Yr13 Physics Term 2 PLC

Electric and Magnetic Fields

Explain that an electric field (force field) is defined as a region where a charged particle experiences a force	Red	Amber	Green
Recall that electric field strength is defined as $E = F/Q$ and be able to use this equation	Red	Amber	Green
Use the equation $F = Q_1Q_2/4\pi\varepsilon_0 r^2$, for the force between two charges	Red	Amber	Green
Use the equation $E = Q/4\pi\varepsilon_0 r^2$,for the electric field due to a point charge	Red	Amber	Green
Recall and explain the relationship between electric field and electric potential	Red	Amber	Green
Use the equation $E = V/d$ for an electric field between parallel plates	Red	Amber	Green
Use the equation: $V= Q/4\pi\varepsilon_0 r$ for a radial field	Red	Amber	Green
Draw and interpret diagrams using field lines and equipotential to describe radial and uniform electric fields	Red	Amber	Green
Recall that capacitance is defined as $C = Q/V$ and be able to use this equation	Red	Amber	Green
Use the equation $W = ½QV$ for the energy stored by a capacitor and able to derive the equation from the area under a graph of PD against charge stored	Red	Amber	Green
Be able to derive and use the equations $W = ½CV^2$ and $W = ½Q^2/C$	Red	Amber	Green
Draw and interpret charge and discharge curves for resistor capacitor circuits	Red	Amber	Green
Explain the significance of the time constant RC	Red	Amber	Green
CORE PRACTICAL 11: Use an oscilloscope or data logger to display and analyse the potential difference (p.d.) across a capacitor as it charges and discharges through a resistor.	Red	Amber	Green
Use the equation $Q = Q_0e^{-t/RC}$ and derive and use related equations for exponential discharge in a resistor-capacitor circuit, $I = I_0\, e^{-t/RC}$, and $V = V_0\, e^{-t/RC}$	Red	Amber	Green
For the above use the corresponding log equations $\ln Q = \ln Q_0 - t/RC$, $\ln I_0 - t/RC$ and $\ln V = V_0 - t/RC$	Red	Amber	Green
Explain and use the terms: *magnetic flux density B, flux* ϕ *and flux linkage N*ϕ	Red	Amber	Green
Use the equation $F = Bqv \sin\theta$ and apply Fleming's left-hand rule to charged particles moving in a magnetic field	Red	Amber	Green
Use the equation $F = BIl \sin\theta$ and apply Fleming's left-hand rule to current carrying conductors in a magnetic field	Red	Amber	Green

Describe the factors affecting the e.m.f. induced in a coil when there is relative motion between the coil and a permanent magnet	Red	Amber	Green
Describe the factors affecting the e.m.f. induced in a coil when there is a change of current in another coil linked with this coil	Red	Amber	Green
Explain how to use Lenz's law to predict the direction of an induced e.m.f., and how the prediction relates to energy conservation	Red	Amber	Green
Explain how to use Faraday's law to determine the magnitude of an induced e.m.f.	Red	Amber	Green
Use the equation that combines Faraday's and Lenz's laws $E = -\mathrm{d}(N\phi)/\mathrm{d}t$	Red	Amber	Green
Explain and use the terms: *frequency, period, peak value and root mean-square value* when applied to alternating currents and potential differences	Red	Amber	Green
Use the equations $V_{rms} = V_0/\sqrt{2}$ and $I_{rms} = I_0/\sqrt{2}$	Red	Amber	Green

Nuclear and Particle Physics

Recall what is meant by nucleon number (mass number) and proton number (atomic number)	Red	Amber	Green
Explain how large-angle alpha particle scattering gives evidence for a nuclear model of the atom and how our understanding of atomic structure has changed over time	Red	Amber	Green
Recall that electrons are released in the process of thermionic emission and how they can be accelerated by electric and magnetic fields	Red	Amber	Green
Recall the role of electric and magnetic fields in particle accelerators (linac and cyclotron) and detectors (general principles of ionisation and deflection only)	Red	Amber	Green
Derive and use the equation $r = p/BQ$ for a charged particle in a magnetic field	Red	Amber	Green
Apply conservation of charge, energy and momentum to interactions between particles and interpret particle tracks	Red	Amber	Green
Use the equation $\Delta E = c^2 \Delta m$ in situations involving the creation and annihilation of matter and antimatter particles	Red	Amber	Green
Use *MeV* and *GeV* (energy) and MeV/c^2, GeV/c^2 (mass) and convert between these and SI units	Red	Amber	Green
Describe situations in which the relativistic increase in particle lifetime is significant	Red	Amber	Green
Recall what the following standard quark-lepton model particles can be classified as: baryons, mesons, leptons and photons	Red	Amber	Green
Recall the symmetry of the model predicted the top quark	Red	Amber	Green
Recall that every particle has a corresponding antiparticle and be able to use the properties of a particle to deduce the properties of its antiparticle and vice versa	Red	Amber	Green
Describe how to use laws of conservation of charge, baryon number and lepton number to determine whether a particle interaction is possible	Red	Amber	Green
Write and interpret particle equations given the relevant particle symbols	Red	Amber	Green

Oscillations

Recall that the condition for simple harmonic motion is $F = -kx$, and explain how to identify situations in which simple harmonic motion will occur	Red	Amber	Green
Use the equations $a = -\omega^2 x$, $x = A\cos \omega t$, $v = -A \omega \sin \omega t$, $a = -A \omega^2 \cos \omega t$, *and* $T = 1/f = 2\pi/\omega$ and $\omega = 2\pi f$ as applied to a simple harmonic oscillator	Red	Amber	Green
Use equations for a simple harmonic oscillator $T = 2\pi \sqrt{(m/k)}$, and a simple pendulum $T = 2\pi \sqrt{(l/g)}$	Red	Amber	Green
Draw and interpret a displacement–time graph for an object oscillating and know that the gradient at a point gives the velocity at that point	Red	Amber	Green
Draw and interpret a velocity–time graph for an oscillating object and know that the gradient at a point gives the acceleration at that point	Red	Amber	Green
Explain what is meant by *resonance*	Red	Amber	Green
CORE PRACTICAL 16: Determine the value of an unknown mass using the resonant frequencies of the oscillation of known masses	Red	Amber	Green
Explain how to apply conservation of energy to damped and undamped oscillating systems	Red	Amber	Green
Explain the distinction between free and forced oscillations	Red	Amber	Green
Explain how the amplitude of a forced oscillation changes at and around the natural frequency of a system and know, qualitatively, how damping affects resonance	Red	Amber	Green
Explain how damping and the plastic deformation of ductile materials reduce the amplitude of oscillation	Red	Amber	Green