3}Nm<c^2>$<br>● derive and use the equation $\frac{1}{2}m<c^2> = \frac{3}{2}kT$. | |